MAYES' MIDWIFERY

A Textbook for Midwives

EIGHTH EDITION

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PART ONE
THE FAMILY AND SOCIETY

1. THE FAMILY AND SOCIETY

We live today in a climate of social and economic change, within a society that has evolved slowly over thousands of years until this present century. Today, the rate of change is faster than at any time in man's history. In 1900 man was still travelling by pony and trap, today advancing technology has taken him to the moon. Great scientific advance brings many advantages, but it also imposes stress, the like of which has never occurred before.

The average income is greater than ever before, the standard of living in a western society is higher than could have been expected 30 years ago. But on the debit side a man may have to be retrained in his profession two, or even three times in a lifetime. This brings strain and insecurity.

Society is more than a mere aggregate of human beings, it is composed of people with differing roles, with obligations towards others and a right to expect certain behaviour from them. There must be a network of recognized obligations and expectations otherwise society would dissolve into chaos. Society and its standards are changing, a man's social position has many facets, he is a son, a father, a husband, a worker, he may belong to a trade union or professional organization, but he knows what to expect of others and what they require of him. He has a point of reference, he recognizes what is socially acceptable and conforms to it. If he rejects society's behaviour patterns he is classed as insane, a criminal, or an antisocial 'drop out' rejected by society.

Today the patterns of behaviour are altering, the points of reference are not as clear as they were, and man finds problems which he feels unable to solve. He seeks for new behaviour patterns with new points of reference, and then finds that these are not acceptable to certain groups with which he comes in contact; for example the kind of situation which is currently known as the 'generation gap'.

We live also in a multi-racial society. The patients who come into our care come from varied backgrounds and different cultural patterns, some cannot speak or understand our language. The midwife

and health visitor must try to know and understand the special needs of such women. They must remember that 'although it is different, it is not necessarily wrong', a very difficult lesson to learn.

The various peoples all approach pregnancy and childbirth in different ways. The Chinese for instance are products of an extended family where four and sometimes five generations have lived together in one house. They are a strongly patriarchal society and the father is the undisputed head of the house, and the supreme authority. Imagine the problems of young students in this country expecting their first baby, without the large family to support them and without the paternal authority.

The West Africans may be more used to our way of life, but some things come less easily to them. They take great responsibility for their ageing parents, and quite a part of their income may be sent home to those in need. Similarly they find our way of talking about illness strange, and there may be an inaccurate history as they will be ashamed to admit they have had diseases such as tuberculosis, as this carries a social stigma at home.

Many societies allow polygamy, a man may have several wives and amongst the Moslems this is legal. Those who have come to western countries tend to accept our way of life having only one wife, but often they try to keep the women segregated by not permitting them to learn English, this poses many problems in communication.

The midwife cannot possibly know all the customs of these countries but she should endeavour to gain knowledge of the backgrounds of the cultures she most commonly meets. In many local authorities there is a Community Relations Officer who would be very happy to give help and advice.

The Family

If we study the lower animals, there seems to be a grouping which can be called a family, birds after pairing take a share in building the nest, hatching and caring for the young until they are capable of looking after themselves. Mammals vary, some carnivora provide for and protect their families, others fail to provide this protection which normal family organization would demand. Without protection by the female the offspring would become the prey of the male. As we ascend the evolutionary scale, the care approaches that of man. The great apes particularly the gorillas, move in groups of females and one male. The male builds a nest and then sleeps at the foot of the tree to protect the females and their young.

Family life in the animal kingdom is confined to the provision of

the needs of the female, and providing protection for her and her young.

Primitive man went a step farther, his function was to protect the female, supply her habitation and her food. This he did either by agricultural labour or more usually by hunting. The female sometimes shared work in the fields but her main role was in the home, collecting fuel, making pots, cooking food, weaving and generally caring for the children.

From these beginnings our sophisticated modern society has evolved. Before the two world wars the husband was still the provider and protector. He worked to provide food and habitation for his family, while his wife cared for home and children. Since the wars, when women went to work in the factories to release men for the forces the culture pattern has changed. In part it was due to the war, but mainly due to the emancipation of women, their recognition of the need of something more than just being at home, and most important of all the need for the money they could earn.

What is a Family?

The family is practically the only social grouping of its kind found throughout the world. It can be described as a collection of individuals living together each with strengths and weaknesses; a small group in constant interaction with each other which may or may not result in disharmony and imbalance.

The family as we tend to know it, husband, wife and children is a nuclear, conjugal or elementary family, a small residential group or single economic unit, a unit for rearing children. In other cultures the conjugal family may be part of a larger joint or extended family.

The main function of the family in every society is the legitimization of children by marriage or whatever kind of union is socially recognized as being accepted and proper. In West Indian culture for instance, there are very stable unions without Christian marriage as we know it, which are accepted and proper.

Changes in society today lead to questioning the traditional role of the family. Is the family really necessary? On one hand we have the family, with only one parent, this includes the unsupported mother and children of separated and divorced parents. On the other, the communes and kibbutzim where life is communal and the responsibility or rearing of children is accepted by the group and not the individual parents.

In the past, families were large, parent–child relationships were direct. There was a reference group for accepted behaviour in the parents and grandparents, ethics and morals were apparent on every

hand. Work relationships and family life were integrated. The skills of the father were passed on to the son and even the grandfather understood the technology of the grandchildren.

In the present day with vast new urban areas, reference groups have almost disappeared, the wider family is dispersed and the small family unit becomes submerged in an urban society. The gap between parents and children, let alone grandparents and grandchildren has widened. The rapid advances of technological change makes it difficult if not impossible for past generations to understand the methods of today. This begins in the school, methods of teaching having changed, parents cannot help with homework as they do not understand for instance the modern mathematics. Liberal studies have replaced the three 'Rs' (reading, writing and arithmetic) and often the child is more literate than the parent and this leads to a breakdown in communication.

Sit in the bus in a low income area and listen to the conversation. 'Where are we going Mum?' 'Out'. 'Can we play?' 'No'. 'Why not?' 'Because I say so.' Then try to imagine this conversation in a more educated area. 'Where are we going Mum?' 'To the park.' 'Can we play?' 'Not today I'm afraid.' 'Why not?' 'It's been raining and you will get rather wet, but we could feed the ducks.'

The quality of communication is different, the monosyllable has become sentences and the child learns to listen to a string of words and extend his knowledge and vocabulary. This happens at school and on television, and nowadays the ability of the child to converse is often beyond his less educated parent. This frustrates the child, who cannot share his experiences with his parents, and equally frustrates the parents, who either withdraw and become very busy getting the tea or washing up, or make some angry comment about all this book knowledge not teaching the meaning of honest work.

This superficiality in the home has resulted in many instances in the teenager narrowing their reference groups to those of their own age with whom they can communicate more readily. Traditional leaders, parents, teachers, clergy and so on are rejected. Greater earning power, the pressure of advertising and easier transport have extended the geographical boundaries and they can get away from retraining influences to places where people do not know them. The extreme manifestation of this is the tearaway group bent on violence and wilful destruction.

This lack of communication and lack of social reference points goes right across society, and this not only affects the family life of today but it influences that of tomorrow.

These alterations in the social climate have a special relevance to antenatal care and parental roles. The midwife needs an under-

standing of these factors in order to help and support her patients. In the past the young woman could take her problems to her mother or an older female relative.

Nowadays most wives work and the start of a family brings problems. The weekly income will diminish and the expenses will increase. If after a time she can return to work, the baby will have to be cared for. In the towns newly married couples tend to live in flats, often in large blocks in areas where employment is high. This may mean setting up home in an area far removed from the family homes of both of them. Families are not on hand to help them when they are needed.

The young pregnant woman cannot 'pop around the corner to Mum' to get the help and advice she needs. Once the baby arrives there is no one to share problems with or to look after the baby for a few hours, and this brings added strains. The couple's friends are their own age and unlikely to be able to help with problems.

In blocks of flats, the neighbours may be quite unknown, there is nothing like a back garden or back yard for encouraging talk, and someone who could and would help knows nothing about the problem.

The midwife has a great opportunity to help these families. First of all in the antenatal clinic, there is a chance for the young expectant mothers to meet together. After the baby arrives the midwife, with her health visitor colleague can encourage them to attend the child health clinics, here they meet other mothers, many with more than one child, who are willing to chat to them. The health visitor as she visits blocks of flats may be able to introduce young mothers to each other, and possibly to older women in the block that she knows. Mothers Clubs are thriving in many areas and these give opportunities for young mothers to meet together. Pre-school play groups not only benefit the children but they give the mothers new social contacts as well as a few hours freedom for other things. All these help to make up for the loss of the extended family. The midwife however, is in a unique position, if she gains the confidence of the parents during the antenatal period they may confide their anxieties to her and she can begin to give help. The midwife must be receptive to the parents at all times, otherwise she may miss some vital information that would make her aware of their needs. She would do well to enquire carefully into the social background of all young primigravidae who attend the antenatal department.

2. SOCIAL ASPECTS OF ABORTION

One of the great concerns at the present time is the subject of therapeutic abortion.

The Abortion Act of 1967

Allows a therapeutic abortion to be performed if two registered medical practitioners are of the opinion that:

1. The continuance of pregnancy would involve risk of injury either to the physical or mental health of a pregnant woman or any existing children of her family, greater than if pregnancy were terminated.
2. There is a substantial risk that if the child were born it would suffer from such physical or mental abnormalities as to be seriously handicapped.

Doctors are obliged to notify terminations of pregnancy, but are allowed to refuse to advocate or take part in such a procedure on moral or conscientious grounds.

The moral issues are profound and each doctor and midwife must act according to their conscience.

There are, however, certain irrefutable facts: in the early 1960s before the Act the number of therapeutic abortions were about 2000 per year; in 1970 there were 83851, and the early quarters of 1971 suggest the figure will be over 100000. Of these, 20 per cent of the patients will be under 20 years of age and 2 per cent under 16 years of age.

Everyone would agree that we do not wish to bring unwanted children into an already overcrowded world, but the question must be asked, is this the right way?

Family planning is a much wider concept than just the use of contraceptive devices. It is a conscious awareness of the social needs of the family, the community and the world. Today, 5 per cent of all the

people who have ever lived are alive today and at the present rate of growth the earth will be unable to feed them. Limitation of family size seems not only desirable but a necessity and this is why the midwife and everyone concerned with health and social welfare must have an intelligent understanding of the problem.

It is every woman's right to be able to space her family and limit the number in the way she desires, and it is for the family to determine what is the right number for them. The midwife needs to be able to give information and advice when it is needed and the practical aspects are discussed on page 384

3. THE UNSUPPORTED MOTHER

The unsupported mother poses a serious social problem. This group includes the widow, the woman separated or divorced from her husband, and the unmarried woman. They have many problems in common, but each group has its own special problems.

The Widow

The widow faces loss of status, where perhaps she led a full social life in the past, invitations for her and her husband are not extended to her alone. Friends and relatives rally round when the husband first dies, but when the shock and numbness wears off, they have ceased visiting and the widow finds herself lonely and isolated in her own home. For the pregnant widow the problem is magnified, she has no one with whom to share her worries and this tends to make her introspective. The midwife can do a great deal to encourage her to go out and meet people, and to attend the antenatal classes where she will meet other mothers.

The Divorced or Separated Woman

With this group there may be two problems. The expected baby may be illegitimate and even the cause of the separation. Or the wife may be the so called 'injured party'. In either case especially if there are other children there will be the worry of who is to be granted custody of the children. The pregnant woman is always psychologically upset and these added problems may make her more depressed than usual. The medical social worker will give what help and support she can, and the midwife needs to be sympathetic and understanding.

The Unmarried Woman

The unmarried woman has the greatest problems of all, and she is

often without a home and financial support and faces the social stigma of being an unmarried mother. Many of them move away from home before the pregnancy becomes obvious to seek the anonymity of a large town. This move is reflected in the illegitimacy rates. The national average is about 8·2 per cent but in large towns such as London the figure is nearer 15 per cent, almost double.

The majority of these women are in the younger age group between 20 and 30 years, although there is a distressing increase in the number under 20 years, and even under 16 years. Once away from home there are two major problems, to find a home and to find employment. Accommodation in large towns is expensive and of the bed-sitter type. Most landladies have objections to pregnant girls and will ask them to leave once the pregnancy is obvious. Employment may be easier, depending on previous training and experience.

Many of them fail to see a doctor or attend a clinic until late on in pregnancy, and they have suffered irreparable mental trauma before anyone can help them.

The midwife must give these women sympathetic understanding and concrete advice. It is she who often discovers in the course of the booking interview that the woman is not married, and right away she can begin to help. Together with her colleague, the medical social worker, and the patient they can explore the help that is needed and begin to make plans, however tenuous, for the future. The National Council for the Unmarried Mother and her Child may be asked to help.

Satisfactory medical care is no problem: the unmarried woman is entitled to just the same care as the married one and this can be arranged. The only problem here is time to attend the clinic without revealing the pregnancy to the employer at this stage. To this end, and to help unmarried working girls, some hospitals and local authorities arrange evening sessions.

Living accommodation may be the next problem, lodgings may be found that will suffice until the latter part of pregnancy, but later she may need to stay in a Mother and Baby Home. Some of these are run by voluntary organizations and others by the local health authorities. The usual length of stay is about 6 weeks before the birth of the baby and 6 weeks after.

The ideal solution in most cases would be for the girl to return home, and the Social Workers often play a great part in helping to bring this about. The girl is often afraid to tell her parents that she is pregnant and if this can be done, they will rally round and give all the help and support needed. It should be remembered that they too may need support and help depending on their own views of the situation. In other cases the girl may have been rejected by her parents and

turned out of the parental home. Sometimes when the initial shock wears off the parents can be persuaded to change their minds and have their daughter home. Other parents remain quite inflexible in their attitude and will give no help at all.

Whatever her personal views and beliefs the midwife must never set herself up in judgment and the patient must never be made to feel condemned. With the changes in moral and social climate the social stigma attached to being an unmarried mother is much less and by some a totally acceptable way of life.

The patient is usually delivered in hospital, and afterwards comes the task of deciding on the future for the baby. Discussions will have taken place before the birth as to the various possibilities, but the mother should be discouraged from making too final a decision at that stage. The decision must rest with the mother and she should be given the facts and allowed to make up her own mind. Clearly she will have to support the baby if she keeps him, and some means must be found to allow her to do this. If she can care for him at night the child minders or a day nursery could be used.

Child Minders

The grandparents or a near relative may take the girl into their home and look after the baby during the day. This has much to commend it if it can be arranged. Alternatively, the baby can be left with a child minder, preferably one registered with the local authority, for the period the mother is working. The registered minder takes the child into her own home, and cares for him during the day. She is paid by the local authority who make a charge to the mother for this service. This method of payment is a safeguard for the child minder.

Day Nurseries

These are run by local authorities who will give her priority over the married working mother. The nurseries have a professional person, a state registered nurse or nursery nurse, in charge. The child is cared for during the day, and most are open from about 08.00 until 18.00 hours. Older children are given breakfast when they arrive and then other meals.

If the mother feels she cannot care for the child at night, a foster mother or a residential nursery could be considered.

Foster Mothers

These are also registered with the local authority and paid by them.

The foster mother takes the child to live in her home. The natural mother can visit and take him out when she wishes. It provides a stable environment for the child, but may be very harrowing for the mother.

Residential Nurseries

These are good, but insufficient are available and if the period of stay is too long the baby becomes institutionalized.

The Father

If the father is known, she may be able to come to an agreement with him so that he contributes to the maintenance of his child. Or, if evidence that he has admitted paternity is available, she can apply to the Court for an affiliation order whereby he is required to pay up to £2.50 weekly towards the cost of maintaining the child. In the latter case it is often difficult to obtain the money despite the Court order.

Another solution that is sometimes accepted is that the couple should marry. If this had been planned anyway it may be the best solution. If not, it will probably be disastrous not only for the parents but for the unwanted child, and is a course best not advised.

Adoption

The most final solution is adoption, many mothers feel this gives the baby the best opportunity and because of this they are willing to give him up. No adoption proceedings can be begun for 6 weeks, until the mother has recovered from childbirth and can make a reasoned judgment. The baby can be placed in a foster home prior to adoption. Arrangements are made by the Children's Officer or an adoption society, and the midwife should be very careful not to get herself involved in the negotiations. The final adoption papers cannot be signed until the baby has been with the adoptive parents for 3 months and during that time the natural mother can take him back (see Adoption Act' page 26).

Finance

All the unsupported mothers are likely to have financial difficulties. The widow will have a widow's pension and possibly family allowances; the divorcee may have no income at all; the unmarried woman will be entitled to benefits on her own insurance. They are all

entitled to the Maternity Grant and depending on circumstances the Maternity Allowance (page 25). Supplementary benefits may also be obtained, if necessary, on application to the Department of Health and Social Security.

All unsupported mothers have psychological needs that cannot be met by their husband, and the love and security of a home is missing. Some are fortunate and find a substitute in those around, others experience an untold loneliness and despair.

4. CENTRAL AND LOCAL GOVERNMENT

A democratic country is governed by a Parliament chosen by the people, the electors in each constituency having returned to Parliament the member of their choice.

The Prime Minister, who has been elected by his party as its leader, chooses his cabinet and other ministers, each to be at the head of a particular ministry or department.

The Department of Health and Social Security is the government department which administers most, but not all, of the legislation concerning the health of the people. Since its creation in 1919 the Department's work and responsibility has increased, at first, gradually, but, since the passing of the National Health Service Act in 1946, much more rapidly and extensively. At its head is the Secretary of State for Health and Social Services, who is assisted by a Minister for Health, a Minister for Social Services, a Permanent Secretary (who is not a politician) and numerous civil servants. There is a medical section with a Chief Medical Officer and various medical specialists. A nursing section with a Chief Nursing Officer with a staff of Nursing Officers and a Midwifery Officer.

Other government departments have certain responsibilities related to the health of the public. Thus, the Home Office undertakes the administration of the Controlled Drugs Acts and the Children Acts; the Department of the Environment, being responsible for housing, deals also with water supplies and sewage disposal; the health of school children and the care of handicapped children are largely the responsibility of the Department of Education and Science; the Department of Health and Social Security deals with the whole of the country's social insurance, including maternity benefits; and the purity and cleanliness of food is the concern of the Ministry of Agriculture, Fisheries and Food.

The lives of all of us in this country are largely regulated by Acts of Parliament. An Act of Parliament is first presented to the House of Commons in the form of a Bill. It is discussed and in some cases

rejected. If the Bill is accepted it may be amended and have clauses added to it. The Bill passes through a first, second and a third reading in the House of Commons. It is then passed to the House of Lords from where, if approved, it is passed to the Sovereign and receives the royal sanction. It then becomes an Act of Parliament, and is statutory, i.e. enforceable in a court of justice.

Types of Act

The majority of Acts of Parliament are public Acts which affect the general law and the whole community. Public Acts follow the introduction of a public Bill by a Minister of the Crown on behalf of the Government. Measures relating to health are introduced by the Secretary of State for Health and Social Service. Before the introduction of a Bill the Minister may publish to the House a White Paper, setting out the lines of the proposed legislation. The White Paper may embody the views of a committee of experts and interested persons. The Beveridge Committee Report was the origin of the National Insurance Act.

A public Act may be an Adoptive Act, that is, it does not become operative until adopted by a local authority, but once adopted becomes legally binding. The Notification of Births Act 1907 was at first adopted by only certain County Boroughs. It was so clearly valuable in promoting child welfare that in 1915 it became a compulsory Act.

The Secretary of State for Health and Social Services is the central authority responsible for the appointment of, and lays down the regulations for the training of, such persons as health visitors, school nurses, Public Health inspectors, and other persons who work in the public health departments of the various local authorities. By virtue of the National Health Service Act, the Secretary of State for Health and Social Service is also responsible for some aspects of the care of the school child, e.g. hospital care and ophthalmic care, but the local Education Committee, and therefore the Secretary of State for Education and Science is largely responsible for the care of children.

The laws of this country relating to public health are contained in Acts of Parliament, in regulations and orders made under these Acts, and in the bye-laws of local authorities. The regulations and orders made under an Act are called Statutory Instruments.

Bye-laws can be made by a local authority, those relating to health being sanctioned by the Secretary of State for Health and Social Services, to deal with matters concerning the local authority which are not provided for by a Statutory Act. Bye-laws must be well adver-

tised in the district to which they apply, and penalties for breaches of them must be laid down.

A *Memorandum* is issued from the Central Authority (Department of Health and Social Security) in the form of a letter to the local authorities and may explain some new Act or give certain advice.

Statutory Instruments are issued by the Central Authority and are official instructions based on some statute, e.g. the Midwives Act 1951, and have the same force as Acts of Parliament.

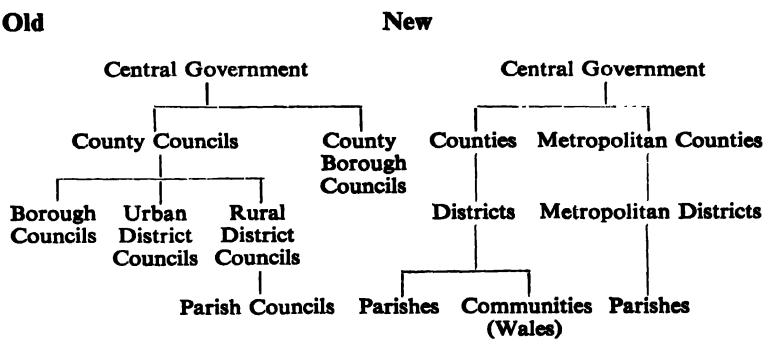
Local Government

The Local Government Act 1972 came into effect on the 1st April 1974, with it reorganisation which involved change in the size, name and status of local authorities.

A *Local Authority* is a representative council elected by the votes of the people in the area controlled by it. This council acts through committees in the administration of public services in its own area and is responsible for local government.

Thd Local Authorities are:

County Councils
District Councils
Parish Councils
Metropolitan County Councils
Metropolitan District Councils



County Councils. There are 47 county councils, each responsible for major services. These include:

The provision of nursery, primary and secondary education; the award of student grants; further education and the education of the handicapped child.

The provision of homes and hostels, residential homes for children in care.

The management of the home help services.

The provision and management of local authority housing, land development, rent assessment.

Consumer protection, police and fire services.

Metropolitan County Councils. There are 6 in all including London, Liverpool and Birmingham. These are responsible for similar services to the county councils in these large urban conurbations.

District Councils. There are 333 which control any services which are more effectively run at a local level:

Local planning for housing, industry and open spaces.

The running of local authority and the responsibility for housing the homeless.

Environmental health which includes food safety and hygiene, refuse collection and disposal, inspection of shops, factories and offices, the provision of public lavatories.

Metropolitan District Councils. There are 36 which are responsible for a similar service to the District Councils, and they have in addition certain responsibilities normally undertaken by the county councils such as education and personal social services.

Parish Councils (Community Councils in Wales). Their work has not yet been fully defined but will deal only with local matters.

Changes include

The transfer of the family practitioner service, health visiting, midwifery, preventative medicine, the immunization programmes, family planning, provision of health centres, school medical and dental services and ambulance services to the *new health authorities.* The local authority medical officer ceases to exist and his role is assumed by the *community physician* employed by the National Health Service. The provision of water supplies, conservation in general, the prevention of river pollution, sewage disposal and land drainage are by the *National Water Council.* This council will have regional bodies responsible to it for the provision of these services.

Working Party on Collaboration

A working party was set up to advise on collaboration between the

new local authorities and the new health authorities in the fields of environmental health, personal and social services and education.

Services of the Local Authorities

The Local Authority still deals with some areas affecting health which cannot be dealt with by the individual. Some of its functions are to:

1. Watch the milk supply, to look out for the adulteration of foods, and to prosecute when necessary.
2. Inspect bakeries, slaughter-houses, dairies and cowsheds, and to enforce bye-laws for their control.
3. Inspect lodging houses and canal boats.
4. Enforce bye-laws respecting the spreading of disease; also to provide disinfecting and cleansing stations.
5. Provide adequate housing and to make and repair roads.
6. Provide for the watering and cleansing of the streets.
7. Provide and maintain public parks.
8. Collect refuse and provide for its disposal.
9. Provide a sewerage system.
10. Attend to nuisances in all forms. In Common Law a nuisance is anything which worketh hurt, inconvenience or damage to anyone.

The financing of local authority services. The revenue to pay for these services is obtained from three sources:

1. The rates. Rates are levied over the area of a local authority, the amount depending on its expenditure.
2. Exchequer grants for specific purposes, such as education, housing.
3. Block grants towards general expenses granted by the Government.

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5. THE NATIONAL HEALTH SERVICE

In 1946 the National Health Service Act was passed and became operative in 1948. This Act was supplemented by four other acts which together form the social security measures which provide security and care for all classes of the community irrespective of class, age and income group.

At the head of the service is the Secretary of State for Health and Social Services advised by a Central Health Services Council and various advisory standing committees. For the purposes of administering the National Health Service Act, the population was catered for in the following ways:

A hospital or specialist service is administered by fifteen regional hospital boards and by the boards of governors of the teaching hospitals.

A local health service is administered by local health authorities, whose areas conform to those of the administrative county, the county borough or the London Borough.

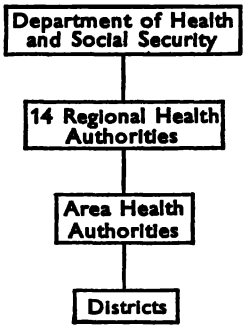
A local medical, pharmaceutical, dental and ophthalmic service is administered by local executive councils, each of which covers the area of the local health authority.

This has now been superseded by The National Health Service Reorganisation Act.

The National Health Service Reorganisation Act 1973 enables the existing service by hospitals, general practitioners and local authorities to be integrated under a single management. Up to this time they have been administered and financed separately which has led to difficulties in effective patient care.

The new reorganisation has been brought into line with the new Local Government structure and has been in operation since the 1st April 1974. The aim of a unified service is to bring together all health care services so that the needs of a community can be assessed and the service planned accordingly.

The New Structure



Regional Health Authority

There are 14 Regional Health Authorities covering geographic areas very similar to the past Regional Hospital Boards. Each Authority has a salaried chairman appointed by the Secretary of State and members who work in a voluntary part time capacity.

The Regional Authority has five salaried officers, professionally qualified who will assist in planning and monitoring the service.

Regional Officers

- Regional Administrator
- Regional Medical Officer
- Regional Nursing Officer
- Regional Treasurer
- Regional Works Officer

Area Health Authority

Each region will be divided into a number of Area Health Authorities corresponding with the County and Metropolitan District boundaries. Greater London has 16 Area Health Authorities, most consisting of one or two London boroughs.

The members of the Area Health Authority will be part time and will be concerned with policy making and planning. There will be four salaried officers, professionally qualified who will coordinate the service within the area.

Area Officers

- Area Administrator
- Area Medical Officer
- Area Nursing Officer
- Area Treasurer

District Management Team

A district is the basic unit of the integrated health service. It serves a population of between 250,000 and 300,000. The management team has four salaried officers

District Administrator
District Community Physician
District Nursing Officer
District Finance Officer

and two representatives of the District Medical Committee—in most cases a hospital consultant and a general practitioner. These six members have an equal status and their decisions will be reached by mutual agreement.

Each member of the team has an individual responsibility to the Area Health Authority and they have a joint responsibility to manage the district and provide the health care required.

Health Care Planning Teams

These have to be established within the district in order to identify the needs of the community and to plan the necessary services. The permanent teams include

Elderly
Children
Maternity
Mentally handicapped
Mentally ill

The *Maternity Health Care Team* is of particular interest to the midwife, it will undertake the integration of the existing hospital and domiciliary service and plan for the future. It replaces the Maternity Liason Committee.

The Community Physician

The District Community Physician will be a specialist in community medicine and as a member of the District Management Team he will be able to assess the priority needs of the community and act as a link with the clinicians and the local authority.

He will have responsibility for preventative medicine such as vaccination and immunization, and for health education. He will also be involved with the School Health Service and act as an advisor to the Department of Social Services.

Community Health Councils

Community Health Councils are to be set up in each District.

Members will be nominated by the District Council, the Regional Health Authority and one third of the total by local voluntary bodies. The Community Health Councils are the representatives of the local community and they will express to the Area Health Authority the views of the consumer on the needs and defects of the service provided.

Changes in responsibility

Many services of special relevance to the midwife were previously supplied by the local health authority, but following reorganisation other agencies have assumed responsibility.

1. The Local Supervising Authority referred to in the rules of the Central Midwives Board becomes the responsibility of the Area Health Authority.
2. The provision of adequate hospital and domiciliary care is the responsibility of the District Management Team.
3. The home nursing service and the bathing attendants are the responsibility of the District Management Team.
4. The home help service will be provided by the County Council or Metropolitan District Council as appropriate. This is not a free service and each household is assessed on its ability to pay the full cost of the help. Domestic help is provided for families in need through sickness, or if the mother is having a baby, either in hospital or at home. Unfortunately, not many areas are able to obtain as many home helps as they need.
5. Health visiting is administered by the Area Health Authority. The health visitor undertakes a great deal of maternity and child welfare work. All children under 5 years of age are her particular province, but she may undertake certain duties concerned with the health of the school child and with social and educational work of the household as a whole.
6. Ambulance services are provided by the Regional Health Authority.
7. Infant welfare is the responsibility of the Area Health Authority.

Immunization. Immunization of children has reduced the number of notified cases of diphtheria from over 50 000, with 2 480 deaths in 1940 to twenty with no deaths in 1964. Diphtheria immunization may be combined with immunization against tetanus and whooping cough by giving three injections of combined diphtheria–tetanus–pertussis prophylactic starting when the baby is about 3 months of age and a fourth 'boosting' injection at about 18 months. It is not compulsory, but is highly advisable. The Community Physician is responsible for ensuring such facilities are available.

Vaccination against smallpox. Although the National Health Service Act of 1946 abolished compulsory vaccination, the Community Physician must ensure such a service is available if required. It is not however recommended for routine use.

Antipoliomyelitis vaccination. This is available for everyone up to the age of 40, including particularly expectant mothers, nurses, and doctors. The oral vaccine (Sabin type) which has been in use since 1962, is most effective.

BCG vaccination. This is given to babies born into families in which there is a case of open tuberculosis (that is, there are tubercule bacilli in the sputum). It may also be given to nurses or doctors exposed to infection if a Mantoux test is negative. A negative Mantoux test shows there has been no previous infection with tuberculosis and therefore no resistance to tuberculosis.

Day and residential nurseries. These are provided by the District Council for children under five years of age, whose mothers go out to work or are ill or are in any other way prevented from caring for their own children.

Health centres. Health centres come under the Area Health Authority, but the provision and running of health centres has not yet been possible in many areas. It is hoped, however, that in the future all clinics and their auxiliary services, with facilities for general practitioners to see patients, will be housed in a building, built and equipped for that purpose.

Payment under the National Health Service Act

In 1963 to 1964 the National Health Service cost more than £1000000000. Two-thirds of this enormous sum was paid by the Exchequer, the remainder being collected from rates, payments by persons using the service and National Health Service and Superannuation contributions.

At first all parts of the service were free, in that no payment was made when the service was used, although obviously the taxpayer, the ratepayer, and the National Health contributor all pay for the service. Small payments are made for certain appliances, and for dental treatment, but these are still free to old-age pensioners, and those receiving War Disability pensions or National Assistance, Dental treatment is free to expectant and nursing mothers, to all children under five and to children at school. Everybody is entitled to free medical

attention and hospital treatment. Hospitals may provide 'amenity' beds, for which a weekly charge is made, but individual rooms are only available when they are not needed for very ill patients. 'Private' beds are available at much greater cost.

Allied Social Legislation

National Insurance Act, 1946 and 1953

This Act is administered by the Ministry of National Insurance, through local offices in every area. The population falls into three categories:

1. Employed persons.
2. Self-employed persons.
3. Non-employed persons, e.g. housewives, schoolchildren.

Contributions are paid weekly, a certain proportion being paid by the employer in the case of category 1.

Payments are made under the following headings:

Maternity grant	Widowed mother's allowance
Maternity allowance	Guardian's allowance
Sickness benefit	Retirement pension
Widow's pension	Unemployment benefit
Widow's allowance	Death grant
Attendance allowance	

Maternity grant. This is a lump sum. If more than one child is born, additional grants can be claimed for each child born and living 12 hours after birth. It is payable either on a woman's own or her husband's contributions, but one or the other must have paid twenty-six contributions in the previous contribution year. This grant may be claimed 9 weeks before and not later than 3 months after the date of confinement.

Maternity allowance. This is paid on the contribution record of the mother herself; and is paid weekly for a period of 18 weeks, usually for 11 weeks before the expected date of the delivery, and for 7 weeks afterwards. It should be pointed out to any woman who hopes to claim this allowance, that she must have her card stamped, or a sickness note signed, if she has to stop work before the twenty-eighth week of pregnancy. The allowance should be claimed as soon as possible after the fourteenth week before the expected date of confinement. Ministry of National Insurance Leaflet N.I. 17A gives details of both benefits.

National Assistance Act, 1946

This Act provides for the care of the poor, the unemployed, the aged, the sick or disabled, who are in need of assistance, either financial or residential. Part of the Act is administered by the local authority through a welfare committee. This Act supersedes all other Acts for the care of the needy, e.g. the Poor Law Acts. Such items as the tuberculosis treatment allowances and the blind persons' allowances are paid through the area office of the National Assistance Board, but residential requirements are the responsibility of the local authorities.

Family Allowances Act, 1944 to 1959

No payment is made for the first child, but the mother may claim 90p weekly for the second and £1 weekly for the third and every subsequent child of school age. It is payable at a post office.

Children Act, 1948 and 1958

Following the report of the Curtis Committee set up by the Government to inquire into the care of children deprived of a normal home life, the Children Act was passed in 1948 and amended in 1958. It is administered by the local authority, which appoints a committee and a Children's Officer who is on the same administrative plane as the Community Physician. This Act makes provision for the care of any healthy normal child deprived of a normal life, and deals with the conditions under which children may be adopted, the care and supervision of foster children, and the care of children who have been brought up before the courts and have been sent to remand homes and approved schools. This Act aims at providing the best facilities for the child to develop his character and make the most of his abilities.

Adoption Act, 1958 and 1960

Legal adoption means that the persons adopting a child take the place of, and assume the duties and rights of the child's parents or legal guardian. Legal adoption requires an adoption order to be made by a Court of Law. The welfare of the child is the chief consideration of the Court, and every care is taken to determine that the adoption will be in the best interests of the child. The preliminary arrangements for adoption may be made by the Children's Officer appointed by the local authority or by a voluntary Adoption Society.

If the midwife is asked for advice by anyone wishing to adopt a child she should advise communication with one of the adoption societies. If the adoption of a child appears desirable she should advise that this should be arranged through an Adoption Society.

Other Important Acts of Parliament

The following Acts concerning public health have been passed from time to time:

Poor Law Act, 1601. This Act was amended in 1834, but many parts remained in force until the Local Government Act, 1930, was passed. In 1948 the National Assistance Act replaced the Poor Law Acts of previous years.

Vaccination Act, 1807 (and the Vaccination Order, 1930). This Act was repealed in 1946.

Public Health Act, 1875 *and* 1936. The 1936 Act contains the public health and sanitary code for England and Wales.

Notification of Births Act, 1907. Originally adoptive, it was made compulsory in 1915. Included in the Public Health Act, 1936, and amended by the National Health Act, 1946.

Registration of Births and Deaths Acts, 1874 *and* 1926.

Children Act, 1908; *Children and Young Persons Acts*, 1933, 1952, 1956, 1963. *Children Act*, 1948 *and* 1958.

Maternity and Child Welfare Act, 1918. This Act was repealed by, and its provisions are included in, the Public Health Act, 1936.

Midwives Act, 1902. This Act was amended in 1918, 1926, 1934, 1936, and 1950 and consolidated in 1951.

Family Allowances Act, 1944 *and* 1945.

National Health Service Act, 1946.

National Assistance Act, 1948.

National Insurance Act, 1946, amended in 1953.

National Insurance (Industrial Injuries) Act, 1946.

Health Services and Public Health Act, 1968.

Disabled Persons Act, 1970.

Important Organizations

The Royal College of Midwives

This began as the Midwives Institute and became the College of Midwives in 1941. In 1947 the College was granted its royal title.

The College is the professional and educational organization for midwives. It exists to ensure the wider education and efficiency of the midwife and to seek to improve her salary and conditions of service. It also provides legal aid and advice to members who find themselves in professional difficulties.

It is an information centre for the general public on matters pertaining to the profession, and it assists midwives visiting this country from abroad.

The International Confederation of Midwives

This is an international body of which the Royal College of Midwives is a member. The secretariat is at the present time in London and the secretary is an Englishwoman. The I.C.M. holds a conference triennially to bring the midwives of the world together. The last was held in Montreal in 1972.

The Central Midwives Board

The Central Midwives Board is a statutory body which is composed of persons elected from professional bodies associated with every angle of midwifery, obstetrics and public health—the Royal College of Midwives appoints four midwives—and of persons, including two midwives, appointed by the Ministry of Health.

The Central Midwives Board publishes the rules and regulations of its constitution. The first rules were published in 1902, when the first Midwives Act was passed.

The rules are divided into eight sections, A, B, C, D, E, F, G and H. The introduction to the rules explains each section clearly and should be read by all midwives. Section B sets out the requirements of training and contains the syllabus for pupil-midwives. Section E is of the greatest importance to all midwives since this section regulates, supervises and restricts within certain limits the practice of midwives. This section contains specific rules, and a schedule of compulsory forms and notices concerning a midwife's code of practice.

Rules: Section E. These are divided into three parts, each of which specifies the rules which are applicable to a midwife in the various circumstances of midwifery in which she may be working.

Part 1. These rules are applicable to all midwives. They specify the midwife's designation and her procedure when she changes her name or address; define terms used; require the midwife to notify her intentions to practice; and clarify treatment outside her province.

Part 2. This applies to midwives in domiciliary practice. It relates to

her work with doctors, her record-keeping, calling a doctor, disinfection, and rulings about deaths, and stillbirths.

Part 3. This is, in many respects, similar to Part 2, but relates to midwives practising in an institution which does not have a resident doctor.

Schedule to Section E. This gives copies of the forms which must be used in certain circumstances to notify the Local Supervising Authority:

1. Notification of intention to practise; in the case of a midwife being called upon to work in another area, both Local Supervising Authorities must be notified.
2. Sending for medical aid.
3. Notification of liability to be a source of infection.
4. Notification of death or stillbirth.

Notices: Whereas in previous editions of the rules, precise rules had been laid down concerning the techniques and personal conduct of midwives, these have been largely replaced by notices (not rules) which indicate to the midwife the standard she is expected to maintain, and also include the duties imposed on the midwife by statute.

It is essential that the midwife should know the rules thoroughly, and how to apply them in practice. Pupil-midwives should read and absorb them as part of their training so that they may be able to understand their duties to the mothers and babies under their care, and to know their relationship to the Central Midwives Board, the doctors with whom they work both in hospital and in domiciliary practice, and their employing authority.

Copies of the rules may be obtained from: Messrs Spottiswoode, Ballantyne & Co Ltd, Dorland House, 14 & 16 Lower Regent Street, London, S.W.1.

Useful Information

There are many organizations with which the midwife may from time to time have dealings. Among the most important are the following:

Statutory bodies:

Central Midwives Board.
Local Supervising Authority, i.e. the Area Health Authority.

Professional bodies:

Royal College of Midwives.
Royal College of Nursing.
Royal College of Obstetricians and Gynaecologists.

Voluntary bodies:

Women's Royal Voluntary Services.
Various adoption societies.
National Council for the Unmarried Mother and her Child.

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6. VITAL STATISTICS AND THE NOTIFICATION AND REGISTRATION OF BIRTHS

Vital Statistics

In vital statistics, facts about the population and events in their lives which concern their health and the incidence of disease are collected together for the purpose of comparison and research, with the object of improving health and eliminating disease. These facts are expressed in figures, which are given in rates per thousand of the population or of the particular group concerned.

Apart from the birth and death rates, the midwife's main interest is in the obstetric mortalities. These are:

The maternal mortality rate.
The stillbirth rate.
The neonatal mortality rate.
The perinatal mortality rate.

The infant mortality rate, which is a delicate index of the health of a nation, is also of interest.

Maternal Mortality Rate

The maternal mortality rate for any year is the number of deaths due to pregnancy and childbearing per thousand registered births. Abortions resulting in death are included, but assessed separately; deaths owing to disease associated with pregnancy, e.g. heart disease, are not included, though they may be reviewed at the same time.

The rate is calculated thus:

$$\frac{\text{Number of deaths due to pregnancy and childbearing} \times 1000}{\text{Total number of registered live births and stillbirths}}$$

During 1970 in England and Wales there were 155 maternal deaths,

and 784486 registered births. The maternal mortality rate was therefore: 0·19. Of these 155 maternal deaths 35 followed abortion.

From 1900 until 1935 the maternal mortality rate was very high, varying between 4 and 5 per thousand births, the commonest cause of death being puerperal sepsis. Other causes were haemorrhage, obstructed labour and eclampsia. Following the introduction in 1935 of the first of the sulphonamide drugs and in 1942 of penicillin, deaths from puerperal sepsis declined, at first with dramatic suddenness, and then more gradually.

Blood transfusion, though a life-saving procedure, was at one time a hazardous and complicated operation. Gradually it became safer and simpler, and blood banks were established, making blood more readily available, while more and more obstetric 'Flying Squads' were set up. Deaths from haemorrhage are thus fewer, oxytocic drugs such as ergometrine and Synometrine having contributed further to the safety of the third stage of labour.

The National Health Service provides complete maternity care for all childbearing women, patients are healthier and better nourished and housing and other social conditions steadily improve. Doctors

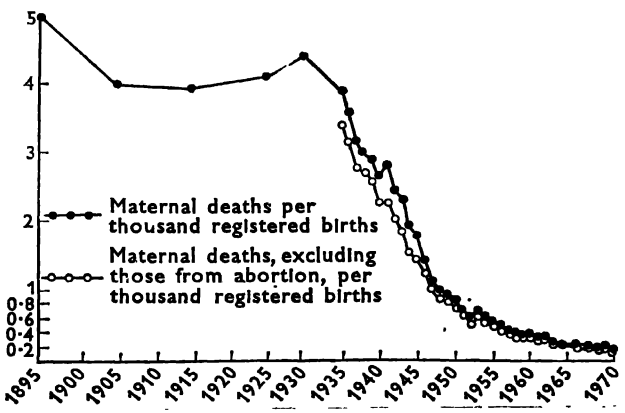

Fig. 1. Maternal mortality rate.

and midwives are better trained, they are supported by a substantial team of health workers of all kinds, and most patients receive good antenatal care. Deaths from eclampsia have declined, though toxaemia remains a serious problem. With more skilled delivery and safer Caesarean section, many of the disasters resulting from obstructed labour and ruptured uterus are now avoided.

Women with medical complications come under the joint care of

specialist physician and obstetrician, anaesthetics are better and safer in the hands of skilled anaesthetists; and hospital delivery, with an experienced obstetrician at hand, good X-ray and laboratory facilities, and blood transfusion readily available, is strongly recommended for all patients whose confinements may be anticipated to present special risks.

The report on *Confidential Enquiries into Maternal Deaths in England and Wales* (published in 1966) analysed 692 maternal deaths and 244 associated deaths occurring in more than 2 500 000 confinements in 1961, 1962 and 1963. The group of eminent obstetricians making the enquiry found that in nearly a third of the deaths there was an avoidable factor, either one of the attendants or the patient herself not having exercised due care. The principal causes of death were abortion, pulmonary embolus, toxaemia and haemorrhage.

With better health education, careful selection of patients for home or hospital confinement, and good collaboration between doctor, midwife and all the other members of the health team, it should be possible still further to reduce the maternal mortality rate.

Stillbirth Rate

By stillbirth is meant the birth, after the twenty-eighth week of pregnancy, of a child which did not breathe or show any other sign of life after being completely expelled from its mother. The figure for the stillbirth rate is given per thousand live and stillbirths:

$$\frac{\text{Number of stillbirths} \times 1000}{\text{Number of births (live and still)}}$$

No figures are available for the years before 1927 as stillbirths were not registered, but since figures were available the rate has decreased from 40 per thousand in 1940 to 13·0 in 1970 (provisional). There has been a gradual reduction in the number of stillbirths during the past few years (see Fig. 2).

Stillbirths are included in perinatal deaths, which are discussed below.

Neonatal Mortality and Infant Mortality Rates

The neonatal mortality rate is the number of deaths of babies within 4 weeks of birth per thousand live births. The infant mortality rate is the number of deaths of infants during the first year of life (including those occurring during the first 4 weeks) per thousand live births.

Although the infant mortality rate has declined greatly in the last

50 years, of the total number of deaths in the first year most still occur in the first 4 weeks of life. The majority of these neonatal deaths occur in the first few days after birth which closely relates the death of the baby to labour and delivery.

The infant morality rate for 1970 was 18·2, of which neonatal deaths accounted for 12·3.

During this century there has been a remarkable decline in infant deaths from 140 per thousand live births in 1900 to 18·2 per 1000 in

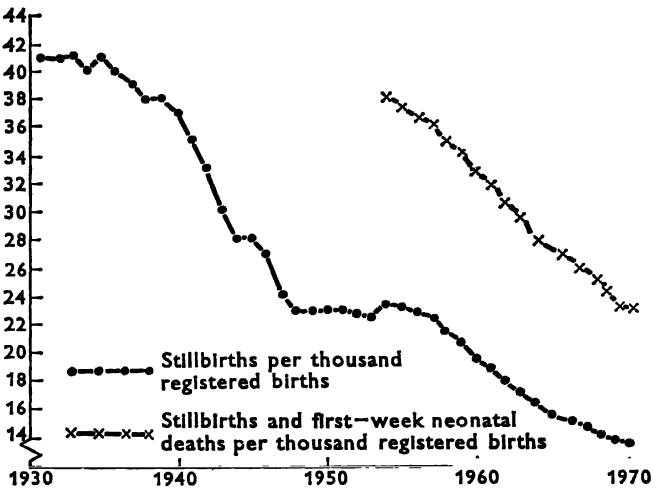

Fig. 2. Stillbirths and perinatal death rate.

1970. A glance at the accompanying graph (p. 36) will show how this applies especially to babies between 1 and 12 months old, and it is good evidence of the great improvement in the care of these babies.

In particular, deaths from infection have been greatly reduced. Better housing and sanitation are in part responsible for this. Cleaner milk and better artificial feeding has brought about an impressive fall in deaths from gastro-enteritis. Though the introduction of sulphonamide and antibiotic drugs has saved the lives of many babies who might have died from bronchitis or pneumonia, these respiratory tract infections, still a prominent cause of infant death, have not yet been conquered.

On the other hand, since diphtheria immunization was introduced, this disease, which used to kill thousands of children annually has now been almost wiped out, while pulmonary tuberculosis is now

recognized and treated, and young babies, who are specially vulnerable, are well protected.

The graph shows also how the neonatal mortality rate has declined more slowly, and it was this fact, together with, for some years, an almost stationary stillbirth rate, which focussed attention on the rate of the child around the time of birth. This led to additional emphasis on preventing perinatal deaths.

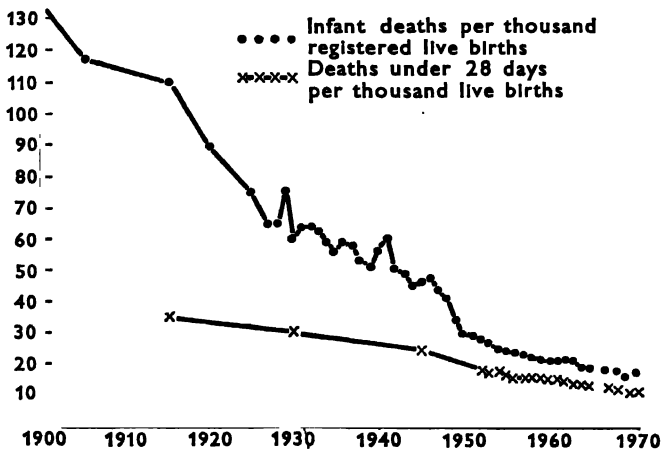

Fig. 3. Infant and neonatal mortality rate.

Perinatal Mortality Rate

This comprises all stillbirths and all deaths in the first week of life, per thousand registered births. The group includes all those children who have died 'around' the time of birth (*peri-* means around, and *natal*, birth).

In 1958 a nation-wide survey was carried out in an attempt to gain more knowledge of perinatal deaths, and thus to reduce the number. Since over 25000 such deaths were occurring each year, there was good reason for trying to save some of these babies.

As a result of this extensive investigation, in which midwives played an important part in collecting information, much valuable material was brought to light and embodied in a comprehensive and informative report which analyses fully all the many factors which might in some way influence the survival of the child.

In more than half of the deaths investigated, the child was

premature. Thus, it may appear, if we could avoid prematurity, many babies might be saved. However, among the known causes of premature labour, the commonest is pre-eclampsia, which remains the most baffling of all obstetric problems.

The principal cause of perinatal death was fetal anoxia or a neonatal asphyxial condition, often, of course, in a premature baby. This might be associated with antepartum haemorrhage, postmaturity, possibly prolonged labour and, again, the placental insufficiency of pre-eclampsia.

In one-fifth of the perinatal deaths a gross congenital malformation was found, anencephaly being the most common. Birth trauma and haemolytic disease of the newborn are responsible for a smaller number of perinatal deaths.

Social investigations showed that the better the social class of the mother, the less likely was she to lose her baby. Perinatal deaths were doubled in anaemic women and higher than average in primigravidae over 30 and in all women over 35. In these older women the proportion of congenital defects, particularly mongolism, was significantly higher.

It is clear that, while the perinatal mortality rate is gradually declining, much remains to be done. There is still scope for better antenatal care, especially in the early recognition and treatment of pre-eclampsia and anaemia. Care during labour should be safer for the fetus now the administration of nitrous oxide and oxygen, which the Central Midwives Board now sanctions for midwives' use, is more widespread. Hospital delivery is now advocated for all women over 35 and for those of high parity. This should give many babies a better chance, since, in addition to skilled delivery and resuscitation, they may receive after-care in a well equipped special care unit. In 1970 the perinatal mortality rate was 23·5.

These, and, in time, further improvements in the care of the mother and child, should lead to a continued reduction in the perinatal mortality rate.

Notification and Registration of Births

The Public Health Act, 1936, requires that the father, or any person in attendance at the birth or within 6 hours after, notify the birth to the medical officer of health of the local health authority, within 36 hours. In practice this duty is commonly undertaken by the midwife, who is supplied by the local health authority with printed cards and stamped envelopes.

All live births (even before the twenty-eighth week) and stillbirths must be notified.

Notification of Stillbirths

The midwife is required by the Central Midwives Board Rules to send to her Local Supervising Authority a notification that a stillbirth has occurred in her practice.

Registration of Births

All live births and stillbirths have to be registered within 42 days (6 weeks) of the birth of the baby by the registrar of the district in which the child was born. This is the responsibility of the child's parents. If the parents fail to register the birth, the duty falls on the occupier of the premises in which the birth took place, the midwife, or some other person of authority. A fee is payable for the certificate.

An illegitimate child is registered by the mother. The father's name can only be entered on the birth certificate if he accompanies the mother and requests that his name be entered.

A stillborn child must be registered before burial, and for this a certificate must be produced signed by a medical practitioner who was either present at the birth or examined the body afterwards, and who is prepared to certify that the child was not born alive. In the case of a child born before her arrival (B.B.A.) the midwife cannot say (unless this is a macerated fetus) whether or not the baby was alive at birth. She should then ask advice of the patient's doctor, the Registrar or the local coroner.

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PART TWO
OBSTETRIC ANATOMY AND THE FETUS

7. THE FEMALE PELVIS

The pelvic girdle is a strong bony ring which forms an essential part of the skeletal framework. In humans it supports, through the spinal column, the weight of the upper part of the body, and it transmits this weight to the lower limbs. It contains and protects the reproductive organs, as well as the bladder and rectum. It is through this bony ring, moreover, that the child must pass during birth, and to understand how this occurs the midwife should have a working knowledge of pelvic anatomy.

It is sometimes asked why human mothers have longer and more difficult labours than animals. It is partly because the upright posture of the human race has resulted in the development of a spine with four slight curves, and a pelvis in which the birth canal is distinctly curved. Most mammals have an almost straight spine and a cylindrical birth canal. The absence of a curve allows the young to be born comparatively easily. There is no cranium to be moulded or to cause prolonged labour. By contrast the human fetus has a large head, chiefly cranium, which has to adapt itself, sometimes by moulding to the mother's curved pelvis. Labour is thus more difficult mechanically, and more liable to complications. Furthermore the human brain is more highly developed and man has a greater awareness of pain, apprehension and fear. Many women approaching labour are apprehensive and fearful, and this state of mind can adversely affect uterine contractions, prolonging labour and increasing pain. Fortunately, with good antenatal preparation and understanding support during labour these affects can be minimized.

It is convenient first to consider the bones, joints and ligaments which together constitute the pelvic girdle, and then, much more important, to study the pelvis as a whole.

The Pelvic Bones

The pelvis is comprised of four bones;

The two innominate or unnamed bones.
Sacrum.
Coccyx.

The Innominate Bone

Each innominate bone is made up of three bones, the ilium, the ischium and the pubis. In childhood they are separated by cartilage; after the age of 20 to 25 years they are fused into one mass of bone.

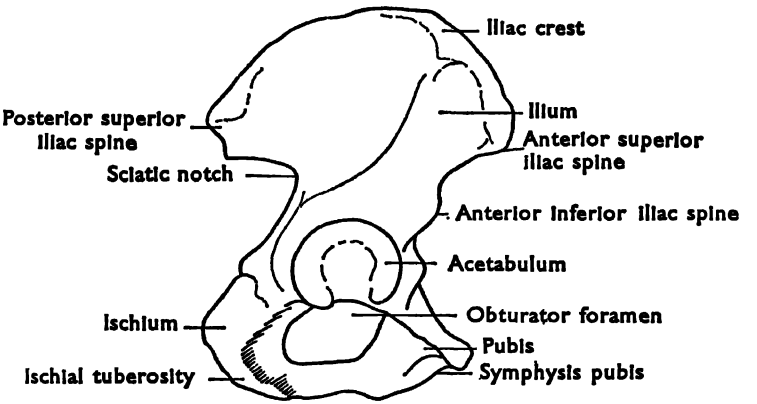

Fig 4. Right innominate bone: outer or lateral surface.

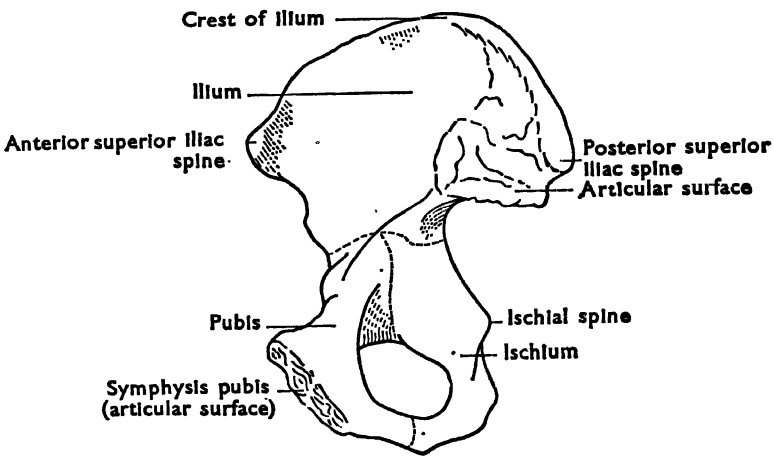

Fig. 5. Right innominate bone: inner or medial surface.

Ilium. The ilium is the upper expanded part. Its concave inner surface is the iliac fossa; its curved upper border is the iliac crest. This ends in

front at the anterior superior iliac spine, both spine and crest being palpable under the skin; at the back the crest ends at the posterior superior iliac spine. The two posterior spines are marked by two dimples. Below each anterior and posterior superior iliac spines lie the inferior iliac spines. Below the iliac fossa is a distinct ridge, the ilio-pectineal line, ending in front at a roughened swelling, the ilio-pectineal eminence, where ilium and pubis fuse. Below this, on the outer side of the innominate bone is a cup-shaped depression, the acetabulum, where the femur articulates, forming the hip joint; here the ilium fuses with both ischium and pubis.

Ischium. The ischium forms part of the acetabulum above, while below it forms a thick rounded mass, the ischial tuberosity. When in the sitting position, the body rests on the two ischial tuberosities. They can be palpated through the buttocks, and their distance apart can be assessed. A little above the tuberosity and directed backwards and slightly inwards is a sharp projection, the ischial spine. The two ischial spines can be palpated vaginally, and they afford important evidence of the size of the pelvic outlet. The ischial spine divides the greater from the lesser sciatic notch.

Pubis. The pubis is a small bone having a body and two rami. The upper ramus joins the ilium at the lio-pectineal eminence and the lower ramus fuses with the ramus of the ischium, forming the anterior boundary of the obturator foramen. The bodies of the two pubes meet at the symphysis pubis and form the apex of the pubic arch.

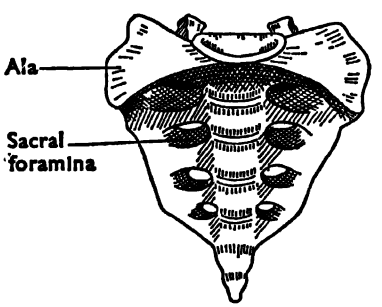

Fig. 6. The sacrum.

The Sacrum

The sacrum lies between the ilia and forms the back of the pelvis. It is a wedge-shaped bone consisting of five fused vertebrae, the first of

which has a prominent upper margin known as the sacral promontory. This, an important pelvic landmark, projects forwards, decreasing the true conjugate diameter, sometimes to a serious degree. The smooth concave anterior surface is called the hollow of the sacrum, and the areas on either side of the promontory are the alae or wings. The rough convex posterior surface is for the attachment of muscles. The sacrum is perforated by four sets of foramina through which pass the sacral nerves.

The Coccyx

The coccyx, the lowest part of the spine, is a small bone, lying below the sacrum. It consists of four fused rudimentary vertebrae.

The Pelvic Joints and Ligaments

Sacro-Iliac Joint

A slightly movable joint between the sacrum and ilium.

Symphysis Pubis

A cartilaginious joint between the two pubic bones.

Sacro-Coccygeal Joint

A hinge joint between the sacrum and coccyx which at the end of labour, allows the coccyx to move backwards facilitating delivery.

To fulfil its supporting function the pelvic girdle requires great strength and stability and the sacro-iliac joints are re-inforced by powerful ligaments. The symphysis pubis is similarly strengthened by ligaments and, ordinarily, these joints though not absolutely rigid, allow only limited movement of the bones.

In pregnancy, however, and rather more in labour, the ligaments are relaxed. This allows 'give' and where there is an element of disproportion it may be vitally important. On the other hand, it may create a feeling of instability in some women, and it is probably responsible for the low backache commonly experienced in late pregnancy and in the early puerperium.

Ligaments bridge certain spaces in the walls of the pelvis. The two sacro-tuberous ligaments extend from the sides of the sacrum to the ischial tuberosities, thus crossing the greater and lesser sciatic notches.

The sacro-spinous ligaments pass from the sides of the sacrum to the ischial spines, extending across the greater sciatic notches.

The Pelvis as a Whole

When the model pelvis is examined it is easily seen to be divided by a distinct bony ridge into a broad upper part and a smaller lower region. The upper division, the false pelvis, plays no part in the processes of labour, and is of little importance to the midwife. The lower part, the true pelvis, is, on the other hand, of the first importance, and will need to be considered in detail.

The true pelvis is bounded at the back by the sacrum, at the sides mainly by the ischia, and in front by the pubes. It thus forms a complete and practically unyielding ring of bone and, because the fetus must pass through this bony girdle to be born, its size, shape and anatomical landmarks should be studied carefully.

The true pelvis consists of a brim or inlet, the first part to be negotiated by the fetus; a curved cavity, which he traverses next; and an outlet through which he emerges during birth. Normally, the fetus is just able to pass through this bony canal, but should the pelvis be rather small or misshapen, or should the fetus be unusually large or presenting abnormally, his progress could become difficult or even impossible.

The Pelvic Brim or Inlet

This bony ridge is seen to be almost circular, except for a rounded projection at the back. Its boundaries are readily traced on a model:

Promontory of the sacrum.
Wings or alae of the sacrum.
Right and left sacro-iliac joints.
Right and left ilio-pectineal lines.
Right and left ilio-pectineal eminences.
Upper inner borders of the superior pubic rami.
Upper inner borders of the bodies of the pubes.
Upper inner border of the symphysis pubis.

The Pelvic Cavity

This extends from the brim to the outlet. It will be noted to be shallow in front and deeper at the back. The boundaries are:

Hollow of the sacrum.
Sacro-iliac joints.

Ischia and the sacro-spinous ligaments.
Right and left upper and lower pubic rami.
Bodies of the pubes and the symphysis pubis.

The pelvic cavity is circular. Its anterior wall is 4·5 cm deep, whereas the posterior wall is 12 cm deep. Clearly anything passing through the cavity must move in a curved rather than a straight path.

The Pelvic Outlet

The outlet appears ovoid or even diamond-shaped, being partly bounded by ligaments. It is the lowest level at which the fetus is on all sides constricted by bone. The boundaries are:

Lower sacrum.
Sacro-spinous ligaments and the ischial spines.
Pubic arch.

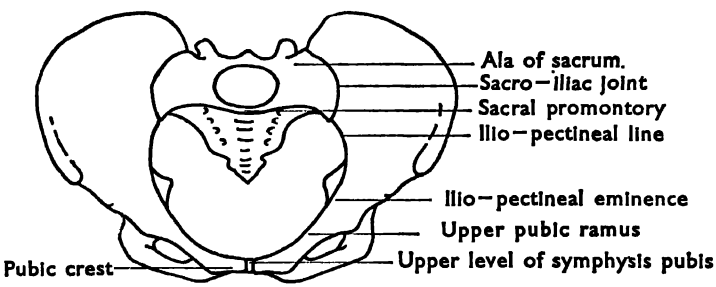

Fig. 7. The pelvic girdle showing brim.

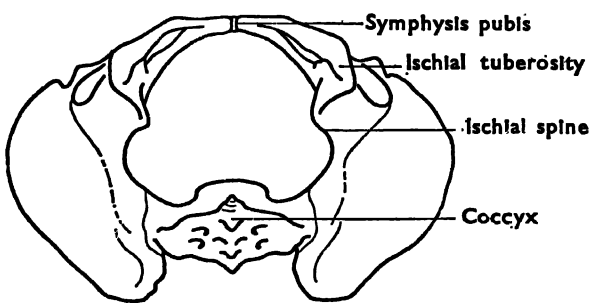

Fig. 8. The pelvic girdle showing outlet.

The coccyx extends lower, but it is mobile and swings backwards

during birth. The tuberosities, too, are lower than the spines, and slightly wider apart.

Diameters of the Pelvis

The pelvis is normally large enough for the fetal head to pass through without difficulty. However, should the head be only slightly larger than normal, or the pelvis in any direction smaller than usual, progress might become impossible. Accordingly, the normal dimensions of the pelvis (and of the infant's head) are described in detail. The midwife should familiarize herself with these dimensions, and she will then more readily appreciate any abnormality in either the size or shape of the pelvis.

The Diameters of the Brim

The antero-posterior diameter extends from the sacral promontory to the upper inner border of the symphysis pubis, and measures 11 to 11·4 cm. This diameter is called the true conjugate and, since it is the first narrow strait the fetal head has to pass, it is the most important of the pelvic measurements.

The right and left oblique diameters. The right oblique passes from the right sacro-iliac joint to the left ilio-pectineal eminence and the left oblique extends from the left sacro-iliac joint to the right ilio-pectineal eminence. They measure about 12 cm.

The transverse diameter. This is between the widest points on the ilio-pectineal lines and measures 13·3 cm.

The sacro-cotyloid diameter. From the sacral promontory to the ilio-pectineal eminence on the same side, it measures 9 cm.

The diagonal conjugate. This is measured from the sacral promontory to the apex of the pubic arch. It measures about 1·25 cm more than the true conjugate (12 to 12·6 cm). In a small pelvis where the measurement is less than 12 cm it can be assessed vaginally as the examining finger is likely to come into contact with the bony promontory.

The pelvic brim is thus smaller from front to back than from side to side.

The Diameters of the Cavity

At a level halfway between the brim, above and the outlet, below, the cavity is almost circular. The diameters, similar in direction to those

of the brim, are again the antero-posterior, the right and left obliques, and the transverse. All measure approximately 12 cm.

The Diameters of the Outlet

The antero-posterior diameter extends from the sacro-coccygeal joint to the lower border of the symphysis pubis and measures 12·5 cm. The oblique diameters pass obliquely fowards from the sacro-spinous ligaments, and thus cannot be accurately measured. They are about 12 cm. The transverse diameter of the outlet, between the ischial spines, measures 10·8 cm.

The outlet is thus slightly smaller than the brim, but it is very

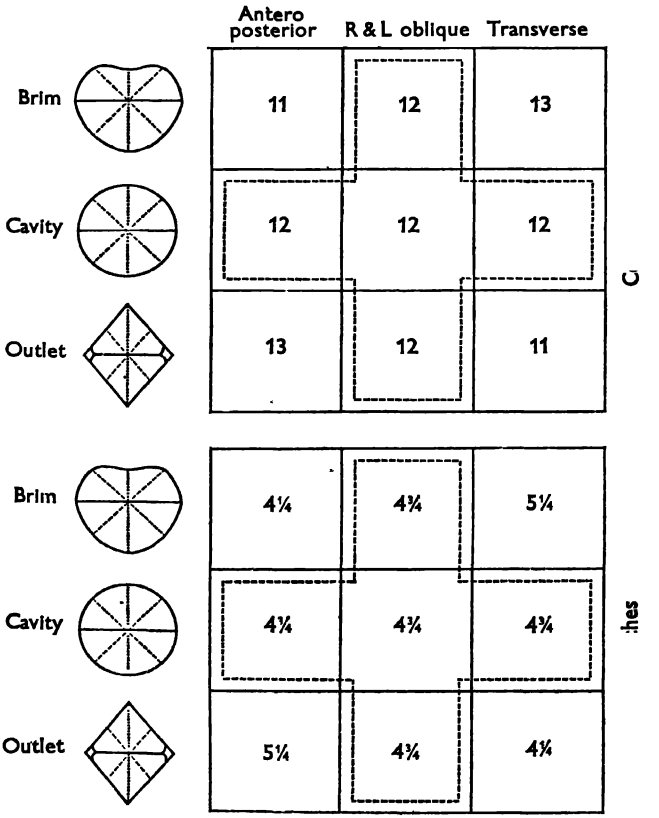

Fig. 9. Pelvic measurements.

unusual for a fetal head to pass through the brim and then to be unable to pass through the outlet.

The outlet is clearly wider from front to back and narrower from side to side. It is thus not surprising that the fetal head commonly enters the pelvis with its long diameter transversely across the brim, rotates in the cavity and emerges from the outlet with its long diameter antero-posterior.

Since the midwife must know these measurements, a simplified summary is set out in Fig. 9.

The Axis of the Birth Canal

This describes the direction in which the fetus moves in order to pass through the pelvis:

An axis is a line passing through the centre of a plane.
A plane is an imaginary flat surface.

The Plane of the Brim

When a woman stands erect the pelvis slopes quite steeply. The

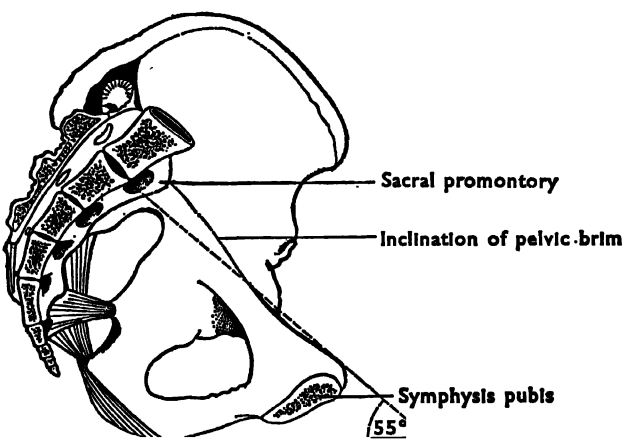

Fig. 10. The pelvis showing curve of the sacrum and degree of inclination of pelvic brim to the horizontal.

anterior superior iliac spines are in the same plane as the symphysis pubis. We describe the plane of the pelvic brim as sloping at an angle of 55° to the horizontal (Fig. 10). The axis of the brim is thus directed

backward and downward. This is the direction in which the fetal head moves in order to enter the pelvic brim.

The Plane of the Cavity

This plane lies across the mid point of the sacrum and pubic bone.

The Plane of the Outlet

This slopes at an angle of 15° and is almost horizontal.

The fetal head follows the axis of each plane. It descends in a straight line through the plane of the brim and the plane of the cavity until it reaches the level of the ischial spines, here it is deflected by the pelvic floor and its course changed from downwards and backwards to downwards and forwards. The marked bend is known as the axis of the birth canal or the curve of Carus (Fig. 11).

The axis of the birth canal needs to be kept in mind for the intelligent conduct of amost any obstetric procedure, e.g. observation of engagement of the fetal head or testing its ability to engage; the observation of progress in labour, by abdominal and vaginal examination; expulsion of the placenta, either by fundal pressure or by cord traction; and by the obstetrician when applying forceps.

Comparison of the Male with the Female Pelvis

In the female:

Bones are lighter and smoother.
Brim is rounded.
Cavity is shallower and more capacious.
Outlet is larger.
Sacrosciatic notch is wider.
Acetabula are further apart.
Pubic arch is wider.
Sacrum is wider and more curved.

Michaelis's Rhomboid

A rhomboid is a four-sided figure having its sides equal but its angles other than right angles. If an imaginary line is drawn on each side from the spine of the fifth lumbar vertebra to the dimples over the posterior superior spines of the ilium, the lines then being continued downwards to the convergence of the buttocks, a rhomboid is formed. This was first described by Michaelis. The symmetry of this figure

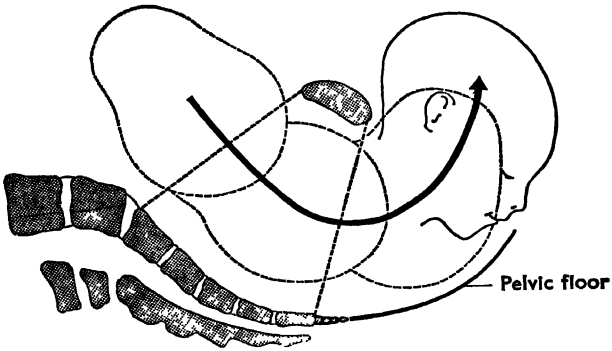

Fig. 11. Axis of the birth canal or curve of Carus.

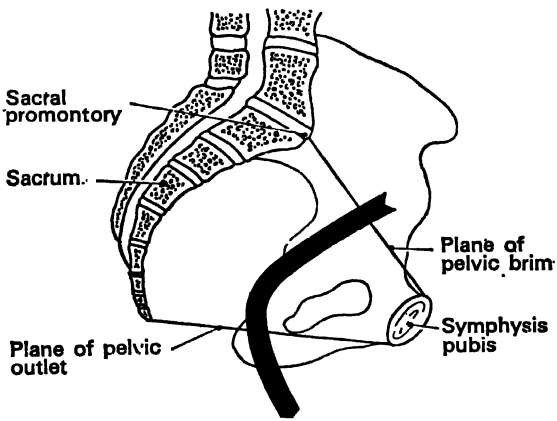

Fig. 12. Diagram showing the curve of the birth canal.

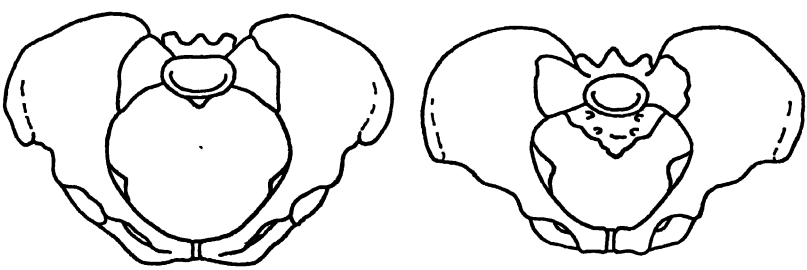

Fig. 13. A, Female pelvis; B, male pelvis.

gives some idea of the symmetry of the pelvis. If the four sides are uneven some abnormality in the pelvis should be suspected.

Variations in the Shape of the Pelvis

Caldwell and Moloy have shown from pelvic X-rays that the female pelvis varies considerably in shape. They described four main types: gynaecoid, anthropoid, android, platypelloid. These variations are not due to disease but to hereditary and racial characteristics and are named chiefly from the shape of the pelvic brim.

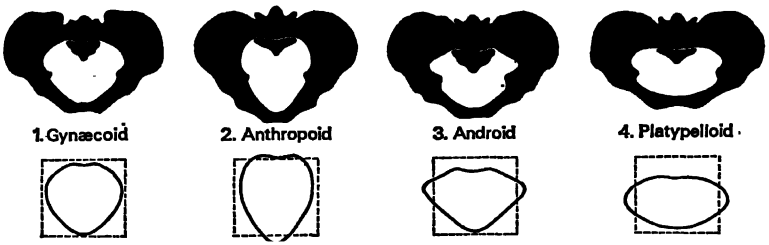

Fig. 14. Inherited shapes of pelvic brim.

The Gynaecoid Pelvis

This is the normal female pelvis.

Incidence. Over 50 per cent of the patients examined had a pelvis of this type.

Characteristics

The brim is round in shape.
The true pelvis is shallow.
The subpubic angle is wide, 90° or more.
The sacrosciatic notch is wide.
The transverse diameter of the outlet is 10 cm at least.

Effect on labour. The head engages in the brim in the transverse diameter or in an occipito-anterior position, and the mechanism of labour is normal.

The Anthropoid Pelvis

This type of pelvis resembles the pelvis of the ape. An alternative and

better name is the pithecoid pelvis. (Anthropoid means man-like, pithecoid means ape-like.)

Incidence. This type was found in about 25 per cent of those examined.

Characteristics

The brim is oval in shape with an increase in the antero-posterior diameter and a corresponding decrease in the transverse diameter.

The sacrum is long and narrow and may contain six vertebrae from fusion of the fifth lumbar vertebra with the sacrum. This increases the inclination of the pelvic brim and is called high assimilation. It tends to hinder engagement of the fetal head.

Effect on labour. The head may engage in the antero-posterior diameter, sometimes with the occiput posterior. The head may descend through the pelvis persistently occipito-posterior and be born face to pubes. This pelvic shape has been noted in unusually tall, well-built women. Generally the pelvis is so large that labour is easy.

The Android Pelvis

This type of pelvis resembles the male pelvis.

Incidence. This type was found in about 20 per cent of those examined.

Characteristics

The brim tends to be triangular in shape, being broader at the back.

The true pelvis is deep.

The subpubic angle is narrow, 60 to 75°.

The sacrosciatic notch is narrow.

The transverse diameter of the outlet may be less than 10 cm.

The convergence of the side walls of the pelvis causes the pelvis to be funnel-shaped and contracted towards the outlet.

Effect on labour. The available space in the forepelvis is restricted by the triangular shape of the brim. The head may engage transversely or in an occipito-posterior position. The descent of the head through the pelvis may be increasingly difficult because of the outlet contraction, and deep transverse arrest is likely. Owing to the narrow subpubic angle the head is forced backwards and severe lacerations of the perineum may occur.

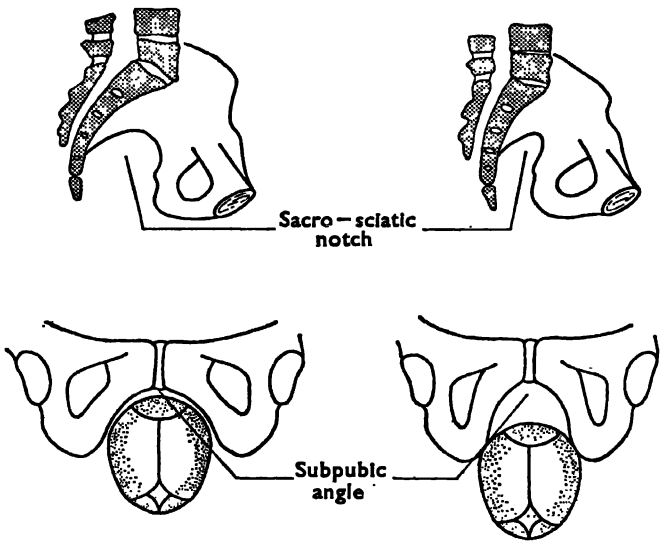

Fig. 15. Narrow outlet in android pelvis, compared with normal pelvis.

The Platypelloid Pelvis

This pelvis corresponds to the simple flat pelvis.

Incidence. This type of pelvis is rare, being found in less than 5 per cent of those examined.

Characteristics

The antero-posterior diameter is short.
The sacrosciatic notch is narrow.
The anter-posterior narrowing of the pelvis continues in the cavity and outlet.

Effect on labour. The head will engage in the transverse diameter of the brim. Rotation of the head may be restricted and deep transverse arrest of the head may occur.

Contraction of the Pelvis

A contracted pelvis is one in which one or more diameters are so reduced as to interfere with the normal mechanism of labour.

Types of Contracted Pelvis

Rachitic flat.
Generally contracted.
Asymmetrical.
  Associated with disease of the hip or spine.
  Naegele's.

Other Rare Pelvic Abnormalities

Osteomalacia.
Spondylolisthesis.
Robert's pelvis.

The Rachitic Flat Pelvis

This pelvic deformity is due to rickets. The disease affects the child in the second year of life. The softened bones are distorted by the weight of the body as the child sits, since walking will be delayed by the disease. The promontory of the sacrum is forced forwards towards the symphysis pubis, producing a flattened or kidney-shaped brim. The lower end of the sacrum swings backwards so that the size of the cavity and outlet is increased.

Incidence. Rickets was at one time the commonest cause of gross pelvic deformity, difficult and obstructed labour, but the disease has now almost disappeared with the adequate diet and the addition of vitamin D for babies and children.

Effects on labour. The head enters the brim with the sagittal suture in the transverse diameter.

The head is incompletely flexed.

The head moves to one side of the pelvis so that the smallest diameter of the head (the bitemporal) (8 cm), can occupy the smallest diameter of the brim (Fig. 17A).

Asynclitism occurs. The head tilts sideways so that a parietal bone enters the pelvic brim, this tilt is corrected as the head enters the cavity. If the anterior parietal bone enters first with the sagittal suture lying near the sacral promontory this is called anterior asynclitism or anterior parietal presentation. If the posterior parietal presents with the sagittal suture nearer the symphysis pubis this is posterior asynclitism or posterior parietal presentation (Fig. 16).

In either case given strong uterine contractions and moulding of

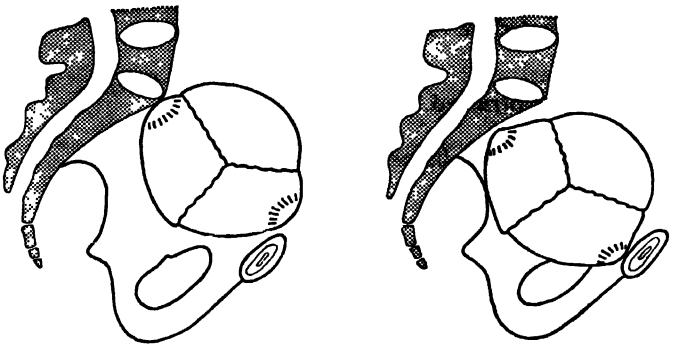

Fig. 16. Posterior asynclitism.

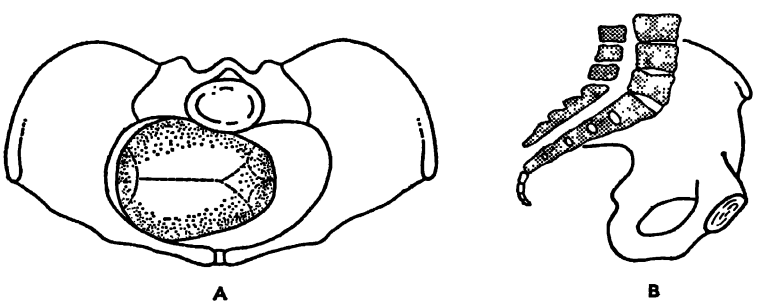

Fig. 17. Rachitic flat pelvis. A, Shape of brim; B, shape of cavity.

the head by these movements the head may pass through the brim. Vaginal delivery is then possible.

The Generally Contracted Pelvis

A pelvis small in all its diameters but normal in shape may occur in women of small stature.

Characteristics

The pelvis is small in all diameters.
Sometimes there are in addition android characteristics making the outlet relatively narrow.

Effect on labour. If the size of the baby is in proportion to the size of the pelvis no difficulty may be encountered. If the baby is larger, with

strong contractions, complete flexion of the head and moulding, the head may pass through the brim, but difficulty may still be encountered at the outlet. If the true conjugate is less than 8·75 cm vaginal delivery is unlikely.

The Asymmetrical Pelvis

If unequal pressure is exerted on the pelvis whilst it is growing it may become asymmetrical. This may occur in congenital dislocation of one hip, or following poliomyelitis.

Deficient development of one side of the pelvis often with bony fusion of the sacro-iliac joint on the affected side causes a rare form of asymmetrical pelvis. This is called *Naegele's pelvis.*

Rare Forms of Pelvic Contraction

Robert's pelvis. There is deficient development of both sides of the pelvis with fusion of both sacro-iliac joints. This may produce extreme pelvic contraction. It is extremely rare.

Osteomalacic pelvis. Osteomalacia is a disease of adults produced by deficient diet, lack of vitamin D and sunlight as is rickets in childhood. It is rare in this country but occurs in Asiatic women. The pelvic deformity differs from that occurring in rickets because the adult walks and stands. The upward pressure of the legs on the pelvis forces the sides of the pelvis inwards. The weight of the body acting through the spine forces the promontory of the sacrum forwards. This produces the triradiate pelvis. The pelvic contraction may be very severe.

Spondyloisthetic pelvis. In this condition the fifth lumbar vertebra slips forwards over the sacrum. It may produce extreme contraction of the true conjugate.

Detection of Pelvic Contraction and Disproportion

Although the recognition of pelvic contraction is important, it is yet more vital to discover disproportion, that is, disparity in size between the fetus and the pelvis. If the head of the fetus has entered, or can be made to enter the pelvic brim vaginal delivery should be possible. The statement that the head of the fetus is the best pelvimeter will always be true.

It is Possible that Disproportion is Present if:

In a primigravida the head is not engaged and cannot be made to engage after the thirty-seventh week.

In a multipara there is a history of difficult labour, forceps delivery or stillbirth.

In these circumstances the midwife should refer the patient to a doctor for further advice. A clinical examination of the pelvis will be made to determine the prominence of the ischial spines and the size of the subpubic arch.

X-Ray Pelvimetry

If the clinical examination reveals no evidence of pelvic contraction or disproportion, the onset of labour followed by a vaginal delivery can be awaited with confidence. In the following circumstances, however, X-ray pelvimetry is advisable:

Any primigravida with the fetal head not engaged at term in whom clinical examination suggests pelvic contraction.

Any patient with a breech presentation, if external version has failed or is contraindicated.

Any multipara with a history of difficult labour.

X-ray pelvimetry will reveal the size and shape of the pelvis and also the relationship of the head to the brim. An erect lateral view of the pelvis may show all that is needed, or it may be supplemented by an X-ray showing the sub-pubic angle.

The shadow of an object thrown by a light on a wall is larger than the object itself. Similarly the picture of the pelvis produced by X-rays on an X-ray plate is larger than the pelvis. The distance of the pelvis and the X-ray tube from the plate is measured at the time the X-ray is taken. From these measurements the actual size of the pelvis can be calculated.

The lateral pelvic X-ray is taken with the patient standing sideways to the X-ray plate which is held vertically. The lateral pelvic X-ray will show:

The general shape of the pelvis.

The shape of the sacrum.

The inclination between the sacrum and pelvic brim.

The antero-posterior diameter of the brim, cavity and outlet.

The width of the sacrosciatic notch.

The depth of the pelvis.

A lateral pelvic X-ray may be valuable in labour, since it will show the position of the fetus, the degree of moulding and engagement of the head.

The Possible Outcome of Labour with Pelvic Contraction

The outcome of labour cannot be estimated solely on the size and shape of the pelvis. The size of the fetus, the strength of the uterine contractions, the degree of moulding and flexion of the head and the position of the head will all influence labour. Normal delivery will be less likely if the fetus is large, the uterine contractions poor, or the position is occipito-posterior.

It is possible to subdivide cases of pelvic contraction into three groups according to the size of the true conjugate.

Slight Pelvic Contraction

The true conjugate is over 9·5 cm. Vaginal delivery is likely.

Gross Pelvic Contraction

The true conjugate is less than 8·5 cm. The delivery of a living child of normal weight is not usually possible. A Caesarean section at or near term and before the onset of labour is advisable.

Moderate Pelvic Contraction

The true conjugate is between 8·5 and 9·5 cm. With strong uterine contractions and adequate moulding of the head, vaginal delivery may be possible but because the course of labour cannot be determined before hand a trial of labour is conducted (page 297).

Three possible outcomes may occur:

Spontaneous vaginal delivery.

Delay in the second stage necessitating a forcep delivery.

Caesarean section if the head fails to enter the pelvis.

Further Reading

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8. EXTERNAL GENITALIA

The female genital tract includes the *external genitalia*, collectively termed the *vulva*, and the *internal genitalia*, namely the *vagina*, the *uterus*, the *Fallopian tubes* and the *ovaries*.

The Vulva

The vulva comprises the following structures:

Mons Veneris

This pad of fat lies over the symphysis pubis and is covered by skin and, after puberty, by short hairs.

Two Labia Majora (*singular, labium majus*)

These are two folds of skin with fat beneath, extending backwards from the mons veneris to the perineal area, where they merge with the perineal body.

Two Labia Minora (*singular, labium minus*)

These are two smaller folds of skin lying between, and almost covered by, the labia majora. Anteriorly they encircle the clitoris forming an upper fold, the prepuce or hood of the clitoris, and a small lower fold, the frenulum. Posteriorly, the labia minora unite at a thin fold of skin, the fourchette, which is commonly torn during the patient's first delivery.

The Clitoris

This is a small, sensitive, erectile structure at the anterior junction of the labia minora, which extends inwards for about 2 cm.

The Vestibule

The vestibule is a narrow space which is brought into view when the

labia minora are separated. On it are seen the urethral and vaginal orifices.

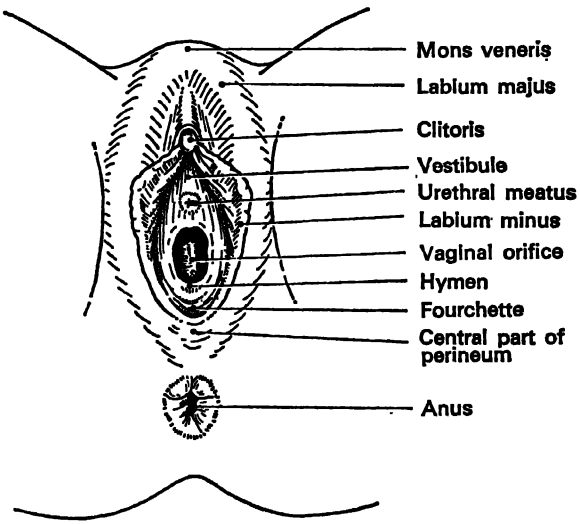

Fig. 18. The external genital organs.

The Urethral Meatus

This is a small opening about 2·5 cm below the clitoris. From here the urethral canal passes upwards and backwards about 3·5 cm to the neck of the bladder. To the side and slightly behind the urethral meatus are two small openings, the orifices of Skene's ducts. They appear as small dimples, with the meatus, which has slightly raised margins, between them. A clear knowledge of these anatomical features will help the midwife in carrying out catheterization accurately and with a minimum risk of infection.

The Vaginal Orifice or Introitus

This lies between the labia minora and posterior to the urethra. It is partially occluded by the hymen.

The Hymen

A thin membrane—the hymen—partially shuts off the vaginal

introitus. In the virgin it is described as intact, having only a small opening through which the menstrual flow escapes; on the first occasion of intercourse it is ruptured; and at the birth of the first child it is torn further, leaving a few tags of tissue, the carunculae myrtiformes, surrounding the introitus.

Bartholin's Glands

These are two small glands lying one on either side of, and slightly posterior to, the vagina, beneath the labia. Their ducts open into the vaginal canal just external to the hymen, and their secretion of mucus helps to lubricate the vulva.

The vulva receives its blood supply from the internal pudendal arteries and the superficial and deep external pudendal arteries. The venous drainage follows a similar course.

It will be noted that perineal lacerations occurring during delivery, and episiotomies carried out at this time, do not, as a rule, give rise to more than slight bleeding. This is largely because the region has a relatively small blood supply. Occasionally, however, a delivery is complicated by tearing of the labium minus or the clitoris. These are vascular structures which bleed readily, and such injuries can cause quite serious haemorrhage.

The nerve supply to the vulva is largely from the pudendal nerves which are branches of the sacral plexus. Infiltration with a solution of lignocaine, of the pudendal nerves and of certain cutaneous nerves induces regional anaesthesia. This is known as pudendal nerve block, and it is, in many instances, entirely satisfactory for forceps delivery.

The Vagina

The vagina is a narrow canal leading from the vulva to the uterus. It is directed upwards and backwards, and is approximately parallel to the plane of the pelvic brim.

The cervix of the uterus projects into the upper part of the anterior wall of the vagina. Thus the anterior vaginal wall, which is 7·5 cm long, is shorter than the posterior wall, which measures about 10 cm. The gutter, or recess surrounding the cervix as it projects into the vaginal vault, is for descriptive purposes divided into four vaginal fornices, or arches. The anterior vaginal fornix is shallow, the two lateral fornices are rather deeper, and the posterior fornix is deep.

The anterior and posterior vaginal walls are normally in contact with one another.

Structure

Outer layer—connective tissue, part of the pelvic fascia which contains arteries, veins, lymphatics and nerves.

Muscle—outer layer having its fibres arranged longitudinally
inner layer having its fibres arranged circularly.

Lining—squamous epithelium or modified skin, which is arranged in transverse ridges or folds, known as rugae. This concertina-like lining allows the vagina to undergo a tremendous degree of stretching, as it must during labour to permit the passage of the fetus.

The vagina has no glands, but its walls are maintained in a moist state partly by secretions from the cervical glands and partly by a transudation of serous fluid from the blood vessels to the surface. This vaginal fluid is acid in reaction, pH 4·5, since it contains lactic acid which is produced by the action of lactobacilli (Doderlein's bacilli) on the glycogen in the squamous cells of the vaginal lining. Lactobacilli are non-pathogenic and normally inhabit the vagina. The lactic acid for which they are responsible helps to destroy any pathogenic bacteria which may enter the vagina. Before puberty and after the menopause the vagina is less acid, pH 7, hence vaginal infections such as vulvovaginitis in children and senile vaginitis in elderly women, are more common.

The vaginal walls are ordinarily pink in colour. In pregnancy, as a result of the increased vascularity and venous engorgement, they develop a bluish tinge. The vagina receives its blood supply mainly from the vaginal arteries, which arise from the internal iliac arteries; and to a lesser extent, from branches of the uterine arteries, which also arise from the internal iliac vessels. The venous drainage follows a similar course.

Anatomical Relations of the Vagina

Anteriorly	Upper half	Bladder
	Lower half	Urethra
Posteriorly	Upper third	Pouch of Douglas
	Middle third	Rectum
	Lower third	Perineal body
Superiorly	Centrally	Cervix
	Above lateral	Fornices Ureters and uterine arteries
Inferiorly	Vaginal orifice and vestibule	
Laterally	Upper	Parametrium
	Middle	Pubo-coccygeus muscles
	Lower	Perineal muscles
		Bulbo-cavernosus muscles

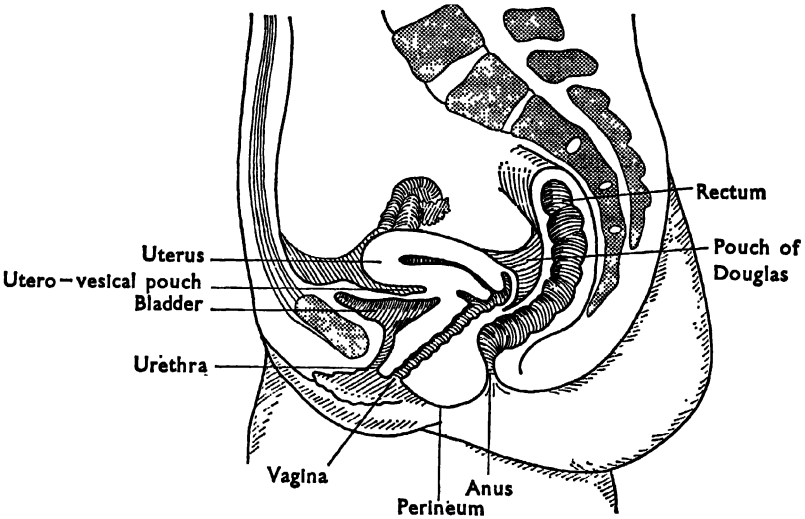

Fig. 19. The pelvic organs in sagittal section.

A clear knowledge of the vagina and the adjacent structures is absolutely essential to the intelligent conduct of any midwifery procedure. Obvious examples are vaginal examinations and the conduct of deliveries.

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9. THE UTERUS

The uterus is a hollow, pear-shaped muscular organ situated in the pelvic cavity with its narrow end directed downwards and backwards towards the centre of the pelvic floor. It is about 7·5 cm long. 5 cm broad, and 2·5 cm thick weighing about 60 grammes (g).

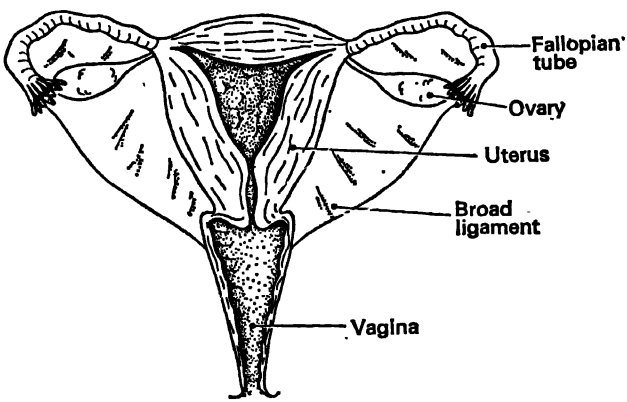

Fig. 20. The uterus and its appendages.

It consists of: A *corpus* or body, which comprises the upper two-thirds and encloses a triangular cavity 3·5 cm in length. In the non-pregnant state the anterior and posterior walls are in contact.

The *isthmus*—is the area joining the cervix to the body which grows during pregnancy to form the lower uterine segment.

The *cervix* or neck—which is cylindrical in shape, 2·5 cm in length and 2·5 cm in diameter. The cervical canal is spindle-shaped, it communicates with the cavity of the body of the uterus by the internal os and with the vagina by the external os. The lower half of the cervix projects into the vaginal vault. The mucous membrane lining the canal contains glands which secrete mucus. On the anterior and posterior walls of the canal, vertical and oblique folds of mucous

membrane closely resemble the trunk and branches of a tree. This is called the arbor vitae or tree of life. Behind the cervix is the pouch of Douglas. On either side of the cervix the ureters pass forwards to reach the posterior surface of the bladder which lies in front of the cervix.

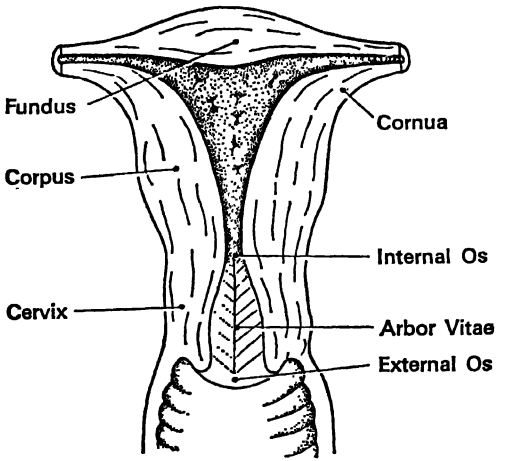

Fig. 21. Divisions of the uterus.

Structure

Perimetrium. The peritoneal covering of the uterus is incomplete. Anteriorly the body of the uterus is covered with peritoneum, which is then reflected loosely on to the bladder at the level of the internal os. This loose peritoneum is important in lower segment Caesarean section. Posteriorly, the body and supravaginal portion of the cervix is covered by peritoneum. The peritoneum is reflected from the cervix onto the posterior vaginal wall and then upwards and backwards forming the pouch of Douglas. The peritoneal layer is incomplete laterally because of the insertion of the Fallopian tubes, the round and ovrian ligaments into the uterus.

Myometrium. The uterus is composed of plain muscle which is arranged in a spiral form running from the cornua to the cervix, giving a circular effect around the Fallopian tube and cervix, and an oblique effect over the corpus (Fig. 22). Lying above this is a very thin layer of fibres continuing from the round and transverse cervical ligaments which meet in the mid line, these fibres are arranged longitudinally (Fig. 23).

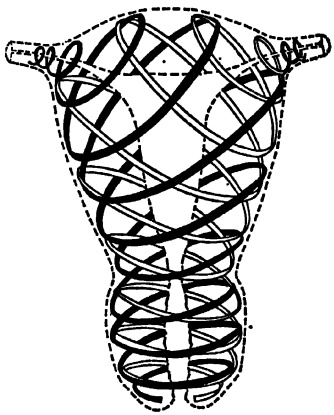

Fig. 22. A diagram to show the spiral arrangement of the uterine muscle fibres.

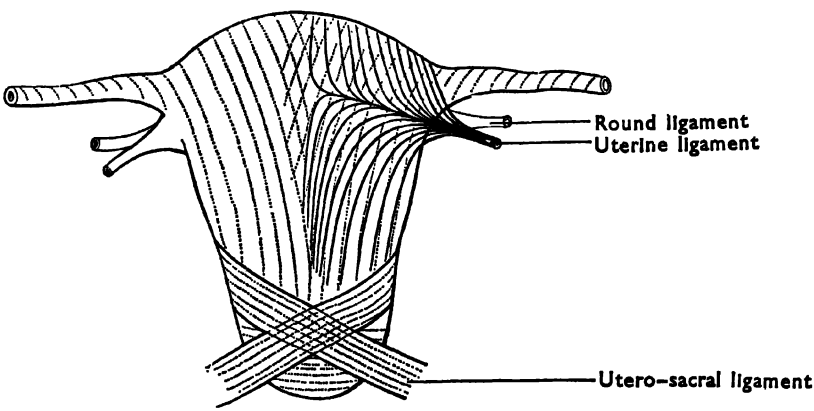

Fig. 23. Uterine muscle, outer layer.

The muscle is called the myometrium and its main function is to expel the fetus and placenta from the birth canal and afterwards, to control bleeding. The muscle fibres interlace in every direction, so that when they contract they act as natural ligatures to the blood vessels when the placenta separates from the uterine wall during labour.

Endometrium. The endometrium is the lining of the uterus and during the reproductive years it is constantly changing. It is a highly specialized, active membrane, composed of columnar cells forming glands which dip down to the level of the myometrium. These glands are of the simple tubular type. The endometrium is highly vascular.

The upper two-thirds of the cervical canal is lined by columnar epithelium containing deep branching glands; these secrete the alkaline mucus which forms the 'cervical plug' filling the canal. The alkalinity and consistency of the mucus is vital if conception is to occur. Spermatazoa can survive only in an alkaline medium and can only pass through cervical mucus of the right consistency.

The lower third of the cervical canal and vaginal aspect of the cervix is covered with stratified squamous epithelium continious with that of the vagina. This squamo-columnar junction is of importance as it is here carcinoma often occurs.

Blood Supply of the Uterus

The blood supply to the uterus is derived from two pairs of arteries: the uterine and ovarian arteries.

The uterine artery. This is a branch of the internal iliac artery. It runs downwards and forwards until it reaches the parametrium where it turns inwards towards the uterus. It enters at the level of the internal os then turns upwards at right angles, and follows a spiral course

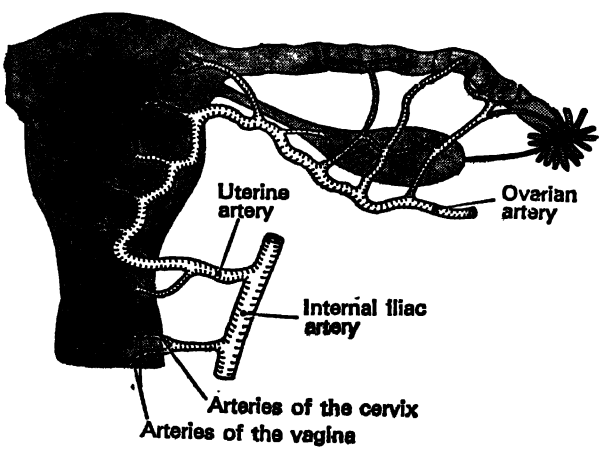

Fig. 24. The blood supply to the uterus and its appendages.

along the lateral border of the uterus to anastomose with the ovarian artery. The uterine artery sends a descending branch to the cervix and vagina.

The ovarian artery. The ovarian artery leaves the abdominal aorta just below the level of the renal arteries. It passes downwards to cross the ureter then the external iliac artery passing over the pelvic brim to enter the broad ligament just below the ovary. The ovarian artery gives off branches to the ovary and tube and eventually anastomoses with the uterine artery.

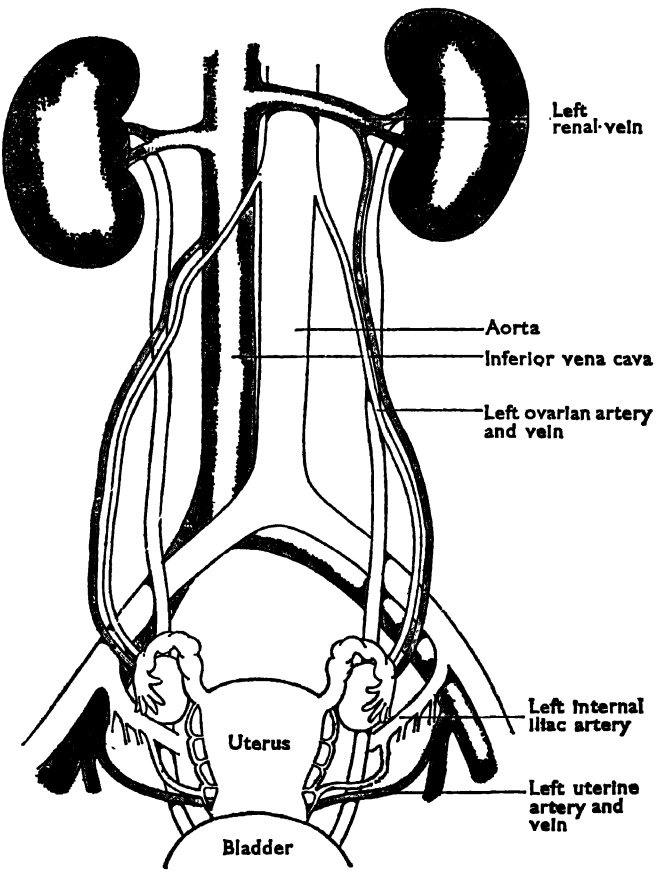

Fig. 25. The blood supply to the uterus. Note where the ovarian veins terminate.

The venous drainage. Blood is drained by veins accompanying the arteries. The right ovarian vein passes into the inferior vena cava and the left into the left renal vein, a distinction of some importance to the surgeon.

The arteries and veins of the uterus are twisted like a corkscrew. This tortuosity is lost as the uterus enlarges during pregnancy, to reform after delivery. This assists in the control of bleeding and the prevention of haemorrhage.

Lymphatic Drainage

The lymphatic vessels and nodes drain off lymph from the pelvic organs. These vessels accompany the main arteries and veins and nodes are found along the iliac vessels and aorta. Drainage from the upper portion of the uterus is to the lumbar and hypogastric nodes. From the lower portion drainage is to the hypogastric nodes.

Nerve Supply

Sympathetic nerve supply. The sympathetic nerve supply to the pelvis is a continuation of a large abdominal plexus, the aortic plexus, which is continued below the level of the bifurcation of the aorta as a large network sometimes called 'pre-sacral nerve', lying in front of the fifth lumbar vertebra and sacral promontory. Joined by branches from the lumbar sympathetic chain it passes downwards dividing into two branches terminating in plexuses lying on the floor of the pouch of Douglas. This network also receives fibres from the parasympathetic system, and is known as Lee–Frankenhäuser plexus. From here nerves pass to the uterus and other pelvic viscera.

Parasympathetic nerve supply. These arise from the second, third and fourth sacral segments and emerge from the sacral foramina to join the plexus of Lee–Frankenhäuser.

The Fallopian Tubes

The Fallopian tubes extend laterally from the cornua of the uterus almost to the side walls of the pelvis, they then turn backwards and downwards towards the ovaries. They lie within the folds of the broad ligament, and connect the pelvic cavity with the cavity of the uterus.

Each tube is 10 to 11·5 cm in length and is divided into four parts. The *interstitial portion*, which passes through the wall of the uterus and has the smallest lumen, 1 mm or less at its narrowest.

The *isthmus*, lying adjacent to the uterus and slightly wider than the interstitial portion.

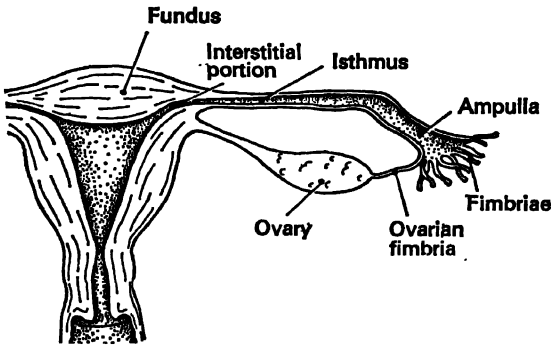

Fig. 26. Divisions of the Fallopian tube.

The *ampulla*, which is the widest part of the tube.

The *infundibulum*, which is trumpet-shaped and has fimbriae, which are finger like processes. One fimbria is slightly longer than the rest and is attached to the ovary below, this is known as the fimbria ovarica.

Structure

The Fallopian tube has three coats:

A covering of peritoneum—the broad ligament.

A thin muscular coat of outer longitudinal and inner circular fibres, the circular fibres are most numerous in the isthmus and less numerous near the fimbriated end.

A serous lining of ciliated columnar epithelium which wafts the ovum from the infundibulum towards the uterus. The lining is thrown into so many folds or plicae that the lumen is difficult

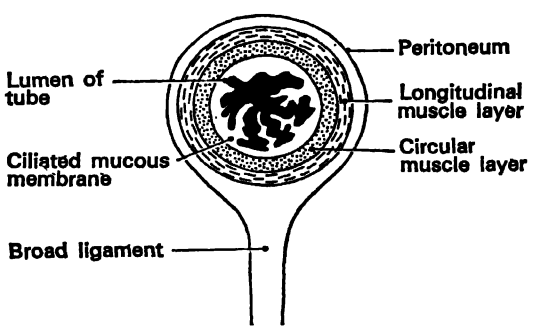

Fig. 27. Section through the Fallopian tube.

to see. It also contains goblet-shaped cells which produce a lubricant and possibly a nutrient substance for the ovum.

The blood supply is from the ovarian and uterine artery. This double blood supply is of great importance and no matter how severe an infection of the tube may be, gangrene will not occur. Venous drainage is by the ovarian and uterine veins and the nerve supply derived from the ovarian plexus and the parasympathetic system.

The function of the Fallopian tube is to propel the inert ovum, which unlike the sperm has no power of movement of its own, towards the uterine cavity. This is achieved by peristaltic movements created by the muscle fibres and the movement of the cilia.

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10. THE OVARIES

The ovaries are two glandular structures lying on the posterior surface of the broad ligament just below the pelvic brim and near to the infundibulum of the Fallopian tube. They develop in the germinal ridges of the posterior abdominal wall and during fetal life they descend into the pelvis in the same manner as the testes.

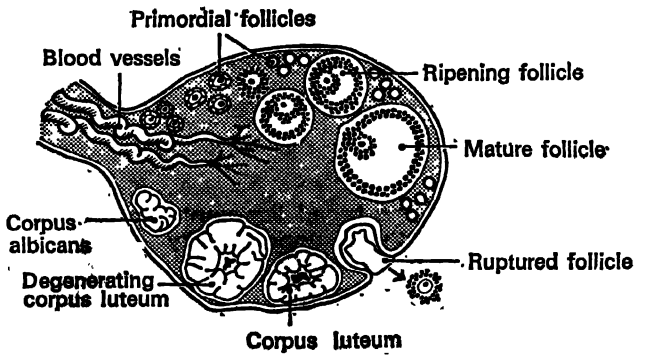

Fig. 28. Diagram to show the sequence of changes occurring in the ovum during each menstrual cycle.

They are almond-shaped, a dull white in colour and corrugated on the surface, they measure 3 cm in length, 2 cm in width and 1 cm in thickness, their weight is between 5 and 8 g (grammes). The ovary is attached at the back to the broad ligament by a thin mesentery, the mesovarian. The area is called the hilum and is the point at which ovarian vessels, nerves and lymphatics enter and leave (Fig. 29).

Structure

The ovary is composed of a cortex and medulla.

The Cortex

The main substance of the cortex, known as the stroma, is firm, white

and fibrous. It contains primordial follicles, Graafian follicles and corpora lutea. The stroma consists of interlacing spindle cells packed tightly together.

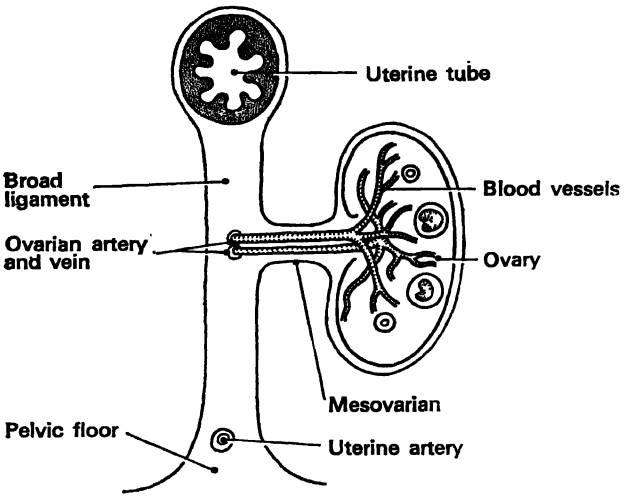

Fig. 29. Lateral view of the broad ligament showing the ovary outside the peritoneal cavity.

The Medulla

The medulla is softer than the cortex and contains a larger number of small arterioles, veins and lymphatics which connect with the vessels entering and leaving at the hilum. The medulla contains no follicular structures, but in pregnancy the corpus luteum may spread towards the medulla.

The Surface (Germinal) Epithelium

This is an incomplete layer of cuboidal cells which is continuous with the peritoneum of the mesovarian. It is now known that the primordial follicles develop in the ovary in early fetal life and do not differentiate from these cells as was previously thought. Hence surface epithelium is the better name.

Tunica Albuginia

This is a dense fibrous capsule similar to its counterpart in the testis.

It lies immediately below the surface epithelium.

The blood supply is from the ovarian artery, a branch of the aorta, and venous drainage to the ovarian veins. The left vein drains into the left renal vein, and the right vein directly into the inferior vena cava. The lymphatic drainage is to the posterior abdominal nodes, and the nerve supply from the ovarian plexus.

Structures in the Cortex

Primordial Follicles

At birth each ovary contains at least 200000 and possibly as many as 700000 primordial follicles. These follicles consist of a primitive ovum, spherical in shape and some 18 to 24 μm (microns) in diameter, surrounded by flattened epithelial cells. These sex cells are constantly degenerating even in intra-uterine life and by the menopause no ova remain. Only about 400 will eventually mature.

Graafian Follicles

While the fetus is still in utero the maturation of some primordial follicles begins. Many more layers of cells surround the ovum, followed by the appearance of a cystic space into which the liquor folliculi is secreted. The cystic follicle is known as a Graafian follicle, first described by von Graaf in 1672. They remain quite small until puberty. A mature follicle measures 12 to 16 mm in diameter. The follicle consists of an outer layer the theca, the outer cells of which are derived from the stroma cells of the cortex and are concerned in the production of ovarian hormones. The theca is lined by granulosa cells derived from the follicle epithelial cells. The ovum is embedded in the membrana granulosa and surrounded by liquor folliculi.

Fig. 30. Graafian follicle.

Atretic Follicles

These may be seen in the ovary and are Graafian follicles which have started to mature and then degenerated. They appear as little white scars.

Ripening Follicles

As the Graafian follicle begins to ripen the cells burrow through the cortex of the ovary towards the surface. More and more liquor is secreted. Tension increases, the follicle protrudes from the surface of the ovary, the covering stretches, thins and finally ruptures often accompanied by a little pelvic pain (Mittelschmerz). The ovum is extruded into the peritoneal cavity.

Ovulation takes place each month from alternate ovaries, that is to say each ovary ovulates at 2-monthly intervals. It is possible for more than one ovum to be discharged at a time, especially after a period of suppression and this results in multiple pregnancies.

Corpus Luteum

Immediately after the rupture of the Graafian follicle and the discharge of the ovum, bleeding occurs into the cavity previously occupied by the ovum and liquor folliculi. The granulosa cells begin to multiply rapidly and build up into a dense mass. This convoluted, solid greyish body is known as the corpus luteum or yellow body, misnamed as it is only yellow when degenerating or during pregnancy. The corpus luteum functions as an endocrine gland, secreting oestrogens and progesterone. It persists for about 14 days after which it degenerates if fertilization has not occurred; within the next 48 hours menstruation begins.

Corpus Albicans

As the corpus luteum atrophies a hyaline tissue is deposited which gradually contracts and leaves a simple white scar on the surface of the ovary. This process is slow and it may take 9 months to entirely replace the corpus luteum by hyaline tissue.

When fertilization has occurred, the corpus luteum does not degenerate but persists for some months. Its greatest development is reached at the third month. It is very active and its diameter may be as much as 1·5 cm. After the placenta has fully formed a gradual decline in its activity and size takes place. It involutes slowly, so that at the onset of labour it may only be the size of the menstrual corpus luteum, and it does not completely disappear until two or three months after delivery. The Graafian follicles cease to ripen and no ova are discharged during pregnancy.

The development of the Grafian follicle and corpus luteum is known as the ovarian cycle.

The Pituitary Cycle

The development of the Graafian follicle and the formation of the corpus luteum are controlled by hormones from the anterior lobe of the pituitary gland. The follicle stimulating hormone (FSH) governs the development of the Graafian follicle and the formation of oestrogens by the follicle. The luteinizing hormone (LH) governs the development of the corpus luteum and the formation of oestrogens and progesterone by the corpus luteum.

The Uterine Cycle

Accompanying the ovarian and pituitary cycles are a series of changes in the uterine endometrium. When menstruation occurs the endometrium is shed down to its basal layer accompanied by bleeding. Under the influence of oestrogen regeneration begins and the endometrium grows thicker. This is the proliferative phase and lasts about 10 days. Following ovulation and the production of progesterone the endometrium becomes even thicker, the glands more tortuous and full of secretions. This is the secretory phase and lasts 14 days, after which the lining is shed once more. The endometrium above the basal layer degenerates, due to spasm in the arteries and deprivation of blood flow, necrosis occurs and the lining sloughs off to be expelled from the uterus by muscular contraction. The menstrual flow continues for about 5 days and the blood loss is some 50 to 100 ml (millilitres).

The phases which are passed through by the endometrium during the 28 days of each complete cycle:

Proliferative phase. The endometrium grows thicker and the glands lengthen under the influence of oestrogens (follicular hormones)	10 days or more
Secretory phase. The glands become tortuous and produce secretion under the influence of oestrogens and progesterone (corpus luteum hormones)	14 days
Menstrual phase	4 to 6 days

The menstrual cycle recurs in most women every 28 to 30 days, but may vary from 21 to 42 days or more. The menstrual phase occurs 14 days after ovulation if fertilization has not occurred. In a prolonged cycle it is always the proliferative phase which is extended not the secretory phase. The cycle continues from puberty to the menopause and is only interrupted in a healthy woman by pregnancy.

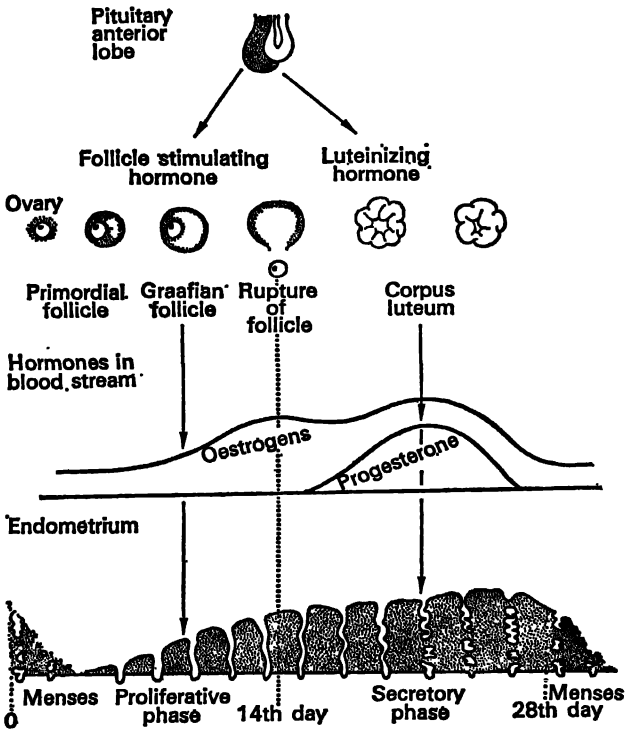

Fig. 31. The menstrual cycle, showing the relationship between the anterior pituitary lobe hormones, the ovary and ovarian hormones, and the endometrium.

The menstrual cycle prepares the uterus for pregnancy. If conception occurs menstruation does not take place. If the whole of both ovaries is removed, menstruation ceases and pregnancy is impossible. Pregnancy is possible even with only a small part of one ovary.

Conception occurs shortly after ovulation, 14 days before the next period. Thus in a 35-day cycle, ovulation would occur 21 days after the period and in a 21-day cycle, only 7 days after. If periods occur irregularly, the calculation of the date may prove inaccurate and in such a case more than usual care will be needed to check the date with other methods of ascertaining the expected date of confinement.

If, at the last menstrual period, the flow lasted only a few hours or one day, careful enquiries should be made before deciding on the date of expected delivery. It may be a case of 'decidual bleeding'

from the lower part of the congested uterus, which is not entirely covered with the ovum until the third month of pregnancy. This slight bleeding occurs at the usual time of a menstrual period, but it should not be referred to as menstruation as it is not the result of the cycle of changes described above. It is probable that in most cases a slight loss of blood in early pregnancy is due to a threatened abortion.

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11. DEVELOPMENT AND EMBEDDING OF THE OVUM

The Ovum

The ovum is the largest cell in the body 0·15 mm in diameter and just visible to the naked eye (Fig. 32).

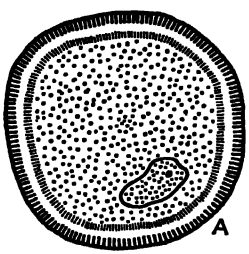

Fig. 32. A, Ovum; B, spermatozoon. Relative size.

The Spermatazoon

Is much smaller 0·05 mm in length and is produced in the seminiferous tubules of the testes (Fig. 33).

The sperm consists of:

A head—which has a pointed end the acrosome, containing —hyaluronidase (hyalase).
A body—which stores energy for movement.
A tail—which with a whip like movement propels the sperm along at the rate of 30 cm per hour.

Maturation

All cells whether plant or animal contain in their nuclei, chromosomes. Chromosomes are threadlike structures containing deoxyri-

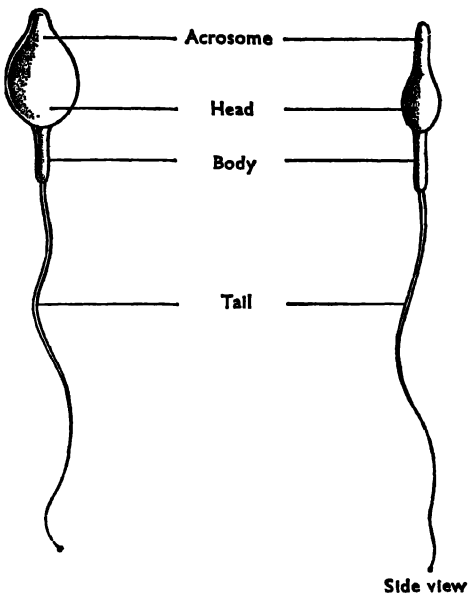

Fig. 33. Spermatozoon.

bonuleic acid (DNA). DNA is the means by which genetic patterns are perpetuated and the means by which physical and mental characteristics are transmitted from parent to offspring. The DNA in every cell is the same, but the arrangement is different and it is this arrangement which allows the wide variation of cell life throughout the animal and plant kingdoms.

Every human cell with the exception of the ovum and sperm carry forty-six chromosomes, twenty-two pairs of somatic chromosomes (autosomes) and one pair of sex chromosomes. In the female the sex chromosomes are the same, XX; and in the male different, XY.

Maturation of the ovum and sperm reduce the number of chromosomes by half, each contains twenty-two somatic and one sex chromosome (one from each pair). After fertilization they unite to maintain twenty-three pairs.

The ovum always carries an X chromosome, but the sperm may carry X or Y, thus it is the male that determines the sex of the fetus.

Fertilization

After ovulation the ovum is transported down the Fallopian tube to

the uterus. Should fetilization occur it does so most usually in the tube. Nature is very liberal and during sexual intercourse some 300000000 spermatazoa are deposited in the upper vagina. The journey from here is rigorous and only the strongest succeed, in this way nature tries to safeguard the next generation.

Many sperm perish in the acid vagina, others cannot penetrate the cervical mucus and of those that do very few reach the Fallopian tube. For fertilization to occur the sperm must penetrate the ovum, and as the head nears the ovum the acrosome explodes releasing the hyaluronidase which destroys the cement between the cells and allows the sperm to penetrate. Once fertilization has occurred the ovum secrets a substance which repels all other spermatazoa. Rearrangement of the nuclear material takes place, and the fertilized ovum or zygote has twenty-two pairs of autosomes and one pair of sex chromosomes. This is a new individual, with inherited characteristics such as sex, colour of hair and eyes already determined.

After fertilization the zygote divides and subdivides as it is carried along the Fallopian tubes towards the uterus. By three or four days it forms a small cluster of cells resembling a mulberry, and called the morula. Cell differentiation occurs very early, this is an important

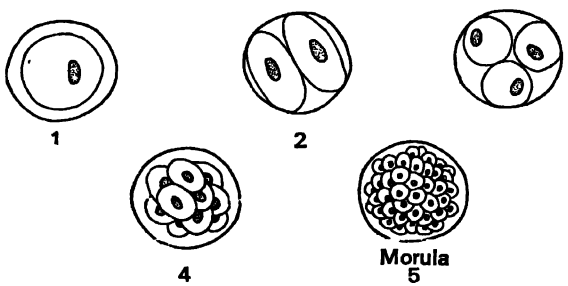

Fig. 34. Diagram of the fertilized ovum undergoing cell division.

fact because damage at this time may have serious consequences later —the destruction of one cell could mean the absence of an organ or limb.

Once the morula is formed, a small cystic space begins to appear pushing the bulk of the cells to one end or pole. The outer layer is known as the trophoblast and the mass of cells the inner cell mass. The whole is called the blastocyst (Fig. 35).

It is at this stage the fertilized ovum enters the uterine cavity, 4 days after fertilization, 5 to 6 days after ovulation. The trophoblast develops quickly and is concerned with absorbing nutrition and

secreting a hormone chorionic gonadatrophin. At this stage it is ready to embed in the endometrium.

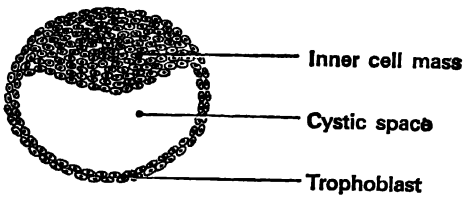

Fig. 35. A blastocyst.

Trophoblast

The trophoblastic cells multiply and differentiate into three layers:

Syncitiotrophoblast or syncitium. The outer layer, where the protoplasm is not enclosed by cell walls.

Cytotrophoblast or Langhams' layer. Well differentiated cells.

Primitive mesenchyme. Loose connective tissue into which the blood vessels grow.

Over the trophoblast small projections or villi appear, similar to the intestinal villi, and composed of the layers mentioned above, but these develop still further branching like a tree and are known as chorionic villi.

The Inner Cell Mass

Whilst these processes have been going on the inner cell mass also undergoes development. Two spaces appear, an amniotic cavity surrounded by ectodermal cells, and a yolk sac, surrounded by entodermal cells. Between is an intervening layer of mesoderm. The embryo is formed from the region where the three tissues ectoderm, mesoderm and entoderm lie in apposition.

The ectoderm; eventually develops into the skin, the eye, nervous system, mammary and other glands.

The mesoderm, into muscle, bone, connective tissue, blood vessels, urinary and reproductive organs.

The entoderm some glands and internal organs, including the liver and spleen, bladder, also the epithelial lining of the larynx, trachea, lungs and alimentary canal.

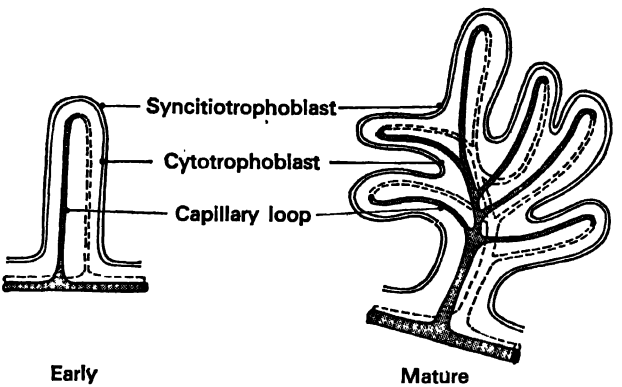

Fig. 36. Chorionic villi (early and late).

The amniotic cavity gradually enlarges to fill the entire space available. It surrounds the growing embryo and the body stalk which attaches the embryo to the wall of the sac. This stalk is the beginning of the umbilical cord.

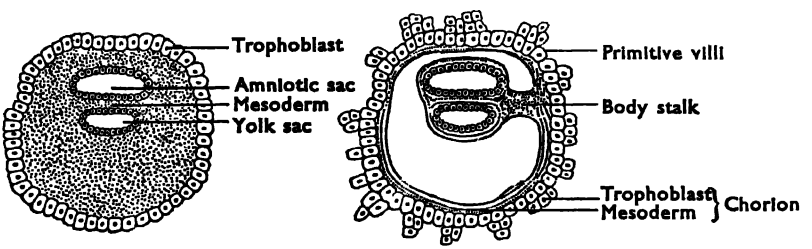

Fig. 37. Development of the embryo.

For the first few days nourishment is by a process of diffusion nutriment being absorbed from the surrounding tissue by the trophoblast. Later the primitive chorionic villi absorb the nourishment from the decidua into which they penetrate.

Development of the Ovum and Fetus

By the fourth week of gestation the fetal heart is formed. It is able to support a rudimentary circulation which transports nutrients and

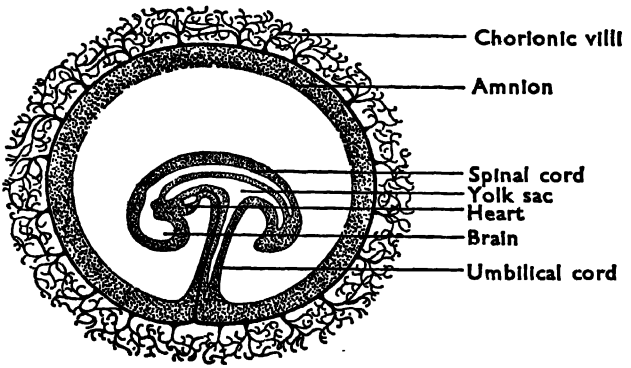

Fig. 38. Further development of the embryo.

oxygen from the maternal blood through the developing placenta and cord. By 5 weeks ossification has begun in the mandible and clavicle. At 6 weeks the embryo becomes known as the fetus.

4 weeks	Ovum 2 cm in diameter Embryo length 1 cm	Covered with villi. Head, tail fold and limb buds
8 weeks	Ovum 5 cm in diameter Fetus length 2·5 cm	Nose, external ears, fingers and toes identifiable, head flexed on chest
12 weeks	Ovum 7·5 cm in diameter Fetus length 8 cm	Placenta formed, cord twisted. External ears show most features, eye-lids fused, nails forming
16 weeks	Length 18 cm	Eyes closed, skin red and transparent, external genitalia can be identified
20 weeks	Length 25 cm	Hair and lanugo (downy hair on the skin) is formed
24 weeks	Length 30 cm	Eye-lids separated, eye-brows and eye lashes present
28 weeks	Length 35 cm Weight 1250 g	Skin red, covered with lanugo. Subcutaneous fat beginning to form, testes descending, fetus viable

32 weeks	Length 40 cm Weight 1500 g	Nails reach the end of fingers, skin less red, more subcutaneous fat. Vernix caseosa present (a white protective secretion), wrinkled appearance gone
36 weeks	Length 45 cm Weight 2500 g	Skin pink, vernix abundant, some lanugo present, subcutaneous fat increasing
40 weeks	Length 50 cm Weight 3500 g	Skin pink, lanugo disappeared, vernix decreasing, plenty of subcutaneous fat, skull hard, testes in the scrotum

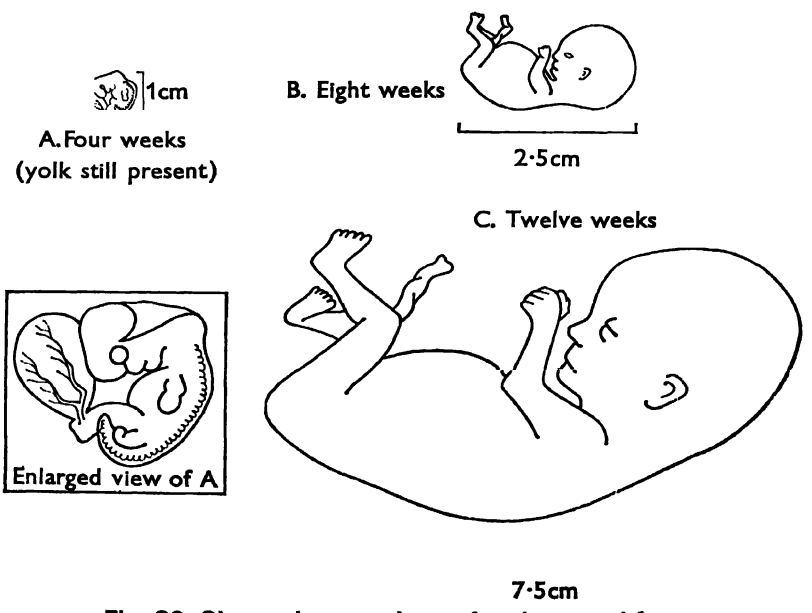

Fig. 39. Size and proportions of embryo and fetus.

Development of the Decidua

When pregnancy occurs menstruation is suppressed and the endometrium develops into the decidua of pregnancy. The corpus luteum

persists under the stimulation of the chorionic gonadatrophin. Endometrial glands become larger, more twisted and dilated. The blood vessels dilate and the connective tissue cells enlarge to form decidual cells. As a result of this development the decidua becomes thicker and more vascular and thereby forms a site suitable for the embedding and nourishment of the ovum.

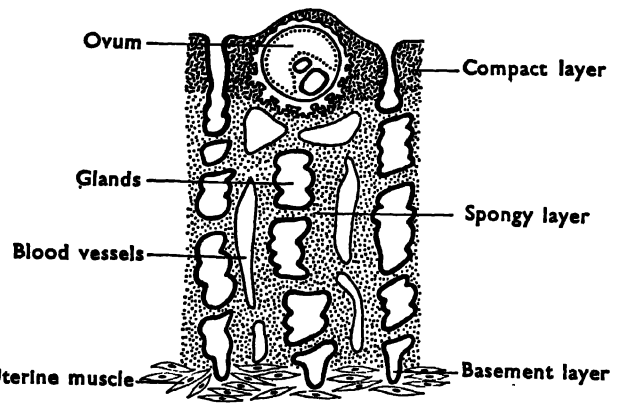

Fig. 40. Layers of the decidua and embedding of the ovum.

Three layers can now be differentiated: the basal, spongy and compact.

Basal Layer

This lies immediately above the uterine muscle. It is formed by the bases of the endometrial glands and remains unchanged at all times. When the placenta separates, the gland bases remain and new endometrium forms from them.

Spongy Layer

This lies above the basal layer. It contains large spaces formed by dilated glands and enlarged blood vessels. The chorionic villi invade this layer to form the placenta. At the deepest part of this layer, between the invading villi and the decidua, a fibrous layer is formed—the perforation layer or layer of Nitabusch. It is at this point that the placenta separates from the uterine wall and can be compared with the lines of perforation between postage stamps which allows easy separation.

The Compact Layer

This is the surface layer of the decidua nearest to the cavity of the uterus. Here the necks of the glands are packed tightly together with the decidual cells. Decidual cells are large and stellate shaped they contain glycogen.

Embedding the Ovum

The fertilized ovum usually embeds itself deeply into the decidua in the upper part of the uterus within 10 days of fertilization. The blastocyst secrets a proteolytic enzyme which digests the endometrial cells and causes a small depression in which the blastocyst lies. As digestion continues it sinks farther into the decidua, until finally it is buried in the decidua and the site of entry sealed with a fibrin plug.

The area of decidua where embedding takes place is known as the basal decidua or decidua basalis; the placenta eventually forms at this site.

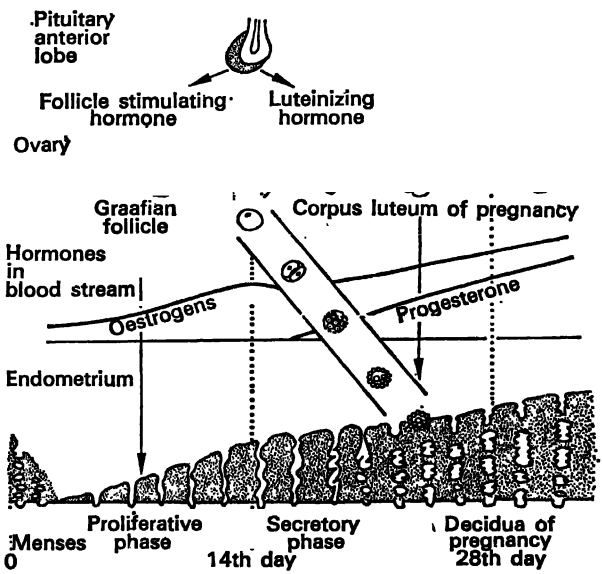

Fig. 41. Early pregnancy, showing how the ovum embeds. The corpus luteum persists and menstruation does not occur.

Embedding of the ovum sets up some activity in the tissues so that the folds of decidua which surround the ovum grow and enclose the

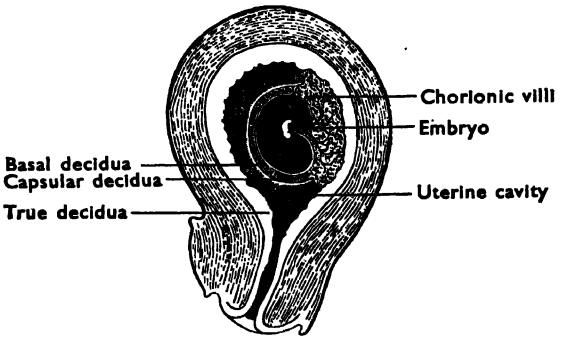

Fig. 42. The uterus at about the sixth week of pregnancy.

ovum in a capsule, known as the capsular decidua or decidua capsularis. A cap is thus formed over the ovum, securing it to the uterine wall.

The rest of the decidua lining the uterus is termed the true decidua or decidua vera. As the ovum grows the capsular decidua is pushed towards the true decidua until they unite and form a single tissue about the end of the twelfth week.

Of the chorionic villi surrounding the embryo, some are more favourably situated with regard to the blood sinuses in the basal decidua. These grow rapidly and obtain nourishment for the growing

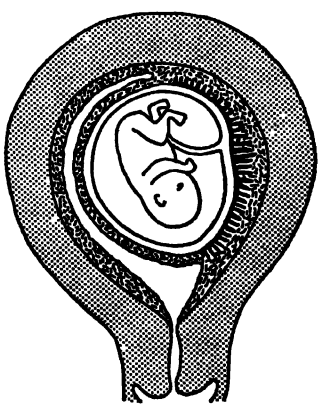

Fig. 43. The uterus showing the fetus at about the tenth week of pregnancy.

embryo. Others under the capsular decidua eventually degenerate leaving a thin membrane in their place.

The villi that proliferate are known as the chorion frondosum which by the twelfth week is the fully formed placenta. Those that degenerate are called the chorion laeve which become the membrane known as the chorion.

To Summarize

From the blastocyst	develops	Trophoblast Inner cell mass
From the trophoblast	develops	Chorion frondosum—Placenta Chorion laeve —Chorion
From the inner cell mass	develops	Fetus Umbilical cord Amnion Liquor amnii

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12. THE PLACENTA

The chorionic villi developing are of two kinds: those which enter deeply into the basal decidua right down to the layer of Nitabusch (fastening or anchoring villi) and the shorter ones which hang loosely in the maternal blood (nutritive villi).

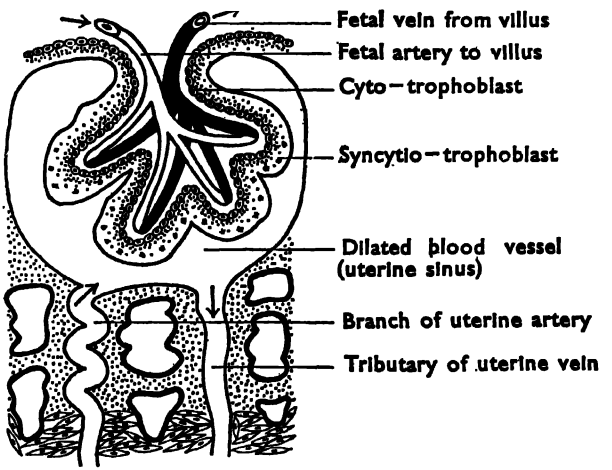

Fig. 44. Diagram to illustrate the formation of the placenta. One chorionic villus in a uterine sinus is surrounded by maternal blood. Arrows show the direction of the blood flow.

The mature tree like villi contain the fetal capillary network and lie in the choriodecidual space, that is the space between the villi and the decidua in which circulates maternal blood. Blood spurts from the spiral arteries in the decidua to shower like a fountain over the villi (Fig. 45) and then escapes back to the uterine veins. Thus the villi are bathed in maternal blood which is constantly changing and bringing the oxygen and nutrients the fetus requires. Substances diffuse from the maternal blood through the walls of the villi into the fetal

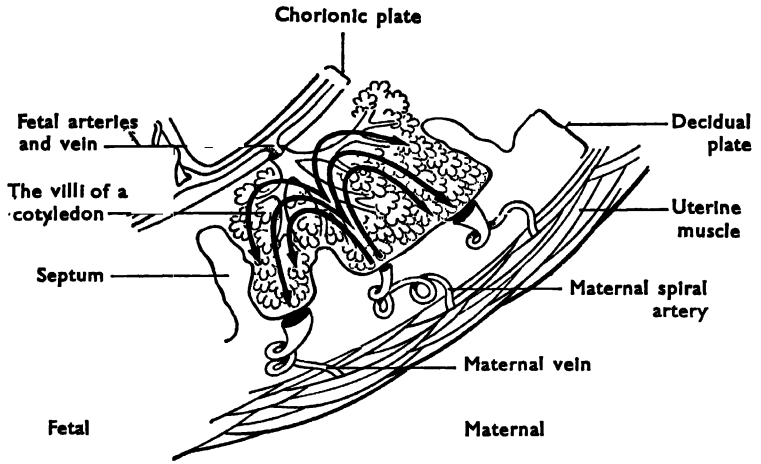

Fig. 45. Diagrammatic representation of the blood in the placenta.

blood stream. The cells of the villi have certain powers of selection. Waste from the fetus is excreted from the fetal blood to the maternal blood.

Note. The maternal and fetal blood streams do not mix, the walls of the villi lie between them.

The Placenta at Term

At term the placenta is flat and round or oval in shape. It is 18 to 20 cm in diameter and about 2·5 cm thick in the centre, becoming thinner towards the edges. Its weight is about 600 g, or one-sixth of the weight of the fetus. The placenta is usually situated on the anterior or posterior wall of the uterine cavity, near the fundus. The placenta has two surfaces, maternal and fetal.

The Maternal Surface

This surface is attached to the uterine decidua, is deep red in colour and divided by deep grooves or sulcii into about fifteen to twenty irregular lobes. These lobes are cotyledons and they contain masses of chorionic villi. On examination after birth a thin greyish layer, part of the basal decidua can be seen (Fig. 46).

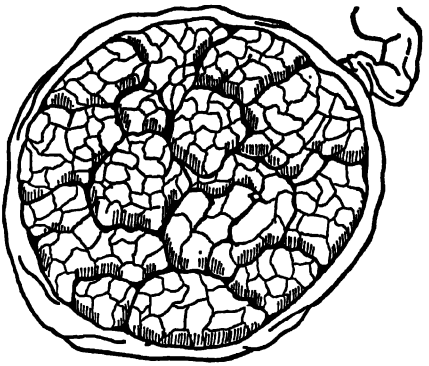

Fig. 46. The placenta: maternal surface showing cotyledons.

The Fetal Surface

This surface lies adjacent to the fetus. From the insertion of the cord, which is usually situated centrally, blood vessels can be seen radiating to the periphery, like the roots of a tree, where they disappear from sight. These vessels give off branches which penetrate into the substance of the placenta, each cotyledon having its own supply of fetal blood. In the centre of each cotyledon there is a main branch of the umbilical artery and vein.

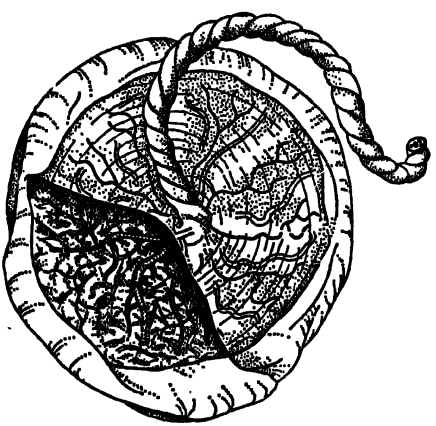

Fig. 47. The placenta: fetal surface.

Functions of the Placenta

Respiratory

Oxygen is brought to the uterine sinuses by the branches of the uterine and ovarian arteries. Interchange of oxygen and carbon dioxide take place without the blood-streams mixing, the capillaries in the villi giving up carbon dioxide and other impurities and receiving oxygen in exchange. The capillaries then unite to form ultimately the umbilical vein.

Nutritive

The fetus obtains its food by the passage of nutritive substances through the placenta. The placenta not only selects substances to pass direct to the fetus but in addition it contains enzymes which can break down proteins, fats and carbohydrates to a form suitable for the fetus. The placenta can also store carbohydrate in the form of glycogen ready to be converted to glucose to pass to the fetus as required.

Excretory

Waste products are given off, and taken away by the uterine and ovarian veins.

Protective

The placenta acts as a barrier to the passage of most bacteria. Thus cocci or bacilli in the maternal blood do not pass into the fetal blood and infect the fetus. Certain smaller organisms such as the spirochaete of syphilis and the virus of rubella are able to pass through the walls of the chorionic villi.

The placenta allows the transfer of antibodies from the mother to the fetus, so giving it a certain immunity to infection for its first few months; on the other hand the passage of antibodies from the mother to the fetus causes haemolytic disease of the newborn.

Endocrine

The placenta forms hormones similar to those produced by the ovary and the anterior pituitary lobe. The placental hormones augment the action of the ovarian and pituitary hormones and help to produce the bodily changes of pregnancy and to maintain the pregnancy.

Abnormalities of the Placenta

Succenturiate Lobe

This is a small portion or lobe of placenta separated from the main body, which is formed from some of the villi of the chorionic membrane which have continued to develop instead of becoming atrophied. It is attached to the main placenta by blood vessels which cross the intervening membrane, these vessels running from the edge of the placenta. There is a possibility of this cotyledon's being retained in the uterus after the main placenta has been expelled. A retained cotyledon is a very serious matter, and gives rise to postpartum haemorrhage and sepsis. When there is a small hole in the fetal membranes, with placental vessels running towards it, it indicates the retention of a placental lobe corresponding in size to the hole in the membrane (Fig. 48).

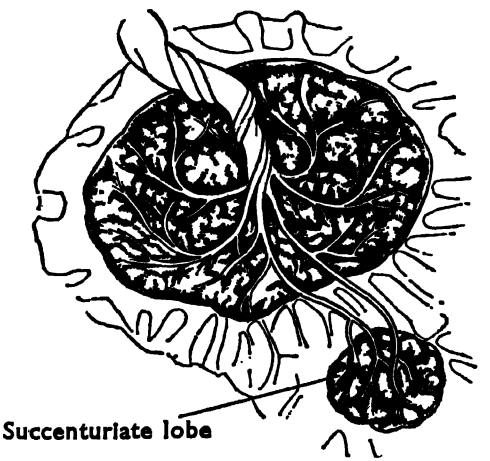

Fig. 48. Succenturiate placenta.

Circumvallate Placenta

In this type of placenta the chorion is attached not to the edge of the placenta, but to the fetal surface at some distance from the edge (Fig. 49).

Bipartite Placenta

This is a placenta divided into two main lobes.

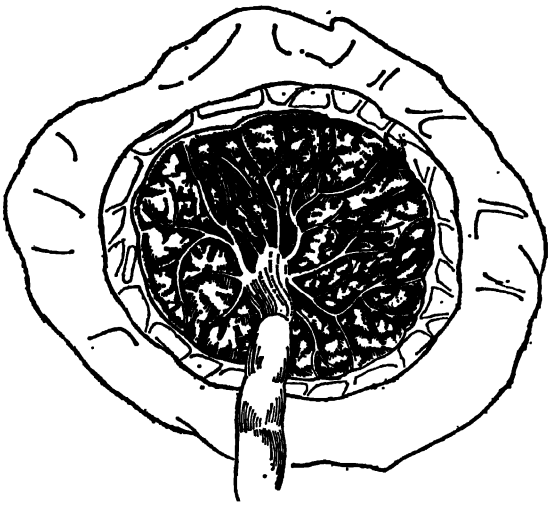

Fig. 49. Circumvallate placenta.

Placenta Accreta

This is a placenta which becomes abnormally adherent to the uterine wall over the whole or part of its surface. It is very rare.

Infarcts

These are red or white patches sometimes seen on the maternal surface of the placenta. They are caused by localized death of placental tissue due to interference with the blood supply.

Infarcts are red at an early stage of their development; later they become white and appear as patches of white fibrous tissue. They may be seen occasionally in any placenta, but often they are associated with pre-eclampsia.

Calcification

On the maternal surface of the placenta small greyish-white patches are often to be seen particularly on the post-mature placenta. These are deposits of lime salts. They convey a gritty sensation to the fingers and are not of any significance.

Fetal Membranes

There are two fetal membranes the chorion and amnion.

The Chorion

The chorion is the outer membrane, continuous with the edge of the placenta and derived from the trophoblast. It is opaque, thick but friable; and roughened by tiny pieces of decidua adherent to it. It lines the uterine cavity.

The Amnion

Is the inner membrane, derived from the inner cell mass. It is smooth, transparent and the stronger membrane of the two. The two membranes lie over each other, but can be separated from each other, the amnion may be stripped back to the insertion of the cord, where it continues as the covering of the cord. The amnion secretes the amniotic fluid or liquor amnii which at term measures 1000 to 1500 ml.

The Cord

The umbilical cord or funis connects the placenta to the fetus. The cord is about 50 cm in length and 2 cm in thickness. It is composed of a jelly like substance known as Wharton's jelly, this is a

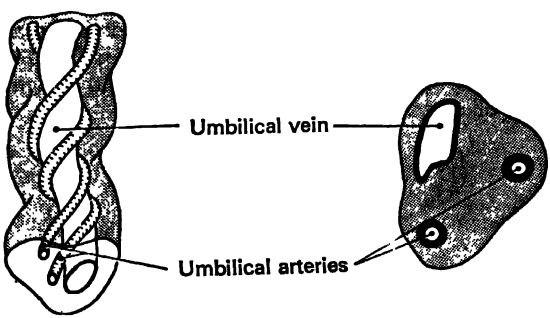

Fig. 50. The umbilical cord. Side view and cross-section, showing the one umbilical vein, with the two umbilical arteries twisting spirally around it. The vein and arteries lie in Wharton's jelly; the cord is enclosed within the amnion.

primitive connective tissue, primary mesenchyme. The cord is covered externally by amnion. It supports and protects three blood vessels, namely one large umbilical vein carrying oxygenated blood to the fetus, and two umbilical arteries winding around the vein carrying deoxygenated blood from the fetus to the placenta.

The absence of a vessel may be associated with renal agenesis (absence of kidneys). The cord has a spiral twist, this torsion gives a certain amount of protection from pressure.

The function of the cord ceases as the lungs start to function immediately after birth and pulmonary respiration is established. The cord is clamped and cut; the circulation in the cord ceases and, as the small portion attached to the umbilicus receives no further blood supply, it becomes dead tissue and immediately begins to atrophy. Great care is required to prevent bacteria from gaining access to it. About the fifth day it should separate leaving a dry and healthy surface.

Abnormalities of the Umbilical Cord

The cord may be too short, causing, occasionally, delay in descent of the head and difficulty at delivery, or too long, when prolapse of the cord is more liable to occur. Occasionally it is very thick or very thin, and in either case great care is required in tying the cord and subsequently watching for haemorrhage. Rarely a piece of fetal intestine may protrude into the cord, but the possibility of this abnormality will be suspected if the cord is swollen close to the umbilicus, the size of the swelling depending on the amount of intestine which has protruded. Knots are caused by movements of the fetus before birth, the baby slipping through a loop of the cord. False knots may be due to the blood vessels being longer than the actual cord and so doubling back upon themselves in the Wharton's jelly, or to irregularities and the formation of nodes.

Fig. 51. Battledore insertion of the cord.

Abnormalities of Insertion

The cord may be attached to one side of the placenta, an eccentric insertion, to the margin of the placenta, a battledore insertion, or the

Fig. 52. Velamentous insertion of the cord.

vessels of the cord may break up and run into the membrane before reaching the placenta, a velamentous insertion. This is particularly dangerous if the unprotected blood vessels should lie near the internal os. This very rare condition is called vasa praevia (vessels in advance of the fetus). Should a blood vessel so situated be compressed when the membranes rupture, the fetus will suffer hypoxia. If is such a vessel should actually rupture the fetus will lose blood from his own vessels in the membrane. Such fetal haemorrhage is dangerous and could lead to stillbirth.

Liquor Amnii

Liquor amnii is a fluid contained in the amniotic sac, and it is secreted chiefly by the amnion, which is in direct contact on its outer surface with the chorionic membrane, the latter being attached to the decidua of the uterus.

Liquor amnii is a clear straw-coloured fluid, but it often contains fetal epithelial cells and vernix caseosa which makes the liquor turbid or milky. Meconium from the fetal intestine will make the liquor green and suggests past or present fetal distress. Liquor amnii is almost 99 per cent water and is made alkaline by salts in the form of phosphates and chlorides. Urea and albumin are also present in it in small quantities. The normal amount of liquor is about 1 litre. An excessive amount is known as hydramnios or polyhydramnios and a reduction in quantity is called oligohydramnios.

The Function of the Membranes and Liquor

To provide a medium in which the fetus can move.
To provide a cushion against knocks.
To keep an equable temperature.
To equalize pressure.
To prevent pressure on the cord.

Polyhydramnios

Polyhydramnios (hydramnios) occurs when the amount of liquor amnii is increased. It is externally difficult to determine the quantity of liquor but the signs suggesting excessive amounts are:

The uterus may appear too large for the duration of pregnancy.
The fetal parts may be difficult to palpate.
The uterus may be tense.

A fluid thrill may be detected; that is, a tap on one side of the uterus is distinctly felt by the other hand placed on the other side of the uterus.

Two types of hydramnios are recognized.

Acute Hydramnios

This is an extremely rare complication of early pregnancy, occurring in association with uniovular twins. The onset at 16 to 20 weeks is sudden, the development rapid, and the mother is acutely affected. Her breathing is distressed from pressure on the diaphragm. The abdomen is grossly distended, the amniotic sac containing 7 litres or more. Tapping of the sac by paracetesis has sometimes been attempted, but nearly always with the same result: that the liquor quickly increased again, and that abortion had occurred.

Chronic Hydramnios

In chronic hydramnios, which is commoner, the liquor gradually

accumulates, usually after the thirtieth week. It occurs in twin pregnancy, or women with diabetes mellitus, and where the fetus is hydropic or malformed. It is noted in particular in association with anencephaly and oesophageal atresia. In nearly 50 per cent of the cases no cause is found.

The midwife should have the patient seen by a doctor, who will probably order an X-ray. This will show any bony malformation of the fetus.

The fetus is difficult to palpate, often very mobile, and usually the head does not engage during pregnancy. Pressure symptoms, such as breathlessness and oedema of the ankles may be troublesome, and if so, the patient should go into hospital to rest. If the fetus is abnormal, premature labour may be induced. Labour, in fact, often begins prematurely with rupture of the membranes, and the midwife should be aware of the possible complications, which are: malpresentation, prolapse of the cord, sometimes weak contractions and post-partum haemorrhage.

Oligohydramnios

This means that there is less than the normal amount of liquor amnii. It does not as a rule cause trouble unless the baby presents by the breech, when, because of the small amount of liquor, version may be difficult or even impossible. Because the baby lies in a cramped position he may be born with positional talipes.

Further Reading

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13. THE FETAL SKULL

The fetal skull is ovoid or egg-shaped and corresponds to the shape of the brain. It differs from that of an adult in the large size of the vault in relation to the face.

The Divisions of the Fetal Skull

For the purpose of obstetrics, the fetal skull may be considered as divided into three sections:

The vault, containing the cerebral hemispheres.
The base.
The face.

The bones of the base and the face are firmly united and, therefore, incompressible.

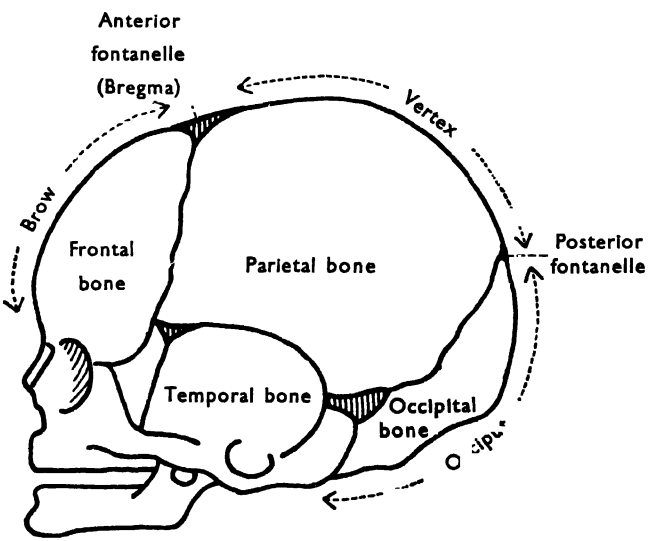

Fig. 53. The fetal skull, showing bones, fontanelles and regions.

Regions of the Fetal Skull

The vertex is the area bounded in front by the anterior fontanelle, behind by the posterior fontanelle and laterally by the parietal eminences.

The brow, or sinciput, is the area over the frontal bone.

The occiput is the area over the occipital bone.

The face extends from the supra-orbital ridges to the chin.

The bones of the vault.

The vault is composed of thin sheets of bone separated, at the sutures, by membrane. This arrangement permits considerable moulding and overlapping during labour, and during childhood allows for the progressive development of the brain. The vault of the skull is composed entirely of membrane in early fetal life. Later, ossification begins at centres in the membranous vault and the bones are formed. At birth the membrane still remains between the bones at the sutures and fontanelles. The points from which ossification spreads in the fetal skull are the occipital protruberance, the parietal eminences and the frontal bosses.

The vault of the fetal skull is made up of:

Two frontal bones.
Two parietal bones.
Two temporal bones.
One occipital bone.

These bones are joined to each other and to the bones of the face and the base of the skull by sutures.

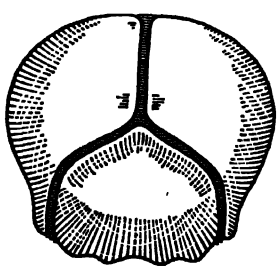

Fig. 54. Back view of the fetal skull.

Sutures

The sutures of the vault are four in number and are composed of soft, fibrous tissue.

The frontal suture unites the frontal bones; this suture is fused in an adult.

The sagittal suture, so called from its resemblance to an arrow, unites the two parietal bones.

The lamboidal suture, named from its resemblance to the Greek letter lamba (λ), unites the posterior margins of the parietal bones to the occipital bone.

The coronal suture, the part of the head where the crown of victory was placed in Olympian days unites the frontal bones to the anterior margins of the parietal bones.

The temporal sutures have no obstetric importance.

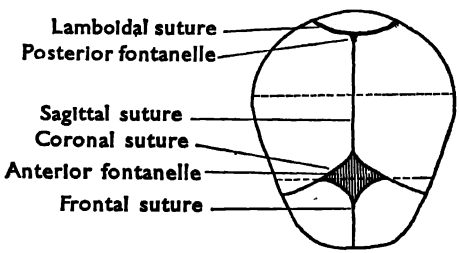

Fig. 55. The fetal skull from above.

Fontanelles

A fontanelle is a membranous, non-ossified area of the skull found where three or more sutures meet. There are two fontanelles of importance in obstetrics, anterior and posterior.

The anterior fontanelle or bregma, is the meeting place of four sutures. It is kite-shaped, 2 to 2·5 cm in breadth and 2·5 to 3 cm in length. It may be palpated on vaginal examination when the head is deflexed as in an occipito-posterior position. In this region the skull is not fully ossified until the child is 16 to 18 months old.

The posterior fontanelle is tri-radiate in shape, and is the meeting place of three sutures. It is a useful guiding point when making a vaginal examination as, by locating its position, one can determine the relationship of the head to a particular part of the maternal pelvis. It closes soon after birth, but may remain slightly open for a time in a premature infant.

The sutures and fontanelles allow moulding of the fetal head dur-

ing labour with temporary alteration in its shape. This moulding naturally puts some strain upon the folds of dura mater, the falx cerebri and the tentorium cerebelli. Moulding which is extreme in degree, or too rapid, or in which the head is compressed in abnormal diameters may cause a tear in one or other of these membranes. If the tear involves the contained or adjacent blood vessels an intracrainal haemorrhage results.

The foramen magnum. The base of the skull is perforated by a circular opening called the foramen magnum, through which the spinal cord passes.

The pericranium. The pericranium is the periosteum covering the outer surface of the bones of the skull and attached at the edges of the bones. In the centre of the bone it is less firmly attached.

The Scalp

The scalp is the thick, soft, movable part over the pericranium; its loose tissues are composed of skin, roots of hair, certain muscle fibres, blood vessels and connective tissue.

The Diameters of the Fetal Skull

The Longitudinal Diameters

The size of the fetal skull can be estimated by measuring the distances between certain points. The diameters of the head can best be understood by learning them according to the posture of the fetal head, that is the degree of flexion or extension.

Sub-occipito-bregmatic, 9·5 cm. Measured from the junction of the head with the neck behind to the centre of the anterior fontanelle. This diameter presents when the head is fully flexed and engages in a normal presentation.

Sub-occipito-frontal, 10 cm. Measured from where the head joins the neck behind to the centre of the forehead. This diameter presents when the head is almost completely flexed. It stretches the soft parts as the forehead emerges at the outlet and in the after-coming head in a breech delivery.

Occipito-frontal, 11 cm. Measured from the centre of the forehead to the occipital protruberance. This diameter lies across the pelvis in an occipito-posterior or occipito-lateral position with deficient flexion.

Mento-vertical, 13 cm. Measured from the point of the chin to the highest point on the vertex. The head is midway between flexion and extension. It presents in a brow presentation.

Sub-mento-vertical, 11 cm. Measures from the junction of the chin with the neck in front to the highest point on the vertex. This dia-

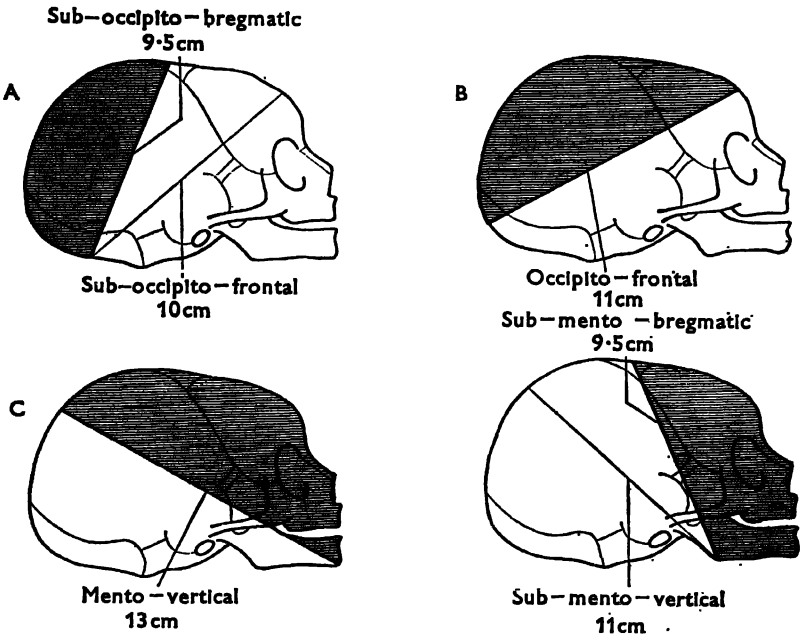

Fig. 56. Diagram to show the longitudinal engaging diameters of the fetal head. The shaded part of the head is the first part to enter the pelvis (the presentation).

A. Flexed head	Well flexed	Sub-occipito-bregmatic
	Moderate flexion	Sub-occipito-frontal
B. Deflexed head		Occipito-frontal
C. Brow presentation		Mento-vertical
D. Face presentation	Full extension	Sub-mento-bregmatic
	Incomplete extention	Sub-mento-vertical

meter presents in a face presentation when the head is not fully extended.

Sub-mento-bregmatic, 9·5 cm. Measured from the junction of the chin with the neck in front to the centre of the anterior fontanelle. This diameter engages when the head is fully extended in a face presentation.

The Transverse Diameters

Biparietal, 9·5 cm. Measured between the parietal eminences.

Bitemporal, 8 cm. Between the most distant parts of the coronal suture.

Circumference of the Fetal Skull

The circumferences of the fetal skull are:

Sub-occipito-bregmatic, 29 cm.
Occipito-frontal, 32 to 35 cm (average).
Mento-vertical, 39 cm.

The importance of knowing the circumference of the fetal head is that when the head is well flexed the sub-occipito-bregmatic circumference (about 29 cm) fits into the lower uterine segment, and also enters the pelvic brim more easily than when deflexed. The circumference of a deflexed head is about 35 cm (occipito-frontal), which does not fit well into the lower uterine segment and is often delayed in its entrance in the pelvic brim. This may result in early rupture of the membranes and, in some cases, a prolonged and possibly difficult labour.

Moulding

As the measurements of the fetal head correspond very closely to those of the maternal pelvis, it is necessary to understand their relationship to each other, and also the effect of pressure and moulding of the head. The result of moulding is a diminution of the diameters, which are most compressed, compensated for by the elongation of those which are not compressed. This process is made possible by the sutures and fontanelles, which allow the bones to overlap; the reduction in presenting diameter may be more than a quarter of an inch. The frontal bone is pushed under the anterior portion of the parietal bone, and the occiput under the posterior part.

It is possible to recognize the way in which the baby's head has passed through the pelvis by examining the moulding soon after birth. The following are the alterations due to moulding which occur with the various presentations:

Vertex presentation with good flexion
Sub-occipito-bregmatic decreased.
Bi-parietal decreased.
Mento-vertical increased.

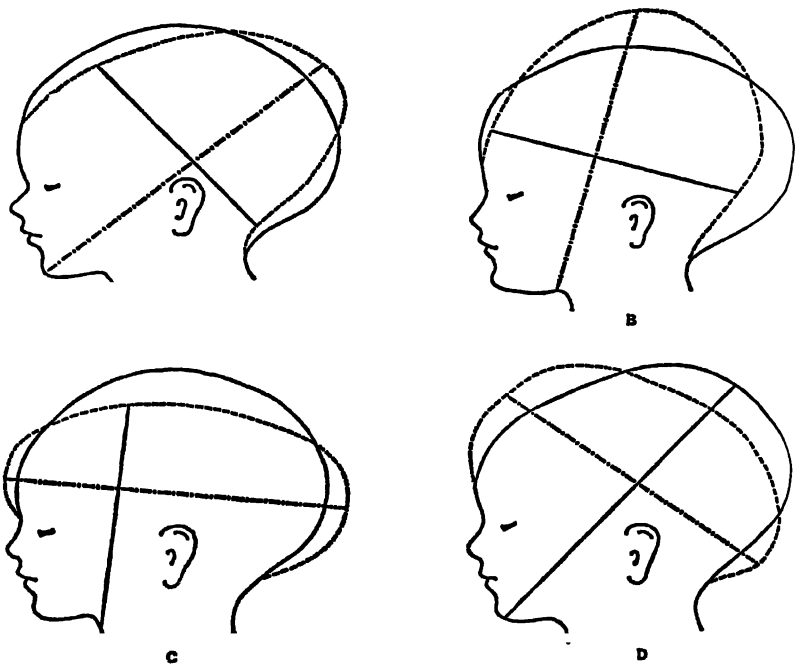

Fig. 57. Moulding of the head.

A. Occipito-anterior position. Sub-occipito-bregmatic diameter compressed and decreased. Diameter at right angles to it, i.e. mento-vertical increased.
B. Occipito-posterior position ('sugarloaf' or 'crash-helmet' moulding). Occipito-frontal diameter compressed and decreased. Sub-mento-bregmatic diameter increased.
C. Face presentation. Sub-mento-bregmatic diameter compressed and decreased. Occipito-frontal diameter increased.
D. Brow presentation (only possible with a small fetus and a large pelvis). Mento-vertical diameter decreased. Sub-occipito-bregmatic diameter increased.
In all cases the biparietal diameter, not shown in this diagram, is decreased.

Persistent occipito-posterior position of the vertex
Occipito-frontal decreased.
Bi-parietal decreased.
Sub-mento-bregmatic increased.

Face presentation
Sub-mento-bregmatic decreased.
Bi-parietal decreased.
Occipito-frontal increased.
Brow presentation
Mento-vertical decreased.
Bi-parietal probably decreased.
Sub-occipito-bregmatic increased.

Caput Succedaneum in Vertex Presentations

During labour and after rupture of the membranes the head is pressed against the ring formed by the dilating cervix. This impedes circulation in the scalp and a swelling due to congestion and oedema forms in the loose tissues of the scalp. The swelling or caput succedaneum forms on the unsupported presenting area and projects through the cervix. The area covered by the caput depends on the degree of dilatation of the cervix and after full dilatation could cover the whole presenting area. The size of the swelling varies greatly. If the labour is easy little caput may form but if the contractions are strong and advance is slow the caput will become much larger. The size of the caput and the degree of moulding are indications of the amount of difficulty in delivery. In a left occipito-anterior position the caput forms on the posterior part of the right parietal bone. In a right occipito-anterior position the caput forms on the left parietal bone.

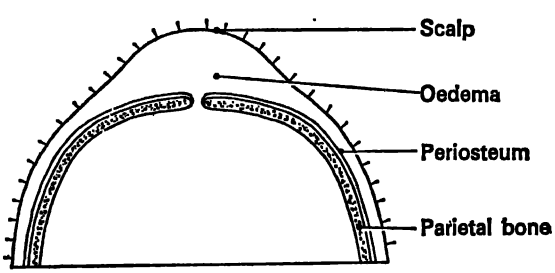

Fig. 58. Caput succedaneum.

In an occipito-posterior position with deficient flexion the caput forms on the anterior part of the anterior parietal bone, near the bregma. A secondary caput may form over the occiput in a prolonged second stage of labour by pressure of the head against the partially dilated vulva.

PART THREE
PREGNANCY

14. PHYSIOLOGY OF PREGNANCY

Pregnancy is more than the growth of the uterus and the contained fetus. It is a state in which changes occur in all parts of the maternal body.

These changes result chiefly from alterations in hormone production, circulation and metabolism. A study of this altered physiology is well worth while, since it will help to explain not only the symptoms and signs by which we recognize pregnancy, but also many of the minor disturbances about which patients so often ask advice.

Physiological Changes in Pregnancy

Hormones

Chorionic gonadotrophin. This is sometimes called the anterior pituitary like principle (APL) and is produced by the cells of the trophoblast from the time of embedding of the fertilized ovum. It is released

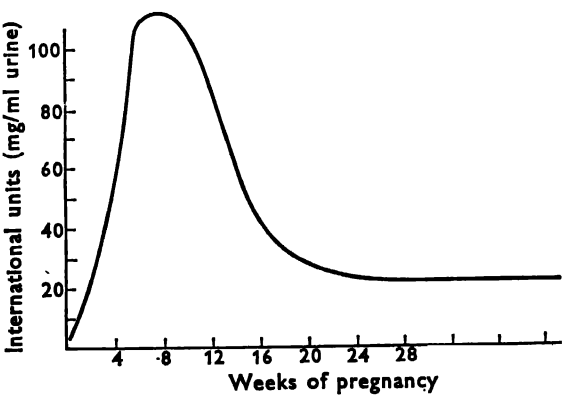

Fig. 59. Urinary chorionic gonadotrophin at varying times during pregnancy.

into the maternal blood which is flowing around the ovum, and is carried in the blood to the ovary, where it stimulates the growth of the corpus luteum of pregnancy. It reaches its maximum production at the twelfth or thirteenth week of pregnancy, thus the corpus luteum grows up to this time and then gradually declines. Chorionic gonadotrophin is excreted via the kidneys, appears in the urine, especially in the early weeks of pregnancy, and thus forms a basis for the biological and immunological pregnancy tests.

Oestrogens. Oestrogens are produced in greatly increased quantities; during the first 12 weeks by the corpus luteum of pregnancy, and after this mainly by the placenta. Oestrogens stimulate growth, notably in the uterus, but also in the duct system of the breasts, in the nipples and possibly in the ureters. When oestrogens are used in medical treatment, they tend to cause nausea and vomiting. The sudden increase in oestrogen production of early pregnancy may contribute to the characteristic 'morning sickness'.

Progesterone. Progesterone is also produced mainly in the corpus luteum during the first trimester and, later, in the placenta. It is in some ways, the most important hormone in pregnancy. It stimulates the development of a thick, vascular decidua ready for the embedding of the ovum, and it normally maintains this healthy decidua throughout the pregnancy. It is responsible for the full development of the glandular tissue in the breasts, thus preparing them for milk secretion.

Progesterone relaxes plain muscle, this allows the growing uterus to accommodate the fetus and placenta without stimulating uterine contraction. However, progesterone production may be deficient, and the uterus, no longer quiescent, begins rhythmic contractions and an abortion ensues.

This relaxing effect may be noted in other plain muscle in the body. The ureters are affected and become kinked and dilated, with a consequent stasis of urine, which predisposes to urinary tract infection. Similarly, because the plain muscle of the bowel is relaxed, constipation is common in pregnancy. Relaxation of the plain muscle in the walls of the veins may lead to the development of varicose veins of the legs, rectum or vulva. This effect is aggravated by the pressure of the enlarging uterus on the pelvic veins, which further retards the return blood flow from the legs.

Other Hormones

Thyroid. The thyroid gland may enlarge as much as 50 per cent of its

previous size. There may be increased hormonal activity which accounts for the increased metabolic rate during pregnancy. The extreme liability of mood may also be partly attributed to the thyroid activity.

Anterior pituitary. The anterior pituitary gland also enlarges during pregnancy, there is an increase in adrenocorticotrophic hormone, thyrotrophic and the melanocytic hormone; the latter accounting for the increased pigmentation found in pregnancy. Follicle stimulating hormone and the luteinizing hormone are suppressed.

Adrenal. The increase in corticosteroids does not occur until the second trimester. This is to protect the fetus as increased cortisone during the early weeks could cause fetal abnormality. Adrenal activity accounts for the glycosuria often found in pregnancy, the striae and some of the water retention.

Relaxin. Relaxation of the ligaments of the pelvic joints is believed to result from the action of another hormone, namely relaxin. This slight 'give' of the pelvic joints, providing as it does a small amount of extra space in the pelvis, can sometimes contribute to a rather easier labour. On the other hand, the additional mobility of the joints may create discomfort. Backache is a fairly common disorder in pregnancy and it is frequently postural in origin. Less common, but no less disagreeable, is the feeling of instability when walking or standing which some women experience.

The Uterus

During pregnancy the uterus increases in weight from about 60 to 1000 g at term; the length increases to 30 cm and its width to about 22 cm. The normal abdominal girth at the level of the umbilicus varies between 95 and 100 cm at term. All the component tissues of the uterus take part in the growth during pregnancy—the parametrium, myometrium, endometrium, blood vessels, nerves and lymphatics. The growth of the muscular tissue is not only due to an increase in the length and size of the already existing fibres (hypertrophy) but to the development of new fibres (hyperplasia). The uterine wall becomes thinner, and at term is 0·5 to 1 cm thick.

In late pregnancy and in labour, the uterus is described as consisting of an upper and a lower segment. The upper uterine segment is the upper three-quarters of the body of the uterus. It is the part which contracts and retracts during labour, becoming shorter and thicker. The lower uterine segment develops from the isthmus. It is

approximately the lower one-quarter of the body of the uterus which with the cervix, thins and stretches during labour.

The Cervix

The changes in the cervix are but slight. Its size does not increase very much but it becomes softer and secretes more mucus, a plug, the operculum, helping to seal off the uterine cavity.

During the first 12 weeks the uterus lies in the cavity of the pelvis. At first it loses its pear shape and becomes more globular, but about the sixteenth week it resumes its pear shape. By the tenth to twelfth week the fundus may be felt above the brim of the pelvis. At about the eighteenth to twentieth week the uterus comes into contact with the abdominal wall, when the fetal movements may be felt by the mother, for by this time the muscles of the fetus are sufficiently developed to move the limbs. This first sensation of movement is referred to as 'quickening'. As the uterus enlarges it pushes the coils of the small intestine further up into the abdomen. The increase in the height of the uterus goes on at the rate of two fingers' breadth every 4 weeks. The fundus reaches or nears the xiphisternum at 36 weeks.

Braxton Hicks Contractions

These are painless uterine contractions which may be observed from about the twentieth week onwards. These contractions do not cause dilatation of the cervix. They assist in the circulation of the blood to the placental site. With each uterine contraction the deoxygenated blood is driven out of the uterine sinuses into the veins, as water is squeezed from a sponge. On relaxation oxygenated blood flows into the sinuses from the arteries. The blood supply to the uterus is increased during pregnancy and the veins and arteries enlarge, and it is the coursing of the blood through these enlarged tortuous arteries that causes the uterine souffle.

The Vagina

The vagina becomes softer and bluish in colour from an increase in the number and size of the veins in the vaginal walls.

The Breasts

Under the influence of the ovarian hormones the breasts begin early in pregnancy to prepare for their function of milk production.

By the sixth week the patient is conscious of a tingling feeling and the breasts are uncomfortable. The breast tissue feels nodular and 'lumpy', and soon a network of enlarged superficial veins is visible giving the skin the appearance of marble. By the tenth to twelfth week the nipple and areola have darkened from pink to brown, slightly in blondes and redheads, markedly in brunettes. About this time a small quantity of colourless fluid may be expressed, and Montgomery's tubercles are seen. These are small pale raised areas on the areola surrounding the nipple. They are the dilated mouths of the sebaceous glands which secrete sebum to lubricate the nipple. By the sixteenth to eighteenth week dark skinned women have developed a secondary areola, a mottled zone of pigmentation surrounding the primary areola.

Cardiovascular System

There is a marked increase in the blood volume amounting to an extra 25 per cent by the thirtieth week, this is equivalent to 1·5 litres. Subsequently this decreases slightly. The increase in plasma is greater than that in the blood cells, hence the blood is, as it were, diluted and its haemoglobin value falls. At the same time true anaemia is common in pregnancy, and if the haemoglobin level falls below 11·6 g (80 per cent) the patient should be considered anaemic. There is also an alteration in the white cell count and in the albumin/globulin ratio. Normal values in pregnancy would be:

Red blood cells	4 000000/mm^3 (cubic millimetre)
White blood cells	12000/mm^3
Platelets	500000/mm^3
Serum fibrinogen	0·4g/100 ml
Haemoglobin	12·5g/100 ml of blood.

The heart, pumping the extra blood round an increased circulation is clearly required to work much harder. The increased weight gain also means an additional strain on the heart and towards term the cardiac output is increased by as much as 30 per cent. The normal heart, which always has some power in reserve, is well able to do this extra work. Patients with heart disease however, may grow seriously worse in pregnancy, and great care is necessary. Blood pressure is dependent on several factors, the increased cardiac output tends to raise the blood pressure, whilst an increase in the numer of peripheral vessels in the uterus and the reduced viscosity tend to cause a lowering. The resultant effect is in most cases a reduction in blood pressure early in pregnancy, which levels out again in the second and third trimesters.

Respiratory System

By the end of pregnancy oxygen requirements have increased by 20 per cent. During the first two trimesters the tidal volume increases, but the respiratory rate remains constant. In the last trimester the enlarging uterus pushes the diaphragm upwards and compresses the lower lobes of the lungs. This alters the air distribution and the lungs become 'stiffer' that is the work of breathing is increased and to meet the oxygen requirements, the respiratory rate increases.

Urinary System

Early in pregnancy the enlarging uterus may compress the bladder and cause frequency of micturition, and at the end of pregnancy the

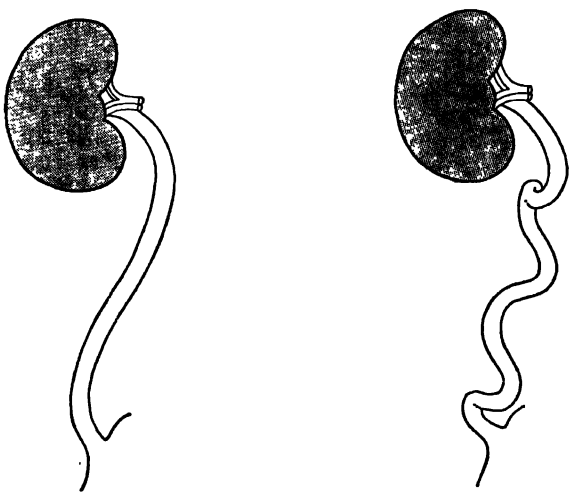

Fig. 60. Diagram showing relaxation of the ureter in pregnancy.

engaged head may have the same effect. The ureters become dilated in pregnancy and this may be partly due to compression of the lower end of the ureter by the uterus, but the chief cause probably is atonicity of the ureter owing to the action of progesterone. Slow emptying of the ureter and renal pelvis may follow and there is a tendency for urinary tract infection to complicate pregnancy.

Gastro-Intestinal Tract

The musculature of the whole tract is relaxed and this is the cause of many minor discomforts of pregnancy. The cardiac sphincter is relaxed and allows oesophageal reflux which may cause heartburn. Gastric secretion is reduced and the stomach takes longer to empty. This is particularly marked in labour. The intestine is also relaxed which leads to constipation during pregnancy.

The Skin

The skin of the abdomen is stretched by the pregnancy and small tears of the deeper layers of the skin may occur. This produces irregular bluish-pink lines on either side of the abdomen called 'striae gravidarum'. Similar marks may occur in the breasts and thighs. In some women, particularly brunettes, an increase of pigmentation occurs during pregnancy. Pigmentation of the aerola has been described. Sometimes the chloasma, a mask-like area of pigmentation covering the forehead and upper part of the cheeks, is seen quite early in pregnancy. It disappears after delivery. Darkening of the vulva may also occur and a dark line, the linea nigra, is often seen on the abdomen.

General Metabolism

The activity of all the body functions increases in pregnancy to meet the growing demands of the fetus and the maternal tissues. An increase in certain articles in the diet is required to balance these demands. Glycosuria is common during pregnancy, the sugar in the urine usually being glucose and only rarely lactose. On investigation it is usually found the glycosuria is not due to diabetes, but to the fact that the kidney has allowed glucose to escape more readily from the blood to the urine during the pregnancy. This glycosuria is due to a low renal threshold for sugar, which returns to normal levels within a few days of delivery.

Weight

There is a considerable gain in weight during pregnancy. Much of this is due to the increase in the size of the fetus, placenta, uterus and breasts and the increase of the blood volume. The average increase in weight is 2500 g during the first 20 weeks of pregnancy, and 10 kg (kilograms) in the second 20 weeks, that is, an average of 500 g a week. The total gain should not be more than 11·5 kg. This may be

greatly exceeded particularly if, as a result of over-eating, the mother becomes very fat. However, another cause is the retention of fluid in the tissues which, in its later stages, may be detected as oedema. Sudden increase in weight due to fluid retention may be the first sign of pre-eclampsia.

At term:

		Grammes
Fetus		3150
Placenta		450
Liquor		1350
Uterus		1000
Breasts		1500
Stored	Protein	1500
	Fluid	1500
	Fat	1000
		11450 g (11·5 kg)

Posture

In order to balance the weight of the growing uterus late in pregnancy, a slightly exaggerated erect attitude may be adopted with the shoulders thrown back. Walking and standing in this position will throw a strain on the muscles and ligaments of the back and backache may follow.

Signs and Symptoms of Pregnancy

First 4 weeks — Amenorrhoea. Following implantation of the fertilized ovum, the increased secretion of oestrogen and progesterone by the ovary converts the endometrium into the decidua of pregnancy and menstruation does not occur. Morning sickness may be noted. This is usually a feeling of nausea, commonly experienced on rising in the morning. Discomfort, tingling and a feeling of fullness of the breasts may be noticed.

8 weeks — Amenorrhoea and possibly morning sickness continue. Frequent micturition. The bladder cannot fill owing to the pressure of the growing anteverted uterus, hence the necessity for frequent emptying of bladder. Enlargement of the breasts and the superficial veins, especially in a primigravida.

The nipples become more prominent and a deeper colour. The pink colour of the aerola in a primigravida begins to change to a brown colour and is most marked in brunettes. The pigmentation is permanent.

12 weeks

Amenorrhoea.
Morning sickness lessens or may cease.
The uterus is palpable above the symphysis pubis.
Montgomery's tubercles are seen on the areola of the breast, which is now secreting fluid.

16 weeks

Amenorrhoea.
Morning sickness has ceased.
Pressure on the bladder is relieved, because the uterus has risen out of the pelvis.
The uterus is midway between the pubes and the umbilicus.
Internal ballottement may be elicited.
Fetal movements (quickening) may be felt by the multigravida.

20 weeks

Amenorrhoea.
Quickening, or the first fetal movements, is felt by the primigravida about the eighteenth to twentieth week.
The breast changes are more pronounced; secretion is present in the breasts.
A secondary areola may appear in some women and may be very marked in brunettes. It is a mottled pigmentation surrounding the primary areola and may extend to cover half the skin of the breast. It fades after the baby is born.
At this period painless uterine contractions become palpable. These are known as Braxton Hicks contraction.
The uterus is just below the umbilicus.

24 weeks

Amenorrhoea.
The fundus is just above the umbilicus.
Fetal heart sounds may be heard.
Fetal parts and movements may be felt on palpation.

28 weeks	The signs are the same as at 24 weeks except that the fundus is higher and the fetus is more easily palpable. The fetus becomes viable, that is, capable of an independent existence.
30 weeks	The fundus is midway between umbilicus and the sternum.
32 weeks	The uterus reaches the costal margin but does not fill all the available space in the abdomen.
36 to 40 weeks	The uterus reaches or nearly reaches the level of the xiphisternum by the thirty-sixth to thirty-eighth week. Until the head engages it will remain at this level, but with engagement of the head the fundus may descend slightly and the relief of pressure the mother experiences is called lightening. However, the head may not enter the brim until the onset of labour and this is particularly common in the multigravida. With lightening the mother may breathe with more comfort but the descent of the head may cause pressure on the bladder, resulting in frequency of micturition.

Positive Signs of Pregnancy

Fetal heart sounds, fetal movements felt by the observer, and palpation of the fetal parts are the positive signs of pregnancy. An X-ray, if it were taken, would show the fetal skeleton at 14 to 16 weeks. It should be avoided, however, since such irradiation may be dangerous to the fetus.

Softening of the cervix, discoloration of the vagina, Hegar's sign and internal ballottement are not usually looked for by a midwife, and doctors rarely make use of these signs to diagnose pregnancy. Hegar's sign can be obtained between the sixth and tenth weeks. The cervix and uterus are softened. The embryo occupies the fundus of the uterus. On bi-manual examination the rounded, enlarged fundus and the cervix can be felt, but between these the softened uterus may be impalpable and the fingers of the internal and external hands seem to meet at this point.

Internal ballottement may be elicited from the sixteenth week. The uterus is tapped from below on vaginal examination. The sensation

of striking a solid structure which recedes from the fingers is obtained. In addition a slight impact on the fingers may be felt when the fetus returns to its original position. The sign is more easily obtained with the patient partially sitting up.

While at one time these examinations could have been valuable in the diagnosis of a doubtful pregnancy, nowadays better, more accurate and safer methods are available. It is unnecessary to submit a patient to the discomfort entailed in eliciting Hegar's sign.

External ballottement. From about the twentieth to twenty-eighth weeks external ballottement can be elicited. Both hands are placed over the uterus and the uterus is tapped gently with the fingers of one hand. If the whole anterior surface is tapped in this way at some point the fingers will come down on the body of the fetus. The fetus recedes, as a ball bouncing, but gives a distinct sensation of contact with a freely movable structure.

Ultrasonography. An ultrasonic echo sounding is extremely reliable and will detect a pregnancy of 5½ to 6 weeks duration. A B-scan is used for this purpose (page 231).

Differential Diagnosis of Pregnancy

Some of the pregnancy symptoms may be found in other conditions not associated with pregnancy:

Amenorrhoea

In general illness, for example, tuberculosis, thyrotoxicosis, or from change of environment, and during lactation and at the menopause.

Morning Sickness

In gastritis. Vomiting may be a prominent feature in urinary tract infection.

Enlarged Abdomen

From increase of fat, tumours, such as an ovarian cyst or fibroids, or ascites.

Fetal Movements

Flatulence may be mistaken for fetal movements.

Pseudocyesis

In this condition amenorrhoea may be present, associated with symptoms suggesting pregnancy, and the abdomen may be enlarged, but the patient is not pregnant. The signs on which a certain diagnosis of pregnancy can be made, namely palpation of the fetus or hearing the fetal heart, are not present. It is sometimes seen in a woman who is anxious to have a child.

Definition of Terms used in Pregnancy

A *nullipara* is a woman who has not had any children.

A *primigravida* is one who is pregnant for the first time.

A *primipara* applies to a woman at the end of her first labour and thereafter.

A *multigravida* is a woman during her second and subsequent pregnancies.

A *multipara* is a woman who has had more than one child.

Pregnancy Tests

Only a few days after the beginning of pregnancy, chorionic tissue (which will later form the placenta) is present in the uterus. Already it is producing a hormone, chorionic gonadotrophin. This hormone is produced only during pregnancy, and the pregnant woman excretes it in her urine.

Since the introduction of immunological tests, which are cheap, the more expensive biological tests are less used.

Immunological Tests

This process depends on the fact that human chorionic gonadotrophin has antigenic properties. If tanned red cells or latex particles are coated with human chorionic gonadotrophin and then exposed to the correspoding antigen they agglutinate. However, if the antiserum is added to urine containing the chorionic gonadotrophin before the sensititized cells are added, agglutination does not take place as the urine and antiserum had already reacted. In the test therefore:

(1) Antiserum is added to the patient's urine.

(2) Sensitized red cells or latex particles are added.

If agglutination occurs, the urine contained no gonadotrophin and is negative.

If agglutination does not occur, gonadotrophin is present and the test is positive.

The indicators used are Latex coated particles (*Gravindex*), a single drop of urine gives the result in 2 minutes and is 92 per cent accurate. Tanned red cells (*Prognosticon, Prepuerin*) in a small test tube of urine gives a result in 2 hours and is 98 per cent accurate. Most errors are from false positives.

Biological Tests

In the biological pregnancy tests, some of the patient's urine is injected into an animal. If the urine contains chorionic gonadotrophin, changes occur in the reproductive organs of the animal; the test is said to be positive, and in about 98 per cent of cases this is accurate.

In the *Aschheim–Zondek* test, the first to be introduced immature, female mice are used and the test takes 4 days.

In the *Friedman* test, on rabbits, the result is obtained in 2 days.

In the *Xenopus* or *Hogben* test, a South African toad is used. If the test is positive the animal ovulates, sometimes as soon as 6 hours after injection. The toads do not, of course, have to be killed. Thus they can be used over and over again.

The *Mainini* test is carried out on a male toad or frog. After injection the animal's urine is examined microscopically and if the patient is pregnant it is noted that the animal has produced spermatozoa, within 2 or 3 hours of the injection of the urine.

Since the introduction of *immunological* tests, which are cheap, the more expensive biological tests are less used.

The Duration of Pregnancy

The average duration of human pregnancy is 280 days, or 40 weeks, or 9 calendar months and a week, counted from the beginning of the last menstrual period. Pregnancy really lasts from conception (closely following ovulation) until delivery, and averages 265 days or 38 weeks; but it may be difficult or impossible to discover the date of conception, whereas it is usually easy to ascertain the time of the last menstruation. Thus it is practical and convenient to think of the pregnancy as lasting 40 weeks and to refer to viability of the fetus at the twenty-eighth week, engagement of the fetal head at the thirty-sixth or thirty-seventh week and term as the fortieth week. Similarly, the expected date of delivery is calculated by ascertaining the date of the first day of the last normal menstrual period and counting forwards 9 months and 7 days. Thus, if the last period had begun on 10 June, 9 months added is 10 March of the next year; the addition of a week brings the expected date of delivery to 17 March.

This is fairly accurate if the periods are regular and the cycle lasts about 28 days. In a 35-day cycle, however, ovulation (14 days before the *next* period, i.e. the suppressed one) would be a week later; thus both conception and delivery would be a week later than with the 'average' 28-day menstrual cycle.

Even with these adjustments, wide variations occur in apparently normal pregnancies. About 5 per cent, of patients are delivered on the calculated date. Many babies are born a week or two 'early', but are mature and healthy. In most cases, this causes the mother no anxiety; indeed, she is usually delighted that the long months of waiting are over. Many other women become apparently overdue, though the infant, when born, is not postmature. These patients, their minds fixed for months on a particular 'expected date of delivery', may find the additional waiting tedious and sometimes worrying.

Two practical points arise from this uncertainty:

(1) When booking a patient and calculating the probable date of her delivery, it is wise to emphasize that this date is approximate and not exact. This should be reiterated whenever reference is made to the time of delivery.

(2) It is worth while inquiring carefully about any variation from the common 28-day pattern of menstrual cycle. Any adjustments, however approximate, are better made at the time of booking. This can do much to prevent the kind of anxiety which occurs when, later, a re-calculation reveals that the patient who thought herself 'due' has now 2 or 3 weeks longer to wait.

On the other hand, multigravid women often learn by experience that a pattern is repeated in successive pregnancies. Thus, a patient whose first and second babies were born at 41½ weeks knows well what to anticipate next time; and it may now be she who reassures the midwife that all is well.

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15. PSYCHOLOGY OF PREGNANCY

Pregnancy makes social, psychological and economic demands on the family and it must be thought of in this context. No one in the household is unaffected and it is important to recognize this.

Psychological Needs of the Husband

The husband may receive the news of pregnancy in many ways. If this is a first child he will undoubtedly be proud at this evidence of his virilism. At the same time will come the realization that his responsibilities are about to increase. If he is sufficiently mature he will probably be ready to accept this, if not his immaturity may exhibit itself in many ways. He may become argumentative and aggressive as if rebelling against the situation in which he finds himself. He may make emotional demands on his wife which she feels unable to meet. He may lean on his mother, if he has a tendency to do this anyway.

He may have to face financial difficulties especially if they are a young couple not long married, or if this is not a first baby. This will cause a very real anxiety, which may be added to if the wife also contributed to the income, as she will now have to give up working for a few months at least.

He may become jealous of the baby because his wife spends more time thinking and talking about the baby than she spends on him. In later pregnancy when he is wanting her company she may prefer to stay at home, and finally when the baby arrives she has even less time for him. It is important the wife understands this and makes an effort to look attractive for her husband and to take as much interest in his activities as she did previously.

Psychological Needs of the Children

The other children in the family greet the idea of a new baby in many ways. Girls are usually delighted at the thought of a live 'doll'

to play with. Boys are often disgusted at the idea, or expect the new baby to play football the moment he arrives. The age of the children governs what they are told but it is wise to let them take part in the preparations beforehand. As a general rule the younger the child, the later they should be told as they get bored with waiting.

With young children it is wise to play out the idea of mother packing up and going to hospital and returning with a new baby. Where possible the children should visit the mother and new baby in hospital.

Children are not usually jealous until the baby comes home and they feel they are not getting enough of mother's attention. A wise mother includes them in all that is going on and allows them to hold the baby and do things for him. What they need is love and security and if given this, jealousy will soon pass.

Psychological Needs of the Wife

Certain emotional changes take place in pregnancy which need to be understood not only by the midwife and doctor but by the patient and her family.

The individual's personality will influence to a marked degree the exact pattern of emotional change in pregnancy. The generally excitable labile temperament will be increased during pregnancy, whereas the woman of slow equable temperament may become quite vivacious. At all times of major changes in hormones there is emotional instability, this is seen at adolescence, prior to menstruation and most marked of all in pregnancy.

During the first trimester there is considerable emotional lability, at one moment she may be gay and laughing and the next moment in tears. Even the most placid women may be irritable, uneasy and anxious. The husband may be very bewildered if he does not understand what is happening and this throws stresses on the marriage that have not been present before. The woman may be ambivalent towards the fetus, one day she is delighted at her condition. and the next day despairing that she is pregnant. This often worries the mother as she feels guilty at rejecting the baby, but this is a natural happening and all women pass through it to a greater or lesser degree. On occasions where there are social and economic pressures and perhaps the baby was not planned, feelings of rejection are exaggerated and there may be moods of depression. This extreme lability of mood does have one advantage, if an abortion occurs in these first twelve weeks it has a much less profound effect than one occurring later. It seems nature's way of cushioning the effect.

During the second trimester there is a change, the emotions are

more stable and the patient is radiant and has a bloom of health. She will tell the midwife she has never felt better, and this is particularly noticeable if there has been severe morning sickness. There is at this time an increased self confidence and drive and she may surprise her husband with her maturity and drive. Even the most timid of women, who never seem able to make a decision, exert themselves. She begins to prepare the home for the baby just as an animal or bird prepares a nest. She thinks about the layette, begins to worry about the right kind of baby bath or perambulator and generally begins to collect together the many necessities for looking after the baby. This is a time when all the family can make a contribution. The other children will be excited by the thought of preparing for their baby, and all the family will be drawn closer together in sharing this experience.

Should abortion occur from the fourth month onwards serious repurcussions may occur, this is the loss of a child with whom she has begun to identify and for whose arrival she has begun to make preparation. Much help and support from the husband, midwife and friends will be needed.

During the last trimester there is a gradual increase of physical and emotional lethargy. She tends to lean more heavily upon her husband and makes increasing demands on him. Anxieties as to whether he still finds her attractive may be magnified if her husband appears a little off hand. He needs to be very reassuring at this time.

Anxieties increase as labour approaches and during the last weeks fears for her own well being and that of the baby increase. This is not unreasonable, as every woman must be aware there is a risk of death in childbirth, however much the conditions may have improved. She will also be aware that babies are stillborn and are born with abnormalities. These fears are often magnified by misguided friends and old wives tales. Everyone likes to recount the drama of their own pregnancy and labour, and so few the joys and pleasures they experienced.

It is vital that as pregnancy advances a confidence is built up between the woman and the midwife or obstetrician, because it is only in this way she will be encouraged to reveal her anxieties and give one the opportunity to help her. Clinic visits must appear unhurried so that the patient will feel able to talk, and must avoid the situation arising where she feels that everyone is so busy that she cannot bother them. This is a critical period, and the midwife must make a conscious effort to listen to what the patient is saying. During these last few weeks the first warning of psychiatric breakdown is sometimes evident and these signs can be easily missed. It is not so much what is said, but what the woman fails to say, that may give us the key to her wellbeing or otherwise.

As the end of pregnancy approaches, some women are filled with an urge to be busy. They start spring cleaning the house and getting everything ready for the great day. Very often she is repeating work she has already done, and in some cases where there is adequate domestic help, she might even start scrubbing and cleaning, tasks she would not do in the normal way. Other women seem to experience a great calm and a sense of detachment as labour approaches.

Whatever her reactions during pregnancy the women needs support, love and reassurance particularly from her husband. She needs to build up confidence in the medical and midwifery staff, so that she has not only a sense of wellbeing but is looking forward to the experience of labour and a new baby.

Once the birth is over the mother feels elated, happy but tired. Once assured the baby is well she is ready to sleep for a while. Around the third day most women tend to become a little depressed the 'third day blues'; this is more marked in the hospital setting and is probably due to hormonal changes, coupled with a natural desire for home and family. This should soon pass and if it does not a doctor should be told.

We have dwelt on the psychological needs of a family who despite initial difficulties welcome the baby, but we must remember there are cases where this is not so. The baby may be unwanted for social or economic reasons and the distress this brings may place the mother to the verge of a psychiatric breakdown. The midwife must always be alert for signs of disturbance in such patients.

Further Reading

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16. ANTENATAL CARE

Against the background of a comprehensive Health Service it is difficult to appreciate that 50 years ago the majority of women in this country received no antenatal care whatsoever. At this time toxaemia and antepartum haemorrhage could develop and progress unchecked, serious mechanical difficulties could complicate labour, and the subsequent traumatic delivery might leave the mother with permanently impaired health, while all too often she lost her baby. Nowadays, good antenatal care is the rule and it is rare to see a pregnancy or labour complicated by conditions that can be prevented. Nevertheless, the aims of antenatal care are not only the prevention of avoidable abnormalities. By intelligent observation, reasoned care and well-planned education we seek to achieve a much broader and more positive objective, which may be summarized thus:

A normal pregnancy, the patient being well prepared for motherhood. A straightforward labour and a good recovery in the puerperium.

A healthy, mature, breast-fed baby, happily integrated into the family.

First Antenatal Visit

When the woman first suspects that she is pregnant, she generally visits her doctor. She usually tells him that she has missed one or two periods and she may, in addition, report some nausea or early breast changes. If she desires a hospital confinement, her doctor gives her a letter to take to the antenatal clinic and advises her to telephone the hospital to make an appointment. The hospital may then send her a questionnaire to fill in and send back. This serves the threefold purpose of giving her time to recall the various dates to be recorded, saving her waiting time at the clinic and enabling the obstetrician and midwife to see at a glance whether or not she is in the group of patients especially at risk, who should at all costs have a hospital confinement. Without such a questionnaire the history taking may be rather slower, but, either way, enough time should be allowed.

The patient is given a friendly greeting and made welcome. A kindly approach is possible even at the busiest clinic. It is appreciated by all and is specially reassuring to the frightened primigravida, the distraught unmarried girl and the lonely foreign patient. It helps, too, to establish the rapport necessary for the somewhat searching questions to follow.

Wherever possible the interview should take place in private, where conversation cannot be overheard.

History Taking

General particulars. The patient's name, address, age, religion, occupation and marital status are ascertained first, mainly because such records are in any case needed, but additionally because her age and the duration of her marriage may together be a guide to her fertility. A primigravida of 35 years may have been married only a year and be normally fertile; she may have been married 15 years and almost given up hope of ever becoming pregnant.

The history of the present pregnancy. Though not in correct chronological order, this is a convenient point at which to begin, since one is now discussing what is uppermost in the patient's mind. The date of the last menstrual period is ascertained, care being taken to check that this is the first day of the last normal menstrual period. By counting forwards 9 months and 7 days, it is possible to arrive at a probable date of delivery. Some people find it easier to count back 3 months, when the calculated date will be the same. It is useful at the same time to ask the menstrual history, namely, the age at which menstruation began, the duration of the periods and the number of days in the cycle. With a fairly regular cycle of around 28 days, the standard calculation is reasonably accurate within a few days, though not to the exact day. A long cycle, a history of missed periods or an irregular pattern make the calculation difficult or impossible. The patient may have a very good idea when conception occurred; in this case it is necessary to count forwards 38 weeks or 7 days *less* than 9 months to discover the expected date of delivery.

Confusion may also arise if slight vaginal bleeding has recently occurred and the patient thinks this was her last period; whereas she might already have been pregnant and had a threatened abortion. Hence the importance of inquiring about the last **normal** period.

Other pregnancy symptoms such as breast changes, morning sickness, and increased frequency of micturition are interesting and sometimes of value, especially when there is uncertainty whether or not the patient is pregnant. Again, morning sickness may mean any-

thing from occasional slight nausea to quite serious vomiting with accompanying ketosis, when immediate medical treatment is necessary. In the first trimester, a patient is quite likely to feel a little tired, perhaps nauseated and generally rather off-colour. Usually she can be reassured that soon she will feel very much better.

Indeed, a patient booking in the second trimester often remarks that she 'never felt better in her life'. She is well adjusted to the pregnancy, her nausea is over, her appetite is good and she feels lively and full of energy. She will, of course, give a longer history of amenorrhoea and she may have felt fetal movements.

Previous pregnancies. It is necessary to ask about all previous pregnancies, whatever their outcome. The patient is asked if she has ever had a miscarriage. It is kinder to say 'miscarriage' rather than 'abortion', since to some patients the former suggests an accidental occurrence, whereas the latter term seems to imply a criminally induced process. If she has had a miscarriage she is asked at what stage of pregnancy it occurred, whether she knows of any possible cause, if she was transferred to hospital and, if so, whether she needed either an operation to remove retained products of conception, or a blood transfusion, or even both.

A similar questioning is necessary in respect of all pregnancies, labours and puerperia. Was the pregnancy normal, or complicated, e.g. by vomiting, toxaemia or haemorrhage? Was the labour at term and straightforward in all three stages? How long did it last? Was her baby born in hospital or at home? Was he born normally or did she require a forceps delivery or a Caesarean section? If so, does she know why? Was her baby quite well at birth? And now? If she lost her baby she is asked if she knows why. Though it may distress her to have to recall this unhappy confinement, she will readily co-operate, realizing that this pregnancy and labour will be conducted with her previous misfortune in mind; and that every effort will be made to achieve a happier outcome.

The birth weight of the child is of interest, since it may give some information about the capacity of the woman's pelvis. A woman who has, without difficulty, delivered herself of a healthy 8 lb. (3·5 kg) infant must have quite a roomy pelvis, while one who has had a forceps delivery of a 6 lb. (2·7 kg) baby may have a small pelvis.

It is desirable to know, too, if the patient was quite well after the baby's birth, or if she experienced excessive haemorrhage or any other complication. She is also asked how long she remained in hospital after her baby's birth, since this may reflect the normal or complicated nature of the lying-in period. Finally, she is asked if she breastfed her baby, and if so, for how long. If she did not, she is asked the

reason (unless, by now, it is obvious), since this may help in making arrangements for the feeding of the expected child.

All pregnancies are dealt with thus, in chronological order.

Medical history. This includes inquiry about any illness, operation or accident that may be relevant. It is neccessary to ask by name about rheumatic fever, chorea (St Vitus' dance), heart disease, tuberculosis, diabetes, and mental illness. Inquiry is also made about kidney disease and, at the same time, scarlet fever is mentioned, since, rarely, it is complicated by nephritis. The patient is usually asked about the infectious diseases of childhood, and one is glad to know if she has already had rubella (German measles), because she will then be immune.

The operations of chief importance are those on the uterus and those on the pelvic floor. Following Caesarean section or myomectomy, there may be a weakened uterine scar, which could rupture during a subsequent pregnancy or labour. In such cases, hospital confinement is essential. Patients of childbearing age sometimes, have to undergo extensive pelvic floor repair operations. If, for example, a woman has had a successful operation for the relief of stress incontinence, both the patient herself and the obstetrician will be concerned about the mode of delivery on this occasion; sometimes indeed, another vaginal delivery is considered inadvisable and a Caesarean section is planned.

Relevant accidents include those involving the spine and pelvis, particularly if a fracture has occurred and deformity resulted. Deformity of the spine or pelvis following poliomyelitis or congenital dislocation of the hip would cause similar concern, since in all these instances the bony pelvis may be asymmetrical and accordingly have a smaller capacity.

If the subject of blood transfusion has not yet been mentioned, it is now introduced. Any transfusion may be of interest, but those of twenty or more years ago are of special importance. It was only during the Second World War that the problem of Rhesus incompatibility was first brought to light. Any patient, of whatever Rhesus type, who received a blood transfusion before 1943 would probably have received Rhesus positive blood. In such circumstances, a Rhesus negative woman could have built up such a high antibody titre that she could never carry successfully a Rhesus positive infant.

Family history. It is worth while asking if all the members of the patient's family are healthy. Familial diseases such as hypertension and diabetes are sometimes discovered during routine antenatal examinations, and it is useful to know the patient's medical back-

ground. It is essential to know if any near relative has pulmonary tuberculosis, since the newborn child is very vulnerable to the infection, and must be protected. Arrangements are accordingly made for the child to receive a BCG vaccination before leaving hospital, as well as to be carefully segregated from the infected person.

There is, too, a familial tendency to produce twins. Thus, in most cases, it is interesting to ask if there are any twins in the family. This, however, is not essential, and it would be inconsiderate to ask such a question of an unmarried girl.

From this account it might appear that history taking is a somewhat lengthy procedure. This is not usually so, however, since the great majority of patients are healthy young women who have never been seriously ill. Women of high parity commonly give a completely normal obstetric history, while those having had complicated labours have rarely had more than one or two children. Normal or otherwise, it is valuable in that it gives the patient an opportunity for a chat with the midwife; for this reason alone all clinics, even the busiest, should allow time for taking histories. Furthermore, this personal history provides a basis upon which it is possible to assess the patient's health and, to some extent, to anticipate the outcome of her confinement; while, in a broader sense altogether, the sympathetic midwife meets and begins to know this patient as an individual and as a person.

Examination

At the patient's first clinic visit a full examination is necessary. The patient is usually asked to undress and put on a dressing-gown. Restricting garments such as brassiere, girdle and pants are removed to give easy access to the breasts, abdomen and vulva, with the minimum of fuss and exposure. The bladder should be empty. The midwife should assist the patient onto the examination couch, a stepping stool is often required during the last weeks of pregnancy. The midwife then assists the doctor making sure the patient is in the correct position, and that only the necessary area is exposed at any one time. To the midwife abdominal and vaginal examinations are commonplace, but to the patient they may be exceedingly embarrassing. Thoughtful preparation and reassurance will be appreciated by her and may encourage her to relax, and so minimize the discomfort such examinations cause.

General appearance. Even when taking particulars the observant midwife will notice the kind of patient she is questioning. Is she calm and placid or obviously worried and anxious? Does she look well, or pale and tired?

Her height and sometimes the size of her shoes are ascertained. The petite woman may have a small pelvis, but it is worth bearing in mind that she may also have a small baby. Build is of interest. Tall, thin women tend to have easier labours than those who are short and very heavily built. Moreover, women who are overweight have an increased tendency to develop pre-eclampsia.

The woman's gait is noted, since a limp, possibly associated with an old fracture of the leg or pelvis, poliomyelitis, or congenital dislocation of the hip, may mean that she has an asymmetrical and perhaps inadequate pelvis.

Her weight is ascertained. When first recorded, at 8 to 10 weeks, it will differ little from before pregnancy, and the subsequent gain is easy to assess. An average weight gain in pregnancy is 2500 g (5 lb.) in the first 20 weeks and 9 kg (20 lb.) in the second 20 weeks. Thus, in the latter half of pregnancy, a weight gain of approximately 500 g (1 lb.) per week is normal, while a gain of more than 500 g (1 lb.) per week would cause disquiet. Furthermore, a patient who is overweight needs to have her weight controlled, in order to try to avoid pre-eclampsia, and this, during pregnancy when she needs extra protein and minerals, may prove difficult.

Urine. At every visit to the clinic a specimen of urine is examined. At her first visit it is usual to note the colour, odour, specific gravity and reaction of the urine. If it appears normal it is still necessary to test for protein, sugar and ketone bodies. Tests for blood, pus and bile are carried out only if the appearance of the urine is supicious. If any abnormal constituent is present, further investigations are necessary. Protein may result from contamination, e.g. from vaginal discharge, or more seriously, from renal disease. Glycosuria is not uncommon. In normal pregnancy it can be related to a lowering of the renal threshold for sugar. Occasionally it is due to diabetes mellitus. When morning sickness has been really troublesome, ketones are found in the urine, indicating that the vomiting has adversely affected the patient's condition.

Blood pressure. The blood pressure is taken at this and every subsequent clinic visit. In some clinics the patient sits on a chair by a table and in others she lies on a couch. This is of little importance provided the same procedure be adopted at all visits. The patient should be at rest and not breathless from recent exertion, as, in this case the systolic reading could be higher than normal. Anxiety, too, will raise the systolic reading and this takes longer to dispel. In a really anxious and nervous patient, the blood pressure reading at the second visit might be at a more normal level.

The patient then lies on a couch for a full medical examination which is carried out by an obstetrician. He asks her how she feels and notes if she appears well. He inspects her teeth and if dental treatment is necessary, she is advised to see the dentist, preferably as soon as any morning sickness has subsided.

Breasts. The breasts are examined to note the pregnancy changes, a useful aid in the diagnosis of pregnancy, and to determine if breast feeding is likely to be easy or difficult. Marked pigmentation, well shaped nipples which protract readily and an elastic skin are all favourable. Women with fair skin show little pigmentation and more easily get sore nipples. Flat or retracted nipples are much more difficult for the child to grasp, but this can sometimes be corrected by wearing Woolwich shells during the latter half of pregnancy. At the same time, breast feeding is discussed, and any patient who is unwilling to breast feed is not coerced, but rather given time to consider it.

Heart and lungs. The doctor will auscultate the patient's heart and lungs. Usually they are normal but occasionally he will refer the patient to a chest physician. Chest X-ray, a routine procedure later in pregnancy, is not undertaken in the early weeks, since it is possible that such irradiation may harm the developing fetus.

The abdomen is examined, to ascertain:

If the uterus is palpable, and
If so, if its size is comparable with the supposed period of gestation.

In many antenatal clinics the obstetrician carries out a pelvic examination at the first visit.

He is able to determine if the uterus is enlarged to a size corresponding to the period of amenorrhoea. He can usually say that there is no pelvic tumour though sometimes he may detect a fibroid or an ovarian cyst. Fibroids are not as a rule treated; ovarian cysts are usually removed early in pregnancy. A pelvic examination at this juncture will not reveal much about the size and shape of the pelvis. This is better determined later, when the pelvic floor is more relaxed.

If the patient has ever had a miscarriage or if she has threatened to miscarry, the vaginal examination is omitted. While it might not necessarily provoke a miscarriage, if this unfortunate event occurred neither the patient nor the doctor could help connecting it with the preceding vaginal examination.

Legs and feet. The legs and feet are examined in order to make sure

there are no varicose veins. At the same time, the obstetrician looks for oedema.

Special Investigations

A specimen of blood is taken and several examinations are carried out:

The ABO group is ascertained.

The Rhesus type is ascertained; Rhesus negative blood is additionally examined for antibody.

A serological test is carried out to exclude syphilis. Usually this is the Wasserman or Kahn reaction. Sometimes the findings are doubtful or positive and further confirmatory tests are necessary. In a few cases the patient has syphilis, and treatment with penicillin is begun. This eventually cures her syphilis, and prevents her child from being born with congenital syphilis.

The haemoglobin value of the blood reveals accurately if the patient is anaemic, 11·6 g or more being considered normal. If it is below this level, the patient is anaemic. Anaemia is common in pregnancy and while it is usually because of iron deficiency, a megaloblastic anaemia associated with folic acid deficiency is not uncommon.

Immigrant parents from West Africa and the West Indies may have in addition a *sickling* test which will exclude or reveal sickle cell anaemia.

Some obstetricians do not administer either iron or folic acid unless the patient is shown to be anaemic. Others prefer to give iron (200 mg of ferrous sulphate three times a day) as a matter of routine, and again some would in addition prescribe routine administration of folic acid (2 mg three times a day). Iron tends to cause digestive upsets and is better given after morning sickness has settled.

Finally, the patient is invited to attend parentcraft classes. She is told about the various benefits, and how to apply for them and she may wish to visit the medical social worker if she has any domestic or social problem to discuss.

Subsequent Visits

Frequency

The usual frequency is:

every 4 weeks until the twenty-eighth week,

every 2 weeks until the thirty-sixth week,

then every week up to the onset of labour, this being the minimum

attendance. Complications may arise necessitating either more frequent visits or admission to hospital.

Some authorities believe that early pre-eclampsia can be better diagnosed if patients visit weekly before 20 and 30 weeks for weighings, blood pressure estimations and urine tests.

Procedure in Hitherto Normal Patients

The examination may be carried out by obstetrician or midwife.

The midwife reads the patient's notes and asks her how she feels. She may feel well in all respects; she may, on the other hand, have some untoward symptom, or some anxiety, and it is wise to give her an opportunity to talk.

The midwife can give her advice about minor disorders, do much to dispel fears when a patient's anxieties are brought to light, and can ask an obstetrician's advice about any complaint which might be of serious import.

An examination is made to detect any signs of pre-eclampsia. Note that there may be no symptoms, the patient announcing that she feels very well. This is one reason why pre-eclampsia is so dangerous.

Weight. The patient is weighed, her present weight being compared with the last record. In early pregnancy there will be little change. In the latter half of pregnancy, her weight gain should not, in 4 weeks, exceed 2 kg. Similarly in a 2-week or 1-week interval a gain of more than 1 kg or 0·5 kg respectively would be abnormal and suggestive of either fluid retention (a sign of pre-eclampsia) or of too great a deposit of fat (probably conducive to pre-eclampsia). Some patients gain very little weight. Usually they are very well, though a few give birth to very small and immature babies.

Blood Pressure. The blood pressure is taken and compared with the previous reading. There is commonly a slight fall of blood pressure in the middle weeks of pregnancy with, in the last months, a rise to the original level. It is safe to regard 130/80 mmHg as the upper limit of normal. Where this is exceeded a doctor should be consulted. However, *this* patient's normal blood pressure should be borne in mind. Thus, in a woman whose normal blood pressure was 100/55 mmHg a rise to 120/70 mmHg should be viewed with suspicion. The systolic pressure is much more variable than the diastolic, so a rise in the latter is more serious.

Urine. The urine is examinated for protein. Any protein in a supposedly clean specimen requires that a further test should be carried

out, preferably on a mid-stream specimen. Proteinuria is always a serious occurrence. It may mean a recurrence of chronic nephritis, the development of pyelonephritis or a worsening stage (not the beginning) of pre-eclampsia. A doctor must be consulted immediately, the patient will be asked to come into hospital at once, and she will stay in bed so long as the proteinuria persists.

Oedema. Clinical oedema is recognized, first in the ankles and lower legs, by swelling. With the fingers firm pressure is applied over the tibia and maintained for at least 10 seconds. If, on withdrawing the fingers, 'pitting' is observed, oedema is present. An unduly large amount of tissue fluid will make the limb appear swollen. Pressure against a firm bony area will squeeze some of the excess fluid from the compressed area. A depression will remain until the fluid gradually returns after the pressure is released.

Some ankle oedema may occur in any pregnancy, since there is normally more tissue fluid in the body and it tend to gravitate towards the feet and ankles. In addition, the increased venous pressure in the legs predisposes to oedema. Ankle oedma is normal only if:

It is slight.
It settles after a night in bed, and
The blood pressure and urine are normal;

otherwise it must be regarded as a sign of pre-eclampsia.

Oedema elsewhere is always abnormal.

Oedema of the hands is not uncommon and it is manifested by a tightness of the patient's wedding ring.

Oedema of the eyelids or of the face. Unless we know the patient well, we do not at first recognize this serious development. She may say that her husband or mother has noticed the swelling. This information should never be ignored, since by the time we ourselves recognize this puffiness the oedema may be very extensive indeed.

Oedema of the abdominal wall is noted when the fetal stethoscope leaves a depressed ring. Often the skin appears thick and coarsened.

Oedema of the vulva is obvious, the labia majora being tremendously swollen. Fortunately, it is not common.

Abdominal Findings

At first, only the height of the fundus is ascertained.

At the twelfth week (or sometimes rather earlier) it is just palpable above the symphysis.

At the sixteenth week it is half-way to the umbilicus. At this stage a multigravida may have felt fetal movements.

At the twentieth week the fundus reaches the lower border of the

umbilicus and all patients should be asked about movements. The fetal heart sounds may be audible.

At the twenty-fourth week the fetus may be just palpable and the fetal heart sounds are heard.

At the twenty-eighth week the fundus of the uterus is one-third of the distance from the umbilicus to the xiphisternum. The fetus is now easily palpable, very mobile, and may be found in any lie, presentation or position.

At the thirty-second week the uterus is two-thirds from the umbilicus to the xiphisternum. The fetus usually lies longitudinally and usually, the vertex presents. If the midwife finds a breech presentation, she should have the patient seen by a doctor. He may wish to turn the breech, though he will probably wait a fortnight.

At the thirty-fourth week the uterus is nearly to the xiphisternum. Almost always the lie is longitudinal; usually the vertex presents. If the breech presents, this is the usual time for an external cephalic version.

At the thirty-sixth week the vertex should be presenting. In a primigravida it may be engaged or this may occur a little later.

If the head is engaged the fundus will be lower than at 34 weeks and the patient will have experienced 'lightening'—the relief of discomfort and the easier breathing which results when the head has sunk into the pelvis.

At the thirty-seventh to fortieth weeks the findings will all be similar except that the fetus becomes more stable and the amount of liquor diminishes slightly.

The examinations described on pages 142–151 are carried out at every visit.

Other Investigations

Other investigations may be necessary at any time. Thus, even in a patient who is not anaemic, further haemoglobin examinations are carried out at the twenty-eighth and thirty-fourth weeks. In Rhesus negative patients antibody tests are undertaken, usually at the thirtieth and thirty-fourth weeks, though more would be needed in cases of serious Rhesus incompatibility.

A chest X-ray is frequently performed about the twentieth week. For most patients this excludes tuberculosis, but a few are found to have untreated pulmonary tuberculosis. Immediate treatment is necessary.

Further examinations, e.g. of the nipples, may be necessary at any stage.

At about the thirty-sixth week the obstetrician makes a second detailed examination of all patients. He auscultates the heart and lungs and in most cases pronounces that the patient is fit to receive an inhalational analgesic in labour.

During the abdominal examination he determines if the head is engaged; if it is not yet engaged he will see if it engages on pressure.

He will also carry out a vaginal examination to assess the pelvic capacity.

If the fetal head is engaged he will observe the size and shape of the pelvic cavity and outlet noting especially the prominence of the ischial spines, if the angle of the pubic arch and the antero-posterior diameter are sufficiently large. If the head is not engaged, his assessment will include also the pelvic brim and an attempt will be made to measure the diagonal conjugate and to determine the shape of the brim.

After this examination it is possible to make a much more accurate forecast of the mode of delivery and in most cases the obstetrician will reassure the patient that she can anticipate a normal labour.

Abdominal Examination

From the foregoing account it will be clear that in the early weeks of pregnancy, abdominal examination consists chiefly in checking the size of the growing uterus. However, as the pregnancy advances, much more can be learnt.

The patient lies on a bed or couch, screened or curtained, or in a separate room. Her head should be as low as is comfortable for her, and her knees may be flexed slightly. It is important that the patient should be relaxed, and every effort must be made to put her at her ease. Obesity, thick muscular abdominal walls, hydramnios and twins make the examination difficult, but provided the patient is relaxed even these difficulties may be overcome.

We use three ways of obtaining the information we need:

Inspection
Palpation
Auscultation.

Inspection

The most important features to be noted are the size and shape of the uterus. The size should correspond with the supposed period of gestation. If the uterus appears much larger (or, as sometimes, smaller) than expected, the date of the last menstrual period should be re-checked, when it may be found that the pregnancy dated from a month earlier (or, as occasionally happens, later) than was

originally supposed. If the dates are correct, and the uterus too large, the main possibilities are multiple pregnancy and hydramnios. If the dates are correct and the uterus very small, then the fetus is probably small. If the midwife considers the girth to be excessive, she should measure with a tape. Ninety-five centimetres at the umbilicus at 40 weeks is the average. Should a girth of 100 cm be reached or exceeded before that time, obesity may be the cause, but there may be hydramnios, twins, or a transverse lie to account for it. The normal shape is a longitudinal ovoid, very clear in the primigravida, but sometimes more rounded in the multigravid woman. In late pregnancy the curious shape created by an oblique or transverse lie is usually unmistakable.

In addition, on inspection, one may note with interest, pigmentation, scars, striae gravidarum, the quality of the muscle of the abdominal wall, obliquity of the uterus, and fetal movements.

Palpation

Palpation determines several things, and for the pupil-midwife this is one of the most difficult tasks, until now we have not used our hands to effect a clinical diagnosis. The hands should be warm and finger nails short to avoid hurting the patient.

Height of the Fundus

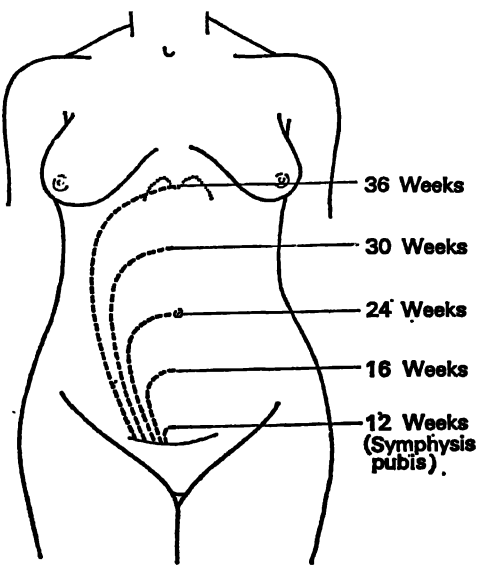

Fig. 61. The height of the uterus at different periods of pregnancy.

The Lie. The lie is the relationship of the long axis of the fetus to the long axis of the uterus. It may be longitudinal, oblique or transverse.

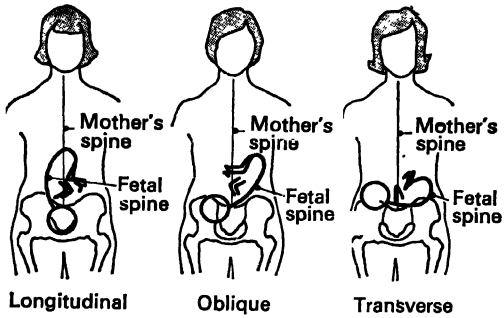

Fig. 62. Diagrams showing the lie of the fetus.

Presentation. The presentation of the fetus is that part which first enters the brim of the pelvis and may be felt through the dilating cervix on vaginal examination. It may be vertex, face, brow, breech or shoulder.

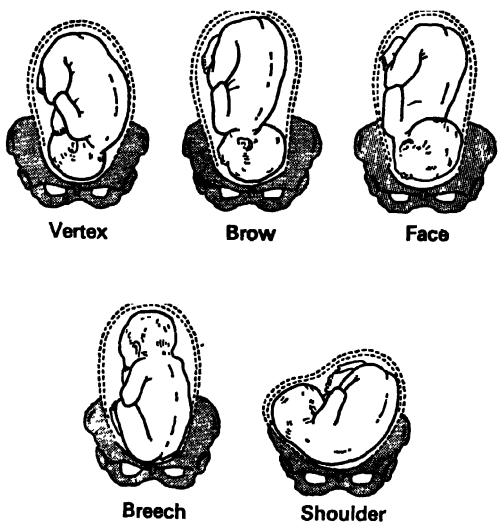

Fig. 63. The five types of presentation.

Position. The position is the relationship of a given part of the fetus (the denominator) to a particular part of the maternal pelvis (ilio-

pectineal eminence) for example left or right anterior, left or right posterior.

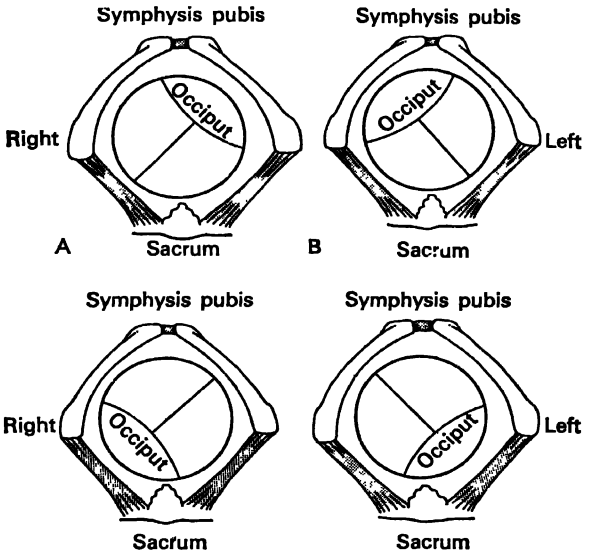

Fig. 64. Diagrammatic representation of the positions of the fetal skull.
A, Left occipito-anterior; B, right occipito-anterior; C, right occipito-posterior; D, left occipito-posterior.

Denominator. In a vertex presentation this is the occiput.

In a breech presentation this is the sacrum.

In a face presentation this is the mentum (chin).

In most cases the occiput lies either on the left or right of the pelvis directed anteriorly, laterally or posteriorly, so the fetus is said to be in the:

left or right occipito-anterior (LOA, ROA)
left or right occipito-lateral (LOL, ROL)
left or right occipito-posterior (LOP, ROP) position.

Attitude. This is the relationship of the fetal head and limbs to its body and may be fully flexed, poorly flexed or extended. When fully flexed the head and spine are flexed, arms crossed over the chest, legs and thighs flexed. In this attitude he forms a compact ovoid, fitting the uterus comfortably, though he can move freely.

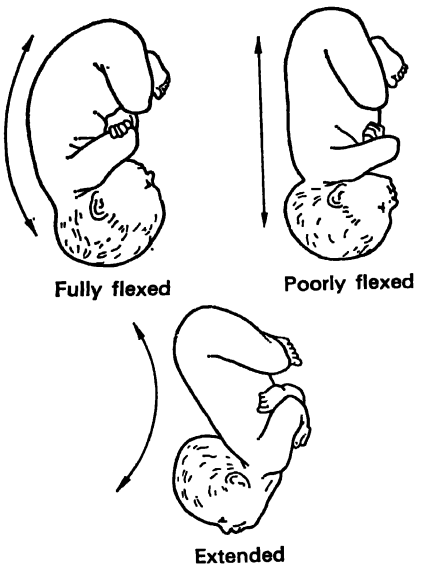

Fig. 65. The attitude of the fetus.

Engagement. Engagement of the presenting part is only of importance from the thirty-sixth week onwards, and is most commonly related to the fetal head. Engagement has occurred when the greatest

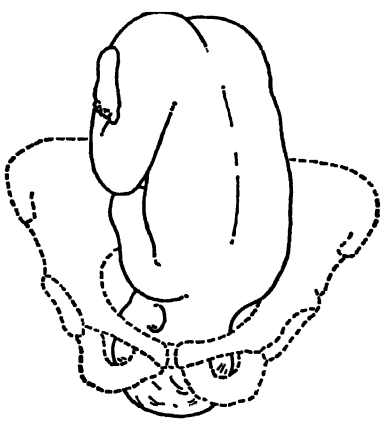

Fig. 66. Engagement of the fetal head.

circumference of the head has passed through the pelvic brim. In the primigravida this occurs around the thirty-sixth week and in the multigravida later. The patient refers to engagement as lightening, because of the sense of lightness they feel now pressure has lessened on the diaphragm.

Method of Palpation

First place the ulnar border of the left hand at the fundus and by comparing the height with the umbilicus or xiphisternum, estimate the height of the uterus and judge whether it corresponds to the period of amenorrhoea. Bear in mind that undue pressure produces pain and will tend to cause a tightening of the abdominal muscles, as well as the stimulation of contractions of the uterus, and so make palpation more difficult. Then ascertain which part of the fetus is lying at the pelvic brim, and confirm the diagnosis by palpating other points in the abdomen. Thus it is possible to find out the lie, presentation and position and also the relationship of the fetal head to the mother's pelvis. Most important information on these points may be obtained from the thirty-second week of pregnancy.

There are four distinct manoeuvres employed in abdominal examination:

Fundal palpation
Lateral palpation
Deep pelvic palpation
The Pawlik palpation.

Fundal palpation. The midwife stands on the woman's right side, facing her head, and places both hands flat on the fundus of the uterus to feel what is lying there. In most cases it will be the breech. If the head is at the fundus it can be recognized as smooth, round, hard and ballottable, separated from the trunk by a groove, the neck. This is why it is more freely movable than the breech, which can only move from side to side, the back moving with it. The breech is also less hard, more irregular in outline, and the lower limbs may be palpated near to it.

Lateral palpation. Still facing the patient's head, run the hands down either side of the abdomen, at the level of the umbilicus. Now, supporting the uterus with the right hand, palpate gently up the patient's right side (with the left hand). Then reverse the process, so that the left hand supports the right side of the uterus, while the right hand palpates the left side of the uterus. The fetal back is felt as a continuous smooth resistant object, whereas the limbs are noted as

Fig. 67. Fundal palpation.

small irregularities which are often felt to move. By palpating from flank to umbilicus, first on one side, then on the other, the bulk and then the 'edge' of the fetal back may be appreciated.

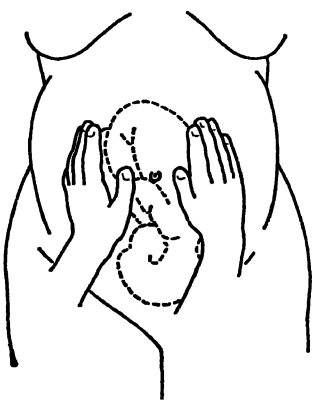

Fig. 68. Lateral palpation.

Deep pelvic palpation. This is carried out with both hands and is by far the most important manoeuvre that has to be learnt. One can find what is the presenting part and from that deduce the lie of the fetus. If the head is presenting one can decide if it is flexed or not. The midwife turns to face the woman's feet and places one hand on either side

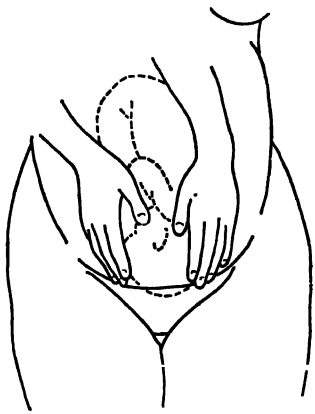

Fig. 69. Deep pelvic palpation.

of the uterus near the pelvic brim (Fig. 69). The finger tips are allowed to sink into the pelvis and to feel the presenting part. When the finger tips can sink further into the pelvis on one side rather than the other, this is due to the fact that the head is flexed and the occiput is lying on the side into which the fingers sink more deeply. The position of the occiput indicates the position of the fetus.

The Pawlik palpation. Stand on the right side of the patient and face her head, when using the manoeuvre. This is done with the right hand only, which is placed over the symphysis, so that the fingers are on the left side of the uterus and the thumb on the right side. The patient is asked to take a breath, and breathe out gently; as she does this the hand performing the examination is allowed to sink deeply above the pubes. Usually the presentation is the vertex. This examination enables one to find out whether the head is movable above the brim of the pelvis or engaged. If it is not engaged, we endeavour to find out if it is capable of being pushed into the inlet of the pelvis. This is especially important about the thirty-seventh week of pregnancy in a primigravida.

This manoeuvre is described because some people believe it to be useful. It has the disadvantage that it is not comfortable for the patient. Furthermore, all the information gained can be discovered by careful deep pelvic palpation.

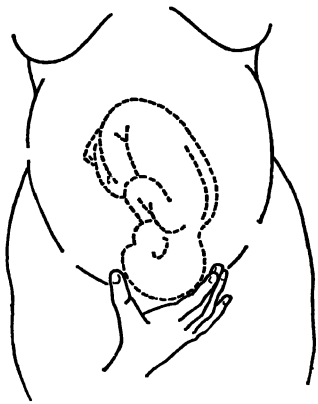

Fig. 70. The Pawlick palpation.

Auscultation

This is done with a stethoscope, either the binaural stethoscope, or the Pinard monaural fetal stethoscope (Fig. 71). Having palpated the abdomen, the midwife should know where to listen for the fetal heart sounds. They are heard at their maximum at a point over the fetal back. When the fetus is lying in an occipito-anterior or occipito-lateral position, the heart sounds are heard to the front and to the right or left according to the side on which the fetal back lies. The fetal heart sounds like the ticking of a watch under a pillow, the rate being about double that of the mother s heart beats observed at the wrist.

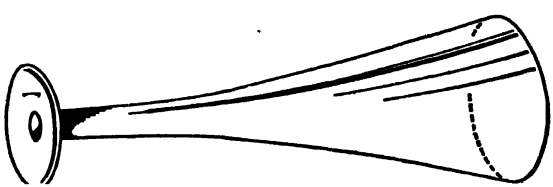

Fig. 71. Pinard's fetal stethoscope.

The uterine souffle is a soft blowing sound, the rate of which corresponds to the maternal pulse. It is due to the flowing of blood through the uterine arteries.

Normal findings in late pregnancy might be summarized thus:

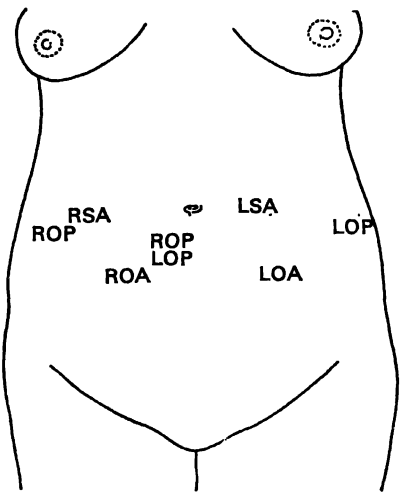

Fig. 72. Approximate points of fetal heart sounds in various positions of vertex and breech presentations. RSA, Right sacro-anterior; LSA, left sacro-anterior; ROP, right occipito-posterior; LOP, left occipito-posterior; ROA, right occipito-anterior; LOA, left occipito-anterior.

On inspection. The uterus, a longitudinal ovoid, in size consistent with the supposed period of gestation.

On palpation. The vertex presenting and engaged. The position left occipito-lateral.

On auscultation. The fetal heart sounds heard on the left side of the abdomen below the umbilicus.

Engagement of the Fetal Head

This means that the greatest circumference of the head, as it presents (its 'equator'), has *passed* the plane of the pelvic brim.

Engagement of the fetal head is an important finding made on abdominal examination. If the head is engaged, the pelvic brim is certainly adequate, and the probability is that cavity and outlet, too, are adequate. Engagement occurs in primigravid patients between the thirty-sixth and thirty-eighth week. Usually it is later in multigravidae, and it may not occur until the onset of labour, or even later.

When, after the thirty-sixth week, particularly in a first pregnancy, the head is not engaged, the cause should be sought. It may be something simple and easily remedied, such as a distended bladder or a full rectum. In occipito-posterior positions the head tends to be deflexed, the presenting diameter is then greater and the head finds more difficulty in becoming engaged.

Cephalo-pelvic disproportion is an important, though not very common cause of failure of engagement. In hydramnios non-engagement is expected.

Placenta praevia is usually characterized first by vaginal bleeding. Sometimes, when bleeding has not occurred, the persistently high head is the first suspicious feature.

Sometimes a very small head fails to engage in an obviously large pelvis. Here, there may be a twin pregnancy, the first with a deeply engaged head.

A steep angle of inclination of the pelvic brim tends to delay engagement. This is seen fairly commonly as a racial characteristic in West African and West Indian patients.

Pelvic tumours and gross fetal malformations are rare causes of a high head.

Head Fitting

Various devices are adopted to see if a non-engaged head can be made, on pressure, to engage.

The bladder is emptied and the patient lies relaxed on the couch. Standing on the patient's right, the obstetrician or midwife defines the symphysis with the fingers of the right hand. The thumb and fingers of the left hand are placed on either side of the head. The patient is asked to breathe in deeply, and as she breathes out the head is pushed downwards and backwards and the fingers of the right hand are used to estimate whether the greatest diameter of the head is passing through the pelvic brim.

This is a simple, and, with experience, an accurate method of head fitting. Other methods are taught with the patient either sitting up or standing, but whatever method is used it is best learnt by clinical demonstration and constant practice.

The head may remain high because of an over-stretched abdominal wall or because the head is deflexed, but a contracted pelvis can only be excluded by pelvic examination. For this reason in most clinics a vaginal examination is made by the doctor at about the thirty-sixth week, in order to estimate the size and shape of the pelvis, even though the head is engaged. For even though the head may have passed through the brim of the pelvis, which can therefore be assumed

to be adequate, the outlet may be contracted. Therefore the subpubic angle and the transverse diameter of the outlet must be estimated. If the head is not engaged, and cannot be made to engage, an attempt is made to take the diagonal conjugate and so estimate the size of the brim.

In doubtful cases a really accurate assessment of the pelvic diameters is made by X-ray examination.

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17. PATIENTS SPECIALLY 'AT RISK'

While we cannot guarantee that any woman will have a normal confinement, we can, with fair accuracy put most patients into one of two broad categories:

Those in whom there is good reason to anticipate a normal confinement. Such a patient would be an absolutely healthy woman having her second or third child, under 35 years of age, with a good obstetric history and no complications in the present pregnancy. If this woman desires a home confinement and her house is suitable, she may be booked for domiciliary delivery and attended by a district midwife, with or without a doctor.

Those who are exposed to known hazards. These patients and their special problems are summarized below:

Grandes multiparae—women having their fourth and subsequent confinements. The serious risks are shoulder presentation, ruptured uterus, postpartum haemorrhage, and concealed accidental haemorrhage; while other disquieting possibilities are hypertension, anaemia, and precipitate labour.

Women having had third stage complications such as retained placenta or postpartum haemorrhage, which might recur.

Women carrying twins and triplets.

Women with serious medical disorders such as heart disease, diabetes, pulmonary tuberculosis, cardio-vascular disorders and severe anaemias.

Patients with malpresentations and those with either suspect or actual disproportion.

Women who have had Caesarean sections or other uterine operations. The uterine scar may rupture.

Rhesus negative women with antibodies. The child is at risk and the mother may on this account need operative delivery.

Women with bad obstetric histories. This term includes unexplained intra-uterine deaths and stillbirths, mechanical diffi-

culties of labour, traumatic deliveries and repeated miscarriages.

Women over 35 years of age, who are more prone to certain complications, including a greater than average likelihood of a malformed child.

Such patients should always be booked for hospital delivery, so that they may be under constant observation, with a skilled obstetrician readily available, and facilities for X-ray, operative procedures and blood transfusion all at hand.

Primigravidae

Some authorities would prefer to have all primigravidae delivered in hospital. Labour is extremely unpredictable, and may be prolonged or otherwise difficult. Labour is only normal in retrospect. Others would accept for home delivery normal women, having their first labour when under 30 years old. All authorities agree that 'elderly' primigravidae should be booked for hospital delivery. Here, there are additional hazards of pre-eclampsia, hypertension, longer labour and difficult delivery, while the patients themselves, sometimes having had many years of infertility, may be full of anxieties and fears, and would have no peace of mind elsewhere.

It is worthy of note that in more than half of the categories described above, the patients are multigravid. Such women often desire a home confinement, not wishing to leave their children in order to go into hospital. In particular, women who have had five or six normal confinements are anxious about their families, but unconcerned about themselves. In cases of this kind the district midwife has a special responsibility in persuading the patient of the wisdom of having this baby in hospital.

18. PARENTCRAFT TEACHING

Maternal instinct does not supply all the knowledge required for the mother to care for herself and her baby. The mother if not given advice will obtain it from relatives or books, but it is best given by a midwife and other members of the health team, with modern knowledge and the ability to convey this knowledge to the mother in a simple, practical manner. The teaching of mothercraft is included in the syllabus of the Central Midwives Board for Second Period training of pupil-midwives.

However, the introduction of a new baby into the home affects not only the mother, but the father. For this reason we prefer to think of parentcraft rather than mothercraft, and encourage them both to come along. No one can support the woman during pregnancy and labour like her husband, but many husbands are shy and need encouraging in this most important role.

Teaching includes not only the care of the baby but also how the mother may keep herself fit, the correct foods to eat, the care of the breasts for successful breast feeding and the knowledge of what to expect in labour. During the antenatal period at clinics and during home visits there is an opportunity for the midwife to teach mothercraft. At clinics some advice must be given to the individual mother but talks and demonstrations can be given to groups of mothers. A short talk on a subject can be followed by a demonstration to maintain the interest of the mothers. Use should be made of all kinds of visual aids to emphasize the points made, for example, simple coloured diagrams on the blackboard, the birth atlas, film strips, as well as practical demonstrations of the use of the analgesia apparatus, baby bathing and patterns for baby clothes. The talks should be as informal as possible so that the mothers may feel free to ask questions. Time should be allocated specifically to deal with the patients' own problems. The pupil-midwife must put the material into her own words, but she should remember the more there is to see, and the more participation by the parents the more they will remember. These sessions must be lively and interesting otherwise the parents will not come again. A cup of tea or coffee served during general

question time helps informality and stimulates talk. During the talks the following subjects should be discussed:

Your Health During Pregnancy

Introduction

This should be an introductory talk which explains how the baby grows in the uterus during pregnancy. It should be emphasized that if the mother cares for herself properly her baby will benefit. On the other hand the mother should not be made to feel that the pregnancy is an illness, but that in fact many mothers feel in better health during pregnancy. Only in the last few weeks may the size and weight of the abdomen cause some tiredness and, perhaps, backache, but these symptoms merely show that the mother should have more rest.

Rest

Extra rest is necessary, especially in the last 3 months. The woman should aim at 8 to 9 hours in bed at night and, in the latter weeks, 2 hours rest each afternoon.

Exercise

Moderate exercise, particularly in the open air, is beneficial. Normal women may undertake cycling, swimming, and riding in moderation. Again, ordinary housework (but not moving heavy furniture), gardening and walking may be recommended. It is better to avoid strenuous exercise.

Clothing

The midwife should point out that special maternity clothes are not needed until the twenty-fourth week at the earliest but in the meantime styles, materials and patterns can be discussed and illustrated, the emphasis being on loose adjustable garments made of washable materials. However, quite early in pregnancy the breasts need support from a properly fitting brassiere. This should be a well-fitting garment with wide straps that do not cut into the shoulders. The cup should be deep so as not to flatten the nipple and as they will need to be 10 cm larger than usual many women buy a type which can be used during lactation. The most useful is the front opening type. A girdle is not necessary if muscle tone is good, maternity belts however, give comfort and support particularly to the woman who has had several children, and the midwife should be prepared to discuss with

the individual mother the type of corset or belt which she should wear. Some support will be needed for stockings, but garters and elastic tops should be avoided as they encourage varicose veins by restricting the venous return. Panti-girdles may also be unsuitable for the same reason in late pregnancy. As pregnancy progresses the uterus is so heavy that the patient leans backwards to maintain her balance. High-heeled shoes aggravate this tendency to tilt forwards, and the strain on the spine and sacro-iliac ligaments may cause backache. The patient is therefore advised to have shoes with lower heels.

Travel

Long journeys should preferably be avoided in late pregnancy. Long road or rail journeys could cause sufficient jolting to bring about a premature labour in a susceptible person. Long-distance flights could, since the available oxygen is slightly reduced, harm the fetus.

Diet

The midwife should explain that a correct diet in pregnancy is essential to maintain the health of the mother and also to provide food for the growing baby. A diet which contains meat, fish, eggs, cheese, milk, fruit, vegetables and wholemeal bread will supply the body building foods, iron, calcium and phosphorus which are necessary for the baby to grow properly and be healthy. Iron is necessary to form the baby's blood, and if there is not sufficient in the diet the mother will become anaemic. The opportunity can be taken in this talk to urge the woman to take iron and folic acid tablets regularly if these have been prescribed by the doctor.

The pregnant woman should be advised to have 1·2 litres (2 pints) of milk and one to two eggs daily. It can be pointed out that she may prefer to take the milk and eggs in puddings. She should be encouraged to have butter, cheese and meat in the daily diet and fish twice weekly. The importance of green vegetables, fresh fruit and wholemeal bread as sources of vitamins should be emphasized and also that these foods will assist in obtaining a daily action of the bowels without the use of laxatives. Sample diets to contain these foods can be given.

The woman should be told that she will keep herself and her baby healthy if she eats a sufficient but not excessive amount of the correct foods. Often a mother will eat far too much of the wrong foods which she may prefer. Fried foods, potatoes, sweets and cakes are not valuable foods and are very fattening so she should be advised to reduce the amount of these foods in her diet.

The woman can be advised how to obtain extra milk and vitamins. Additions to the diet are available for some pregnant women. Vitamin A and D tablets and a pint (1·2 litres) of milk daily can be obtained free if there are two children under school age, or the income is low. The application form for welfare milk and vitamin tokens (Form F.W.8) is supplied and signed by the doctor or midwife, and is taken or sent by the mother to the nearest local Pensions and National Insurance Office.

Smoking

Moderate smoking is probably harmless in normal pregnancy. Heavy smoking is in any circumstances inadvisable. It has been shown that heavy smokers tend to have slightly smaller babies.

Alcohol

Again, moderate drinking is probably harmless and excess is as undesirable in pregnancy as at any other time.

Sexual Intercourse

Most authorities recommend that it should be avoided during the last 6 to 8 weeks of pregnancy. If there is a history of miscarriage it should be avoided in early pregnancy.

Care of the Teeth

Routine dental examination and treatment is very important, and the mothers should be assured that there is no danger in treatment or even the extraction of teeth during pregnancy. A pregnant woman is given priority and free treatment, but she may need a letter from her doctor in order to see her dentist as soon as possible.

Apart from the general talk to all mothers, at the first antenatal visit, each individual mother should have her teeth examined and be given advice on the care of her teeth and whether a visit to the dentist is advisable.

Bathing

Most women will realize that a daily bath or shower is necessary and advisable during pregnancy.

At the end of the discussion the mother should be urged to attend

the antenatal clinic at the recommended intervals and be given simple reasons why this is necessary in the interests of herself and the baby.

Baby Feeding

Breast Feeding

The midwife should enlarge on the advantages of breast feeding for both mother and baby, pointing out that it is the ideal food for the baby, and is, in many ways, more convenient for the mother as there

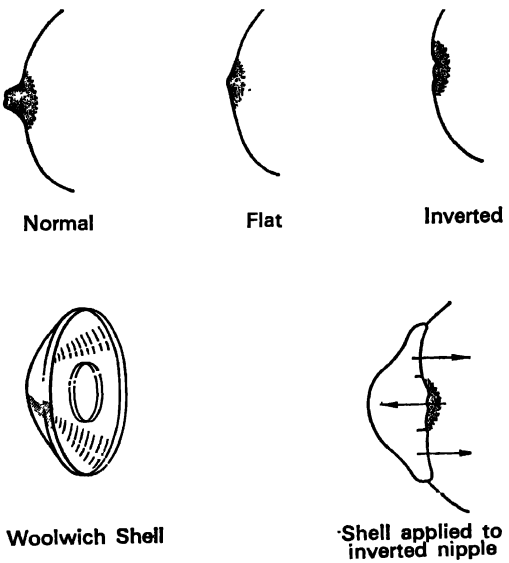


Fig. 73. Diagrams of the types of nipple. Woolwich breast shell applied to inverted nipple.

are no bottle feeds to prepare. Some failures in breast feeding occur in the first few days, and proper care during pregnancy will often prevent the first difficulties. It can again be pointed out that a proper diet will maintain the mother's health and contribute to successful lactation. Advice can be given on the wearing of a correct brassiere, sufficiently large and to give adequate support.

The main teaching on the care of the breasts and nipples requires personal advice to each individual mother during an ante-

natal examination. The advice given to the mother depends on the condition of the breasts and more particularly of the nipples. If the nipples stand out firmly from the breasts, advice on routine cleanliness and care of the nipples is given. She should wash the breasts and nipples daily with soap and water and after drying apply lanolin to the nipples and gently pull them forwards. Should there be much secretion coming from the breasts a pad of absorbent cotton wool covered with a piece of soft linen can be worn to protect the underclothing. If the nipple is flat or retracted the midwife must determine whether it can be made to project. The finger and thumb are placed on either side of the areola and gently compressed in imitation of the grasp of the baby's jaws. If the nipple fails to project or turns inwards the mother should be advised to wear Woolwich shells (Fig. 73). These are hollow plastic cups with an opening which is placed over the areola and nipple; it is kept in position with the brassiere. Continuous gentle pressure by the shell pushes the areola and nipple into the cup, and gradually the retraction of the nipple may be overcome and successful breast feeding achieved. The shells are worn for increasing periods during the pregnancy. Each day the shells are washed and dried and the nipples washed, dried and lanolin applied.

Many authorities believe that breast feeding will be more successful if, antenatally, colostrum is expressed from the breasts, once or twice daily, during the last 6 weeks of pregnancy. This clears the ducts, allows the milk to flow more easily, and prevents the early engorgement which so often causes pain and discomfort and adversely affects lactation.

Artificial Feeding

Some mothers express a definite preference for artificial feeding. There are primigravidae who dislike the idea of breast feeding. Some multigravidae have had unfortunate experiences when attempting breast feeding, and have become so discouraged as not to want to try again.

The midwife must carefully review these patients and exercise great diplomacy in advising them. She may well discuss with them, quite objectively, the pros and cons of both methods. She may successfully persuade some that breast feeding really is better, but she should not try to impose her will upon them. A woman cannot be coerced into a successful breast feeding plan.

It is the midwife's responsibility, too, to give some instruction in the preparation of bottle feeds and the care of the equipment used, while she can usefully discuss the various types of food and the calculation of quantities.

Preparation for Labour

Discussion on Labour

The parents may approach labour with apprehension or even fear chiefly because of a lack of knowledge of what happens in labour. The first object of this talk is to give the parents a simple explanation of the onset and stages of labour, and to help to overcome any preconceived ideas or exaggerated stories of difficulties in childbirth.

With the aid of simple diagrams or the birth atlas, the position of the baby in the uterus, the cord and the afterbirth are shown. It is pointed out that the neck of the womb is closed until labour begins, but with the onset of labour there is a gradual opening of the neck of the womb, so that a passage is formed for the birth of the baby. The mother is next told the indications that labour has begun. The show is caused by the opening of the neck of the womb and the expulsion of the plug of mucus from it accompanied by a little blood. The breaking of the waters may occur at the onset of labour, but it is more usual for this to happen when labour has been in progress for some hours. The mother with her hands will feel hardening of the womb accompanied by discomfort, usually in the back, occurring at regular intervals of 15 to 20 minutes. She should contact the hospital or midwife if any of these symptoms occur, and the telephone numbers of the hospital and ambulance or midwife should be clearly written on her clinic card. The midwife explains why on admission the vulva is shaved and the mother is given an enema and has a bath. During the first stage of labour, the neck of the womb is opening and this stage is the longest part of the labour. The amount of discomfort in this stage varies but the midwife can assure the mother that she will be given drugs to relieve her. This is the stage when the husband's presence gives help and support. He can be shown how to rub his wife's back during a contraction and so help her to relax. The second stage begins when the neck of the womb is fully opened and ends with the birth of the baby. It is during this stage, which is quite short, that the mother can help in the birth of her baby, by co-operating with the midwife. During the third stage the placenta is expelled after a few minutes and this completes the labour. The mother is then made comfortable. The relief and elation she will feel on seeing and holding her baby will make her forget any discomfort she may have suffered.

Demonstration of Analgesia Apparatus

After the general talk on labour a demonstration on the use of the analgesia machines can be given. The Entonox nitrous oxide and

oxygen machine, and the two trichloroethylene machines and the Cardiff Inhaler for Methoxyflurane should be shown. The midwife can describe the advantages of the self-administered method for the relief of discomfort in labour. There is rapid alleviation of discomfort without harming the baby, and the mother does not lose consciousness but is aware of what is happening and can still co-operate in the birth of her baby. It is important that each woman should become familiar with the use of analgesia apparatus and the mask during pregnancy rather than use the machine for the first time when she is either confused by drugs or in pain during labour. Here the husband makes another contribution, he can be his wife's memory and remind her what to do at this time.

Relaxation

Relaxation is a state in which bodily relaxation is accompanied by mental tranquillity. This is in direct contrast to a state of physical and mental tension which can develop in labour and which will interfere with rest and sleep and exaggerate the pain of the contractions. There is no doubt that relaxation can do much to relieve the physical and mental strain of labour but the length of the labour does not appear to be shortened. With proper teaching during pregnancy it is possible for many, but not all, women to learn relaxation and to maintain a state of bodily relaxation and mental tranquillity during labour.

Classes in relaxation and in the control of breathing are given by a physiotherapist or by a midwife who has learnt how it is done. The classes should be small and held in a quiet room. The women must be prepared to give sufficient time to each session. It will require a number of sessions and practice at home for the woman to achieve real benefit. Here again the husband can practise with his wife and help her to persevere.

At these classes the physiotherapist can also give advice on correct posture in standing and walking which will help the mother to avoid backache which is one of the common discomforts of pregnancy.

Preparations for the Baby

The Layette

From the early weeks of pregnancy the parents will wish to make preparations for clothing their baby. Indeed, the midwife should stress that the layette should be ready by the thirty-second to thirty-fourth week of pregnancy; firstly because the baby may be born early, and secondly, because in the last few weeks of pregnancy the mother may become disinclined for needlework.

Every woman has her own ideas of how her baby should be clothed, and economic and social factors will enter into her preparations, but the midwife can suggest the basic garments necessary and the number required—three each of vests, nightgowns and coats, 2 dozen napkins, a warm shawl and a few pairs of bootees are the minimum. Dresses are not really necessary during the first few weeks, but most mothers will wish to include one or two in the layette. It is advisable to have well-made completed garments on show during the talk, and patterns, styles and materials can be discussed, stressing that nightgowns can be made large enough to last several months if made in raglan pattern. Matinee coats and bootees in lacy patterns are best avoided for every day use. The baby may trap his fingers in the holes and the circulation can be interfered with. Similarly, loose threads of cotton or wool in gloves and bootees have wound around fingers and caused gangrene. The midwife should impress upon her listeners that although the baby must be kept warm, care should be taken that he is not over-clothed, especially in hot weather.

Bathing the Baby

The same factors of economic and social environment will affect the equipment which the mother can provide for the care of her baby, but the midwife must be prepared to discuss the various kinds of cots, prams, blankets and bathing equipment which are available. Plastic baths and buckets can be recommended, being strong, light and resilient.

Having discussed the equipment, the midwife must then give a demonstration of bathing, changing and general handling of the baby, and for first pregnancies individual tuition and practice should follow. Particular care should be given to teaching the woman how to hold the baby, giving support to the head and spine. She will want to know the kind of soap to use, whether or not powder is necessary and the kind of towels to buy. A temporary bath apron can be made from a length of towelling and demonstrated by the midwife. The washing of baby clothes, particularly woollies and napkins can be mentioned, stressing that no strong soap, soap powder or detergent should be used. Pure soap flakes are recommended, and the clothes and napkins should be well rinsed. Families with washing machines will find these of great help, and if this is a winter baby some form of drying such as a spin dryer or drying cabinet is an essential. The use of Napisan and similar preparations should be discussed. Mothers should be told of the napkin-washing service which exists in some towns, and they should have an opportunity to see some of the disposable napkins, and the rolls of disposable tissue which effect

such a saving in napkin washing. It will also be appreciated if the types of non-disposable napkins are shown the soft muslin (Harrington) squares, turkish towelling napkins and the napkin liners which act like a wick to attract the urine away from the skin (Marathon Dryliners).

Welfare Services for the Baby

While the mother is under the care of the midwife, either in hospital or the district, the feeding and general care of the baby will be under her supervision, but the midwife should reassure the mother that when she is on her own, the health visitor will call to give advice and help. The mother should also be reminded that her baby must be registered before he is 6 weeks old, and that at the time of registration she will be given a form (E.C.1) which will entitle her to put her baby on a doctor's list under the National Health Service. A second form will be available to her which will enable the mother to obtain milk for herself when she is breast feeding the baby or National Dried Milk for the baby if the baby has to be bottle fed, free of charge, where there is special need because of low income. Otherwise she may buy National Dried Milk and vitamin supplements at special clinic prices. She may also claim for the family allowance if she is entitled to it.

Maternity Benefits and Social Care

Maternity Benefits

Under the National Health Service every expectant and nursing mother is entitled to the services of a doctor, dentist, midwife and health visitor and hospital services if necessary, without charge. Milk and vitamins are provided at low cost through the Welfare Foods Service. On the other hand, cash maternity benefits are provided through the National Insurance scheme and are available if the mother or her husband fulfil the contribution conditions. The mother may claim a Maternity Grant a lump sum either on her husband's or her own insurance. The Maternity Allowance paid weekly for 18 weeks beginning 11 weeks before the expected week of confinement is claimed by the employed woman who has paid the necessary number of contributions. She must cease work during this period. Full details of these benefits are given in leaflet N.1.17.A. and the mothers should be advised to obtain a claim form from the nearest Pensions and National Insurance Office not later than 12 weeks before the baby is expected.

Social Care

If the parents have special social problems the midwife should discuss these with the parents in private and may need to refer them to the medical social worker in a hospital or a social worker employed by a local health authority if she is having the confinement at home. The family may require a home help when the woman is admitted to hospital or after her confinement and the midwife or medical social worker may contact the home help service. A charge is made for this help by the local health authority varying with the parent's ability to pay. Sometimes arrangements must be made for the care of other children while the mother is in hospital. The unmarried mother needs expert guidance and help from the doctor, midwife, medical social worker and others. Provision has often to be made for her care, possibly in a Mother and Baby Home, for the last few weeks of pregnancy and following the confinement until her problems have been solved.

Fathers Evening

The midwife may arrange for talks to be given in the evening so that the husband can be invited to attend with his wife. This may not always be possible, and a special effort should be made to encourage him to attend the Fathers Evening. The object of these talks is not only to show how the husband may help his wife but also to overcome the tendency for the mother to become too possessive of the baby and to urge her to allow the father to co-operate in the care of the baby from the earliest days.

A film of childbirth might be shown, and the presence of a doctor often helps the father to verbalize his problems. Sometimes the group can divide up into two small discussion groups—mothers with the midwife and fathers with the doctor.

19. PREPARATION FOR CHILDBIRTH AND AFTER

Preparation for Childbirth

Psychophysical Preparation

In recent years the practice of learning relaxation in the antenatal period, deliberately and under supervision, has in some women produced a labour which is practically painless. The basis of this teaching is that fear causes tension of the cervix during the contractions of the uterus; the tension causes pain and hence greater fear, and thus a vicious circle is begun which can prolong labour and bring other complications in its train. It follows, therefore, that if during the antenatal period the woman can be taught to relax her whole body completely, when labour begins she can put this into practice during contractions. Her whole body is relaxed, and the cervix shares in that relaxation; tension is thus absent, and the taking up of the cervix and the dilatation of the os uteri continues without hindrance, because there is no pain.

Ideally the teacher during the antenatal period should be with the woman during labour, but this is not always practicable. Every midwife can, however, help by encouragement and by keeping the atmosphere around the mother quiet and calm. If relaxation is perfect and if labour is uncomplicated, no hypnotic or analgesic is required, but sometimes, towards the end of the first stage, the woman becomes restless and it is then that analgesia is appreciated. The second stage is somewhat different; the mother relaxes and often sleeps between contractions; her strength has been conserved during the first stage, and during the second stage she may surprise herself and her attendants by the progress she makes.

Hypnosis

Some obstetricians and midwives have achieved success in the practice of hypnosis during labour. Patients who have received careful

individual teaching during pregnancy have been noted to 'sleep' through their labours, experiencing no pain, needing no drugs and, afterwards, recalling nothing of their labours.

Psychoprophylaxis

This is another mode of preparation for childbirth often used, the aim is gradually to build up a high degree of muscular control, both in breathing and in the use of the abdominal and pelvic floor muscles. Here, however, the patient is fully conscious throughout her labour, participating to the utmost, and deriving pleasure and satisfaction from her experience. This mode of preparation is much used in Russia and France.

It is obviously the primigravida who needs this help most, but many multigravidae are very enthusiastic about attending the classes, especially those who have previously had difficult or prolonged labours.

Exercises

Childbearing is sometimes associated with the fear of an undesirable change in the figure; especially is this so in the case of young women who wish to maintain a good figure.

The skin and muscles of the abdomen will be stretched by the pregnancy and postnatal exercises will help to restore the tone of the muscles and improve the figure. It is better to restore the muscles with exercises than to support them with a corset. Well planned exercises, not too strenuous, will do much to restore the muscles of the abdominal wall and pelvic floor to their former tone. Exercises also improve the circulation and lessen the risk of venous thrombosis. The regular action of the bowels, and the return of the patient's vitality is also stimulated by the use of suitable exercises. The following exercises have been found very easy to carry out and have given good results.

Antenatal Exercises

Deep breathing exercises. Stand at an open window, if possible, and inhale slowly through the nostrils, counting up to ten. Keep the mouth closed and exhale the air slowly. Repeat eight times. Quiet, slow breathing gives the best results. Another method is to inhale slowly through the nostrils, counting ten. Open the mouth and release the air quickly. Repeat two or three times a day.

The hands may be placed on the hips or extended as shown in Fig. 74.

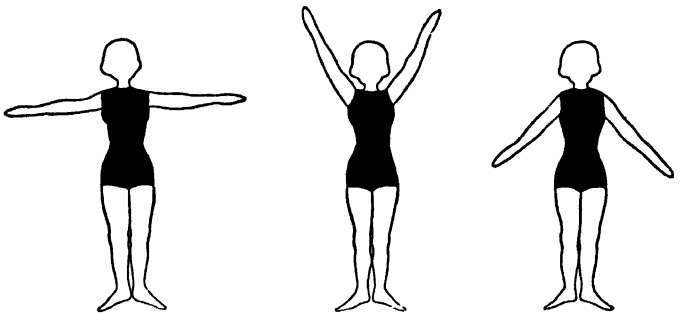


Fig. 74. Deep breathing exercises.

Exercises to improve the flexibility of the spine (early months only). The patient is asked to kneel and to bend her body forwards until her head nearly touches the ground in front of her knees, with her forearms on the floor. She counts five, and then she very slowly straightens her back, drawing her hands back along the floor to her knees and raising the flexed head last (Fig. 75). Breathing deeply during this exercise is beneficial.

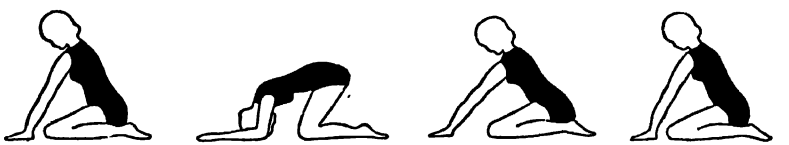


Fig. 75. Exercises to improve the flexibility of the spine.

Exercises During the Puerperium

Deep breathing and free movements in the bed should be encouraged from the day of the delivery. On the second day the following exercises may be done provided the labour has been normal and the patient is in good health. In prescribing exercises discretion must be used and the exercises must be adapted to the individual. In hospital the exercises will probably be directed by a physiotherapist.

1. Deep-breathing exercises as described for the antenatal period, with the patient lying flat in bed. Stretch, stiffen and relax the muscles of the right and left leg alternately.

2. To restore tone to the muscles of the pelvic floor, lie flat on the back with body relaxed. Tighten the anus for ten seconds as though trying to control a loose motion or retain an enema. Repeat six times, then rest for 1 minute. Carry out the same procedure eight times.

3. Lie flat on the bed and forcibly abduct the thighs against resistance (the nurse attempts to hold the thighs together while the patient pushes them apart). Repeat slowly six times. Later the same exercise may be carried out, but with the nurse holding the patient's knees together instead of the thighs.

4. Lie flat upon the back with the hands upon the hips, and elevate the feet alternately, counting one to six, up, and one to four, down.

5. Lie flat with the hands resting lightly on the abdominal wall. Then slowly raise the head and shoulders. The patient must not push the chin forwards, or the abdominal wall will be pushed outwards instead of contracting, nor must any weight be rested on the elbows (Fig. 76.)

Fig. 76.

6. Sit up in bed with the hands clasped round the flexed knees and endeavour to touch the knees with the chin. The nearer the head and knees approach the greater the contraction of the abdominal muscles (Fig. 77).

Fig. 77.

7. *For strengthening the muscles generally.* The patient, sitting up in bed and bending forward with legs outstretched, places her hands on her ankles. The trunk is then stretched backwards and the arms drawn up and bent to imitate rowing. The knees are slightly flexed at the same time (Fig. 78).

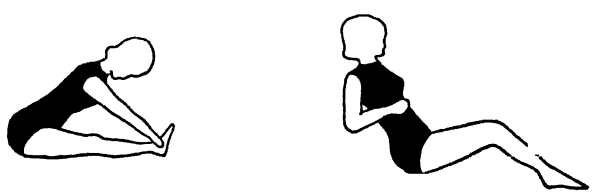


Fig. 78.

8. *Posture.* The exercises already described are designed to restore the muscles of the back, abdomen and pelvic floor, but it is very important to ensure that the posture on standing is restored to normal. Many women suffer from backache after childbirth. This is often owing to poor posture and fatigue of the muscles of the back. On standing the abdomen is allowed to protrude, the back is arched (lumbar lordosis) and the knees slightly bent. This attitude throws a great strain on the ligaments of the lumbar spine. The mother will usually have worse backache towards the end of a fatiguing day, particularly after carrying an increasingly heavy child. The mother should be taught the correct posture, with the abdomen drawn in and the back and knees straight, and advised to continue to maintain this good posture.

The patient is advised to continue some of these exercises after her return home. She should be given a simple programme rather than an elaborate one as she will be fully occupied looking after her household and the baby. A useful and not too time-consuming plan is suggested below:

1. The maintenance of a good posture, whether sitting down, standing or walking. Incidentally, walking is itself excellent exercise.
2. The bending and stretching movements of ordinary day-to-day activities such as housework, bed-making and weeding the garden are just as good as many specific exercises.
3. Following childbirth the pelvic floor exercises of contracting the levator ani muscles is probably the most valuable of all. It can be carried out at any time and in any position: standing, sitting or even lying in bed. Performed regularly, this exercise may well save the patient from developing a prolapse late in life.

By following a simple regime of this kind the patient may well be found at her postnatal clinic examination to have muscles almost as good as before her pregnancy.

20. DISCOMFORTS OF PREGNANCY

There should be no great discomfort during pregnancy, but as the uterus increases in weight and size it produces a certain amount of pressure on the various organs and tissues.

Morning Sickness

This is experienced by about 50 per cent of all pregnant women, usually between the sixth and twelfth weeks. Generally there is nausea and sometimes actual vomiting, often when the patient first gets up in the morning. This is unpleasant, but, if the urine is free from ketones, not serious. The patient is advised to eat a dry biscuit or some dry toast in bed before getting up. If she prefers, she may eat an apple. This can be followed a little later by a cup of tea.

Sometimes the sickness is more troublesome with slight ketosis and here a doctor's advice should be sought. He may recommend a sedative, such as phenobarbitone 30 mg twice a day, or an antihistaine preparation such as promethazine theoclate (Avomine) 25 mg twice a day, either of which should quickly effect a cure.

Exceptionally, the vomiting is persistent and the patient develops severe dehydration and ketosis. The doctor will then admit her to hospital immediately.

Heartburn

This is a burning pain resulting from regurgitation into the oesophagus of acid stomach contents. It occurs because the cardiac sphincter of the stomach is relaxed during pregnancy. The patient should avoid fried and fatty foods and have small frequent meals. Alkaline preparations such as magnesium trisicilate often give temporary relief; while for heartburn occurring at night the patient should have extra pillows, keeping the head high.

Constipation

This may be troublesome due to the relaxation of muscle by progesterone. It can normally be overcome by adjusting the diet, adding extra fluid, fruit, vegetables and bran cereals. If aperients are needed, senna and milk of magnesia are safe, salts and castor oil are unsuitable, and liquid paraffin should be taken only for short periods since it can interfere with the normal absorption of fat-soluble vitamins.

Frequency of Micturition

This occurs during the first 12 weeks of pregnancy due to the pressure of the growing uterus on the bladder and is spontaneously relieved when the uterus rises up into the abdomen. It recurs during late pregnancy when the fetal head descends into the pelvis. If it is accompanied by pain and a burning sensation, medical advice should be sought.

Prutitis Vulvae

Irritation of the vulva may be due to lack of hygiene, monilia or glycosuria. The urine should always be tested to exclude sugar. Treatment is dependent upon the cause.

Vaginal Discharge

An increase in the secretion from the cervical glands is normal. It may be sufficient to cause a slight, non-irritating mucoid discharge. The discomfort can be relieved by frequent washing or bathing.

Discharge which is purulent, blood-stained, irritating or offensive is abnormal, and a doctor should be consulted. It may arise from an infected cervical erosion, from monilial vaginitis, from trichomonal vaginitis or, sometimes, from gonorrhoea.

Cramp

Cramp, usually in the legs, is quite common. It has been attributed to deficiency in vitamin B_1, calcium and salt, and extra amounts of these substances are sometimes prescribed. Night cramps may be related to ischaemia of leg muscles and are often relieved when the patient sleeps with the foot of the bed raised 20 to 25 cm (9 to 10 in.).

Oedema of Legs and Feet

Oedema of the ankles and feet may arise because pressure from the

weight of the uterus on the veins at the pelvic brim interferes with the venous return. The oedema in this case usually comes on towards the end of the day, and is better in the morning. The cause of the oedema and its treatment must be decided by a doctor, as it may be due to pre-eclampsia.

Varicose Veins

Varicose veins may develop, or if already present, become worse during pregnancy, this is again due to the high level of progesterone circulating. Varicose veins are usually in the thigh and legs, but sometimes occur in the rectum, vagina or on the vulva.

For *varicose veins in the legs*, long periods of standing should be avoided and it may be necessary to wear a crepe bandage or elastic stocking. The latter has the advantage of looking reasonably attractive. Whatever method of support is used it must be put on before rising to prevent the veins overfilling with blood. The patient must be carefully instructed not to sit on the edge of the bed, but put on the support with the leg extended on the bed. This is difficult at any time, but in late pregnancy impossible without help. Reassurance can be given if the patient is worried about the appearance of the legs, considerable improvement will occur once the baby is born.

Haemorrhoids may cause bleeding and are sometimes very painful. Constipation must be avoided as straining will aggravate the condition. Anaesthetic suppositories such as Anusol may be prescribed and give a great deal of relief.

Varicose veins of the vulva are very painful and a vulval pad may give support and ease. The condition is potentially dangerous, a vein may rupture at delivery. These patients should always be delivered in hospital.

Varicosity in any place is relieved by rest, particularly with the legs raised to aid venous return. At night a pillow under the mattress, or blocks raising the foot of the bed will have the same effect.

All types of varicose veins regress after delivery, and active treatment is usually avoided for at least 6 weeks so that a true assessment of the situation can be made.

Backache

Backache is partly due to the relaxation of ligaments and partly to the posture adopted by many women to balance the weight of the fetus. The back is hollowed and the abdomen pushed forward. Correction of posture with the help of a physiotherapist, sensible shoes and adequate rest will relieve the condition. A mild analgesic may at times be necessary.

Insomnia

Insomnia is relatively common in late pregnancy owing to discomforts of fetal movements, frequency of micturition and the difficulty in finding a comfortable position. It may be a manifestation of some deep-seated anxiety or fear and this must not be overlooked, and expert help obtained if necessary. For the physical discomforts a mild hypnotic such as butobarbitone should prove effective.

Headache

This is not a minor ailment. It may be a symptom of severe pre-eclampsia, and it should never be ignored.

Potentially Serious Conditions

Vaginal bleeding, however slight, is abnormal, and a doctor should be consulted immediately.

General malaise and feverishness is indicative of infection, and perhaps the commonest infection in pregnancy is pyelonephritis, which needs prompt treatment.

Abdominal pain is not uncommon. It may be due to stretching of the round ligaments, and thus not of serious import. On the other hand it cannot be ignored, since it may be associated with appendicitis—always serious in pregnancy—red degeneration of a fibroid, abortion or ectopic pregnancy.

21. DISORDERS OF PREGNANCY

BLEEDING FROM THE GENITAL TRACT

Bleeding from the genital tract is usually considered in two groups, depending on whether it occurs before or after the twenty-eighth week of pregnancy.

Bleeding before the Twenty-Eighth Week

Abortion

The expulsion of the contents of the uterus before the fetus is viable, i.e. before the twenty-eighth week of pregnancy, is known as an abortion or a miscarriage. Although these two words have the same technical meaning, patients sometimes think that a miscarriage is an accident and an abortion a criminally induced process. Therefore in a discussion with a patient it is tactful and kind to use the term miscarriage. A midwife does not undertake responsibility in a case of abortion, a condition which requires the immediate attention of a doctor but she must have some idea of what to do until the doctor's arrival. In some cases the nurse is sent for by the doctor or relatives of the patient.

Incidence. It is estimated that 10 to 20 per cent of all pregnancies end in abortion, this is probably too low a figure as many occurring very early are not recognized and mistaken for a heavy period. The majority of these occur within the first 3 months of pregnancy.

Causes of Abortion

General maternal causes. Chronic nephritis and diabetes are diseases which may cause abortion. Syphilis is an uncommon cause of late abortion. Severe anaemia and severe nutritional deficiency may cause abortion. Any acute illness, particularly with a high temperature,

for example pyelonephritis or influenza, can be the cause. A severe emotional upset may precipitate an abortion.

Local maternal causes. The Fallopian tubes, uterus and vagina are formed from the two Müllerian ducts. These two ducts join to become a single duct which forms the cavity of the uterus and the vagina. Incomplete union will result in a bicornuate (two-horned) or other form of double uterus, possibly with a double vagina. These malformations can lead to abortion.

Sometimes the uterus fails to develop to the full adult size, remaining infantile. Pregnancy in such a uterus may also end in abortion. A uterus containing fibroids may be the cause. Retroversion of the uterus does not itself cause abortion. As the uterus enlarges it will usually rise into the abdomen. If it fails to do so vaginal and abdominal manipulation to correct the retroversion is much more likely to cause an abortion.

A deep laceration of the cervix or undue stretching of the internal cervical os, produced by a previous abortion or childbirth, may allow the membranes to bulge through the cervical canal and rupture to produce an abortion. This condition, an incompetent cervix, may be the cause of repeated late abortions. A nylon tape inserted and tied around the cervix at about the fourteenth week may prevent this. This is called a Shirodkar operation. The tape must be removed before the onset of labour.

Abnormality of the ovum. A hydatidiform mole may form from the placental tissue and this always ends in abortion. The embryo itself may be malformed; this is a common cause of abortion.

In the majority of cases of abortion, in spite of investigation, no cause can be found.

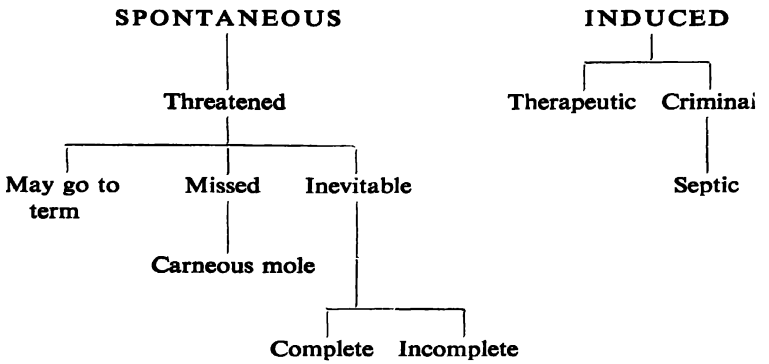
Abortion can be divided into spontaneous and induced.

Spontaneous Abortion

Threatened Abortion

Slight bleeding may occur, usually during the first 3 months of pregnancy. Pain does not occur nor does the cervix dilate. The bleeding may cease and pregnancy continue normally.

No aperient or enema should be given and no vaginal examination should be made by the midwife, for a threatened miscarriage may easily become an actual miscarriage. The doctor usually orders phenobarbitone or something similar to allay anxiety and rest in bed until the bleeding ceases. The patient may be transferred to hospital so that she can have complete rest.



Inevitable Abortion

The bleeding is more severe than in a threatened abortion and sometimes the patient may collapse from blood loss. The ovum separates from the uterine wall and is expelled by the contractions of the uterus. The uterine contractions cause discomfort similar to that of labour contractions. If a vaginal examination were made, the doctor would find the cervix dilating, possibly with the ovum protruding through it. The ovum may be expelled complete—a *complete abortion*—or part of the ovum, usually placental tissue, is retained—an *incomplete abortion.*

Treatment. Should the midwife be the first to arrive she should swab the vulva, using full aseptic precautions, and apply a sterile pad. This will enable the doctor to estimate the amount of blood lost in a given time. Whatever is passed must be saved for the doctor's inspection, so as to ascertain if any part of the ovum has been expelled. The midwife should make the patient comfortable while awaiting the doctor.

If the abortion is complete and the condition of the patient is good, the doctor will probably give ergometrine maleate 0·5 mg or oxytocin 5 units and she can be nursed at home. If the abortion is incomplete or if there has been much blood loss the patient may be transferred to hospital after ergometrine has been given, provided her condition is good. If haemorrhage is severe, it is much wiser to call the obstetric 'Flying Squad' who will resuscitate the patient, if necessary giving a blood transfusion. When her condition has improved she may then be transferred to hospital. In hospital, evacuation of

retained products of conception from the uterus may be carried out and a blood transfusion given if blood loss has been severe.

The midwife's responsibility will be to observe the pulse, blood pressure and vaginal loss, prepare the requirements for the doctor and give support and reassurance to the patient.

Once the uterus is empty the vulval area should be washed or swabbed twice daily, and providing the temperature is normal the patient will be discharged about 3 days later. Hexoestrol or stilboestrol may be necessary if milk is produced in the breast.

Missed Abortion

This is also known as carneous mole, blood mole or fleshy mole. At an early stage in pregnancy a threatened abortion occurs, that is, haemorrhage without the expulsion of the uterine contents. Bleeding occurs between the gestation sac and the uterine wall and the ovum dies. Layers of blood clot are formed, later becoming organized. The uterus does not increase in size, and as the presence of the mole in the uterus appears to inhibit menstruation the patient is apt to think that her pregnancy is continuing, although other signs of pregnancy have disappeared. The bleeding from the vagina may be only a trickle or there may be none at all, but usually there is a brownish discharge.

Gradually the signs of pregnancy disappear and some women become aware all is not well. A few find the idea of a dead fetus in utero very distressing, in which case an oxytocic drug may be given in an attempt to make the uterus contract and expel its contents. Surgical intervention is not desirable and the uterus will eventually expel the mole spontaneously, but this may not occur for many months.

Habitual Abortion

This is a term used when three or more consecutive abortions have occurred. Careful investigations should be undertaken to find the cause. This may be due to abnormality, low grade infection of the genital tract, systemic disease or cervical incompetence.

Treatment varies according to the cause. Low grade infections are treated with the appropriate antibiotic. An incompetent cervix may be closed by the insertion of a suture (Shirodkar stitch). The suture is removed just before term or earlier if labour commences. This treatment has proved a success in a large number of cases. Hormonal deficiency may be treated by a progesterone implant, this is variable in its success.

Induced Abortion

Induced abortions are divided into therapeutic and criminal.

Therapeutic Abortion

The Abortion Act of 1967 for the first time legalized abortion in this country. The Act empowers a doctor to carry out an abortion providing the decision is taken by two doctors and notified to the Medical Officer of Health. This allows the doctor to take into account the pregnant woman's total environment and to decide whether the continuation of pregnancy would be detrimental to her well-being or that of her children. The many ethical and social implications are discussed in Chapter 2. The consent of both husband and wife is required.

Criminal Abortion

This is the evacuation of the uterus by unauthorized persons and is an offence punishable by law. The abortion may have been induced either by the woman herself or by some other person. Drugs or instruments may have been used, and whether successful or not, the action is illegal. The methods used may cause sudden death from haemorrhage, air embolus or vagal inhibition. Because of the lack of asepsis, infection readily occurs which may lead to chronic invalidism, or salpingitis and sterility. The midwife should always remember she is a vulnerable member of society and may be asked for advice and help when bleeding occurs. She should never undertake anything except on the instruction of a doctor, or she could find herself liable to prosecution.

Septic Abortion

This may be the result of a criminal abortion or from the retained products of an incomplete abortion. There will be fever, tachycardia, headache and general malaise. On examination, signs of pregnancy such as breast changes may be evident. The uterus may be tender and the vaginal loss offensive and profuse.

The patient should be isolated and a high vaginal swab taken and sent for bacteriological examination. The obstetrician must then decide on the appropriate treatment. He can either give antibiotics and a blood transfusion and wait for the patient's condition to improve, or with the aid of antibiotics perform a dilatation and curettage under a general anaesthetic. The danger of septicaemia and renal failure must be borne in mind.

Whatever decision is made, careful observation must be made by the midwife so that warning signs such as further rise in temperature, or diminishing urinary output, will not be missed.

Hydatidiform Mole

This condition is due to the degeneration of the chorionic villi at an early stage of the pregnancy. The ovum becomes absorbed and the placental tissue develops abnormally. The chorionic villi become enlarged and form cysts about the size of white currants, which may be seen in the blood-stained discharge. The uterus is usually too large for the period of gestation. On palpation it is soft and 'doughy'. No fetal parts can be felt, and no fetal heart can be heard. Sometimes

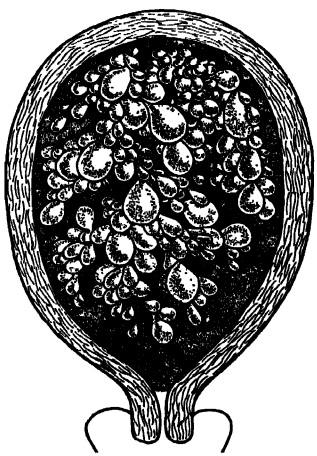


Fig. 79. A hydatidiform mole.

pre-eclampsia develops, even in the early weeks of pregnancy. The patient may have repeated, slight bleeding, or the first sign may be a profuse haemorrhage. If a pregnancy test is carried out the result will be strongly positive even when the urine is diluted a hundred times or more. This is because the over-active chorionic tissue is producing excessive amounts of chorionic gonadotrophin. Once the bleeding has commenced it persists until the mole is completely expelled. The actual expulsion may be accompanied by severe haemorrhage.

Every effort must be made to help the uterus to expel its contents spontaneously, e.g. by the use of ergometrine or Syntometrine, or with

a continuous oxytocin infusion; but where bleeding continues because of retained fragments of the mole, the obstetrician may empty the uterus manually under general anaesthesia. The abnormal villi damage the uterine wall considerably, so that it becomes very thin and is easily ruptured, and in some cases the uterus may be emptied more safely by abdominal hysterotomy.

Chorion Carcinoma

This is a malignant growth of the chorion which may follow a hydatidiform mole but which occasionally follows a normal pregnancy. It is fortunately a very rare condition for the growth spreads rapidly and can be quickly fatal. The pregnancy test becomes strongly positive again and bleeding occurs. As the growth infiltrates the uterus and vagina, pain increases. Spread occurs by the blood stream to the lungs, liver and brain.

Treatment is by total hysterectomy with the removal of the tubes, ovaries and any metastatic lesions which can be seen. Cytotoxic drugs such as nitrogen mustard and methotrexate have been used with success against the metastases. Before the use of methotrexate (an antifolic agent which disorganizes cell metabolism) cure had been uncommon if metastases were present. After a hydatidiform mole pregnancy tests are repeated regularly for a year or even longer, in order to see whether such a growth is developing.

Ectopic or Extra-Uterine Gestation

About 1 in 150 pregnancies the ovum implants not in the uterine cavity but in some other place, these are ectopic pregnancies; of these, 95 per cent occur in the Fallopian tube and are called tubal pregnancies.

Tubal Pregnancy

A tutal pregnancy arises when some factor has slowed the passage of the ovum through the tube. This may be some congenital defect, but is more usually the result of fibrosis following salpingitis.

The fertilized ovum, once embedded in the Fallopian tube, begins to develop and increase in size. The tube cannot stretch sufficiently to contain the growing ovum. The narrow uterine end of the tube will rupture when the ovum has become 1 to 2 cm in diameter, usually at the fifth to seventh week of pregnancy. If it is inserted into the wider ampullary end the ovum may become a little larger and therefore the pregnancy may continue a little longer (8 to 10 weeks) and the ovum is then usually expelled from the fimbriated end of the tube. This is

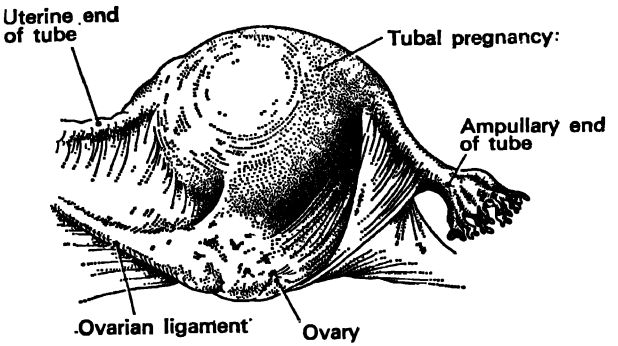


Fig. 80. Tubal pregnancy.

known as a *tubal abortion*. As the ovum separates from its attachment to the ampullary part of the tube, layers of blood clot may be deposited around the dead ovum to form a mass of blood clot similar to a uterine carneous mole; this is called a *tubal mole*. It may remain in the Fallopian tube or may be expelled from the fimbriated end of the tube as a tubal abortion. In both tubal rupture and tubal abortion intraperitoneal bleeding occurs but it is usually more severe with tubal rupture. The decidua is formed in the uterus, though the fertilized ovum has embedded itself outside the uterus. The vaginal bleeding is due to the separation of the decidua which occurs following the death of the ovum.

Signs and symptoms of tubal rupture. A sudden generalized attack of lower abdominal pain associated with vaginal bleeding before, with

Fig. 81. Rupture of Fallopian tube.

or after the onset of pain. There may be a history of amenorrhoea for 1 or 2 months, but some patients have not missed a period. The uterus is enlarged to the size expected for the period of amenhorrhoea. Early breast changes may be evident.

In a third of the cases there are signs of internal haemorrhage and shock. Pallor, cold clammy skin, rapid feeble pulse, faintness, vomiting are present. Pain referred to the shoulder is often found, due to the irritation of the diaphragm by the bleeding. On examination there is tenderness in the region of the tube, and on vaginal examination if the cervix is moved.

This is an acute surgical emergency and requires immediate treatment.

Treatment. The patient is taken to theatre with the minimum of preparation. Intravenous fluids are set up followed by a blood transfusion when cross-matching has been carried out. A laparotomy is performed, blood and blood clot are evacuated. Bleeding points are ligated and the tube divided and removed.

Recovery tends to be speedy as the patients are usually healthy young women. When conscious, the patient is nursed sitting upright. intravenous fluids being discontinued when her condition is satisfactory. There is a 10 per cent chance of a further ectopic pregnancy in the remaining tube.

Symptoms of tubal abortion. A patient who has a tubal abortion also suffers pain, but the condition is not so acute because the bleeding is less, and although surgical treatment is given, the emergency is not so great.

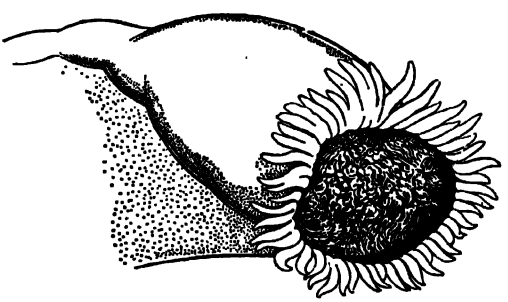


Fig. 82. Tubal abortion.

Secondary abdominal pregnancy

Very rarely, rupture of a tubal pregnancy may occur, the ovum being

partly extruded into the peritoneal cavity but enough chorionic villi remaining attached to the tube so that the embryo does not die. Chorionic villi on the surface of the ovum then become attached to neighbouring abdominal organs and the pregnancy continues. This is known as a secondary abdominal pregnancy. It may continue, the fetus developing free in the abdominal cavity. Shortly before term the abdomen is opened and the child is extracted. The placental tissue is left in situ since to attempt to detach it would cause uncontrollable haemorrhage.

Bleeding from Associated Conditions

The following conditions may cause bleeding although, strictly speaking, they are not early bleedings of pregnancy, since the bleeding is not from the site of the pregnancy.

Cervical Polyp

This is a small gelatinous growth attached by a pedicle to the mucosa of the cervix. It may give rise to slight irregular bleeding.

Erosion of the Cervix

An erosion usually gives rise to an excess mucus discharge from the vagina, but in pregnancy the increase in blood supply to the cervix may cause slight bleeding from the erosion. No treatment is necessary.

Carcinoma of the Cervix

This condition rarely occurs in pregnancy. On vaginal examination the cervix is hard and irregular and bleeds when touched. It is extremely serious and requires immediate treatment.

Any history of vaginal bleeding during pregnancy should be reported to the doctor.

Bleeding after the Twenty-Eighth Week

Antepartum Haemorrhage

Antepartum haemorrhage is defined as bleeding occurring from the genital tract after the fetus is viable, that is, after the twenty-eighth week of pregnancy and before the birth of the baby. It is a serious complication, which may result in the death of the mother or baby.

There are two main varieties of haemorrhage:

Unavoidable. Bleeding from separation of an abnormally situated placenta. (The placenta lies partly or wholly in the lower uterine segment—placenta praevia.)

Accidental. Bleeding from separation of a normally situated placenta.

'*Incidental*' or associated bleeding may be mentioned. This is vaginal bleeding arising from some other part of the birth canal, e.g. cervical polyp, as described above.

Unavoidable Haemorrhage (Placenta Praevia)

Classification of placenta praevia:

Type I The placenta is mainly in the upper segment but encroaching on the lower segment.

Type II The placenta reaches to but does not cover the internal os.

Type III The placenta covers the internal os when it is closed but not completely when it is dilated.

Type IV The placenta completely covers the internal os.

This is a standard classification. The distinction between Types III and IV is purely academic.

Placenta praevia occurs rather more commonly in multigravidae than in primigravidae.

Warning: Bleeding may occur at any time from the twenty-eighth week of pregnancy. There is, from this time, as a result of the Braxton Hicks contractions, slight stretching of the lower uterine segment and taking up, though not actual dilatation, of the cervix. The placenta cannot stretch, and so many begin to separate prematurely. The haemorrhage ceases for a time and then recurs, sometimes more than once. Because the haemorrhage occurs in the lower pole of the uterus, the blood escapes easily and because the Braxton Hicks contractions do not distress the patient, the bleeding is described as painless.

If these 'warning' haemorrhages were ignored and labour began, the dilatation of the cervix would cause much more separation of the placenta and serious bleeding. Even without being in labour a severe haemorrhage can occur, and this haemorrhage is impossible to predict with any accuracy. It *is* unavoidable, hence the name. It is regarded as the most dangerous haemorrhage of pregnancy, and from this has arisen the dictum: 'Any case of antepartum haemorrhage should be treated as a case of placenta praevia until proved not to be'.

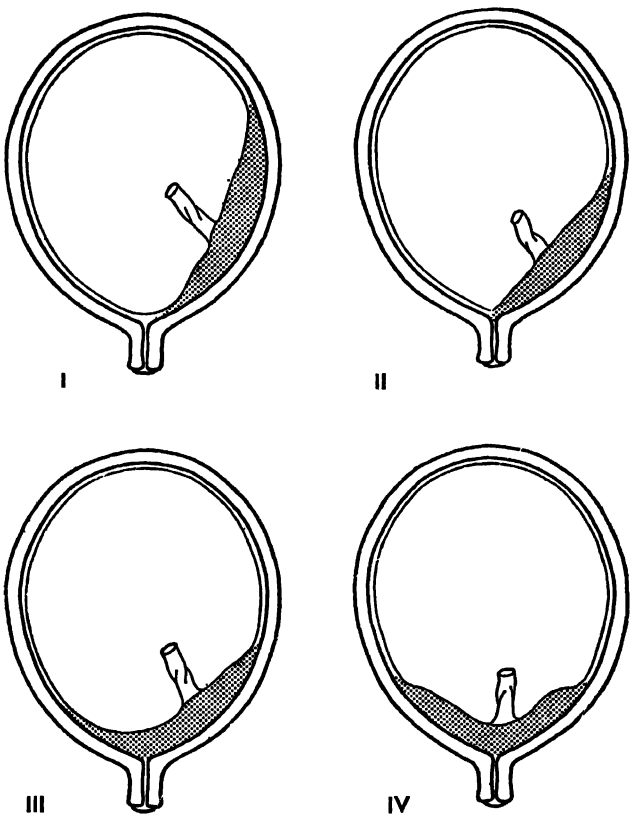


Fig. 83. Placenta praevia, types I to IV (see text).

Domiciliary treatment. A woman who has any vaginal bleeding after the twenty-eighth week of pregnancy should call either her doctor or the district midwife. The midwife's duty is to put the patient to bed, to keep her quiet, lying flat if the haemorrhage is severe, to call a doctor, and to stay with her until he comes. In her message to the doctor, the midwife should indicate the severity of the loss and the patient's condition, which will be in direct proportion to the amount of blood loss. If, therefore, as is probable, the initial loss is small, her blood pressure and pulse rate will be normal, and she will appear well, though probably a little anxious. Should the loss be severe, she will present the typical picture of a woman who has had a haemorrhage; pale, sweating, restless, thirsty, with a rising pulse rate

and a falling blood pressure. In this somewhat unlikely event, the midwife should herself call an obstetric 'Flying Squad', since the patient is now in urgent need of resuscitative treatment before she is moved. The midwife should keep a quarter-hourly pulse and blood pressure chart until medical help arrives.

In any case of this kind, *no vaginal examination should be made in the patient's home.* If this is a case of placenta praevia, a vaginal examination could precipitate disastrous haemorrhage. Rectal examinations are similarly dangerous, and even examining the abdomen, which often provokes Braxton Hicks contractions, might cause further bleeding. In fact, whatever the degree of haemorrhage, the less the patient is disturbed, the better. The midwife should tell the patient that the doctor will almost certainly want her to go into hospital.

Treatment in hospital. A patient who has had only a small blood loss is made comfortable in bed and her history is taken. Usually she has had a perfectly normal pregnancy and cannot account for the bleeding. Typically, it began when she was 'asleep in bed' or 'sitting watching the television'. When pressed, she may admit to very slight 'spotting' 2 or 3 weeks previously. This is the so-called painless, causeless, recurrent bleeding of placenta praevia; painless, because it is brought about by the painless Braxton Hicks contractions; 'causeless' to the patient, who cannot think why it should occur; and recurrent, because there is always more placenta to become detached.

If a gentle abdominal examination is made, the uterus will be found to be of normal size for the period of gestation, of normal consistency and not tender. The vertex is usually presenting and the fetal head is noticeably high; higher than would be expected even before it might become engaged. This suggests that the placenta is occupying space in the pelvic cavity. Sometimes the fetus lies obliquely, giving the impression that the head has been displaced sideways by the placenta. Almost always the fetal heart sounds are heard and the fetus is normally active.

It may be difficult to differentiate placenta praevia from accidental haemorrhage. In accidental haemorrhage there is often associated pre-eclampsia, while the presentation and engagement of the fetal head are usually normal. Thus, an absence of pre-eclampsia and a high or abnormal presenting part would be evidence in favour of placenta praevia.

At this juncture, however, no attempt at a final diagnosis is made: it is delayed in order to give the child time to grow more mature.

Observations should be made of the temperature, pulse and fetal heart. The blood pressure should be taken on admission, and

recorded 4-hourly to begin with. The urine should be tested for protein, and if bleeding is severe a catheter specimen may be required. Blood is taken for haemoglobin estimation, for grouping, and at least 1 litre of blood is cross-matched, marked with the patient's name and set aside for immediate use should a severe haemorrhage occur. The girth is measured and often the fundus of the uterus is outlined with a wax pencil, this will differentiate concealed accidental bleeding, as then the fundus rises as the uterus fills with blood. Finally, the amount of loss is estimated and recorded.

If, after 48 hours, no further bleeding has occurred, the doctor will gently pass a vaginal speculum and inspect the cervix and vaginal walls. Usually they are normal and 'incidental' haemorrhage can be discounted.

When a week has elapsed without bleeding the patient may get up to the bath and lavatory. If haemorrhage recurs, she must return to complete bed rest; the likelihood of placenta praevia is now increased.

Sometimes, by skilled X-ray examination, the exact situation of the placenta can be demonstrated. Where it is normally situated, the patient may go home; otherwise, she must remain in hospital.

Possibly, at the thirty-sixth or thirty-seventh week, the fetal head might become engaged. In this case, some authorities, believing that placenta praevia is impossible, would allow the patient home. Others, preferring to be extremely cautious, would continue to keep her under observation. Then, if no serious haemorrhage has made it imperative to act before, at about the thirty-eighth week of pregnancy the patient is examined in an operating theatre, all preparations having been made for immediate Caesarean section and blood transfusion.

The patient is anaesthetized. The obstetrician, his assistant and the theatre sister are all scrubbed, the cross-matched blood is at hand; it may be that an intravenous dextrose infusion is set up, so that, if necessary, a blood transfusion can be started without delay.

With the patient in lithotomy position, the obstetrician makes a very gentle and cautious vaginal examination, passing his finger through the cervix into the lower pole of the uterus.

1. (*a*) The placenta may not be palpable.
   (*b*) It may be felt just encroaching upon the lower uterine segment.
   (*c*) It may be felt on the anterior wall of the uterus, just reaching to the margin of the cervix.

In all of these cases the doctor will rupture the membranes. Normal labour is possible, bleeding should not be severe, and the fetus, receiving an adequate supply of oxygen, will be safe.

Alternatively:

2. (*a*) The placenta may reach the margin of the cervix, but lie posteriorly, occupying much pelvic space.
   (*b*) It may be felt actually covering the os.
   (*c*) Considerable bleeding may occur before the examination is completed.

In all of these cases the obstetrician will immediately perform a Caesarean section. The assistant will begin while he himself changes his gloves. The anaesthetist will exchange the dextrose for blood.

It cannot be emphasized too strongly, first, that vaginal examination is an extremely dangerous procedure and should not be attempted, except with the precautions described above; and, secondly, that once the patient has bled she should stay in hospital until her baby is born or it has been proved that no placenta praevia is present.

Accidental Haemorrhage

This type of bleeding is due to the separation of a normally situated placenta. The term 'accidental' is used in the sense of an unexpected happening. The cause of the placental separation cannot always be satisfactorily explained. In the majority of accidental haemorrhages, particularly where the bleeding is slight, no cause can be found; of the remainder, many are associated with pre-eclampsia, some with essential hypertension, while in others, folic acid deficiency has been noted. Trauma is an uncommon cause; accidental haemorrhage may follow an external cephalic version and, exceptionally, a fall or a blow.

The haemorrhage may be:

Revealed, in which case the blood lost escapes from the vagina,
Concealed, where all the blood lost remains within the uterus, greatly distending it, though usually a trickle escapes from the vagina,
Mixed, when the haemorrhage is concealed and revealed, some escaping and some being retained.

Revealed Haemorrhage

Bleeding occurs from separation of the placenta at its margin, the blood passing between the membranes and the uterine wall and issuing from the vagina.

Domiciliary treatment. The patient reports the bleeding, the midwife visits her and calls a doctor, all in exactly the manner described in placenta praevia, above. For slight bleeding, no treatment is needed;

for severe bleeding a 'Flying Squad' may be called and a blood transfusion started, again, in precisely the same way. No pelvic examination is carried out, no final diagnosis is made, although the differential diagnosis from placenta praevia may be suspected as

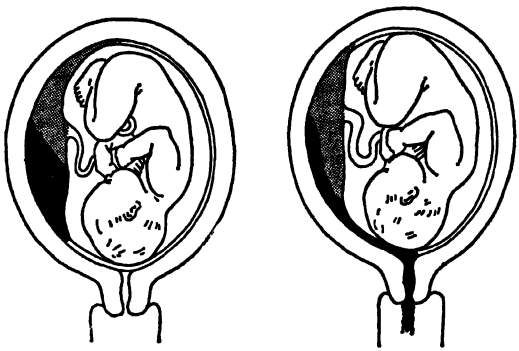


Fig. 84. Diagram showing accidental antepartum haemorrhage.

described below. The patient is quickly transferred to hospital to be under observation.

Treatment in hospital. In hospital, the patient must still, of course, be treated as having a placenta praevia. However, there may be some features which help in making a diagnosis.

Sometimes the patient says that she had pain when the bleeding occurred; certainly she will be in pain if there is blood retained within the uterus. She may relate the bleeding to exertion, for example the effort of moving heavy furniture, which could have caused a rise in her blood pressure. She will probably have had the one haemorrhage only. If she has signs of pre-eclampsia it is likely, though not certain, that this is an accidental haemorrhage.

On abdominal examination the uterus will be tender if there is any concealed haemorrhage; otherwise not. Usually the vertex presents, while if the fetal head is engaged, placenta praevia is most unlikely.

Often the distinction is not clear; it is particularly difficult if the patient has had a small revealed haemorrhage but no pain, no apparent cause for the bleeding, and no signs of pre-eclampsia. She is therefore treated precisely as described in placenta praevia; rest in bed; haemoglobin estimation and cross-matching of blood; speculum examination to exclude cervical or vaginal lesions; sometimes an attempt to locate the placenta by X-ray examination.

This expectant treatment may well continue until the thirty-eighth week simply because this patient has not been proved not to have a placenta praevia. Ultimately, on vaginal examination under anaesthesia, the diagnosis of accidental haemorrhage is made because the placenta cannot be felt in the lower uterine segment. Her membranes are ruptured and a normal delivery will probably follow.

Concealed Accidental Haemorrhage

This is an uncommon but exceedingly dangerous type of bleeding in which the mother may die and the fetus is unlikely to survive.

The normally situated placenta begins to separate, so that there is some bleeding from the placental site. The blood, instead of escaping through the vagina, as in revealed accidental haemorrhage, collects behind the placenta, forming an increasingly large retro-placental clot. The patient suffers from blood loss and, in addition, from pain and shock from the gross distension of her uterus. The most striking feature of this type of bleeding is shock. The patient looks, and is, extremely ill, with greyish pallor, a cold, clammy skin and a subnormal temperature. The pulse is weak in volume, sometimes rapid, though it may be slow. The blood pressure falls, but, if it has previously been high, it may now present a paradoxical picture of shock with a normal blood pressure. The urine is scanty and loaded with protein, and there may be marked oedema.

There is continuous and very severe abdominal pain, and the uterus is so tender that the patient can hardly bear it to be touched. It looks large and distended and is of a uniformly hard 'woody' consistency. Even if she can tolerate palpation, it is usually impossible to identify fetal parts, nor can the fetal heart sounds be heard.

Domiciliary treatment. The midwife may be the first professional person called. One look at the patient's face will convince her of the gravity of the situation and she should, without hesitation, send for a 'Flying Squad'. Detailed examination of the patient is not merely unnecessary, but time-wasting and traumatic. The first need is to combat the shock, whether it be due to a concealed accidental haemorrhage or to a ruptured uterus or a twisted ovarian cyst.

The obstetrician will order morphine, 15 to 20 mg intramuscularly, which will effectively relieve the pain, while intravenous fluid is necessary to restore the circulation. After cross-matching, blood is given, and when the patient is in better condition, she is transferred to hospital.

Treatment in hospital. The aim now is to restore the patient to a good

condition, to get her labour completed quickly and to avoid the two dangerous complications of renal failure and hypofibrinogenaemia. The blood transfusion is continued. Several litres may be needed as much blood has been lost. The patient's blood pressure and pulse are charted frequently to see how she is responding to treatment. Her urinary output is measured, a decrease being a grave sign (see 'Acute Renal Failure'). The protein content is estimated, an increase causing serious disquiet.

In **hypofibrinogenaemia**, the blood fails to clot because it lacks fibrinogen, which has been used up in combining with a substance, thromboplastin, which is present in excess in concealed accidental haemorrhage. If, in consequence, the blood cannot clot, intractable postpartum haemorrhage will occur.

To avoid this catastrophe, the plasma fibrinogen level is estimated. Normally it is 300 to 600 mg/100 ml and 100 mg/100 ml is dangerously low. In this event, the patient is given, by intravenous injection of freshly prepared fibrinogen 4 to 6 g, which restores the normal clotting power of the blood.

Labour is induced by artificial rupture of the membranes. When the intra-uterine tension is lessened, the woody hardness of the uterus decreases and is replaced by normal intermittent labour contractions. Labour progresses rapidly and soon ends in the birth of a stillborn child, quickly followed by the placenta and a mass of old blood clot. Once delivered, the patient usually makes a good recovery.

Exceptionally, the bleeding continues, the patient's condition deteriorates, her normal uterine muscle tone fails to return and labour does not begin. The obstetrician is practically forced into performing a Caesarean section on a woman who is too ill to undergo such an operation safely. Even so, when her uterus is emptied, almost always it retracts normally and, now that the haemorrhage is controlled, she makes a gradual recovery.

In happier circumstances, a patient with concealed accidental haemorrhage is admitted to hospital and the fetal heart sounds are still audible. This patient will probably have an immediate Caesarean section, the obstetrician hoping thereby to save the baby. Her general treatment is otherwise the same.

Concealed and Revealed Bleeding

There is no special management. If most of the blood has escaped and it is clear that little is retained within the uterus, the treatment is that of revealed haemorrhage. If most of the blood is retained within the uterus and there is but a slight external loss, the treatment is that of concealed haemorrhage.

OTHER DISORDERS OF PREGNANCY

Hyperemesis Gravidarum

This condition of excessive vomiting in early pregnancy is uncommon, but serious.

First the patient has the common morning sickness which 50 per cent of pregnant women experience. This usually ceases spontaneously or with simple treatment.

Sometimes, however, the sickness gets worse so that there is now vomiting after meals and sometimes between meals. It is not surprising that the patient grows despondent and that her relatives become increasingly anxious. As the vomiting continues her health begins to deteriorate and there is evidence of dehydration and ketosis. The skin and tongue are dry, eyes sunken, and urine scanty and containing acetone.

By now the patient has usually telephoned the hospital or called her doctor. If the urine contains acetone she should be admitted to hospital. The doctor will take a history and examine her to see how badly she is affected and to exclude any other condition which could cause vomiting.

In a mild case he may order a sedative such as phenobarbitone 60 mg three times a day, but no other treatment. The change of environment alone may be effective in curing the vomiting. The worried relatives may well have been over attentive and fussy and the patient improves rapidly when she is submitted to the mild discipline of hospital routine. The nursing staff, too, should be kind and reassuring but firm rather than indulgent. Some authorities believe these patients are better nursed in a single room; others are in favour of a general ward.

If she stops vomiting and takes ordinary food the patient soon feels better, and her urine becomes clear of acetone. After a week or so in hospital, she may go home, fully recovered. Occasionally on returning to the home environment her sickness returns, the whole cycle is repeated, and she is re-admitted to hospital, whereupon her vomiting ceases once more. This supports the view that the vomiting is to some extent initiated by some emotional factor.

Occasionally a patient is afflicted with severe and almost continuous vomiting, and soon becomes seriously ill, with dehydration, ketosis and deficiency of chloride and vitamins. If she is not treated quickly she will deteriorate further, with pyrexia, jaundice and neurological symptoms leading to coma and death. Treatment consists first in giving intravenous dextrose infusion (5 per cent) to combat the dehydration and ketosis. Nothing is given by mouth, and the stomach

may be periodically aspirated with a naso-oesophageal tube. Meanwhile, blood electrolytes and urinary chlorides are estimated and, depending upon the laboratory report intravenous dextrose with normal saline may be given, vitamin B and possibly calcium gluconate may be added to the infusion. An antiemetic drug and a hypnotic may also be useful.

It is exceptional for a patient to become so ill, since, with prompt treatment of excessive vomiting, the unfortunate sequence of events described above can be avoided. Indeed, the milder cases of hyperemesis gravidarum may well be preventable. The midwife should draw the doctor's attention to any patient who has even a trace of acetone in her urine.

Toxaemia of Pregnancy

This term includes pre-eclampsia and eclampsia, which are peculiar to pregnancy; and essential hypertension and renal disease when they occur in pregnancy. These conditions have certain features in common, notably hypertension, oedema and proteinuria.

Pre-Eclampsia

Pre-eclampsia is very common, occurring in this country in about 10 per cent of all pregnancies, almost always after the twenty-eighth week. The cause, in spite of much research, remains unknown. Dietary deficiency, hormone imbalance of various kinds, disordered metabolism, placental abnormality and intra-uterine tension are among the many theories advanced, but none has yet explained pre-eclampsia satisfactorily.

Certain associated features are known. Pre-eclampsia is twice as common in primigravidae as in multigravidae. It occurs more frequently in multiple pregnancy, essential hypertension, diabetes mellitus and fetal hydrops. In hydatidiform mole, it may develop in early pregnancy. More commonly, it arises at 32 to 34 weeks.

Diagnosis. The signs are a rise of blood pressure, oedema and, later, proteinuria.

It is notable that the diagnosis is made on physical signs and not on symptoms. This is important, since a patient may have severe pre-eclampsia and yet feel well. Thus, since early diagnosis is so essential, all antenatal patients need regular blood pressure estimations, investigations for oedema and urine tests. The midwife who undertakes this responsible work intelligently is a valued member of the health team.

A rise of blood pressure. A reading of 130/80 mmHg is regarded as the upper limit of normal. Any higher reading, especially of the diastolic pressure, should be checked and, if correct, reported to the doctor. Earlier recordings should be compared, and sometimes even lower readings are abnormal. Thus, a West African woman whose blood pressure is normally 90/60 may have quite severe pre-eclampsia with a pressure of 120/80.

Oedema. Slight swelling of the ankles, which subsides overnight, may occur in normal pregnancy. This may be discounted only if blood pressure, weight gain and urine are normal. Persistent or severe ankle oedema, and oedema of hands, face, or abdominal wall should be reported immediately. This extra tissue fluid may cause an excess weight gain earlier, perhaps even before the rise of blood pressure. A gain of 2·5 kg in 4 weeks, 1·5 kg in 2 weeks or 1 kg in 1 week is excessive and the doctor should be informed.

A patient with a blood pressure of 140/90 should, preferably, be in hospital. If, in addition, she has slight ankle oedema, she should certainly be admitted. She may be surprised and even reluctant to come in, insisting that she is quite well; but she should be under constant observation.

Proteinuria. This term is preferable to albuminuria, since the urine probably contains serum albumin and serum globulin, both proteins. It is usually the third sign to be manifested and it is *always* serious.

Protein may be found in:

(a) urine which is contaminated by vaginal discharge; and
(b) urinary tract infection, since pus is present and pus contains protein.

If, however, a mid-stream specimen which looks crystal-clear contains protein, almost certainly this is 'true' proteinuria, that is the kidneys are damaged and plasma proteins are leaking from the blood into the urine. Should this occur, even though blood pressure and weight gain are normal, the patient should be admitted to hospital and remain in bed for so long as the proteinuria persists. This woman is ill, the fetus is endangered, and close observation is necessary. Nevertheless, she may still say she does not feel ill.

In a few patients the condition worsens. The hypertension, oedema and proteinuria may increase and the patient may now experience definite symptoms. These are:

Severe frontal headache, probably associated with cerebral oedema.

Visual disturbances, resulting from oedema of the retina.

The vision may be dim or blurred, the patient saying that she

cannot read her newspaper; or she may see spots or flashes of light.

Vomiting, which may be related to cerebral oedema or associated with:

Epigastric pain, this is caused by haemorrhages under the liver capsule, and can be a warning that eclamptic fits are imminent.

Oliguria. A diminished output of urine is noted in cases where oedema is a marked feature. This sign is dangerous.

It must not be supposed that every patient with severe pre-eclampsia presents all these symptoms and signs. Indeed any one symptom is sufficient to indicate that she is getting worse.

Dangers

Maternal Eclampsia.
Accidental antepartum haemorrhage.
Renal failure.

Any of these may lead to death. If recovery occurs the blood pressure may remain permanently raised, leading to ill health and jeopardizing any future pregnancies.

Fetal Retarded fetal growth syndrome.
Intra-uterine death.

The placenta may become infarcted and thus not supply enough oxygen and food for the fetus. Protein for growth is lost because of the loss in the maternal proteinuria. The fetus may die from hypoxia, and be stillborn; or he may be born alive, but so small and puny that he cannot survive.

Management. Pre-eclampsia is, at present, not preventable but its severity can be lessened. Eclampsia is nearly, but not quite preventable. It is important, therefore, to detect pre-eclampsia as early as possible, and to admit the patient to hospital for close observation, and treatment.

Management in hospital. The first essential is rest, which may well bring down the blood pressure, lessen the oedema, clear up any proteinuria and, because the uterine circulation improves, give the fetus more oxygen and food and a better chance of survival.

The patient therefore rests in bed, and is given drugs which allay any anxiety and keep her in a sleepy state. The doctor commonly prescribes phenobarbitone 100 mg (three times a day) with quinalbarbitone (Seconal) 200 mg at night to help her to sleep. In a more severe

case amylobarbitone (Amytal) 200 mg 6 hourly might be prescribed. A normal diet, with plenty of protein and milk, is given; though both carbohydrate and salt are restricted more than usual. A high protein and low carbohydrate diet will help in avoiding excessive weight gain. Salt, if retained in the tissues, tends to draw fluid towards it, thus causing, or increasing oedema. This is treated by reducing the salt intake but not the intake of fluids. In severe oedema, a diuretic, such as chlorothiazide 0·5 mg (twice daily) for 3 days, may be recommended.

Hypotensive drugs, which reduce the blood pressure, are sometimes given in essential hypertension, but seldom in pre-eclampsia.

This simple care cannot be undertaken in the patient's home, since, for most women, real bed rest at home is impossible; but, even more, because of the absolute necessity for constant observation by trained people.

Observations. In hospital the temperature and the pulse rate are usually recorded once or twice daily, and this suffices, as pre-eclampsia does not cause pyrexia.

The important investigations are:

The blood pressure is estimated twice daily, or, if very high, 4 hourly.

The fluid intake and urinary output are measured, and the urine is tested daily for protein. If protein is found, the amount is estimated.

The oedema is observed daily. The tissue fluid tends to gravitate to the lower back, producing, in a patient lying in bed, a sacral pad of oedema.

The abdomen is examined daily and the fetal heart sounds are counted twice daily or 4 hourly, with the blood pressure estimation.

At the same time, careful note is made of any symptoms that the patient may experience.

Sometimes, daily weighing is carried out.

If these findings are recorded on a graph the obstetrician can see at a glance how the patient is progressing.

As the condition improves the blood pressure falls to normal and the oedema subsides. The patient may then be allowed up for increasing periods and may be allowed home. If however, at the next antenatal visit the blood pressure is raised, she would need to be readmitted. This does occur, and it shows clearly that pre-eclampsia is never cured before delivery. Some obstetricians consider it wiser

not to discharge any patient admitted with pre-eclampsia, even though she may appear better.

Some patients remain stationary: no worse, but no better. In mild pre-eclampsia, such a patient might continue her pregnancy to term but she should not become overdue, on account of the risk to her child of placental insufficiency. Patients with proteinuria who remain stationary will have labour induced, probably at the thirty-sixth week.

Sometimes, despite bed rest and sedatives, the patient gets worse. The doctor has now no alternative but to deliver her without delay. He will probably induce labour by an artificial rupture of membranes. Usually labour begins quite soon, progresses quickly and ends in a normal delivery. The patient must be observed closely, since the pre-eclampsia will not improve and may worsen, before labour ends.

Caesarean section might be carried out for early (twenty-eighth to thirtieth week) for rapidly worsening pre-eclampsia, or, if fetal distress were suspected.

After delivery, nearly all these patients make a rapid recovery. Within 24 hours the blood pressure is normal, the oedema has disappeared and the urine is clear of protein. Some take longer to improve, and are hypertensive when they leave hospital but recovered by the time they attend the postnatal clinic, whereas a few remain with permanent hypertension.

Eclampsia

This is a severe form of toxaemia characterized by convulsions similar to those of epilepsy. It is uncommon, occurring in this country once in about 1000 births. The fits sometimes begin before labour, but are more often seen during labour or immediately after its completion.

Clinical features. Any of the serious symptoms and signs of pre-eclampsia described above may be a warning that an eclamptic fit is imminent. In particular, epigastric pain is a cause for anxiety.

There is one sign of eclampsia, namely, the eclamptic fit, four phases of which are recognized:

The premonitory stage. (This transient phase may be missed if the patient is not under constant observation.) The woman rolls her eyes, while her facial and hand muscles twitch momentarily.

The tonic stage. Almost immediately, her muscles go into violent spasm. Her fists are clenched and her arms and legs are rigid. She clenches her teeth and she may bite her tongue. Since her respiratory

muscles are in spasm, she stops breathing and her colour becomes deeply cyanosed. This spasm continues for perhaps 30 seconds.

The clonic stage. As the spasm ceases, jerky muscular movements begin and become increasingly violent. Her whole body is thrown restlessly from side to side, while frothy, often blood-stained saliva appears on her lips. Once more she begins to breathe and she may inhale mucus or blood from her mouth. After reaching a climax of violence, the convulsive movements gradually subside, this restless phase having lasted up to 2 minutes.

The comatose stage. The woman is deeply unconscious and perhaps breathing noisily. The cyanosis fades, but her face may remain swollen and congested. Sometimes she regains consciousness in a few minutes, or the coma can persist for hours.

Dangers

Maternal. The fits are extremely exhausting and, if they recur frequently, heart failure will develop. If the hypertension is greatly increased, the woman may have a cerebral haemorrhage. Patients with massive oedema and oliguria can develop pulmonary oedema or renal failure. Inhalation of blood or mucus may lead to pneumonia.

Any of these complications may be fatal, the death rate in eclampsia being between 4 and 5 per cent.

Fetal. In antenatal eclampsia, the fetus may be affected by placental insufficiency. During the fit, when the mother stops breathing, the fetal oxygen supply, already impaired, is now dangerously reduced. The fetal death rate is as high as 30 per cent.

Prevention. If pre-eclampsia is recognized early and treated promptly, eclampsia will hardly ever occur. Very rarely, a fulminating form of pre-eclampsia may begin and proceed to eclampsia between regular and frequent antenatal examinations.

Treatment. More than 50 years ago the Russian obstetrician Stroganoff made two important observations and based his treatment on them. He realized that the fewer fits a patient had the more likely she was to recover; and he noted that any disturbance—noise, bright lights, sudden movement or activity—could start off a fit. Accordingly, he kept his patients absolutely quiet and undisturbed in an almost noiseless environment. Conversations were whispered and nurses wore quiet slippers and unstarched aprons. The patients were given generous doses of powerful drugs, such as morphine and

chloral, which so dulled their senses that nursing procedures and even labour contractions hardly roused them. This treatment was remarkably successful, and even today the management of eclampsia is, basically, the same.

If the patient is at home, the doctor will first give her a narcotic and then have her transferred to hospital. In hospital, the patient is nursed in a single quiet room and, until her fits are controlled, she must never be left alone. Although bright sunshine should be excluded, the room should be light enough for the midwife to be able to assess the patient's colour and general condition without switching on a lamp or torch.

Management during a fit. This is much the same as the care of any unconscious patient, or one who is recovering from an anaesthetic. The essentials are:

To maintain a clear airway.
To protect the patient from injury.

If the patient is under observation during the premonitory phase of the fit, a gag should be quickly inserted between her teeth. If, however, the tonic stage of the fit has begun, the gag is not merely useless but traumatic. The woman's head is held to one side and her convulsive movements are restrained, all this being done as gently as possible and not forcibly. As she begins to breathe again the gag is inserted and the mouth cleared of mucus and blood, either with a gauze swab in a sponge holder or with a suction apparatus. Oxygen is then given, as it will probably benefit both mother and fetus.

Drugs are given generously and in great variety; morphine and chloral hydrate are still used; pethidine, chlorpromazine (Largactil) and promethazine (Phenergan) used together, are popular; and paraldehyde, tribromo-ethanol (Avertin) all have their advocates. The midwife should familiarize herself with the practice of one hospital, or of one obstetrician, learning this in detail, and not attempting to memorize all the others.

General nursing care. While unconscious, the patient should lie well over on the side, without a pillow and with the head low. The mouth is mopped clean at frequent intervals and oxygen is given whenever cyanosis occurs. The bladder is kept empty with a self-retaining catheter draining into a sterile polythene bag.

The midwife must work methodically and plan ahead. With an assistant she should carry out procedures such as washing, mouth cleansing and bed making when the patient is well under the influence of a narcotic drug. Routine observations should be similarly planned.

The temperature and, probably the blood pressure, should be taken 4-hourly though, if hypotensive drugs are given, more frequent blood pressure readings will be needed. The pulse and respiratory rates can be counted hourly or half-hourly without disturbing the patient. While she is unconscious nothing is given by mouth. Sometimes intravenous dextrose is given, and oral fluids may be commenced when the fits are controlled.

Labour. In antepartum eclampsia, once the fits are controlled, that is if the patient has not had a fit for 16 to 18 hours, labour is induced by artificial rupture of the membranes, or, in some cases a Caesarean section is performed. Sometimes, labour begins spontaneously.

The midwife should know that a heavily narcotized woman can be in labour without its being obvious. Thus she should note any restlessness which coincides with uterine contractions, watch for a 'show' or rupture of the membranes, count the fetal heart sounds as often as she can without undue disturbance, and always be prepared for the second stage of labour to become manifest.

Usually the child is small, progress rapid and delivery easy. Otherwise, the doctor will apply forceps when the cervix is fully dilated. Pushing is inadvisable since it might cause a dangerous rise of blood pressure, and, for the same reason, oxytocic drugs are given with caution. Once the patient is delivered she often makes a rapid recovery. Within a few days, her blood pressure is normal, her output of urine, soon protein-free, is greatly increased and her oedema subsides.

Eclampsia rarely recurs in a subsequent pregnancy, though these patients are rather more likely to develop pre-eclampsia.

Essential Hypertension in Pregnancy

Essential hypertension is a condition of permanently raised blood pressure in which no cause is apparent. It tends to occur in families and, because it is fairly common in young people, it is seen quite frequently in pregnancy.

A patient attending an antenatal clinic is said to have essential hypertension if her blood pressure in early pregnancy is 140/90 mmHg or more. The first reading of the blood pressure is apt to be unreliable. If it is unusually high, it is checked after the patient has had a short rest, in case she has hurried to the clinic. If now the systolic pressure is high, it may well be that the patient is anxious or apprehensive, and, unless the reading is extremely high, it is better for the moment to ignore it. Repeated re-checking by worried nurses will neither dispel the patient's anxiety nor lower her blood pressure;

whereas a reassuring chat with a doctor or midwife may well do both, and at her next visit her blood pressure is likely to be normal.

If, however, the patient's blood pressure is still high, more particularly the diastolic reading, essential hypertension must be seriously considered. It is distinguished from pre-eclampsia by the fact that the hypertension is present in the early weeks of pregnancy, long before pre-eclampsia arises, and there is no oedema or proteinuria.

During the middle weeks of pregnancy the blood pressure often falls to a normal level, rising again in the later weeks to its original point or even higher. If the patient books late, it is more difficult to distinguish essential hypertension from pre-eclampsia, but this need not cause the midwife anxiety. For safety she should regard 130/80 mmHg as the upper limit of normal, and draw the doctor's attention to any higher reading.

So long as the patient's blood pressure does not rise above 150/90 mmHg, the outlook is good. She is likely to have a normal pregnancy and labour, but throughout pregnancy she is advised to have extra rest, spending longer in bed at night and having an afternoon rest, while she is often given a hypnotic to ensure that she sleeps well. She is booked for hospital delivery, admitted a week or so before term and, if labour does not begin punctually it is induced. If she becomes overdue, there is an increased risk to the fetus of placental insufficiency.

The outlook is less good if the blood pressure is very high. If it is 160/100 mmHg or more, she should rest in hospital, where the obstetrician may try to control her blood pressure, first with hypnotics and then with hypotensive drugs, such as reserpine (Serpasil) or guanethidine sulphate (Ismelin).

This patient may develop a superimposed pre-eclampsia, or she may have a severe accidental haemorrhage; renal failure is an occasional complication, and, if the blood pressure is exceptionally high, 200/120 mmHg or more, cerebral haemorrhage or heart failure may occur.

The fetus, too, is at risk, because the placental circulation is poor and his oxygen supply is depleted.

If the blood pressure cannot be controlled, the obstetrician can only avoid these serious risks by hastening the patient's delivery. Thus, he may rupture her membranes, or, if the danger is more acute, or arises earlier, he will deliver her by Caesarean section.

Renal Disease in Pregnancy

Renal disease, usually chronic nephritis, is a rare, but very serious problem when it occurs in pregnancy.

At the booking clinic a patient might give a typical history of a severe attack of scarlet fever and, subsequently, repeated bouts of 'kidney trouble', though sometimes there is no relevant medical history. She may or may not have hypertension and oedema. Nearly always the urine is of low specific gravity and contains protein. Laboratory tests will reveal that the blood urea is raised, the urine contains casts and the renal function tests (concentration and dilution test and urea clearance test) are deficient.

In severe nephritis, termination of pregnancy may be recommended. Nephritis is a cause of abortion, so the patient may miscarry spontaneously.

If renal function is not seriously impaired, pregnancy may proceed without complications. Throughout this time the patient is kept under close observation. She needs much extra rest and may have to spend long periods in hospital. The nephritis can become worse and renal failure may develop with the possibility of death from uraemia. A superimposed pre-eclampsia may develop, with the risk of accidental antepartum haemorrhage. Intra-uterine death may occur as a result of placental insufficiency. Usually therefore, labour is induced at about the thirty-sixth week, or in some cases, a Caesarean section is carried out even earlier than this.

Further Reading

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22. DISEASES ASSOCIATED WITH PREGNANCY

Anaemia

Anaemia is very commonly found to be present during pregnancy. In order to form the haemoglobin in the red blood cells there must be sufficient iron in the diet. A lack of iron will be followed by anaemia, which is therefore called an iron deficiency anaemia. Anaemia in pregnancy is usually of this type.

Iron Deficiency Anaemia

The anaemia may be present before the pregnancy and is likely to occur in women who are poorly nourished, or who lose excessive amounts of blood during menstruation. During the last weeks of pregnancy the demands of the fetus for iron may make a pre-existing anaemia worse. So common is a mild degree of anaemia in pregnancy that it was at one time called physiological anaemia of pregnancy.

During pregnancy the blood volume increases and often the increase is mainly of the fluid part of the blood, with little increase in the number of red cells and haemoglobin. This will dilute the blood, and if a specimen of blood is tested, the haemoglobin level will be found to be lowered. However, it has now been shown that if iron is given, the haemoglobin level will not fall and therefore it must be accepted that the so-called physiological anaemia is a true anaemia. To prevent this, iron may be given as a routine in the last 3 months of pregnancy. If not given as a routine then it should certainly be given if the haemoglobin level falls below 12 g per 100 ml.

Megaloblastic Anaemia

Less commonly, a more serious form of anaemia is encountered, which is similar to pernicious anaemia. It is known as megaloblastic anaemia of pregnancy. It differs from pernicious anaemia in that

once the pregnancy is over continuous treatment is not required. It is diagnosed by a haemoglobin estimation and a red cell count, and perhaps a sternal marrow puncture to obtain samples of bone marrow in which red blood cells are formed. The treatment is with folic acid. It has been noted that many patients who have had an accidental antepartum haemorrhage show a low serum folate level. Some authorities therefore recommend that all expectant mothers should receive folic acid as well as iron.

Sickle Cell Anaemia

With the increased number of immigrants from West Africa and the West Indies, cases of sickle cell anaemia are sometimes seen in pregnancy.

This is an inherited condition of abnormal haemoglobin Hb S in which the erythrocytes are sickle shaped and are easily haemolysed. It is a condition in which the stress of pregnancy, an anaesthetic or a blood transfusion may precipitate a crisis. During a crisis there is severe pain in the back and limbs, and due to the haemolysis there is an acute anaemia.

The patient should receive iron regularly throughout pregnancy. She may need a blood transfusion, but the doctor, recognizing that though needed, it is dangerous. will give it with caution.

It is essential to discover and treat anaemia in pregnancy, not only because of the improvement in the general health that results from treatment, but also so that the woman may withstand an antepartum or postpartum haemorrhage if this should occur. The midwife should ensure that a pregnant woman in her care has a haemoglobin estimation performed early in pregnancy and repeated during the last weeks. Iron deficiency anaemia will usually respond dramatically to iron given by mouth. Occasionally the response is poor and then the doctor may give intramuscular iron (Imferon) or folic acid. Sometimes, because of inadequate antenatal care, a severe degree of anaemia is discovered only late in pregnancy or when labour is imminent; iron–dextran may be given intravenously as a total dose infusion or a blood transfusion may have to be given if no time is left to overcome the anaemia with iron therapy.

Heart Disease

Heart disease is seriously complicated by pregnancy. The most common heart conditions seen in the pregnant woman are congenital abnormalities such as atrial and ventricular septal defects, and mitral stenosis. Since the latter is the commonest it has been

described in detail, but the management is the same in any cardiac condition. When a history is taken the patient may say she has had rheumatic fever as a child. Such a patient may have been left with a permanently affected heart. The valves of the heart, particularly the mitral valve, may become scarred following the infection. The scarred valve contracts, narrowing the opening. This is called mitral stenosis. While the heart muscle is strong enough to drive the circulating blood through the narrowed opening, no symptoms will occur and the condition is said to be compensated. When the heart muscle begins to fail, the patient will develop undue breathlessness and tachycardia on ordinary exertion. Finally even when resting in bed there is breathlessness, cyanosis and a rapid and perhaps irregular pulse. The heart is then said to be decompensated and heart failure is present. During pregnancy the weight of the child, the upward pressure of the uterus on the diaphragm, the maintenance of the placental circulation and the increased volume of circulating blood, all throw additional strain on the heart muscle and may precipitate heart failure. The greatest strain on the heart occurs between the twenty-eighth and thirty-sixth weeks.

Management of Pregnancy

If at the antenatal examination the midwife obtains a history of rheumatic fever or heart trouble or a history of undue breathlessness on exertion, the patient should be referred to a doctor for medical examination. If heart disease is present the patient will remain under medical supervision throughout pregnancy. Fortunately many patients remain compensated throughout pregnancy and only require additional rest either at home, or in hospital and admission to hospital for supervision of the confinement. If the patient is anaemic, iron therapy should be given. Those with slight symptoms may have to be admitted to hospital during the second half of pregnancy, sometimes for a few weeks, but perhaps for several months.

In the most severe cases in which heart failure has occurred early in pregnancy, the obstetrician and physician may decide that termination of pregnancy should be performed. This is only carried out after rest and digitalis, have made the patient as fit as possible. If heart failure occurs later in pregnancy the patient will stay in hospital under medical treatment until labour begins. Some of the more severely affected women may be found to be suitable for mitral valvotomy. This is an operation on the heart to increase the size of the opening of the narrowed mitral valve. Much improvement in the health of the mother may be produced by this operation.

Management of Labour

Labour is conducted under medical supervision in hospital. Analgesics are given in the first stage. The pulse rate should be recorded regularly, the colour and respiratory rate should be noted, and oxygen should be made available. The patient will usually find for herself the most comfortable position during labour. Because the muscular effort of the second stage may be great and so may tax such a patient severely, it may be necessary to carry out a forceps delivery, preferably under pudendal nerve block, at full dilatation of the cervix. If heart failure is present when labour begins the outlook is serious, whatever method of delivery is chosen. Labour will be a further strain on the heart particularly if it is likely to be prolonged or difficult, and Caesarean section is sometimes decided upon as the easier way to effect delivery, though cardiac patients are often noted to have remarkably quick and easy labours, so that Caesarean section is rarely necessary. Oxytocic drugs are given only with great caution. Sudden strong uterine contraction in the third stage may direct so much of the uterine circulation of blood to the systemic circulation that the impaired heart may become seriously embarrassed and congestive heart failure ensue.

Management of the Puerperium

Additional nursing care is required in the puerperium. In the most severe cases heart failure may occur in the first few days of the puerperium. This will require all the nursing and medical care of a medical emergency, with complete rest, analgesics, oxygen and perhaps digitalis. In all heart cases, and even when the heart has been little affected, the method of feeding the baby, the length of stay in hospital, and the advisability of further pregnancies must be considered. Breast feeding should not be too readily abandoned. If breast feeding can be established easily it may prove to require less effort from the mother than the preparation of artificial feeds. The mother should be encouraged to stay longer in hospital, since it is unlikely she will be able to get much rest on returning to housework and the care of the baby. If her heart is severely affected, she may be advised to avoid a further pregnancy. If the heart is only mildly affected the doctor may advise her to have her babies fairly quickly, while she is young. If, later on, she must have more rest, it can be better achieved if the children are past the toddler stage. If it is considered that the mother should never have another child, sterilization may be advised.

Any patient who has a cardiac lesion must be most carefully protected from infection throughout her confinement. Even a mild

infection may, in such a patient, be complicated by subacute bacterial endocarditis.

Acute Renal Failure

Acute renal failure may occur in association with concealed accidental antepartum haemorrhage, eclampsia and septic abortion, particularly in a case of *Clostridium welchii* infection, while it may follow a mismatched blood transfusion or sulphonamide therapy. Though rare, it is extremely serious and, because the outcome is not predictable, it has been recommended that all patients with renal failure should be transferred to a unit where renal dialysis is available in case of need.

It will be recalled that the kidneys have an abundant circulation of blood. As this large volume of blood flows through them the kidneys filter off water, containing waste materials, such as urea, and surplus amounts of materials such as potassium. Thus the blood is purified and its constituents are kept constant. If, as now happens, the renal blood vessels go into spasm, the blood flow through the kidneys is reduced almost to nothing. The kidneys can no longer excrete urea and potassium, so large amounts accumulate in the blood, making the patient dangerously ill. As she cannot excrete much water, she becomes oedematous. These results will also follow blockage of the renal tubules.

The aim of the treatment is to rest the kidneys since, given time, they may well recover. At the same time, the patient's blood urea must not rise too high, or she will die of uraemia. Protein must be avoided as its end product is urea. Thus she is given daily about 150 g of glucose and 500 ml water. This will just satisfy her need for food and fluid, without throwing unnecessary work on her kidneys. Vitamins are given intramuscularly.

The glucose solution can be given orally, when it may be more palpatable in weak tea or coffee. It can be given as a continuous gastric infusion or, if vomiting is troublesome, as an intravenous infusion. This concentrated solution (30 to 40 per cent) would cause clotting in small veins, so it is allowed to infuse into the inferior vena cava through a fine polythene tube introduced into the femoral vein.

The patient's fluid balance is carefully recorded, her blood urea and electrolytes are estimated daily, and her physical and mental state observed carefully. At first only a few millilitres of urine are passed each day; sometimes none at all. Then, in favourable circumstances the amounts increase to a large volume, while the blood urea and potassium level steadily decrease to normal.

If this diuresis does not occur, the patient is in danger of death from uraemia, though, with renal dialysis she may yet recover.

Pyelonephritis

This inflammatory state of the urinary tract, formerly known as pyelitis, is a bacterial infection generally involving the upper ureter, the renal pelvis and part of the kidney. It is particularly liable to arise during pregnancy, because of the physiological changes which occur. An intravenous pyelogram of the renal tract during pregnancy has shown that the ureters and pelvis of the kidney become dilated. It is thought that these changes are due to the effect of hormones during pregnancy, though pressure on the ureters by the growing uterus is a possible cause. As a result of the dilatation of the ureters there is some stasis of urine within them and this predisposes to infection. The organism usually responsible is *Escherichia coli*, which is a normal inhabitant of the intestines. It is uncertain whether the organisms gain access to the urinary tract via lymphatics, from the colon or via the bladder. There is a connection between catheterization, even with impeccable technique, and the subsequent development of urinary tract infection. A woman who develops pyelonephritis in pregnancy may subsequently have repeated attacks, with further damage to her kidney function. She may die from renal failure within 5 or 6 years. Thus catheterization should, if possible, be avoided.

The patient complains of pain from the loin to the groin, often on the right side, of headache, nausea and vomiting, and, if there is an associated cystitis, as there often is, of pain and increased frequency of micturition. The temperature will be raised and the pulse rate increased. In severe infections the temperature may rise to 39° or 40°C, or more, and rigors may occur. The patient is often anaemic. The condition is diagnosed by the microscopical examination of a mid-stream specimen of urine. This will reveal the presence of pus cells and bacteriological examination will detect commonly *Escherichia coli*, but sometimes *Bacillus proteus*. The urine is usually acid, and often has an offensive smell.

The usual treatment is to render the urine alkaline, since in an alkaline medium the growth of the *Escherichia coli* is inhibited. Treatment includes a mixture of potassium citrate and sodium bicarbonate 1 g 4-hourly until the urine is alkaline, a soluble sulphonamide, nitrofurantoin, an antibiotic or hexamine mandelate. At the same time large quantities of bland fluids are given. The haemoglobin should be checked frequently.

Usually the acute condition subsides quite quickly and the patient

is able to go home. She should be followed up for some months after delivery since pyelonephritis is apt to recur, particularly in the puerperium.

Diabetes Mellitus

This is another disease which seriously complicates pregnancy. Before the discovery of insulin, death from diabetic coma occurred in many pregnant diabetic women, but the use of insulin has reduced the mortality to 1 to 2 per cent. Pregnancy in diabetics, however, may be further complicated by pre-eclampsia and hydramnios, which are both more common than in the normal woman. Although the maternal mortality rate from diabetes has been greatly reduced, the perinatal loss may be as high at 25 per cent. Abortion or intra-uterine death of the fetus is liable to occur. The child in utero usually becomes very large, often weighing over 4·5 kg at term, and difficulty in delivery may result. Even if born alive the baby may be feeble and may die in a cyanotic attack. Congenital abnormalities are also more common in babies born of diabetic mothers.

In a known diabetic patient, pregnancy is supervised by the obstetrician and physician. From the very earliest weeks, the amount of insulin and the diet may need frequent readjustment. In an antenatal clinic diabetes is suspected if glucose is found in the urine, but it can only be confirmed by a fasting blood sugar or a glucose tolerance test. Quite commonly, glucose is present in the urine in pregnancy, but the glucose tolerance test usually shows this to be due to a low renal threshold for glucose. In severe cases excessive thirst, polyuria, and loss in weight may be present, showing that the diabetes is well advanced. The patient must be admitted to hospital while investigations are completed. The diet and insulin are adjusted, the patient must be taught how to give herself insulin and to test the urine for sugar and acetone before she goes home.

Because of the likelihood of a large fetus and the possibility of intrauterine death, termination of pregnancy at about the thirty-sixth to thirty-eighth week may be advised. Some obstetricians advocate Caesarean section and others induction of labour. The latter is probably more suited to the multigravid patient. Caesarean section allows the best possible control of the maternal metabolism, but the hazard to the baby of respiratory distress syndrome is high.

During a normal labour careful observation is needed. Routine records of pulse rate, fetal heart sounds and the progress of labour must be made. An intravenous infusion of glucose will be given to balance the insulin the patient is receiving. The urine should be tested for glucose and acetone each time it is passed.

The baby, though large requires specialized nursing for the first few days of life. In spite of its size it is and should be treated as a premature baby. Mucus must be frequently aspirated from the pharynx and sometimes from the stomach. Oxygen is given if there is cyanosis. Because the baby may be hypoglycaemic, daily blood sugar estimations are required and glucose is given if necessary. The infant must be kept warm and protected from infection.

The mother's stay in hospital is usually lengthened, while the diabetes is stabilized once more. Breast-feeding is not contra-indicated, but many diabetic mothers provide insufficient milk for their babies, and breast-feeding has to be abandoned for that reason.

Pulmonary Tuberculosis in Pregnancy

Sometimes a woman who is under observation or receiving treatment for pulmonary tuberculosis becomes pregnant. She continues her rest and treatment, whilst receiving streptomycin para-aminosalicylic acid (PAS) and isoniazid from her chest physician and having periodic antenatal examinations carried out by an obstetrician.

Alternatively, tuberculosis may be diagnosed as a result of a routine chest X-ray taken at about the twentieth week of pregnancy. From the time of diagnosis, the patient will be under the joint care of a chest physician and an obstetrician. The incidence is about 1 in 300 pregnancies.

Therapeutic abortion is not advocated, since it is appreciated that pregnant tuberculous patients do not deteriorate any more than those who are not pregnant. Since most chest units in this country are without a maternity unit, the patient is usually transferred at the thirty-seventh or thirty-eighth week to a maternity hospital, where she is isolated and continues her rest and treatment. Nurses attending her should be Mantoux positive.

In labour, the patient is kept resting as much as possible, and in the first stage, is given hypnotic and analgesic drugs. In the second stage, the patient should not push, so the obstetrician generally applies forceps as soon as the cervix is fully dilated. A pudendal nerve block is preferable to a general anaesthetic. Blood loss must be kept to a minimum, so an intravenous injection of ergometrine is given with the birth of the anterior shoulder.

After delivery, lactation is suppressed, and after about a week the patient is able to return to chest unit. If the mother has active tuberculosis, that is if the sputum is positive, the baby, who is specially vulnerable, must be segregated from her for some weeks. He is artificially fed, and, a few days after birth, he receives a BCG (Bacille Calmette-Guérin) vaccination which will, in about 6 weeks, convert his Mantoux

reaction from negative to positive. Meanwhile, he may be discharged from hospital, preferably to the care of a healthy relative, or, temporarily, to foster-parents.

In modern socio-economic conditions there is often an elderly relative living with the family. They can be a source of pulmonary tuberculosis, and it is wise at the time the history is taken to enquire if they are healthy and if they have a troublesome cough. Where there is doubt it may be possible to persuade the elderly relative to have a chest X-ray.

Vaccination of the baby is necessary if any member of the household has pulmonary tuberculosis.

Epilepsy During Pregnancy

When a woman who suffers from epilepsy becomes pregnant, it is not possible to forecast the outcome. There may be more or fewer fits, or their frequency may remain unchanged. Accordingly, the dosage of sedative or anti-convulsant drugs, may need to be adjusted. She may suffer from folic acid deficiency.

Sometimes a patient fails to report that she is an epileptic, or her history is taken without due care and this fact is not brought to light. If, then, in late pregnancy or labour, a fit occurred, it would be assumed to be due to eclampsia. Later, a differential diagnosis would be made, since in epilepsy the urine is usually free from protein, the blood pressure normal and oedema absent; while in eclampsia, the blood pressure is high, oedema is common and may be marked, and proteinuria is present.

The major problem for the epileptic patient is after delivery. There is always the danger of a fit occurring when she is holding the baby. The parents will need advice on measures to protect the baby. Fires should always be guarded, and bath time might be better in the evening when father is at home. The midwife should ensure the Health Visitor is informed before the patient leaves hospital to enable her to visit within a day or two of discharge.

Virus Diseases in Pregnancy

Virus diseases occurring in pregnancy sometimes cause serious problems.

An attack of rubella during the first 12 weeks is particularly to be dreaded. This virus can in these early weeks pass from the maternal blood into the embryonic tissues and affect the development of certain organs, notably the heart, the eye, or the ear. In about 15 per cent of

such cases the child is born with congenital heart disease, cataract, or deafness. Rubella occurring later in pregnancy has no ill effect on the fetus.

A woman who is, during this critical period, exposed to rubella, should report the matter at once. A midwife who suspects the possibility should, without delay, have the patient seen by a doctor. If he gives her an injection of gamma-globulin within the next 4 days, this, by conferring a passive immunity, should protect her from infection. It is hoped the risk will decline now immunization programmes have commenced, but there is a very real risk of innoculating someone who is already pregnant and careful questioning should preceed immunization. It is possible that other virus diseases, such as measles, smallpox, poliomyelitis, and even influenza contracted in early pregnancy, could adversely affect the developing embryo, though the evidence is not clear.

So many women have had measles in childhood, and are thus immune, that it is rare in pregnancy. Poliomyelitis is itself dangerous, but immunization is possible. Smallpox is an uncommon but serious complication of pregnancy while vaccination may have an adverse effect on the fetus.

Virus or infective hepatitis is an extremely serious complication of pregnancy, which is recognized to be one cause of acute yellow atrophy of the liver.

Vaginal Discharge During Pregnancy

Many patients complain of some discharge during pregnancy. In most cases this is due to an excess of cervical mucus and vaginal transudate. The discharge is clear, or white, and there are no signs of infection. Microscopical examination shows no abnormal organisms and no pus cells, and that the discharge consists mainly of vaginal epithelial cells.

Monilial Infections

Commonly the vagina is infected by a yeast like fungus, named *Candida albicans*. This fungus grows easily on a moist mucous surface with an acid reaction, and particularly in the presence of glucose. It grows readily in the mouth of the infant and in the adult vagina, especially during pregnancy. When the vagina is infected a thick white discharge results, sometimes associated with soreness and always with severe irritation of the vulva. Examination shows redness of the vulva with white patches of thrush. Microscopical examination of a

smear made from a vaginal swab shows the spores and hyphae of the fungus. The condition is treated by the administration of the antibiotic nystatin. A course of oral nystatin may be sufficient, but it is poorly absorbed by the gastro-intestinal tract and local application is better. Pessaries containing nystatin 100 000 units are inserted into the vaginal vault every night for 2 weeks. The vagina may be painted daily for a week with a 1 per cent aqueous solution of gentian violet. This is effective, but the dye stains the clothing.

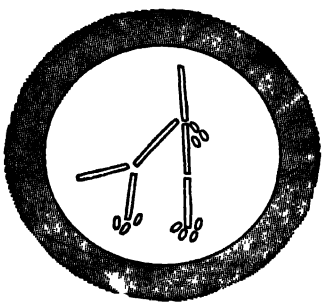

Fig. 85. *Candida albicans.*

Trichomonal Infection

A fairly common cause of an abnormal discharge is infection of the vagina by *Trichomonas vaginalis*. This is a flagellated protozoon about the size of a pus cell. It may infect the vagina during childhood or old age, but it is particularly common during pregnancy. The patient complains of severe vulval irritation and vaginal discharge, dyspareunia and sometimes urinary frequency and dysuria. There is a profuse watery discharge which is offensive and often frothy. Examination shows a reddened vulva and vagina with small punctate haemorrhagic areas on the cervix and adjacent tissues. The presence of the trichomonas is confirmed by examination of the discharge under a microscope. A specimen is obtained by inserting a speculum into the vagina and using a platinum loop to obtain some secretion. The secretion is added to a drop of isotonic saline and examined immediately. The organism is motile and can be seen moving about in the suspension.

The usual treatment is metronidazole (Flagyl) 250 mg daily, by mouth for 10 days. In a few instances when this treatment fails, arsenical compounds may be ordered. Acetarsol (Stovarsol. S.V.C.) pessaries are inserted into the vagina over a period of 6 weeks.

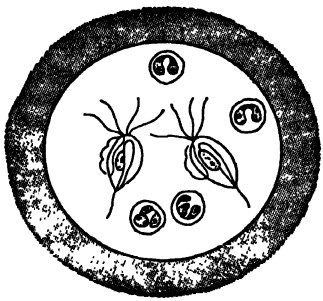

Fig. 86. *Trichomonas vaginalis* and pus cells.

For gonorrhoea as a cause of vaginal discharge see page 220.

Sexually Transmitted Diseases

Venereal diseases are those which are transmitted by sexual intercourse. Two—syphilis and gonorrhoea—are of importance in midwifery. Both can adversely affect childbearing women and both can cause serious consequences to the child.

These two diseases are different in all features save their mode of transmission. They may co-exist, and this can lead to their being confused, especially in the mind of the public. The midwife, while generally not requiring a greatly detailed knowledge of venereal diseases, must distinguish clearly between syphilis and gonorrhoea. They must also realize the risk they run of contracting this disease especially if they have cracks or abrasions on the hands. Rubber or disposable gloves should be worn when carrying out any treatment for these patients.

Syphilis

Syphilis belongs to the family of trepanomatoses, and is caused by the *Treponema pallidum*, a spiral micro-organism. It is a generalized infection caused by the entrance of the organism into the genital tract and, thence, into the blood-stream.

Primary stage. Symptoms appear within 2 to 5 weeks of infection, they are usually in the genital tract but oral lesions may result from kissing, or drinking from infected vessels, and digital lesions from handling open sores.

The primary lesion—the chancre, develops at the site of inoculation, it may be at first a small papule or a tiny fissure. This becomes

indurated and feels firm when palpated. The surface breaks down leaving a shallow ulcer with a brown or red base. It is most commonly seen on the labia or clitoris, but may occur in the vagina or on the cervix. The lesion is painless, but because of the oedema the patient occasionally notices a lump. Very soon the organisms penetrate into the lymphatics and the regional lymph nodes become enlarged, firm

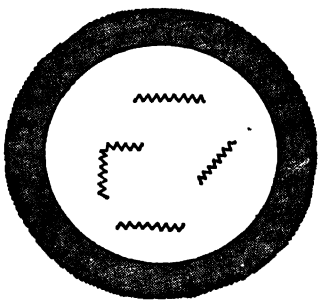

Fig. 87. *Treponema pallidum.*

but painless. Finally, they reach the blood-stream about 4 weeks after the appearance of the chancre, and the blood may be positive to serological tests.

Secondary stage. As the primary lesion heals, other symptoms begin to develop about 6 to 8 weeks after the primary chancre. Symptoms may be so mild that once again they are overlooked, and often diagnosis is difficult as syphilis mimics so many febrile and skin diseases. At this stage there is often a mild pyrexia, rarely exceeding 38°C, headache in the occipital region and general malaise, sore throat which is seldom acute, laryngitis which results in a painless loss of voice. On examination the tonsils are seen to be swollen, bluish and unhealthy. Mucous patches are seen on the uvula, soft palate and tonsils, these are shallow ulcers with a narrow red edge and covered with a thin white membrane. Because of their appearance, they are described as 'snail track' ulceration. These lesions are highly infectious. The rash varies in character and degree, the early rash is a faint erythema which is only noticed in a good light. Frequently it is found on the forehead, chest and flexor aspects of the limbs and may leave a copper-coloured stain. The only really constant feature of a syphilitic rash is that it never irritates. In the moist areas such as the vulva and perianal region, flat-topped moist warts appear, condylomata lata, these are usually teeming with treponemata. The hair may fall out in

patches, giving a rather moth-eaten appearance, syphilitic alopecia, and eye conditions occur, commonly iritis, keratitis and retinitis.

The secondary stage is highly infectious, especially the mucosal surfaces. Once more it may pass unnoticed as the patient may never feel ill, the rash may be missed and other symptoms may not be urgent enough to cause the unsuspecting patient to seek advice. In a small proportion of cases the patient is obviously ill, with a widespread rash, a high pyrexia and all the symptoms of fever and toxaemia.

Tertiary stage. The tertiary stage or late syphilis develops at any time from 2 to 30 years after the initial infection. During this latent period the only evidence of the disorder is a positive serum test. If the early stages have passed unnoticed, the first sign may be a tertiary lesion. Gummata, syphilitic tumours may form on any part of the body. Blood vessels, particularly the aorta may be involved, and a large aneurysm may develop; or the brain or spinal cord may be affected with the development of general paralysis of the insane or tabes dorsalis.

Diagnosis. Diagnosis may be confirmed by demonstrating the presence of the *Treponema pallidum* in exudate obtained from a chancre and examined by 'dark ground' illumination under a microscope.

Serological tests. The following serological tests may be used, the first group will give a positive reaction if any Treponeme is present whether it is due to syphilis or other diseases such as Yaws, also a false positive sometimes follows a severe cold, glandular fever or vaccination.

Non-Specific Tests

Wassermann test (W.R.)
Cardiolipin Wassermann test (C.W.R.)
Kahn test
Price precipitation test (P.P.T.)
Venereal Disease Reference Laboratory slide test (V.D.R.L.)
Reiter protein complement-fixation test (R.P.C.F.T.)

Specific Tests (for syphilis only)

Treponema pallidum immobilization test (T.P.I.)
(This takes 10 to 14 days and only four laboratories in this country are equipped to do this.)

Fluorescent treponemal antibody test (F.T.A.)
Easier and quicker to do.

A selection of the non-specific tests are carried out, if these produce a positive reaction the tests are repeated using a specific test.

Congenital Syphilis

Congenital syphilis is sometimes seen in the babies of untreated affected mothers. At birth the baby may appear perfectly normal and healthy, and only after 4 or 5 weeks, or even longer, do the typical signs appear. These include a blood-stained nasal discharge which becomes gradually more profuse due to osteitis of the nasal bones, cracks and fissures at the angles of the mouth and around the anus, which heal, leaving noticeable scars called rhagades; and various skin rashes. These reddish 'ham-coloured' rashes may occasionally appear earlier, as may the watery blisters on the palms and soles which are termed syphilitic pemphigus. The baby may be a year old or more before the saddle nose, interstitial keratitis, deformities of long bones and other evidence of congenital syphilis become apparent.

Pregnancy appears to delay the development of syphilis, the condition remaining latent. It is, nevertheless, present, though not obvious, and the fetus may be affected.

Syphilis may cause a late abortion, between the twentieth and the twenty-eighth week; or, the pregnancy may continue slightly longer and end in a premature labour and the birth of a weak, puny baby, said to resemble a 'wizened old man'. The fetus may die in utero, and be stillborn in a macerated condition; in these cases the placenta is sometimes large, pale and oedematous, though it may appear normal. Finally, the child may seem normal and healthy at birth, but, later on, manifest the signs of congenital syphilis described above.

It cannot be too strongly emphasized that these unfortunate developments are all preventable.

Prophylaxis and treatment. Antenatal clinics furnish excellent opportunities. Routine serological examination of the patient's blood at her first antenatal visit will usually reveal that she is Wasserman and Kahn negative. In a few cases (1·5 per cent), the reaction is doubtful or positive, and further blood tests may confirm that some of these women have syphilis. Not only can they be treated promptly, but they can be advised to encourage their husbands to be examined, and to take any children for similar examination.

The treatment of the mother or child is the same and the patient is non-infective in 24 hours. The most usual preparations used are benzathine penicillin (Penidural) long acting 1·2 mega-units twice weekly

for six doses, or procaine aluminium monostearate (PAM) 600000 units daily for 14 days. If the patient is sensitive to penicillin, aureomycin or tetracycline can be used.

The patient can be cured and assured the baby will not be affected.

After treatment has been completed, the patient must be kept under observation, routine blood tests are repeated at intervals during the next 2 years. On occasions a lumbar puncture and examination of the cerebrospinal fluid may be required. If patients are treated very early, then blood tests may never be positive, or will rapidly become negative. If treated later it may take up to 10 years to become negative, and those treated in the tertiary stage may remain positive for the rest of their life. It is important when encountering positive tests to enquire whether the patient has been treated and been discharged.

Gonorrhoea

This is infection of the genital tract by the *Neisseria gonorrhoeae*, a bean-shaped diplococcus that is found in pairs enclosed in a pus cell. It attacks the mucous membrane of the cervix and urethra and gives rise to a purulent vaginal discharge. During delivery this may be deposited on the baby's eyelids, gain entrance to the conjunctival sacs, and there set up a severe conjunctivitis. In the past, this led to ulceration and scarring of the cornea, with seriously impaired vision or even blindness.

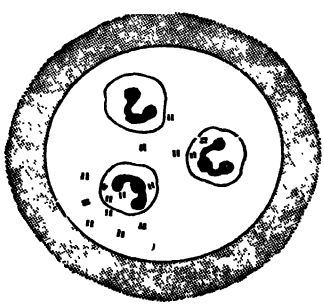

Fig. 88. *Neisseria gonorrhoeae* in pus cells.

Symptoms and signs. Gonorrhoea is sometimes, though not very often, first discovered during pregnancy, symptoms usually occur within 2 to 5 days of infection. In the rare acute case, the patient may be pyrexial, with general malaise, she has a greenish white vaginal discharge, and the urethritis causes her scalding pain on micturition and increased frequency. More often, however, the symptoms are less

striking, and the condition must be differentiated from the commoner non-venereal monilial vaginitis and trichomonal vaginitis.

The diagnosis is established when the discharge, on culture, shows the characteristic Gram-negative intracellular diplococci. The midwife should be aware that the organism is sensitive to heat and drying. The swab must either be plated on chocolate agar immediately it is taken, or a charcoal swab used and placed immediately into Stuart's transport medium.

Treatment. Procaine penicillin (aqueous) 1·2 mega-units given as a single dose will cure in the majority of cases. The patient is non-infectious within 24 hours. Chronic conditions may require a course extending over 3 days. Careful isolation and disinfection are necessary.

If the patient were near term when she first received treatment, or if gonorrhoea were first suspected during labour, extra precautions would be necessary, including isolation, during her stay in hospital, the labour and lying-in rooms that she occupied being subsequently fumigated.

During birth, the child's eyelids would be thoroughly cleansed with normal saline solution, while immediately after birth, his hands should be washed and tucked inside his wrapper, so that he could not rub his eyes. Shortly afterwards, one drop of a suitable antiseptic, e.g. 10 per cent sulphacetamide, would be instilled into each conjunctival sac; the child's eye should subsequently be closely observed for discharge or inflammation.

Gonococcal Ophthalmia

If a woman has gonorrhoea the eyes of the fetus may become infected as he passes through the vagina. This may lead to blindness if not treated effectively.

Signs and symptoms. A profuse purulent greenish discharge usually bilateral, and oedema and redness of the eyelids, occurring shortly after birth.

Treatment. Ophthalmia neonatorum is a notifiable disease and highly contagious. The baby must be isolated and the nurse should wear a gown and gloves when attending to him. The minimum of staff should be involved in his care. A swab is taken for culture (using a charcoal swab and Stuart's medium) and the eyes then carefully swabbed and penicillin eye drops 100000 units in 1 ml or chloramphenicol eye drops ½ to 1 per cent are instilled. One drop is instilled into each eye

every minute for 30 minutes. The intervals between the instillations are then progressively increased until in a few hours one drop is being instilled every 3 hours. Systemic penicillin should also be given. The midwife must be very delicate in her touch when opening the eyelids so as not to increase the oedema. The baby should be laid in his cot with the most severely affected eye downwards, so that the discharge will run onto the sheet and not into the other eye. Every contaminated article, swabs, gowns, baby gowns and cot sheets are a potential hazard. Wherever feasible disposal items should be used and burned as soon as possible. The eye should be cured within 24 hours.

The midwife's duties. Should she have the slightest suspicion that a patient might have syphilis or gonorrhoea, the midwife must have the patient seen by a doctor. She herself should express no opinion.

If either disease is present, the doctor will tell the patient, and make arrangements for treatment. The patient may well be distressed and the midwife can do much to cheer her, at the same time re-enforcing the doctor's advice to co-operate over persuading her husband to be examined and treated.

The patient can be authoritatively assured that the treatment will be effective, that she will be completely cured, and that her baby will be healthy and unharmed.

Retroversion of the Gravid Uterus

This is the falling back of the pregnant uterus into the hollow of the sacrum, when it may become imprisoned or incarcerated in the pelvis.

Causes. If pregnancy begins in a retroverted uterus it usually becomes anteverted as it enlarges, but if it fails to do so, it will become fixed in the pelvis. By the fourteenth and fifteenth week of pregnancy, the retroverted pregnant uterus completely fills the pelvis, the cervix is drawn up towards the pelvic brim, the anterior vaginal wall is stretched and so, at the same time, is the urethra. The urethra then becomes narrowed and the patient is unable to pass urine.

Symptoms. The patient will at first complain of difficulty in micturition and later of complete inability to pass urine, that is retention of urine occurs. The bladder becomes more and more distended until at last some urine may dribble from it—retention with overflow. At this stage the patient will complain of severe abdominal pain.

Signs. On examination of the abdomen there is a large soft swelling

above the pubes. The swelling, which is the bladder, may rise to the level of the umbilicus or even above it.

The fundus is not palpable at the brim of the pelvis.

Treatment. The patient requires hospital treatment. The bladder is emptied by catheter, and kept empty with a self-retaining catheter draining into a sterile polythene bag, while postural treatment is carried out. The patient lies in Sim's position, with the foot of the bed raised on blocks, so that her pelvis is almost upside down. The uterus may then correct its attitude spontaneously, by gravity. The retroversion will not recur, since the uterus is growing steadily and will, in a few days, be too big to fall back into the pelvis.

The doctor may occasionally correct the retroversion and insert a Hodge pessary, but this is not often necessary. Manipulation of the uterus into the anteverted position is avoided as it is rarely necessary and is likely to cause an abortion.

Fibromyomata (Fibroids)

Fibroids of the uterus may occasionally be associated with pregnancy, particularly in older women, though they are not uncommon in young West Indian and West African women. On palpation of the uterus one or more smooth rounded swellings may be felt continuous with the wall of the uterus. In pregnancy red degeneration of a fibroid may occur, there is necrosis and bleeding into the fibroid, which becomes red and soft. This may cause pain and local tenderness, but surgical intervention is rarely necessary. The doctor will order analgesic drugs to relieve the pain.

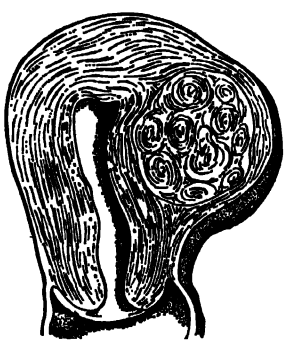

Fig. 89. Uterine fibroid.

Rarely, a fibroid may be in the lower segment of the uterus beneath the engaging part, preventing its descent into the pelvis, and this will only be diagnosed when a rectal or vaginal examination is made. It is very unusual for fibroids to cause any complication in labour or to require treatment, as those fibroids lying below the presenting part will be drawn upwards as the lower segment is stretched and labour then proceeds normally. Labour should, however, be conducted in hospital, in case difficulty should arise. Subsequently the fibroids tend to become smaller.

Ovarian Cyst

An ovarian cyst in association with pregnancy is less common than fibroids. The cyst may be in the abdomen or in the pelvis below the presenting part. It may be discovered during a routine pelvic examination in early pregnancy. It is generally recommended that the cyst

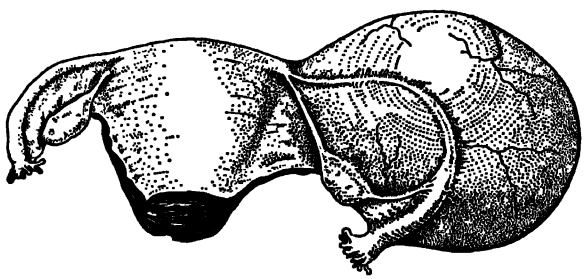

Fig. 90. Uterus with simple serous cyst.

should be removed fairly early in pregnancy. If it were left, it could become malignant, undergo torsion (either before or after delivery) or obstruct labour.

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23. ASSESSING FETAL HEALTH

One of the problems existing today is how to assess the health of the fetus. In certain instances the internal environment of the uterus is no longer favourable, and the baby would be better delivered. The problem is how to balance prematurity against the dangers of placental insufficiency, rhesus incompatibility and the like. In the last decade much research has been directed to this end, and today the obstetrician has many techniques to augment his clinical skills. Even so, the problem is only partly solved.

Many obstetricians and midwives would agree that careful clinical examination provides the best guide to fetal growth and accurate recording of fundal height, abdominal girth and the maternal weight must never be ignored. If the fetus is growing placental activity is likely to be adequate and his health satisfactory.

Estimation of Urinary Pregnandiol

Progesterone is produced in the placenta from cholesterol. The progesterone is then metabolized by the maternal liver and excreted as pregnandiol in the bile and urine. The amount of pregnandiol in the urine can be estimated and this has been used as a guide to placental function. There is however, a wide variation in the day to day urinary levels of pregnandiol, and for this reason it is considered of doubtful value.

Estimation of Urinary Oestriol

Oestriol is obtained from the fetal adrenals and cannot be manufactured in the placenta. It therefore contributes to the total circulating oestriol in the maternal blood. Again, clinical experience has shown that there is a wide variation in the daily output of oestriol. For any significant guide a series of estimations must be made with at least 24 hours interval between each. A normal reading (Fig. 91)

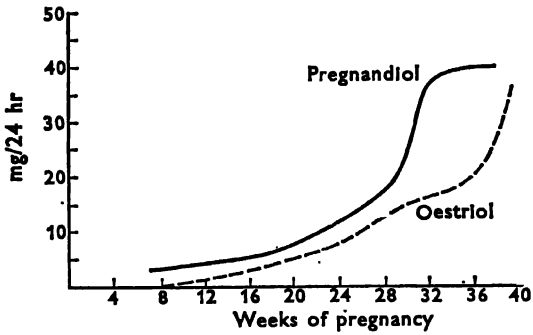

Fig. 91. Excretion of oestriol and pregnandiol during pregnancy.

indicates the fetus is probably not in immediate danger, whereas a low reading may indicate a deterioration in fetal health, provided it is related to the clinical picture. In selected cases, where repeated estimations can be made this technique may be useful.

Amnioscopy

This is the viewing of the liquor through an endoscope. This is passed vaginally and with the aid of a light the liquor can be seen in the amniotic sac. If the liquor is golden it suggests Rhesus incompatability, and if it is greenish the presence of meconium and possibly fetal distress. This technique can be used alone but is more usually associated with fetal blood sampling.

Fetal Blood Sampling

Using an endoscope, blood is taken from the fetal scalp for the estimation of blood gases and acidity.

Indications

1. Fetal distress, when the heart rate rises above 160 or falls below 120 beats/min, when there is irregularity of the rate or rhythm. Meconium staining of the liquor when the membranes rupture, or appearing later in labour.
2. In prolonged labour—to assess whether labour should be terminated.
3. Where placental insufficiency is suspected, to anticipate risk to the fetus (pre-eclampsia, low urinary oestriol, small for dates baby, prolonged pregnancy).

Method

After cleansing the vulva and draping with sterile towels, the doctor estimates the cervical dilatation. An appropriate endoscope is lubricated and gently passed through the cervix. The introducer is withdrawn and if the membranes are still intact the forewaters are ruptured.

The light is attached and the fetal scalp visualized and swabbed dry. Ethyl chloride is sprayed on the visible area, this causes a reflex dilatation of capillaries, and allows a tiny puncture on the scalp to bleed adequately. The scalp is smeared with a silicone cream to encourage a drop of blood to form otherwise it will run down the endoscope. The scalp is then pierced with a small protected blade (2 mm wide) over a bony area. The blood drop is collected into a

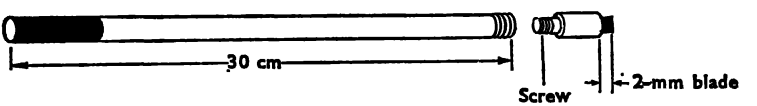

Fig. 92. Handle and disposable blade for fetal blood sampling

heparinized glass capillary pipette partly by capillary attraction and partly by gentle suction from the operator (similar to collecting blood for haemoglobin estimation).

At the same time an assistant collects a specimen of venous blood from the mother for comparison.

An Astrup micro-method is used to determine the acidity, bicarbonate content and gas tension (for values see page 456).

Amniocentesis

Is the removal of liquor amnii from the gestational sac through the abdominal wall.

Indications

Rhesus incompatability—when 2 to 5 ml are withdrawn.
Acute polyhydramnios—when a large volume is removed.

Method

The bladder is emptied to avoid the risk of damage. The skin over the suprapubic area is cleansed. The fetus is palpated and the long needle attached to a syringe is inserted just below the umbilicus, and

on the opposite side to that of the fetal spine. Local anaesthetics are not used as discomfort is less inserting the needle than infiltrating the anaesthetic. The liquor is aspirated and placed in a dark, screw topped bottle and sent at once to the pathology department. The puncture hole is sealed with something like collodion.

When amniocentesis is carried out for acute polyhydramnios this is treatment rather than investigation, and a large quantity of liquor amnii is aspirated.

Fetal Electrocardiography

The fetal electrocardiograph can be recorded in a similar way to that of the adult, but the placement of leads is somewhat different.

Position of Electrodes

Two abdominal, one near the pubis and one near the fundus.
Abdominal and vaginal.
Abdominal and rectal.
Scalp electrodes.

Uses

Confirmation of pregnancy.
Rate and rhythm of fetal heart.
Multiple pregnancy—multiple signals.
Hydramnios—no signals.
Continuous assessment during labour—whether the heart rate and rhythm are varying.

External Phonocardiography

This is an apparatus for monitoring the fetal heart. It is attached to the abdominal wall and the amplified heart beat can be heard. This is useful in early pregnancy when the sounds are too soft to be heard through a Pinard stethoscope and is reassuring to the mother. The apparatus can be used for continuous monitoring during labour. Its main disadvantage is that the sounds may become inaudible during a contraction or if the fetus moves.

Cardiotocography

This is a correlation of fetal heart rate patterns with uterine contractions. The patient is placed in the lithotomy position and a scalp

electrode is attached to record the fetal heart rate. If the cervix is less than 1 cm dilated phonocardiography may be used. The frequency and strength of uterine contractions are recorded as a tocograph. An external tocograph is obtained from a belt fixed to the abdominal wall containing a pressure sensitive device. An internal tocograph means placing a fluid filled polythene catheter in the uterus, attached to a strain gauge. This latter method has many disadvantages and is not usually used.

A trace similar to Fig. 93 is obtained. On most occasions the

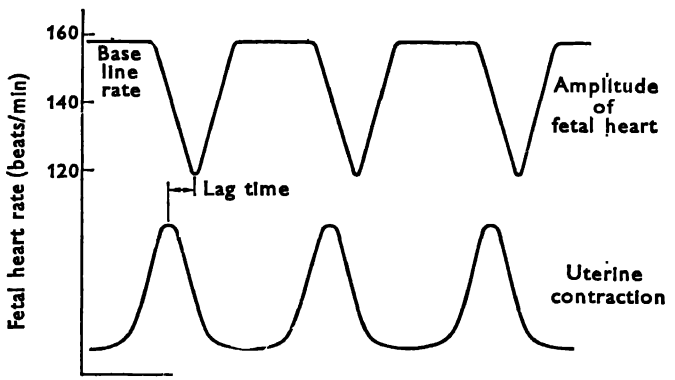

Fig. 93. Cardiotocograph.

recording is made at a speed of 1 cm per second, but if an abnormality is detected it may be increased to 2 cm per second.

Cardiotocography and Fetal Blood Sampling

In a few units a very sophisticated technique is used. A blood sample is taken when the scalp electrode is attached and the fetal heart rate and uterine contractions are monitored as above. If an abnormality occurs a series of fetal blood samples are taken. It is known that a change in fetal heart rate usually preceeds an alteration in pH, but at the present time it is impossible to determine at what level of hypoxia permanent neurological damage to the fetus occurs.

Ultrasonography

Ultrasound is the name given to sound waves with a frequency above that of the human ear, over 20000 cycles/sec. They can be generated by passing a high voltage through a crystal and causing it to vibrate at

a high frequency. Sound waves are emitted, formed into a beam and directed onto the abdomen, whenever the beam crosses a boundary (interface) between two tissues of differing properties it is partially reflected back to the crystal. The crystal (or transducer) converts the sound into electrical energy which can be seen on a cathode ray screen, either as a vertical deflection of a horizontal line (an A-scan) or as a bright spot (a B-scan).

This apparatus has much to offer in determining fetal health.

Method

A film of oil is placed between the patient's abdomen and the probe as air does not transmit ultrasound. The patient experiences no discomfort and feels no sensation when the machine is in use.

A-Scan

This gives a picture as in Fig. 94. Each blip indicating an interface. Very accurate measurements can be made between the points.

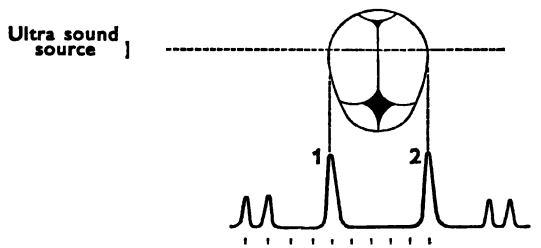

Fig. 94. A-Scan Sonogram. 1 and 2 indicate the parietal eminences.

Uses

Fetal biparietal cephalometry—measuring the biparietal diameter.
To assess maturity (9·5 cm).
To forecast disproportion—if the diameter is extra large.
To detect failure to grow—which might indicate the fetus is at risk.
To detect post-maturity—a diameter of 10 cm whatever birth weight.

B-Scan

This gives a picture as in Fig. 95. A bright spot indicates the position

of the echo as the probe moves across the abdomen. The spots coalesce to give an anatomical outline.

Ultrasound should not be regarded as an alternative to radiography, but rather as an adjunct.

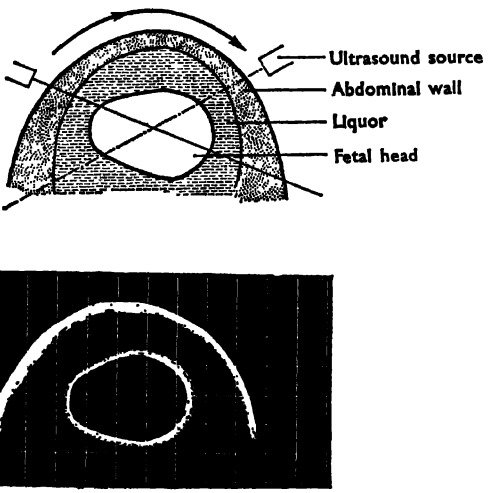

Fig. 95. B-Scan Sonogram showing the abdominal wall and fetal head.

Fetal Risk

There has been no evidence of fetal damage, but some obstetricians have reservations about using ultrasound in early pregnancy.

Nile Blue staining—for assessing fetal maturity

In utero, squamous cells from the fetal skin become rubbed off and are found in the liquor. Following amniocentesis, if the liquor is mixed with a 0·1 per cent aqueous solution of Nile Blue sulphate, mature cells stain orange. Before the thirty-sixth week less than 10 per cent are stained. Between thirty-eighth and fortieth week 50 per cent or more are stained. This guides the obstetrician on any action he wishes to take. The test is unreliable if there is polyhydramnios.

Intra-uterine Death of the Fetus

The fetus may, at any stage of pregnancy, die in utero. We know that

Rhesus incompatibility, essential hypertension, diabetes, pre-eclampsia, chronic nephritis, accidental antepartum haemorrhage, and syphilis may cause the death of the fetus, but it sometimes occurs when no cause can be found.

The mother may say that for some days she has felt no movements. She may be, unconsciously, reluctant to face this misfortune. Perhaps, then, she says the child is 'not moving so much'. The midwife does not

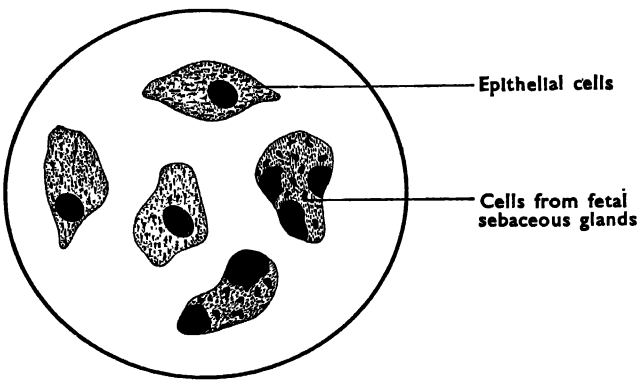

Fig. 96. Amniotic fluid cytology. Nile Blue staining of fetal cells.

hear the fetal heart sounds, the uterus ceases to grow, activity in the breasts diminishes, and later a brown vaginal discharge may be seen. After some days, an X-ray may show overlapping of the cranial bones; this is known as 'Spalding's sign'. Gas may collect in the large blood vessels, throwing a shadow on the X-ray screen. The unnatural attitude of the fetus, bunched up into a ball, is suspicious.

Usually labour occurs within a few days of the death of the fetus, but it may be delayed for some weeks. If spontaneous delivery does not occur within 3 weeks measures are taken to induce labour. Retention of a dead fetus in utero for 4 weeks results in no harm, but after this time the risk of hypofibrinogenaemia increases daily. Frequent checks should be made of the clotting time and fibrinogen levels. Once labour is induced it should be brought to a speedy conclusion, as once the membranes are ruptured the risk of intra-uterine infection is very great, because the dead fetal tissue is a good media for bacterial growth. The doctor may however order a medical induction. The fetus is macerated when it is born, that is the epidermis peels leaving the red dermis exposed, the tissues are soft, and the skull bones are loose and overlapping.

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PART FOUR
LABOUR

24. THE PHYSIOLOGY AND MANAGEMENT OF LABOUR

Labour is the physiological termination of pregnancy. Normal labour is the birth of a living baby by the natural forces within reasonable time, vertex presenting and without injury to mother or baby.

What causes the onset of labour is unknown, but it can easily be demonstrated how difficult it is to induce labour to commence by artificial means. There are many theories to explain this, but there is much to support the idea of a hormonal balance, necessary to maintain pregnancy and an alteration in that balance causing the onset of labour. It may well be this alteration is caused by fetal production of hormones, possibly oxytocin. Uterine size and the degree of stretch of fibres also play a part.

First Stage

Perceptible uterine contractions with some retraction.
A show (blood and mucus).
Formation of the lower segment and gradual dilatation of the cervix.
Formation of the bag of forewaters.
Progressive dilatation of the cervix.
Rupture of the membranes.

Second Stage

Strong uterine contractions with more retraction.
Descent of the head through the pelvis.
Dilatation of the remainder of the birth canal.
Birth of the baby.

Third Stage

Uterine contractions with marked retraction.

Separation of the placenta.
Expulsion of the placenta.
Control of bleeding.

The Stages of Labour therefore, are:

First stage

Dilatation. From the onset of labour until full dilatation of the cervix.

Second stage

Expulsion. From full dilatation of the cervix until the birth of the baby.

Third stage

Placental stage. From the birth of the baby until the expulsion of the placenta and membranes.

Approximate Length of Time for Each Stage:

	First stage	Second stage	Third stage
Primigravida	12 to 14 hours	½ to 1½ hours	5 to 15 minutes
Multigravida	6 to 12 hours	5 to 30 minutes	5 to 15 minutes

The Factors Concerned in Labour

Muscular Activity

Involuntary—uterine muscle.
Voluntary—diaphragm, thoracic and abdominal muscles.

The Birth Canal

Hard parts—the bony pelvis.
Soft parts—the lower segment of the uterus, the cervix uteri, vagina and the pelvic floor.

The Uterine Contents

The liquor amnii.
The fetus.
The placenta, cord and membranes.
These factors have sometimes been called the powers, the passages and the passenger, respectively.

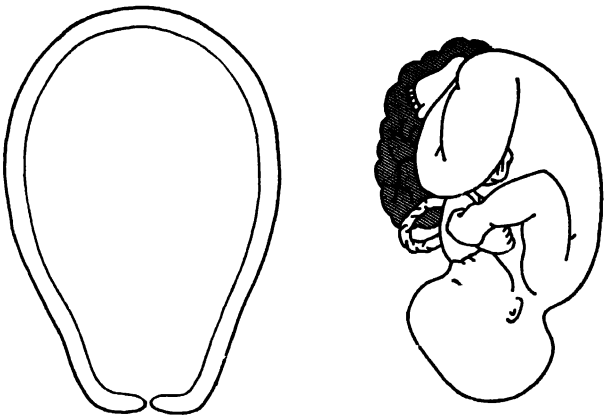


Fig. 97. The fetal ovoid.

Uterine Activity

The purpose of labour is to expel the fetus from the uterus and to do this it must dilate the cervix and provide the necessary expulsive forces. Two problems have to be overcome, first to provide sufficient force without fatiguing the uterus and secondly to maintain an adequate oxygen supply to the fetus. During a uterine contraction the blood supply is diminished and the placenta is squeezed, this reduces the oxygen supply to the fetus therefore it is necessary to have a compensating period of relaxation. This being the case there would never be enough force to propel the fetus down the birth canal without another factor called retraction entering into uterine activity.

We therefore speak of:

Contraction—A temporary shortening of muscle fibres.
Relaxation—The condition of muscle fibres in the absence of a contraction.
Retraction—The permanent shortening of a muscle fibre by molecular rearrangement, without active contraction of the muscle.

Whereas other muscles contract and relax, the uterus during labour contracts and retracts. Thus over a period of time the length of the uterus is decreased and the walls become thicker.

Contractions in the uterus in labour are:

Involuntary.
Intermittent.
In most labours, painful.

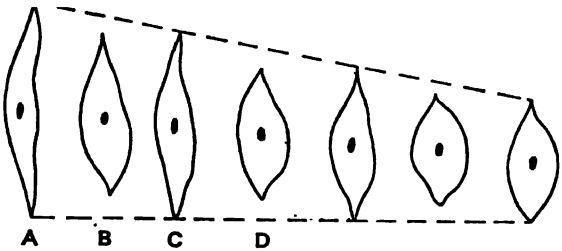


Fig. 98. Diagram to illustrate retraction. Uterine muscle fibre (A) relaxed; (B) contracted; (C) relaxed, but with retraction; (D) contracted, but shorter and thicker than (B).

The cause of pain during the contractions of labour is not understood. In part it may be due to the ischaemia developing in the muscle fibres, and to the muscle fibres squeezing nerve endings.

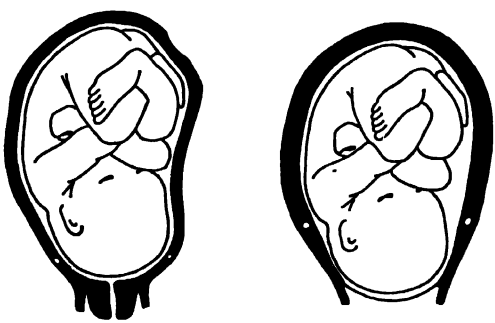


Fig. 99. Uterus, showing dilatation of the cervix and formation of the lower uterine segment.

The uterus is never completely relaxed and in between contractions a resting tone can be measured. Contractions cause a rise in intrauterine pressure, this is called intensity or amplitude of the contraction. The contraction rises rapidly to a peak and then slowly declines to the resting tone. The frequency refers to the number of contractions per unit of time.

Alvarez and Caldeyro-Barcia, two South Americans, have contributed much to our present knowledge of uterine activity. They have identified an area at the junction of the uterus with the Fallopian tube from which originates the contraction. There is a pacemaker on each side but one of them is dominant, from this eminates all the contractile waves which pass over the uterus. The concept is similar to the

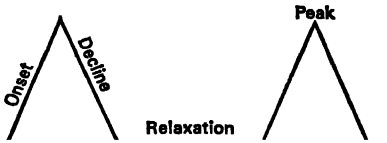


Fig. 100. Diagram to illustrate uterine contractions.

pacemaker in the heart, with which the midwife will already be familiar. Each wave passes inwards and downwards at a regular rate of 2 cm/sec, causing the entire uterus to contract. In normal uterine action the intensity is greatest near the pacemaker, that is in the upper uterine segment, and weakest near the cervix. Because of this, coordination is obtained. This co-ordination is balanced and harmonious, and is sometimes called polarity of the uterus. With each contraction the fibres are shortened and as the cervix is deficient in muscle it is progressively dilated.

Cervical Dilatation

As the upper uterine segment becomes shorter and thicker this exerts a pull on the less active lower uterine segment, the maximum pull being directed towards the weakest point, that is the opening or

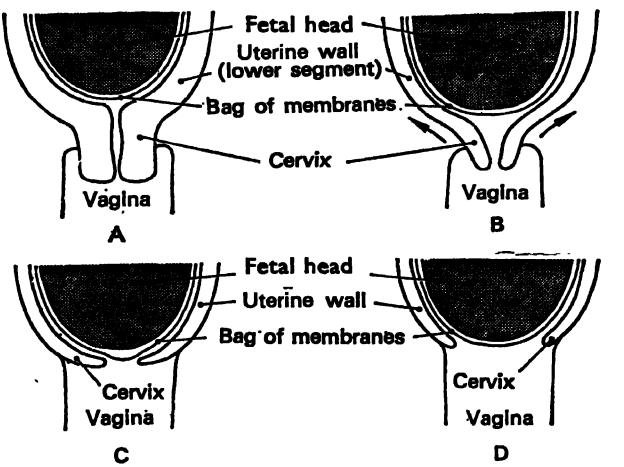


Fig. 101. Diagrams showing 'taking up' of cervix (A and B), and dilatation of the os (C and D).

external os. This is gradually pulled upwards until the cervical canal is obliterated, a process known as 'taking up' of the cervix or effacement. The continued upward pull now dilates the cervix, that is enlarges the opening.

Formation of the Forewaters

During each contraction in the first stage of labour, a small amount of liquor amnii passes in front of the fetal head and so gradually forms the bag of forewaters, which bears with an even pressure on the dilating cervix, and possibly aids the dilatation of the cervix. The fetal head, if well flexed, acts as a ball valve and prevents the forewaters and hindwaters from communicating. The forewaters can often be felt on vaginal examination and their shape give an idea of how well the presenting part is flexed.

Rupture of the Membranes

This takes place as the result of the increased force of the uterine contractions causing an increase in the fluid pressure inside the forewaters and a lessening of the support offered by the cervix as it dilates.

When the dilatation of the cervix is complete, the cervix as such, no longer exists and is drawn into the lower uterine segment, which at this stage of full dilatation is continious with the vagina. A complete birth canal is therefore formed.

Following rupture of the membranes the uterine contractions act directly on the fetus, forcing it along the birth canal. This is known as **fetal axis pressure.** The descent of the head produced by a contraction is maintained by greater retaraction of the uterine muscle and so the head is prevented from being pushed up again by the resistance of the pelvic floor. This is sometimes called the 'rachet mechanism'.

In the third stage, contractions and retraction result in the separation and expulsion of the placenta and membranes and control of bleeding.

Movements of the Fetus

As labour progresses the fetus is moved through the birth canal and because of the forces acting upon him he is induced to make various twists and turns. These movements are known as the mechanism of labour.

In the past much time and energy has been spent by the pupil midwife in learning a mechanism of labour for each position of the fetus.

This is unnecessary, providing she understands the basic principles, and with a doll and pelvis in her hands can illustrate these movements. These movements are caused by:

Uterine contraction and retraction.
Fetal axis pressure.
Shape of the birth canal.
The denominator.

A General Mechanism of Labour

Descent. This occurs with every other movement. The pressure of the uterine contraction on the fetus forces him downwards in the uterus. When the membranes have ruptured, this is directly onto the breech and the fetal axis pressure is transmitted down the spine to the occiput, which must advance.

Flexion. At the beginning of labour the head is in an attitude of natural flexion. This flexion is further increased as labour progresses. Because the spine is joined to the head nearer to the back than to the front, fetal axis pressure is transmitted through the occiput rather than the forehead. As a result, the occiput is pushed down lower and the forehead is pushed upwards by the resistance of the soft parts, and so complete flexion is obtained.

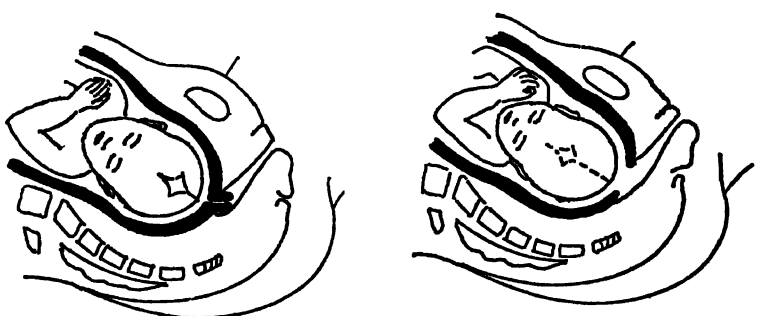


Fig. 102. (Left), Onset of labour. (Right), Descent with increasing flexion.

Internal rotation. This is accommodation to the lower part of the pelvis. The head entered the pelvis in one of the obliques, and the widest diameter of the outlet through which it must emerge is the antero-posterior. The head must rotate, and this is brought about by

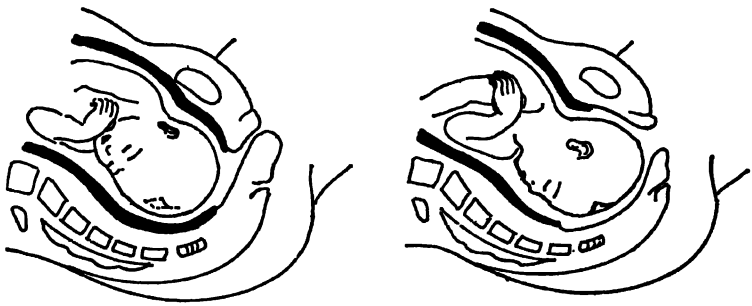


Fig. 103. (Left), Internal rotation occurring. (Right), Internal rotation complete.

the slope of the pelvic floor. **The rule is**—whatever touches the pelvic floor first rotates forwards to the antero-posterior diameter of the outlet. Usually this is the occiput.

Extension. When the occiput is well down and the nape of the neck is under the symphysis pubis, in order that the head may advance it must become extended. The bregma, forehead, face and chin pass over the perineum and the head is born by extension.

Restitution. Directly the head is born it rights itself with the shoulders which are lying in the oblique or antero-posterior diameter. During the movement of internal rotation the head is slightly twisted. The baby untwists his neck by restitution.

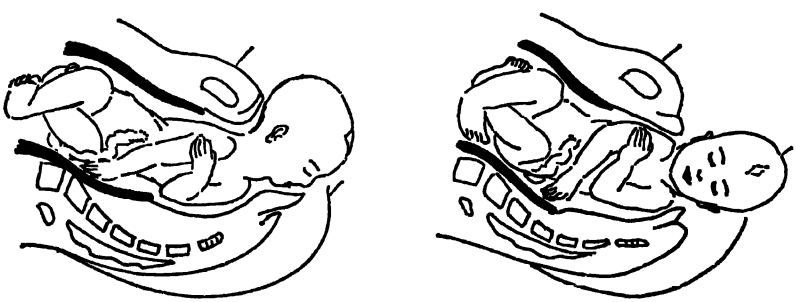


Fig. 104. (Left), Extension: birth of head. (Right), Restitution.

Internal rotation of the shoulders, causing external rotation of the head.

The shoulders, if they lie in the oblique diameter of the outlet, undergo an internal rotation similar to that of the head and then lie in the antero-posterior diameter of the outlet (12·5 cm). The head, being free outside, moves at the same time, so that the occiput turns to the same side of the maternal pelvis as it was at the beginning of labour.

Note that the fetal back remains to the right or left side of the pelvis during the birth of the head, after which the occiput turns so as to lie in a direct line with the spine, its natural position. That is, the long axis of the head is at right angles to the shoulders.

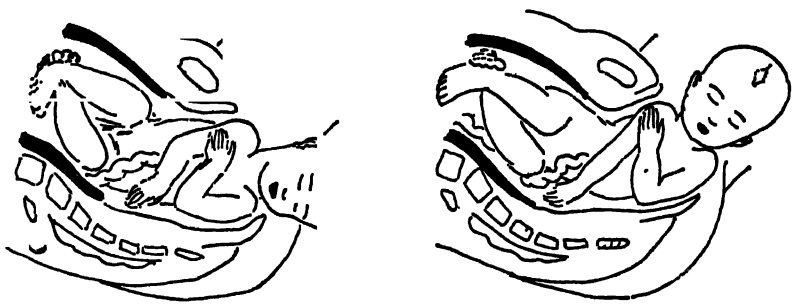


Fig. 105 (Left), Birth of anterior shoulder. (Right), Lateral flexion: birth of posterior shoulder.

Lateral flexion. The trunk of the baby is born by bending sideways in order to pass through the curve made by the bony pelvis and soft parts.

Reasons for the Predominance of Vertex Presentations

The uterine cavity is ovoid with the wider end at the fundus and the narrower end at the lower segment. The long axis is longitudinal. The fetus in an attitude of flexion is a similar shape, the flexed breech being larger than the head. As term approaches the space within the uterus becomes limited; the fetus then fits best in the uterus as a longitudinal lie with the head presenting.

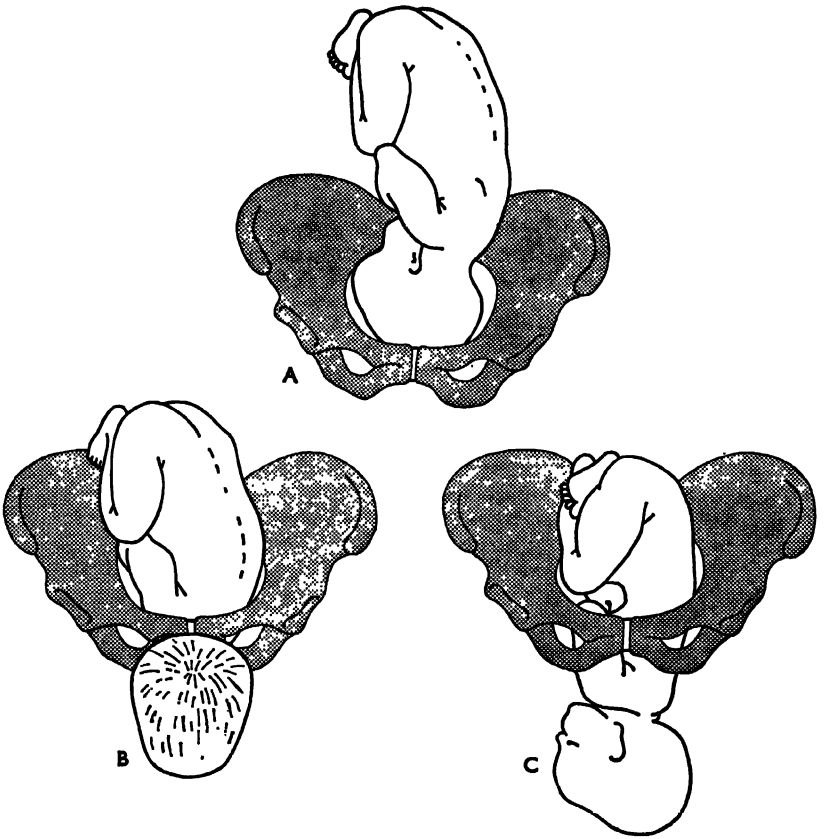


Fig. 106. A, Vertex presentation. Left occipito-anterior position at onset of labour. B, Left occipito-anterior mechanism: extension. C, Birth of anterior shoulder.

THE FIRST STAGE OF LABOUR

Signs that Labour has Commenced

The presence of uncomfortable contractions, slight at first but increasing in severity and frequency, occurring at regular intervals. The discomfort is referred to the sacral region and passes round to the abdomen, where contractions may be felt on abdominal palpa-

tion. The uterus is felt to contract (harden) when the patient complains of discomfort.

A 'show' of blood-stained mucus. The mucus is from the cervix and the blood comes from the separation of membranes around the opening internal os.

Commencing dilatation of the cervix.

False Labour

The contractions are irregular and are referred to the abdomen. They appear stronger when the patient is in bed and weaker when she is up and about. They have no effect upon the cervix. The discomfort passes off after an aperient or enema has taken effect.

Dilatation of the Birth Canal

This takes place from above downwards:

The internal os.
The cervical canal.
The external os, until full dilatation at the end of the first stage, when the membranes usually rupture.
The vagina, perineum and the vulva, which are dilated by the fetal head during the second stage of labour.

The obliteration of the cervical canal is called taking up the cervix. Sometimes this occurs before the onset of labour and the cervix may even be one to two fingers dilated. In a labour in a multigravida dilatation of the cervix may occur before it has been taken up.

Postures Adopted for Delivery

In England deliveries were for many years conducted with the patient lying on her left side. Nowadays, the dorsal position is becoming increasingly popular. Apart from England the dorsal position is the one most generally favoured.

For any delivery that is not absolutely normal, the lithotomy position is used.

Management of the First Stage

The successful management of labour depends in the first place on the result of a complete examination to make sure that the patient is healthy and that the pelvis and the presentation are normal.

Great care should be taken, especially with a primigravida, to

welcome the patient. It cannot be emphasized too much how greatly the midwife's manner may influence the patient. If the midwife seems brisk and in a hurry the patient will be anxious and apprehensive, fearing she may be left alone if the ward is busy. On the other hand, if the midwife radiates calmness and serenity the patient's confidence will be increased. If a happy and successful labour is to be achieved the morale of the patient must be maintained and she must have confidence in herself and her attendants. She should not be left alone once labour is established and her husband or mother should be encouraged to visit and stay with her. This needs to be discussed in the antenatal period to make sure this is the wish of all concerned.

All strange proceedings—vulval toilet, the giving of an enema—should be handled gently and an explanation of them given beforehand. Privacy should be obtained at all costs. She should be encouraged to relax during and between contractions, and if she has not had this taught to her during the antenatal period, she should be shown even at this late hour. Sleep at night, as apart from rest, should be assured her by means of a hypnotic if necessary. If those the midwife is allowed to carry are not strong enough, then a doctor should be consulted. She should be encouraged to stay up during the first stage if everything is normal, and she should be occupied in some way. In early labour she can sew, knit, read, watch television, chat with other patients or have her own visitors, notably her husband and her mother.

In every early labour she should have small quantities of solid food, preferably in puree form. Later it is wise to restrict solid food. This is because the emptying time of the stomach (normally 4 hours) is increased in stress and the stomach contents may not pass on at all during labour. This creates a hazard if general anaesthetics are required, as it increases the risk of vomiting.

On Admission

When the patient is admitted to hospital the temperature and pulse should be taken, the blood pressure recorded, and the urine tested. The antenatal notes should be available, and once all necessary particulars have been obtained, the abdomen should be examined, and the fetal heart sounds listened to. She should be asked whether the membranes have ruptured or not. With this information the midwife can decide at the onset of labour that everything is normal.

Preparation

Vulval and perineal area. The vulval and perineal area may be shaved,

long hair clipped, or left alone. Methods vary and there seems to be little variation in the infection rates with any method. One reason in support of shaving is that should a laceration occur it is more easily sutured.

Bowel care. It is desirable to have the bowel empty for several reasons. Firstly, it clears the pelvis of anything that could interfere with the descent of the presenting part. Secondly, it allows a clean field for delivery and the patient feels secure knowing that she cannot expel faeces when she is pushing in the second stage. Thirdly, it may effectively stimulate uterine contractions. Some favour an enema, plain tap water or a small enema pre-packed in a disposable plastic bag; others prefer suppositories. The latter are certainly more comfortable for the patient.

Bath or shower. A bath is pleasant and relaxing if the membranes are intact. The patient will appreciate assistance especially with her feet and legs. When the membranes have ruptured a shower may be taken.

During these preparations is an opportunity to observe whether liquor is draining, whether there is any oedema, varicose veins, soreness or vaginal discharge, or scarring of the perineum. These may indicate disease or impending trouble, e.g. varicose veins may rupture, or a scar may break down.

Records

A record of the progress of labour should be accurately kept, the frequency, duration and strength of contractions being recorded at regular intervals (2-hourly, 1-hourly, ½-hourly and then more frequently). At the same time, the descent of the presenting part should be estimated, and the rate and regularity of the fetal heart sounds and the maternal pulse rate should be recorded. The temperature and blood pressure should be taken 4-hourly, and the urine should be tested for protein and acetone. The bladder must be kept as nearly as possible empty, and a record kept of the amount of urine passed. The time at which the membranes rupture should be recorded, and the liquor observed to see whether it contains meconium or not.

Drugs

In early labour the patient will probably need medication. If she has had a wakeful night she may well sleep in the daytime. If

labour begins in the evening she should be settled in bed with a hypnotic.

Chloral is a useful drug which the midwife is permitted to use. She may give 2 g orally, or 650 to 1300 mg dichloralphenazone (Welldorm) but, bearing in mind the fact that absorption of food and fluid is slow during labour, it may be more satisfactory to give 4 g rectally. This will help relaxation and induce sleep. It will not relieve pain and, if the patient is experiencing pain, she should, either as an alternative or, in addition, be given an intramuscular injection of 100 to 150 mg of pethidine or 30 to 40 mg pentazocine (Fortral). These are analgesics, and have an antispasmodic action, helping dilatation of the cervix.

Examinations

Rectal or vaginal examinations may be necessary (with all the necessary precautions taken against infection) to assess the progress of labour, that is the dilatation of the cervix and the descent of the presenting part, but abdominal examination should first be made, and internal examinations only if necessary to confirm the abdominal findings.

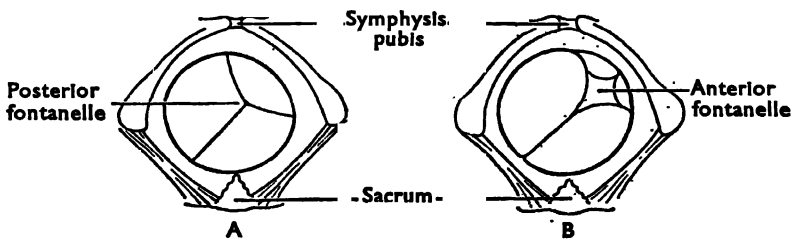


Fig. 107. The presenting part. A, Left occipito-anterior position. B, Right occipito-posterior position.

Later, inhalational analgesia is given by the midwife. No definite stage can be given at which analgesia may be commenced. The average is between three-quarters and full dilatation.

Before either a drug is given or analgesia is commenced, the midwife should satisfy herself that the patient is prepared—that her bed has been made and that she has been washed and that her hair has been combed, that her bladder is empty and her urine free from ketone bodies, that the fetal heart sounds are satisfactory, and that she knows the stage labour has reached. The patient should not be left alone.

Vaginal Examination

An abdominal examination is made to determine the presentation, position, degree of engagement of the head and to auscultate the fetal heart. Some perform a rectal examination to determine the degree of dilatation of the cervix and the descent of the presenting part in the pelvis, and a vaginal examination only if there is some doubt about the nature of the presentation, the position, or the degree of dilatation of the cervix. Others prefer a vaginal examination at all times.

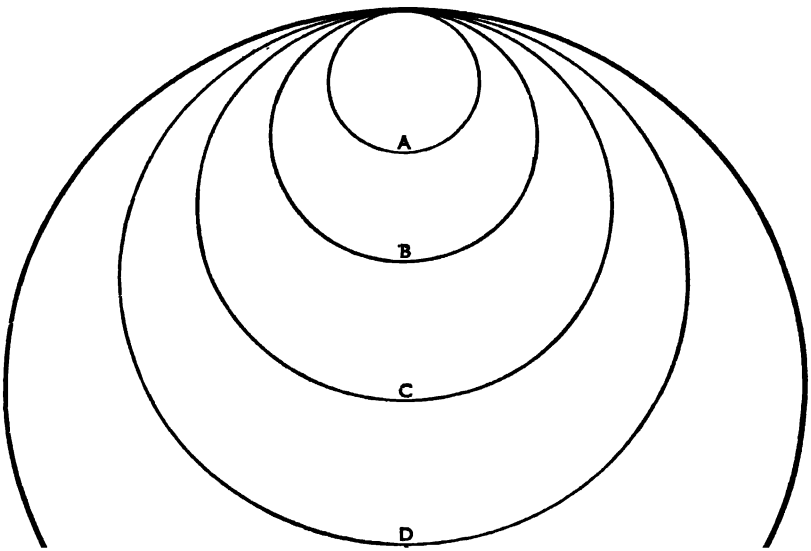


Fig. 108. Dilatation of the cervix. A, 2 cm (one finger); B, 3·5 cm (two fingers); C, 5·5 cm (three fingers); D, 7·5 cm (three-quarters dilatation); E, 10·5 cm (full dilatation).

Indications

To determine the degree of cervical dilatation.

To check the descent of the presenting part.
To confirm the presentation where there is doubt.
To exclude prolapse of cord when the membranes rupture and the presenting part has been high or there is a malpresentation.

Method. The midwife should explain to the patient the nature of the examination she is about to perform. The patient's bladder should be empty, and the midwife should carry out a careful abdominal examination. Only in this way can she learn the maximum from her vaginal examination. She is already wearing a cap and mask, and she now washes her hands and puts on a sterile gown and sterile gloves.

The patient may be on her back, legs flexed and abducted, or on her left side, an assistant supporting her right leg.

The midwife, using her left hand, swabs the vulval and perineal area, swabbing from before backwards, using each swab once only, and using, first chlorhexidine (Hibitane) lotion 1:2000 and then chlohexidine (Hibitane) obstetric cream 1 per cent.

The examining fingers (the index and middle finger of the right hand) are covered with obstetric cream.

Findings on Vaginal Examination

The vagina. As the midwife passes her fingers through the vagina, she will notice if the pelvic floor muscle (which surrounds the vagina) is firm or lax, and she may note, too, the degree of relaxation of the patient.

The cervix. At the onset of labour, the cervix may still be felt to project into the vaginal vault and the cervical canal may still be

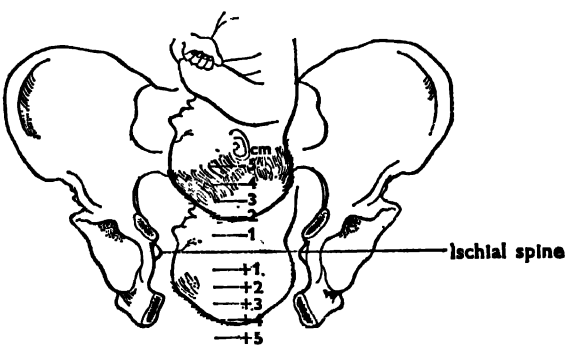


Fig. 109. Stations of the head.

present. Often, however, even before the onset of labour, the cervix is taken up, that is, the cervical canal is effaced and the cervix is no longer felt as a projection but lies flat against the presenting part. The os may admit one or even two fingers. With the establishment of labour, there is progressive dilatation of the cervix and the degree of dilatation is described by the number of centimetres diameter of the dilating cervix; or, by the number of fingers which could lie side by side across the cervical diameter (Fig. 109). As the finger is moved inside the rim of the cervix, the thickness, softness and application to the presenting part should be noted. A tight, unyielding cervix may be associated with a long labour.

The membranes. The membranes early in labour are normally applied closely to the head and may be difficult to feel. During a contraction, the increase of pressure within the uterus will cause the bag of forewaters to become tense and to bulge through the cervix. To avoid rupturing the membranes, pressure should not be applied to the bag of forewaters at this time. If the head is not well applied to the cervix, the bag of forewaters may bulge unduly early in the first stage and early rupture of the membranes may result. This tends to occur with an occipito-posterior position. At the same time, the midwife should realize that with a well-fitting presenting part, that is a vertex presentation with a well flexed head, it may be more satisfactory if the membranes are ruptured, since the round hard head is a more efficient dilator of the cervix than are the membranes.

The presenting part. Normally the smooth, firm, rounded vault of the head is felt. As the cervix dilates, the sutures and fontanelles can be felt more easily. In an occipito-anterior position the posterior fontanelle is found lying anteriorly. In an occipito-posterior position, the anterior fontanelle will lie towards the front of the pelvis. Although dilatation of the cervix makes palpation of the sutures and fontanelles easier, as labour continues and particularly if it is prolonged with the membranes ruptured, the formation of a caput succedaneum may make the recognition of the suture lines and fontanelles difficult or impossible.

Rarely, a prolapsed cord will be felt as a soft loop lying beside or in front of the presenting part and will be pulsating if the child is still alive.

The level or station of the presenting part is determined by noting its relationship to the ischial spines, which are palpable at the sides of the bony pelvis. Progressive descent of the presenting part and progressive dilatation of the cervix are the signs of normal labour.

The bony pelvis. Before and while withdrawing her fingers from the vagina, the midwife should try to find out certain details of the pelvis. It may be obviously roomy, or the fetal head may seem to be a tight fit, with prominent ischial spines or a somewhat narrow pubic arch.

On withdrawing her fingers the midwife again swabs the vulva, and applies a sterile vulval pad.

The midwife should now try to correlate all her findings; on general observation, abdominal examination and vaginal examination. By this, and by reviewing the labour so far, she should be able to make an accurate assessment of the patient's progress, and even a fair forecast of how labour will advance. The patient, now settled comfortably should be told, encouragingly, of her progress.

THE SECOND STAGE OF LABOUR

The character of the contractions in the second stage of labour is different from those in the first stage, since there is, in addition to the uterine contractions, a bearing-down force on the part of the mother to overcome the resistance of the soft parts, vagina, pelvic floor, and external parts.

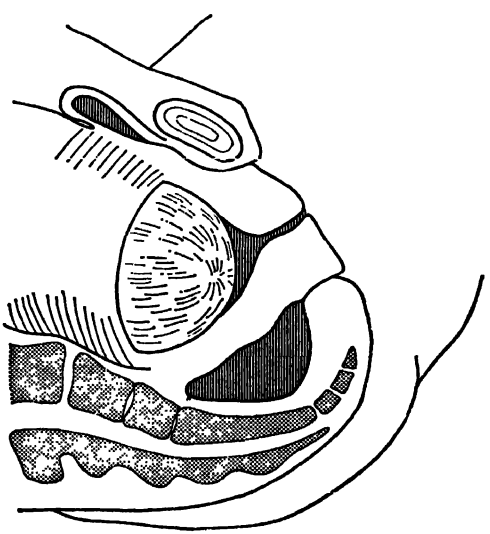


Fig. 110. The cervix is fully dilated and the head enters the vagina.

The voluntary muscles of the chest and abdominal wall act reflexly in concert with the uterine contractions. When the second stage is reached, the patient is compelled to bear down, or push, and says so. Her face becomes congested and she makes a characteristic grunting noise at the height of the contraction. At this stage she is very often relieved at the thought of being able to help to bring about the birth of her baby, instead of lying quiescent. The midwife should be on the alert with a multipara, for sometimes the second stage lasts only a few minutes, and the birth will catch the midwife unprepared.

The midwife, having gained the confidence of her patient, is able to instruct her when to bear down, or push, and when to relax. On the whole it is wise not to encourage pushing. The presenting part will, if the uterine contractions are good, advance steadily. However, should the presenting part be on the pelvic floor, nothing can prevent the patient from bearing down.

It is highly important to note the effect of the second-stage contractions upon both mother and fetus. The maternal pulse rate and fetal heart sounds should, if possible, be checked after every contraction. An increase in the mother's pulse rate will be one of the first indications of some distress on the part of the mother. The increase or decrease of the fetal heart rate may be a cause for anxiety. A slowing fetal heart signifies fetal distress. Later, meconium may be passed. During the first stage of labour the fetus is protected from pressure by the presence of liquor amnii; after the escape of the forewaters, the fetal head is subjected to some resistance from the bony walls of the pelvis and rigid soft parts. A caput may form on the presenting part. It should be borne in mind that the whole of the fetus and the placenta are subjected to intra-uterine pressure.

During the second stage the child is born, assisted by the voluntary efforts of the mother, who will be lying in the left lateral or dorsal position. As the fetal head fills up the cavity of the pelvis the bladder is drawn up into the abdomen, and the rectum and posterior vaginal wall and perineum are pushed downwards as the head advances. (Swingdoor action of the pelvic floor.)

Preparation for Delivery

If the patient is a multigravida, the midwife should prepare for delivery as soon as she suspects the second stage is imminent. The primigravida usually progresses more slowly, and the advancing head may be watched as it appears at the vulva during contractions. Soon after this, the midwife should wash her hands, and put on a sterile gown and sterile gloves.

If the patient is on her side, as the advancing head distends the

perineum, the right thigh should be supported by an assistant. The descending head may cause some faeces to pass from the rectum, especially if the patient has been hurriedly prepared. These should be wiped *away from* and not *towards* the vulva, and the swab must not be used twice.

The patient may complain of cramp in the legs. Cramp is generally relieved by extending the leg and dorsiflexing the foot, that is bending it upwards.

Before the birth takes place the vulva should again be swabbed with an antiseptic, such as chlorhexidine (Hibitane) lotion, 1:2000, followed by chlorhexidine (Hibitane) obstetric cream 1 per cent.

It is now that the true value of the midwife is revealed. If she has taken care to give sufficient relief of pain during the first stage and has explained to the mother what to expect, has told her how labour is progressing and has given her reassurance, the mother can approach the actual delivery with confidence. A woman in the second stage distraught with pain and fear may become almost uncontrollable. Brusque, hurried commands to the mother will only serve further to confuse and frighten her. There are few occasions on which a short explanation cannot be given, and, knowing what is happening, the mother is better able to co-operate. The atmosphere in the labour ward should be calm and unhurried, so that the mother may reflect this calmness and by her behaviour emerge from the labour happy and with her self-respect intact.

The actual management of delivery can be learnt only by experience. Methods vary but the object of all is to control the head to prevent sudden birth which might cause severe laceration of the perineum or intracranial injury to the baby. The delivery should be allowed to proceed slowly and steadily but the head should not be held back so long that although a laceration of the skin is avoided the deeper structures of the pelvic floor are stretched and torn. Subsequent prolapse is more likely in these circumstances than in an episiotomy or a laceration which is correctly sutured.

The advance of the head is controlled and attempts are made to avoid too sudden extension of the head by pressure of the fingers over the occiput until the parietal eminences appear, when the head is said to be crowned. The remainder of the head is now born by extension, the maximum diameter to be born being the sub-occipito-frontal of 10 cm. The birth of the head is best managed by a controlled push by the mother between contractions, the head being restrained by the palm of the hand. During a contraction a direction to the mother to 'stop pushing' will have little effect, since the bearing down is involuntary. Instructions to breathe rapidly in and out using the analgesia apparatus are more likely to be successful.

When the child's head is born the nostrils and mouth may be very gently cleared of mucus.

The fingers should be slipped over the occiput to see if the cord is round the baby's neck. If so, it must be freed, or a loop made large enough for the shoulders to pass through. Failing this, two pairs of artery forceps must be applied 2 to 5 cm apart and the cord cut between them.

The birth of the trunk should not be hurried unless there is some special reason for doing so. The next contraction usually expels it. Be careful not to drag on the baby's head or to press the fingers into its neck when the trunk is being born, and be sure that the shoulders have rotated into the antero-posterior diameter of the pelvic outlet. The anterior shoulder comes down below the pubic symphysis, and the baby's trunk is carried forwards over the mother's abdomen, being born by lateral flexion.

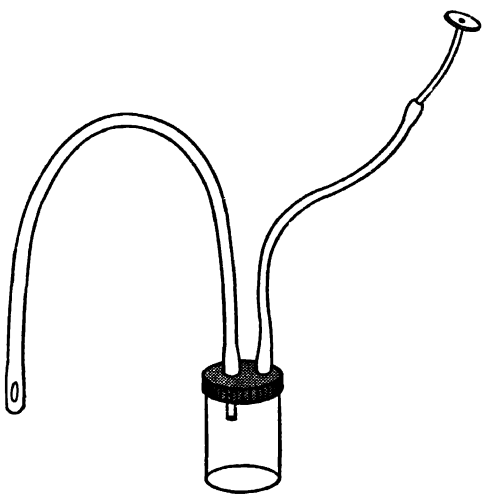


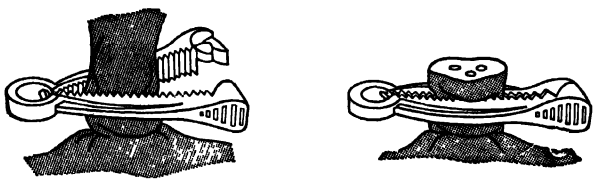
Fig. 111. Mucus extractor.

Special care is needed during the birth of the shoulders. Both shoulders should not be allowed to pass through the outlet at the same time. As previously mentioned, the anterior shoulder should be well down below the pubic arch before the posterior shoulder is allowed to pass over the perineum. The baby's trunk is usually born during a contraction.

The baby should be placed on the bed lying over the mother's left thigh. This helps in the natural clearing of the air passages and

favours expansion of the lungs. In addition, the mother is able to see her baby as soon as possible.

Usually an assistant will clear the pharynx and nostrils of any tenacious mucus, using a mucus extractor. Meanwhile, the cord should be clamped with artery forceps, approximately 7 to 12 cm from the umbilicus. It is cut between the clamps, with blunt-ended scissors, and the cut end is covered with sterile gauze. The second clamp is necessary in case there should be a twin, which might lose blood from the placenta if it shared a common one. Alternatively, Hollister plastic



Open Closed

Fig. 112. Cord clamp (open and closed).

cord clips may be used. An identification band is checked by the mother and midwife and put on the baby's wrist in view of the mother. He is wrapped in a warm sterile towel and the mother may now hold him in her arms for a few moments.

He is then put in a warmed cot lying on his right side. Usually the cot is horizontal, but if the airways are still not clear of debris the head of the cot may be slightly lowered. The baby's respiration is closely watched. If necessary, further mucus extraction is carried out.

The cord, too, must frequently be inspected. Even with a clamp, which is much more secure than a ligature, the cord might bleed. It must be realized that the loss of 30 ml of blood from the baby is equivalent to a 600 ml loss in an adult. Therefore a relatively small loss of blood from the cord may cause serious illness or even be fatal to the new-born child.

THE THIRD STAGE OF LABOUR

The third stage of labour is the most hazardous for the mother because of the possibility of haemorrhage.

Mechanism of Placental Separation

Certain physiological changes take place and investigation has shown

that the placenta usually separates with the contraction following the birth of the head. The placental site diminishes in size, as a result of the contraction and marked retraction of the uterus. The placenta, being inelastic and therefore larger than the contracted placental site, becomes wrinkled and is pushed off the uterine wall, usually from the centre first. Blood tends to collect behind the placenta and form the retro-placental clot, this further helps to shear it off the uterine wall.

When separation is complete, the upper uterine segment contracts strongly, forcing the placenta into the lower segment and then into the vagina. The patient, using her diaphragm and abdominal muscles, expels the placenta from the vagina and the third stage is complete.

Detachment of the membranes begins in the first stage of labour, when separation occurs around the internal os. In the third stage complete separation of the membranes takes place assisted by the weight of the placenta, which peels them from the uterine wall.

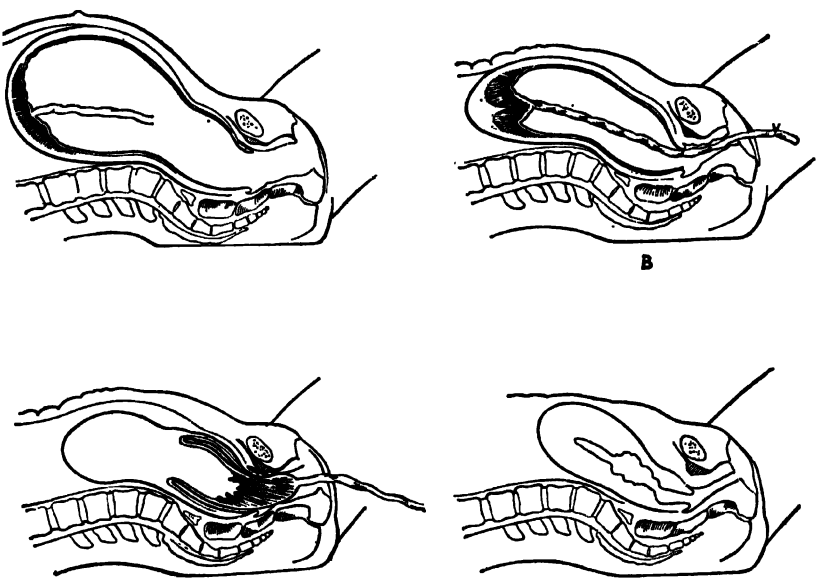


Fig. 113. A, Placenta before the child is born. B, Placenta immediately following birth of the child: it is partially separated. C, Placenta completely separated and descends to the vagina. D. Placenta expelled. Uterus strongly contracted and retracted.

The placenta may appear fetal side first (Schultz expulsion) rather like an inverted umbrella; or if the placenta was low lying it may slide down the uterine wall the maternal surface appearing first (Matthew Duncan expulsion), this latter is usually accompanied by bleeding as a retroplacental clot does not form.

The arrest of haemorrhage is caused by:

The constriction of blood vessels by contraction of the interlacing muscle fibres.

The clothing of blood at the placental site, in the sinuses and torn blood vessels.

Management of the Third Stage

At the end of the second stage the patient is turned into the dorsal position, a receiver is placed close to the vulva to catch any blood and liquor which may escape from the vagina. A piece of dry sheet is pulled, beneath the buttocks and a warm covering placed over the chest. The patient often complains of cold and shivers at this time following the exertion of the second stage.

The midwife should check that the bladder is empty. Catheters should be ready on the delivery trolley, but should not be used unless really necessary. The method of delivery of the placenta varies.

Active Management of the Third Stage

Active management of the third stage has led to:

A marked reduction in post partum haemorrhage.
A shortening of the third stage.
A slight increase in the incidence of retained placenta.

According to preference, either ergometrine maleate 0·5 mg or Syntometrine 1 ml is given with the crowning of the head or the birth of the anterior shoulder. This causes contraction of the uterus. As the contraction occurs, the ulnar border of the left hand is placed on the uterus just above the symphysis pubis and used to push the uterus upwards towards the umbilicus. At the same time, the cord is twisted around the right hand and gentle traction is exerted, at first towards the bed and then towards the ceiling (anatomically backwards, then forwards). This is sometimes called the modified Brandt-Andrews technique, after two American obstetricians who recommended it. The membranes are delivered either by twisting the placenta to form a rope, or grasping them with sponge-holding forceps and moving

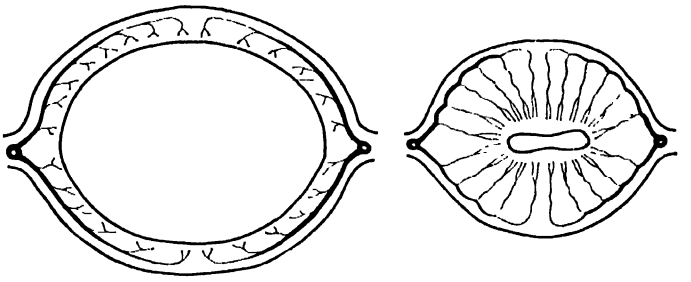
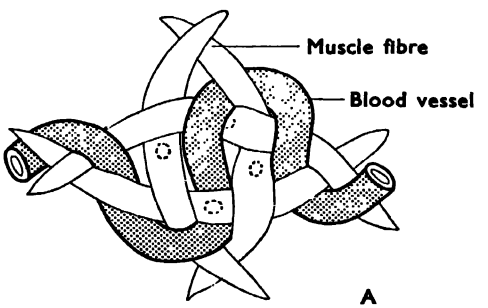


Fig. 114. Transverse section of the uterus. A, Relaxed, before third stage. B, Contracted and retracted, after third stage. Blood vessels compressed and bleeding arrested.



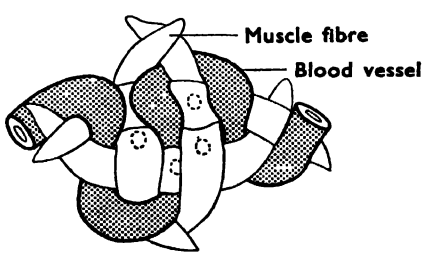


Fig. 115. Diagram to show how the blood vessels run between the interlacing muscle fibres of the uterus. A, Muscle fibres relaxed and blood vessels not compressed. B, Muscle fibres contracted, blood vessels compressed and bleeding arrested.

them gently up and down to free them. Great care must be taken to avoid tearing the membranes.

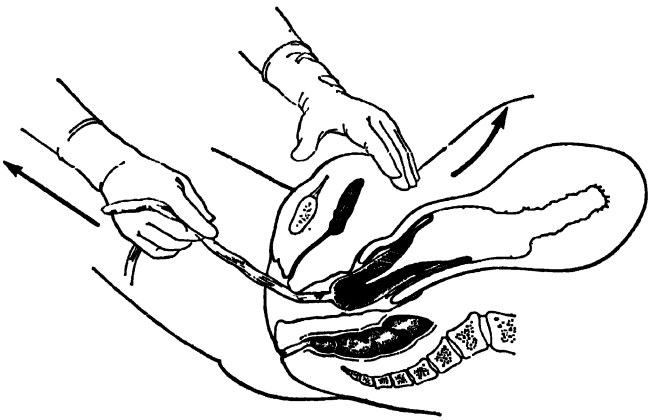


Fig. 116. Controlled cord traction.

Traditional Management

This method is used less and less and it allows the placenta to separate and descend without any interference.

The ulnar border of the left hand is placed above the fundus and the thumb very lightly over the upper anterior surface of the uterus. This is not to 'control the uterus' as is often thought, but to note the condition of the uterus, and make sure that it is not contracting and not filling up with blood. The midwife stands quietly watching the patient's colour and avoiding manipulation of any kind. The abdominal wall is so relaxed, that when the patient is not obese the left hand on the uterus can feel the aortic pulse.

The following signs are awaited, usually some 20 minutes later:

Sign of separation— Bleeding.
Signs of descent — The uterus is smaller and rounder.
The fundus rises, is harder and more freely mobile.
The cord lengthens.

Once descent has occurred the placenta can be delivered.

Expulsion of the Placenta

By the patient's own efforts. The midwife having ascertained that the

uterus is still contracted, asks the patient to push as she did during the baby's birth. She may be successful in expelling the placenta, but often her abdominal muscles are not strong enough.

In this case, the midwife may put a hand flat on the patient's abdomen while she pushes, thus providing counter-pressure to compensate the poor abdominal muscle tone.

By fundal pressure. If the patient fails to expel the placenta this alternative may be adopted. The patient relaxes, the midwife puts her left hand on the fundus of the well-contracted uterus, and pushes downwards and backwards. The uterus is pushed against the placenta and the placenta emerges from the vagina. This action is similar to pushing the piston of a syringe against the fluid in the barrel, which in turn is forced out of the syringe.

These methods have the disadvantage that the uterus is pushed down and its supporting ligaments are stretched. Fundal pressure, particularly in unskilled hands, may cause the patient considerable pain.

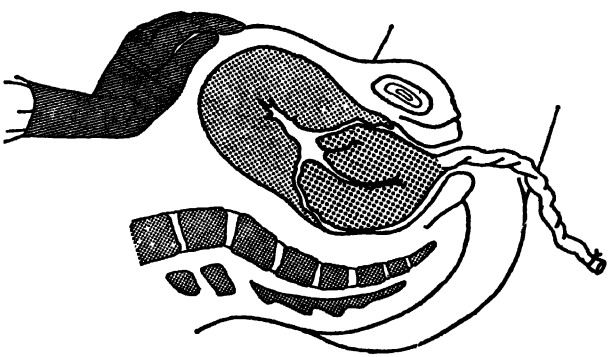


Fig. 117. Expulsion of placenta by fundal pressure.

Oxytocic Drugs

These are drugs which stimulate the uterus to contract. Used before, during and after the third stage of labour they hasten separation of the placenta and diminish blood loss.

Midwives may use the following oxytocic drugs:

Intramuscular ergometrine 0·5 mg. This will cause strong sustained contraction of the uterus within 7 minutes.

Intramuscular ergometrine 0·5 mg with hyaluronidase 1000 units this hastens absorption, the ergometrine takes effect in about 4 minutes.

Intramuscular Syntometrine (1 ml contains 0·5 mg ergometrine and 5 units of Oxytocin). The syntocinon fraction acts within 2 minutes and the uterus contracts very strongly. Though the effect wears off, the ergometrine maintains strong uterine contraction for 2 hours or more.

Any of these drugs may be given by a midwife, either routinely or where bleeding is a little excessive. They may be given at the crowning of the head, at the birth of the anterior shoulder, during the third stage, or after the third stage.

They do undoubtedly decrease blood loss, and are thus extremely valuable to the midwife who may use them in normal circumstances or, in post-partum haemorrhage while awaiting the doctor or flying squad.

These drugs have minor disadvantages. They may, by causing the contracting uterus to squeeze blood into the systemic circulation, slightly raise the blood pressure. Sometimes they appear to cause the placenta to be retained. However, if the drug had not been given, the patient might instead have had a severe post-partum haemorrhage, a much more disastrous occurrence.

After the Third Stage

The midwife must first make sure that the uterus is firm and well contracted. The perineum, vulva and vaginal walls must be inspected in a good light in case there are any lacerations to be repaired. This examination must be very gentle, but thorough. The midwife must call a doctor to repair any laceration except a small nick or crack of the skin.

The vulva and perineum are now gently cleaned with warm antiseptic lotion, a sterile vulval pad is applied, the soiled linen is removed and the patient is made comfortable. She will naturally be anxious to see her baby and she may now cuddle him for a few minutes. Usually, too, she will appreciate a cup of tea.

Meanwhile the midwife must make a careful examination of the placenta and membranes.

Examination of the Placenta and Membranes

Wash the placenta, in running water, remove the clots, and then hold it up firmly by the cord to see if the membranes are complete. If so, there will be one hole through which the fetus has passed. Then strip

the amnion from the chorion and see if both membranes are present. Next, turn the placenta over, with the fetal surface resting upon the hand, and let the membranes hang over the forearm, so that the position that the placenta occupied in the uterus may be seen (Fig.

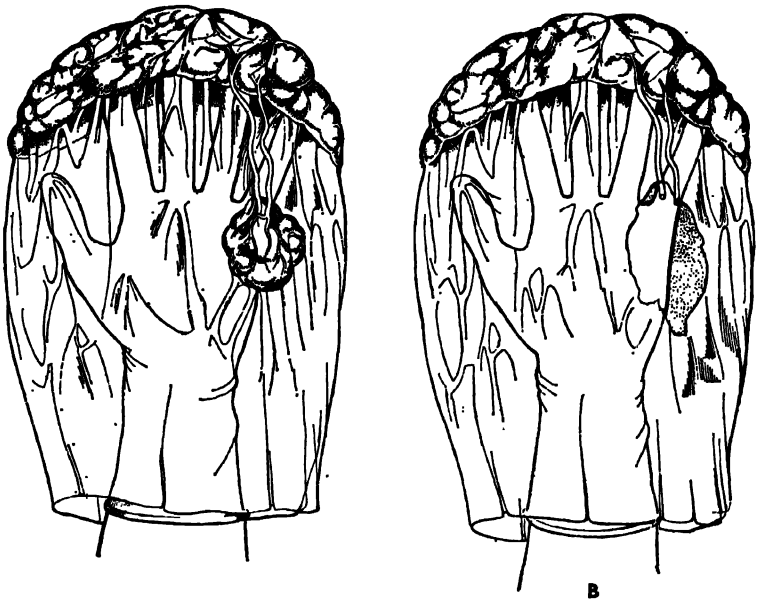


Fig. 118. A, Succenturiate placenta. B, Torn membrane. The missing lobe is in the uterus.

118). Examine the maternal surface and see if all the lobes are complete. Notice if the maternal surface seems ragged. If all the lobes are present there will be no spaces whatever. Then examine the edge to see if any blood vessels run into the membranes; if so, they lead to a *placenta succenturiata*, or accessory placenta, which has developed away from the main placenta. Occasionally one vessel only is seen, which comes back into the placenta; this is called an erratic vessel.

It is important to report to the doctor immediately if it is thought that a piece of placental tissue has been retained. The midwife must not leave her patient, for she may have a severe haemorrhage at any time while it remains in the uterus. If the membranes are ragged and it is thought that a portion of them is retained, it should be recorded

on the case papers and the doctor should be informed. The retained membrane is passed spontaneously within a few days.

Completion of Care During Labour

The mother's temperature, pulse rate and blood pressure should all be within normal limits at the end of labour. She should be given an opportunity to pass urine, and the uterus should be massaged and any blood-clot expelled. It cannot be too strongly emphasized that during the hour or so before the patient is transferred to the lying-in ward (and indeed, after her transfer) the midwife should frequently feel the uterus to ascertain that it is well contracted.

During the same period, the baby should be closely observed. The midwife must note his colour and respiration, and be prepared to clear the air passages of mucus a second and even a third time. She should also inspect the umbilical cord at frequent intervals to be certain that the clamp is in place and that there is no bleeding.

Remember, too, that after he emerges from the warmth of the mother's uterus, the baby can easily become chilled. The cot should therefore be warm and the baby should be exposed as little as possible.

In domiciliary practice the midwife must not leave until 1 hour after delivery. In practice she is unlikely to do so, as the clearing up, attending to the mother and baby will take longer than this. In most cases she leaves behind her one dose of an analgesic and one dose of ergometrine, with clear instruction that if the patient is in pain she takes the analgesic. If she starts to bleed she takes the ergometrine and sends someone to telephone the midwife. The midwife pays a return visit a few hours later to check her condition is satisfactory.

Records

Whether in hospital or domiciliary practice a complete and correct account of labour must be kept, with particular reference to blood loss, the condition of mother and child at the end of labour, the birthweight and sex of the baby. Finally, she is required to notify the birth within 36 hours to the Medical Officer of Health in the area in which the baby was born. This is not the same as registration of birth made by the parents within 42 days of childbirth.

Further Reading

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25. COMPLICATIONS OF THE FIRST AND SECOND STAGES OF LABOUR

Abnormal uterine action

At the present time the cause of the onset of labour is not known, but once begun, labour proceeds as an involuntary process. In the normal case with good uterine contractions, the dilatation of the cervix in the first stage and the expulsion of the child in the second stage proceed steadily, and in most patients labour is completed within 16 to 18 hours.

Hypotonic Uterine Action

Occasionally the first stage of labour is prolonged beyond 24 hours. Such prolongation may be associated with weak, short, infrequent, and irregular uterine contractions. The contractions are not associated with much pain. The uterus relaxes normally between contractions. The weakness and infrequency of the contractions may make it difficult to be certain that labour has really begun. This hypotonic uterine action as it is called, may continue during part, or sometimes the whole of the first stage. Nearly always in the second stage, normal contraction and retraction occurs and a normal delivery and third stage follow, without excessive bleeding. This is quite different from uterine exhaustion in which the uterus after contracting strongly for a time becomes exhausted, ceases to contract, and loses the power of retraction. A fully developed condition of uterine exhaustion is rarely, if ever, seen now. Before this state is reached, help will have been given. For example, in the second stage of labour with weakening contractions and no advance, the mother is delivered by forceps. The prophylactic use of ergometrine with the birth of the baby will usually cause the uterus to contract and prevent a post-partum haemorrhage.

Inco-Ordinate Uterine Action

Prolongation of labour can be associated with contractions which cause much pain in the lower abdomen and back, and yet the cervix dilates only very slowly. The uterus may feel firm even between contractions. A number of names are given to varieties of this condition which describes its various aspects. Because of the prolonged firmness and high tone, the uterus may be described as hypertonic. The severe pain may cause the term colicky uterus to be used. The slow dilatation of the cervix may be called rigid cervix. It is probable that in this condition the rhythm of the uterine action is disturbed occurring irregularly so that little dilatation of the cervix is achieved. It is therefore best described as inco-ordinate uterine action.

Causes. The efficient action of the uterus may be influenced by several factors. The majority of patients whose labours are thus prolonged are primigravidae. The birth of the first child alters the birth canal and subsequent deliveries are easier. With an occipito-posterior-position of the vertex, or when disproportion exists or a malpresentation is present, the presenting part may remain high and may not fit down into the lower segment and hypotonic uterine action may follow. Finally, undue anxiety on the part of the mother appears sometimes to cause inco-ordinate action of the uterus.

Dangers. Prolongation of labour is harmful to both mother and fetus. The mother suffers from the anxiety and the pain of the prolonged labour, she cannot take much food and drink and may not obtain adequate sleep. A condition of mental and physical exhaustion will finally result. The mother may develop an intra-uterine infection, especially if the membranes ruptured early, while post-partum haemorrhage may occur because the tired uterus cannot contract strongly. How much mental trauma the patient sustains we are not able to assess.

Quite often early rupture of the membranes will occur, and the liquor drains away. The uterus contracts, and with each contraction there is a temporary reduction of the blood supply to the placental site, and so of oxygen to the baby. If labour is sufficiently prolonged the child will begin to suffer from lack of oxygen (*hypoxia*). This will be indicated by slowing of the fetal heart rate (below 120) and possibly by the passage of meconium. The death of the fetus in utero may follow. With long ruptured membranes the fetus may be born with an infection acquired in utero. In labour lasting over 36 hours the perinatal death rate is much greater than in normal labour.

Management of prolonged labour. A prolonged labour is defined as a labour lasting for more than 36 hours. The midwife should regard a labour lasting for more than 18 to 20 hours as abnormal and should remember how dangerous it is to the fetus. It is essential that any cause should be discovered. All the factors of the labour should be assessed, namely, the nature of the contractions, the presentation and position of the fetus, and the size of the pelvis. Twins and hydramnios rarely prolong labour. It may be due to a malpresentation, and sometimes the cause is a minor degree of disproportion because the fetus is large or the pelvis slightly contracted; but the commonest cause of all is an occipito-posterior position with a deflexed head. The abdomen should be examined frequently to note whether or not the presenting part is descending. If not, a doctor should be called. Similarly if the midwife should note any increase in the maternal pulse rate, or any change in the rhythm of the fetal heart sounds she should quickly call a doctor, since immediate delivery is necessary, in the first stage by Caesarean section, in the second stage by forceps or ventouse extraction. However, provided that there is progressive descent of the head into the pelvis and progressive although slow dilatation of the cervix, and that the condition of mother and baby remain satisfactory, normal delivery may occur. The midwife's duty in those circumstances is to ensure that early in labour the patient has sufficient nourishment and fluid. At night the patient must sleep, and pain must be relieved by means of analgesic drugs; the midwife must call in a doctor if the drugs available to her are not strong enough. She should try to get the patient to pass urine frequently, since, preferably, the bladder should not become distended, though on the other hand, catheterization is dangerous and to be avoided whenever possible. Every specimen of urine should be tested for acetone. If it is found, a doctor should be called, as the patient needs an intravenous infusion of dextrose. The patient should be made comfortable by washing, combing her hair, and cleaning the teeth. She should be kept occupied, and it should not be forgotten that explanation and kindly advice to the patient will go far to disperse her fear of the unknown.

After the prolonged first stage the second stage may be completely normal, in which case the third stage, too, may be normal; or the second stage may be prolonged and delivery by forceps become necessary. There is then a risk of post-partum haemorrhage, so when forceps delivery is performed, the doctor almost always gives an intravenous injection of 0·5 mg ergometrine maleate, as the child's anterior shoulder is being born.

Precipitate Labour

Labour is sometimes very rapid and the child is born before an attendant can reach the patient. This is much more common in the multiparous mother. The first stage of labour has probably occurred almost without pain, and only when the head is about to be born does the mother become aware of it. Occasionally the baby is born before the mother can sit down and the child may fall to the ground, the cord breaking, usually at some distance from the umbilicus. Another form of precipitate labour results from excessively strong uterine contractions which follow one another in rapid succession. In such a case fetal hypoxia may occur, as the almost continuously contracted uterus limits the circulation of blood to the placental site. As a result of the rapid birth the child may sustain a tentorial tear and die from intra-cranial haemorrhage. To avoid such a happening, it is usual to admit to hospital some days before her baby is due a mother who is known to have had precipitate labours.

Tonic Contraction of the Uterus

This term describes a condition in which part or the whole of the uterus remains contracted for a prolonged period, and spasm of the uterus occurs. In the partial form a ring of muscle undergoes spasm and is known as a constriction ring; it cannot be felt abdominally, but is diagnosed when the doctor is about to deliver the baby by forceps, or to deliver the placenta manually.

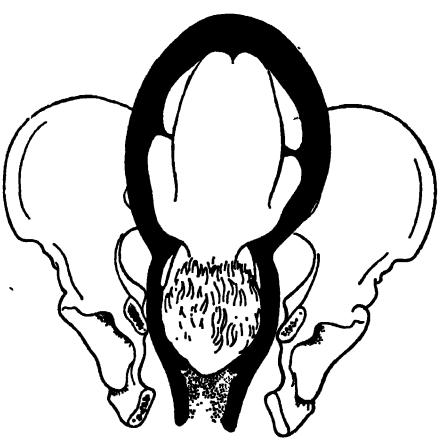


Fig. 119. Constriction ring.

The most common form of a constriction ring is the **hour-glass constriction** which forms in the third stage and results in a retained placenta, and this will be described more fully in the chapter on the abnormal third stage. It is rare for a constriction ring to form in the first or second stage of labour, but if it does form in the second stage it may be difficult to deliver the mother by forceps. The ring may relax if anaesthesia is deepened. A constriction ring is entirely different from Bandl's retraction ring, which is described in the section on obstructed labour (page 299).

Very rarely indeed, general tonic contraction of the uterus occurs. It may happen if, late in labour when all the liquor has drained away, labour is not progressing favourably and attempts are made to stimulate the uterus or to deliver the mother by forceps. The continuous contraction of the uterus is accompanied by continuous severe pain and rapid deterioration in the condition of the mother, and intra-uterine death occurs, since the circulation of blood in the placenta is greatly decreased. The mother must be delivered by forceps under deep anaesthesia, or by Caesarean section.

Malposition and Malpresentation of the Fetus

The normal presentation of the fetus is cephalic in an attitude of flexion so that the vertex presents. If any other part of the fetus presents, or if the head presents in an extended (face) or partly extended attitude (brow), a malpresentation is present.

The possible malpresentations are:

The breech.
The face, when the head is fully extended.
The brow, when the head is midway between flexion and extension.
The shoulder.

An occipito-posterior position of the vertex, strictly, a malposition, though sometimes called a bregmatic presentation, will be described under this heading as the course of labour may be abnormal.

There are certain complications of labour which may occur whatever the type of malpresentation. The presenting part may not be engaged in the pelvis or its outline may be irregular. Because of this the bag of forewaters is in communication with the hindwaters, and with each contraction of the uterus the bag of forewaters is forced through the cervix so that it ruptures early. Hypotonic uterine action and prolongation of the first stage often occur if a malpresentation is

present. The combination of early rupture of the membranes and prolonged labour may cause fetal hypoxia or anoxia. The cord may prolapse if the membranes rupture with the presenting part above the brim and this is an additional hazard to the fetus.

With some malpresentations spontaneous delivery is impossible, for example with a shoulder, brow, or a face in the mento-posterior position. These abnormalities, if uncorrected, will end in obstructed labour and ultimately cause the death of the fetus; and of the mother from exhaustion or rupture of the uterus. Finally it should be remembered that the malpresentation may have been caused by disproportion between the size of the pelvis and the size of the fetus and that normal delivery may be difficult even after correction of the malpresentation.

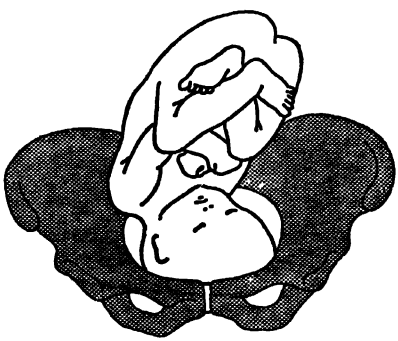


Fig. 120. Right occipito-posterior position.

Fig. 121. Left occipito-posterior position.

Occipito-Posterior Position

An occipito-posterior position is a malposition of the vertex presentation. It is common, occurring in about 10 per cent of all labours, most of which end normally. It is, however, the commonest cause of prolonged labour and of mechanical difficulties associated with delivery.

Occipito-posterior positions throw a heavy responsibility on the midwife. Where the labour is progressing satisfactorily she may be looking after the patient, either in hospital or at home, without a doctor. Thus she must be alert to recognize promptly any complications which may arise, and to call assistance. Where progress is slow, even though the obstetrician is in charge she has the exacting task of maintaining a close watch on the progress the patient is making, attending to her physical care and, at the same time, providing the encouragement, reassurance, sympathy and moral support that the patient needs during the course of a tedious and painful labour.

The chief problem in occipito-posterior positions is that the fetus tends to be in a deflexed attitude, with the anterior fontanelle immediately over the internal os. For this reason it is sometimes called bregmatic presentation.

Normally the fetus lies in a round-shouldered attitude, head flexed and chin on chest, so that he forms a compact ovoid shape. The rounded back bulges forward into the mother's abdomen and the flexed head engages easily, fitting into the pelvis as neatly as an egg into an egg cup. In labour it fits the lower uterine segment accurately and presses evenly on the cervix, stimulating good contractions and facilitating dilatation. During birth, the smallest possible diameters stretch the pelvic floor and perineum, while, if moulding occurs, the fetal head is squeezed in the most favourable diameters, so that there is little risk of birth trauma.

In contrast, in the occipito-posterior position, the fetal spine is towards the forward curve of the maternal lumbar spine, so that flexion is easily undone. As the fetal spine straightens, he tends to 'square' his shoulders and raise his chin from his chest, thus adopting an erect or 'military' attitude. This brings the head into a more difficult relationship with the pelvic brim, like an egg put sideways on an egg cup. It sits insecurely above the pelvic brim, being slow to engage as larger diameters present. Contractions are not effectively stimulated, descent is delayed, dilatation is uneven and slow, while during birth the larger diameters are liable to cause severe tearing of the vagina and perineum. The fetal head is compressed in unfavourable diameters, with a greater risk of tearing of the tentorium cerebelli and consequent intracranial haemorrhage.

The cause of occipito-posterior position is not satisfactorily explained and though, in pregnancy, the diagnosis may present no problem, it is not possible to forecast accurately the course of labour.

Occipito-posterior position in pregnancy. The diagnosis is made by abdominal examination. On inspection, the abdomen appears flattened, or slightly depressed, below the umbilicus. On palpation, the fetal head is high. Occipito-posterior position is the commonest cause of a non-engaged head in late pregnancy in a primigravida. If

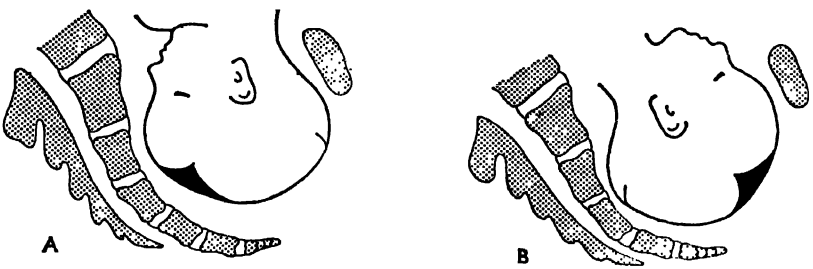


Fig. 122. Position of the anterior and posterior fontanelles. A, Occipito-anterior; and B, occipito-posterior positions.

the fetus is almost occipito-lateral, the deflexed head may feel large, because the occipito-frontal diameter is palpated, while the fetal back can be palpated out in the flank. If the occiput is markedly posterior, the high head feels small, since it is palpated near the bi-temporal diameter; fetal limbs are felt as small knobs on both sides of the uterus, and it may be impossible to feel the back. The fetal heart sounds are often heard just below the umbilicus, while if the heart sounds are audible in one flank, it suggests that the child's back is directed to that side.

Occipito-posterior position in labour. The diagnosis may be made by abdominal examination, as described above, though now the head may be flexed and engaged. In this case, a prominence, the sinciput, can be felt above the pubic bone, usually on the left side.

On vaginal examination, palpation of the anterior fontanelle is almost diagnostic. When the head is flexed, it is felt towards the front of the pelvis, while occasionally the posterior fontanelle is just within reach at the back. With a deflexed head, the anterior fontanelle is almost central and, unless obscured by caput, easily recognized by its shape and size.

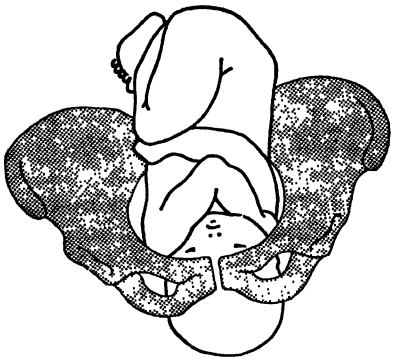


Fig. 123. Birth of head in persistent occipito-posterior position. Flexion whereby the occiput is born.

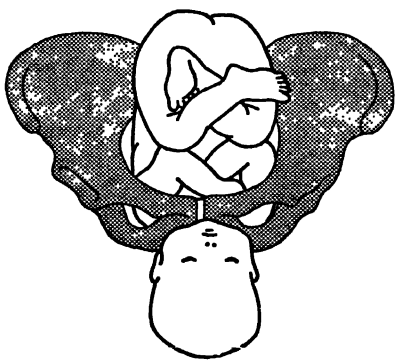


Fig. 124. Extension: birth of face and chin.

Progress in labour may be summarized thus:

If the head is flexed, labour will probably be completely normal. The occiput touches the pelvic floor first and rotates anteriorly, through three-eighths of a circle and the baby is born with the occiput anterior.

If the head is deflexed, flexion often improves. The deflexed head tends to remain high, or to take some time to engage. Labour is slow to become established. Once the head becomes flexed, labour is usually speeded up and continues normally, with a long internal rotation and an occipito-anterior birth.

If the head remains deflexed, labour is likely to be prolonged and

painful, backache being a prominent characteristic. The sinciput may be the leading part which touches the pelvic floor first and rotates anteriorly through one-eighth of a circle. This brings the sinciput under the pubic arch and the occiput into the hollow of the sacrum. With good contractions spontaneous delivery occurs. This is called the persistent occipito-posterior position or face to pubes delivery.

If the head is high and deflexed it may partially extend, so that the brow presents. It may extend completely and result in a face presentation.

Complications

Prolapse of the cord. As with any ill fitting presenting part the membranes tend to rupture early and the cord may prolapse.

Prolonged labour, with the development of either fetal or maternal distress.

Management

If problems arise in the first stage the midwife should without delay, call a doctor. However, the head may become engaged and the first stage can, in slow and tedious fashion, progress to full dilatation, mother and baby remaining in good condition.

Even in the second stage, the outcome is not predictable. In about two-thirds of occipito-posterior labours long internal rotation to an occipito-anterior position occurs and, in most of these cases, normal delivery ensues. In the remaining third, the sinciput is leading and the occiput remains persistently posterior. Given good contractions delivery takes place face to pubes.

If the contractions are not strong enough to effect delivery, the midwife should call a doctor as soon as she realizes that the head is not advancing. The doctor will probably rotate the fetal head, either manually or with Kjelland's forceps and perform a forceps delivery. He may, perhaps, carry out a Ventouse vacuum extraction.

The fetal head may attempt a long rotation, but become caught in the transverse diameter of the outlet, between the ischial spines, should they be unduly prominent. This is called deep transverse arrest and the head cannot progress further. It is to be suspected if after ½ hour in the second stage (less in a multigravida) the head is not visible at the vulva.

The midwife should make a vaginal examination when she will find the sagittal suture extending transversely across the outlet, with a fontanelle at each end, close to the ischial spines. A doctor must be called

at once, and he will perform a Kjelland's or a manual rotation of the head and a forceps delivery.

The midwife should remember that posterior position of the occiput is a frequent cause of delay in the second stage of labour. It is essential that she watch progress closely in order to recognize promptly when the presenting part is not advancing. She should not hesitate to call medical assistance, since immediate delivery is probably in the best interests of both mother and child.

The detailed nursing care is described on page 270.

Breech Presentation

Breech presentation is one in which the fetal buttocks, with or without the feet, lie lowermost in the maternal uterus. Four types are described:

The complete or flexed breech (Fig. 125B). The fetus sits tailorwise

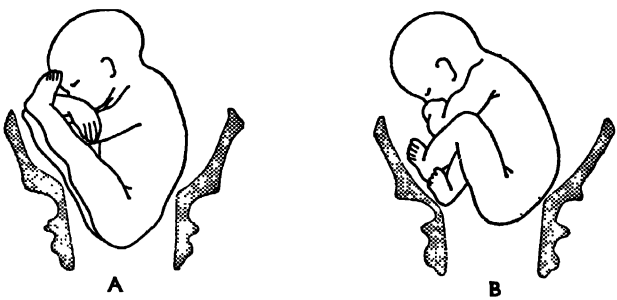


Fig. 125. A, Breech with extended legs. B, Flexed breech.

over the pelvis, the legs flexed and the feet close to the buttocks. This type is commonest in a multigravida.

The incomplete breech. The breech with extended legs, or frank breech (Fig. 125A). The fetal thighs are flexed, but the legs are extended at the knee and lie alongside the trunk, the feet being near the head. This is the commonest type of breech, occurring in almost all primigravidae and in some multigravidae.

The footling presentation, with one or both feet below the buttocks.

The knee presentation. The fetus lies with one or both knees below the buttocks. These two varieties are uncommon.

Breech presentation occurs in about 2½ per cent of deliveries, that is, one birth in forty. The cause of breech presentation is not entirely clear. At the twenty-eighth to thirtieth weeks of pregnancy the

breech has been noted to present in one out of every four women examined, but by the thirty-fourth week most of these fetuses have turned, so that the vertex presents. Thus, if a woman has a premature labour, we are not surprised to find the breech presenting.

If the fetus has failed to turn spontaneously by the thirty-fourth week, we may assume that something has prevented this. The legs may be extended or there is insufficient liquor, and movements may be restricted. A mass such as a low lying placenta or fibroid prevents the head from fitting into the lower segment. If there are twins in the uterus they may present, vertex and breech, like a pair of shoes in a box, fitting so closely that spontaneous version is unlikely. On the other hand, in grande multiparity and hydramnios, the fetus is so unstable that any malpresentation is possible. In a good many cases, there is nothing whatever to account for the fact that the breech presents.

The diagnosis is made chiefly by abdominal examination. Though inspection reveals nothing unusual, on palpation the presenting part feels firm, but not 'bony' hard, and less rounded than the head. The diagnosis is made by feeling the head, hard, round and ballottable in the fundus of the uterus. Often the patient complains that this hard, round object causes her discomfort, and the diagnosis may be very easy and obvious. It is more difficult, however, if the legs are extended and the breech is deep in the pelvis. Thus the presenting part is nearly out of reach of the midwife's palpating fingers, and can be mistaken for the deeply engaged head. The baby's feet, lying under the chin, so immobilize the head that ballottement cannot be elicited. The placenta may lie on the anterior uterine wall and still further obscure the head. The fetal heart sounds, classically 'above the umbilicus' in breech presentation, may well be heard at maximum intensity at the supposedly 'vertex' point: halfway between the anterior superior iliac spine and the umbilicus.

The midwife should be aware of these deceptive findings, and, unless she is certain that the vertex presents, she should be cautious and ask a doctor to see the patient. He, too, may be in doubt. He will then have the patient X-rayed in order to be certain.

Dangers. Breech delivery is not particularly dangerous to the mother, but to the fetus it is a serious hazard. It will be recalled that in vertex delivery the fetal head enters the bony pelvis either before, or soon after labour begins. It is gradually compressed, moulds by slow degrees and, finally, emerges slowly, the pressure being gradually released. Once the head is born, the baby can breathe and, indeed, sometimes does so before the shoulders emerge.

In breech delivery, however, the fetal head does not approach the

maternal pelvis until after the thorax and arms are born, while less than 10 minutes later the head is born. In these few minutes it is submitted to such rapid compression that gradual moulding is impossible, as it passes swiftly through the entire birth canal, with an equally sudden release of pressure as it emerges. This puts a tremendous strain on the tentorium cerebelli and its contained and adjacent blood vessels, so that there is a serious risk of intracranial haemorrhage from this rapid passage of the head. This is the major hazard.

On the other hand, the slower the birth the more likely is the fetus to be deprived of oxygen. As the after-coming head enters the pelvis it inevitably compresses the cord; this lack of oxygen continues and while the fetal head is still in the vagina, the hypoxia can stimulate breathing. As a result liquor, blood or mucus may be inhaled, so that after birth it is difficult or impossible to clear the air passages and initiate normal breathing. This is a lesser, but still serious risk.

Even in the most skilful breech delivery it is impossible to avoid these two dangers entirely, and there is a mortality of 3 to 4 per cent. In unskilled hands, it is much higher, additional dangers being fractures, rupture of abdominal organs and injury to nerves.

These grave risks must be borne in mind whenever a breech presentation is seen.

Management in Pregnancy

If, at the thirty-second week, the midwife finds, or even suspects, that the breech presents, she should then have the patient seen by an obstetrician. He will study the patient's notes, examine her carefully and, probably decide at the thirty-fourth week to perform an external cephalic version, i.e. by manipulation through the abdominal wall, to convert the child from a breech to a vertex presentation.

For this manoeuvre, the patient, her bladder empty, lies flat on a couch, while the midwife chats with her to reassure her and to aid relaxation. The fetal heart sounds are counted and some talcum may be sprinkled on the abdomen. Usually the obstetrician tells her what he proposes to do, though sometimes the version is so easily accomplished that the child is turned without the patient's realizing it.

The obstetrician will move the breech gently towards one iliac fossa, at the same time guiding the head to the other side. He maintains this gentle pressure, moving breech and head, a little at a time, until the head lies over the pelvis and the breech is in the fundus. The fetal heart is listened to frequently during the manoeuvre and the vulva is exposed for evidence of bleeding or liquor draining.

The whole procedure should be calm and unhurried. The doctor will not use force, his aim being only to turn the child if it can be done gently. If the patient cannot relax, she may be given an anaesthetic, solely to achieve relaxation.

Version is not attempted in hypertension, twins, antepartum haemorrhage, if the fetus is dead, or if the woman has ever had a Caesarean section.

If version is successful, the presentation is checked weekly. Usually the vertex continues to present. If it is unsuccessful or contra-indicated, the doctor will make a decision between breech delivery and Caesarean section. A breech delivery is planned only if, on X-ray pelvimetry, the patient's pelvis is perfectly adequate and there are no other problems associated with her labour.

Mechanisms

There are six positions in breech presentations. The denominator is the sacrum, and its relationship to the maternal pelvis determines the position. The positions are the same as the vertex presentations, substituting the sacrum for the occiput.

Left sacro-anterior position (*LSA*). The sacrum points to the left ilio-pectineal eminence and the abdomen and legs are directed towards the right sacro-iliac joint. The left buttock is anterior, and the bitrochanteric diameter is in the left oblique diameter. The natal cleft is in the right oblique diameter. A caput may form on the left buttock and on the genitals.

Right sacro-anterior position (*RSA*). The sacrum points to the right ilio-pectineal eminence, and the abdomen is directed towards the left sacro-iliac joint. The right buttock is anterior.

Left or right sacro-lateral (*LSL, RSL*). The sacrum is towards the left or right side of the pelvis.

Left or right sacro-posterior (*LSP, RSP*). The sacrum points to the left or right sacro-iliac joint, and the abdomen towards the right or left ilio-pectineal eminence.

Mechanism of Labour of a Breech in the Left Sacro-Anterior Position

Birth of the Buttocks

Descent. The breech engages with the bitrochanteric diameter (10 cm) in the left oblique diameter of the pelvic brim and descends into the pelvic cavity.

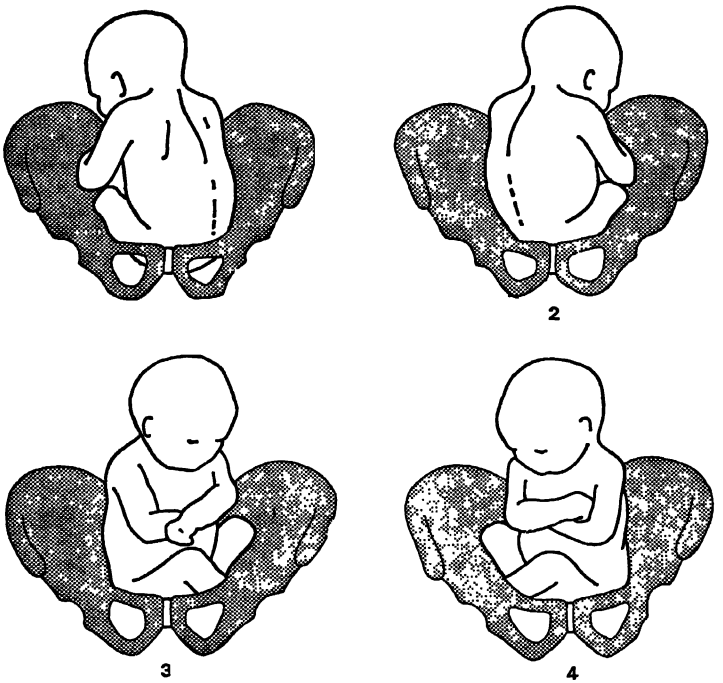


Fig. 126. Breech presentation. (1) Left sacro-anterior; (2) right sacro-anterior; (3) right sacro-posterior; (4) left sacro-posterior.

Internal rotation of the buttocks. The anterior buttock reaches the pelvic floor, is rotated forwards through one-eighth of a circle and comes to lie behind the symphysis pubis. The bitrochanteric diameter now lies in the antero-posterior diameter of the outlet.

Lateral flexion of the trunk. Lateral flexion of the trunk allows the continued descent of the buttocks along the curve of the birth canal.

Birth of the buttocks. The anterior buttock passes under the symphysis pubis and is born followed by the posterior buttock which passes over the perineum.

Birth of the Shoulders

Internal rotation of the shoulders. With the birth of the buttocks the shoulders descend into the pelvis with the bisacromial diameter

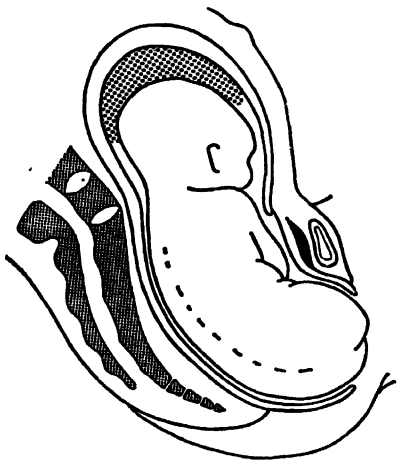


Fig. 127. Lateral flexion and birth of buttocks.

(11cm) in the left oblique diameter of the brim. Internal rotation of the shoulders through one-eighth of a circle brings the anterior shoulder behind the symphysis.

Birth of the shoulders. The left (anterior) shoulder and arm escape under the symphysis and the right (posterior) shoulder and arm pass over the perineum.

Internal rotation of the head and external rotation of the trunk. The flexed head engages with the sub-occipito-bregmatic (9·5 cm) or sub-occipito-frontal diameter (10 cm) lying in the right oblique or transverse diameter of the brim. Internal rotation of the head carries the occiput behind the symphysis. The face now lies in the hollow of the sacrum. External rotation of the buttocks and shoulders is produced by the internal rotation of the head. The back of the baby's head now faces in the same direction as the mother's abdomen.

Birth of the head. The chin, face, brow, vertex and occiput are expelled over the perineum by a movement of flexion to complete the delivery.

Management of Breech Labour

The labour is conducted in hospital, under the supervision of an experienced obstetrician, with an anaesthetist and a paediatrician immediately available.

The first stage differs a little from that of normal labour. If the breech is not engaged, as is probable in a flexed breech, there is a risk of early rupture of the membranes and prolapse of the umbilical cord. The patient should then stay quietly in bed. Where the breech is engaged, the legs are probably extended, and the risk of cord prolapse is less, so the patient might stay up a little longer. In either case, the moment the membranes rupture, the midwife should make a vaginal examination, primarily to exclude prolapse of the cord, though, at the same time, the usual observations are made to assess progress.

The abdominal findings will be as set out above.

Vaginally, the buttocks are noted to be less hard and less rounded than the head. The natal cleft is felt. Only if the presenting part is high (and the abdominal findings inconclusive) might the anal orifice be mistaken for the mouth in a face presentation. The child's sacrum may be palpable, the spines feeling rather like a string of pearls. The genitalia are soft and not easily recognized. The feet may be felt close to the buttocks.

In the early first stage, analgesics are given in the ordinary way. As the cervix nears full dilatation, the patient will benefit, without jeopardizing the child's safety, if she inhales nitrous oxide and oxygen, in a mixture of 50 per cent of each, from an Entonox machine. The breech tends to slip through the cervix before it is fully dilated, and this makes the patient desire to 'push'. The buttocks may then descend easily, but the larger head cannot pass through the three-quarters' dilated cervix and dangerous delay results. Accordingly, the patient must at all costs be discouraged from 'pushing' until full dilatation of the cervix has been confirmed by another vaginal examination. The steady breathing, with each contraction, of this nitrous oxide and oxygen mixture will help her to relax until the cervix is completely dilated, after which she may bear down with her contractions.

For the second stage the patient lies on her back, changing to the lithotomy position for the actual delivery.

During the delivery, the patient may continue to inhale nitrous oxide and oxygen, or the obstetrician may prefer her to have a pudendal nerve block.

He then watches as the labia gape, the anterior buttock comes into view and the posterior buttock distends the perineum. Now, using local anaesthesia if a pudendal block has not been employed, he performs an episiotomy, whereupon the posterior buttock emerges and the breech advances more quickly. He waits patiently, not interfering until the baby is born as far as the umbilicus. Then he disengages the legs (unless they have already slipped out) and pulls down a loop of cord to prevent traction at the umbilicus. Normally the cord is pulsating strongly.

With the next contraction the shoulder blades appear; the arms, which are normally flexed across the chest, are easily slipped out and the shoulders are born.

The baby is now allowed to hang by his own weight, to facilitate descent and flexion of the head (the Burns–Marshall manoeuvre). Usually, in about a minute the nape of the neck and the hair-line come into view, showing that the head is now ready to be born (Fig. 128).

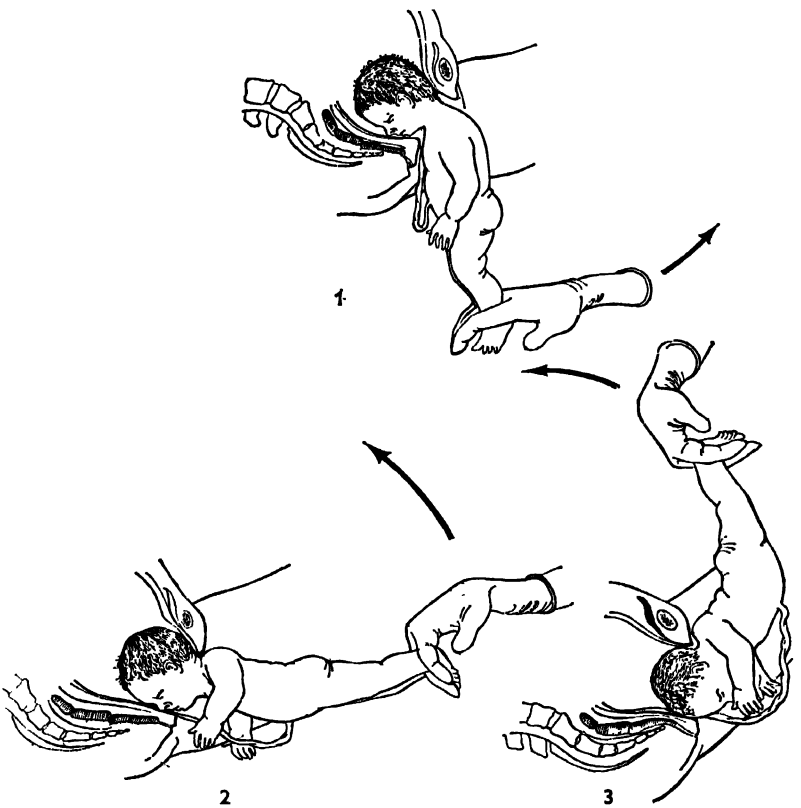


Fig. 128. The Burns-Marshall manoeuvre.

The obstetrician then grasps the baby's ankles and, using slight traction, carries the trunk in a wide arc, up and over the mother's abdomen. As soon as the mouth and nose appear at the vulva the air

passages are cleared and the baby can now breathe. The birth of the head then proceeds very slowly indeed. If it were allowed to 'pop out' quickly, the sudden release of pressure could easily give rise to an intracranial haemorrhage.

The obstetrician, therefore, controls most carefully the speed at which the head emerges, putting gentle counter pressure on the perineum if it is advancing too quickly, or having an assistant apply suprapubic pressure if it remains stationary for too long.

It is possible, for a variety of reasons, for a midwife to be faced with an emergency breech delivery. In domiciliary practice, the midwife should make every effort to get the patient into hospital. When the labour is not advancing very quickly this is perfectly possible. Sometimes, however, the patient's labour is progressing rapidly, delivery is imminent and it would be foolhardy to attempt to move her. Such rapid progress could occur only if the uterine contractions were exceptionally strong. If, therefore, this patient is having really good strong contractions, there is every chance that she will have a smooth and easy spontaneous breech delivery. The midwife's management is then that of the obstetrician described above. She should perform an episiotomy, since not to do so would further endanger the fetus. She should use the best analgesic available to her. This might be Trilene or nitrous oxide and oxygen by inhalation, or perhaps lignocaine sprayed on the perineum.

The actual delivery would be conducted exactly as described above.

Assisted breech delivery. Many obstetricians believe that an assisted breech delivery, as it is called, is safer for the baby than the spontaneous delivery described above. Adequate local anaesthesia is achieved with a pudendal nerve block, but an anaesthetist is present and the patient is prepared for general anaesthesia, should it be needed.

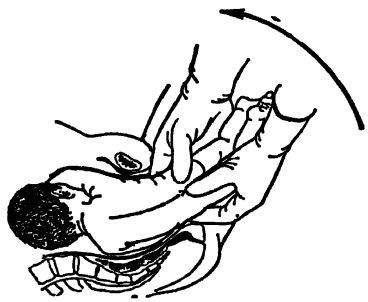
The procedure is the same as in the normal breech delivery up to the birth of the head. When the baby's trunk has been raised, the obstetrician applies either axis traction or Wrigley's forceps to the after-coming head. This enables him to control exactly the speed with which the head is born. It is brought down until the baby's mouth and nose are accessible so that the air passages can be cleared and oxygen can be given as soon as the baby gasps. Subsequently the birth of the head proceeds very slowly.

Complications of Breech Delivery

Delay with extended legs. Sometimes in a primigravid patient the

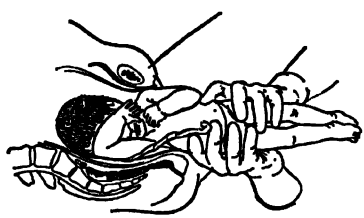
legs splint the trunk, limiting the movement of lateral flexion. Usually the contractions are moderate rather than really strong. The obstetrician, with a forefinger in each of the baby's groins, exerts gentle traction, just sufficient to assist the descent of the buttocks. Once the popliteal fossa is seen the legs can be released by gentle pressure outwards behind the knees to abduct and flex the knees.

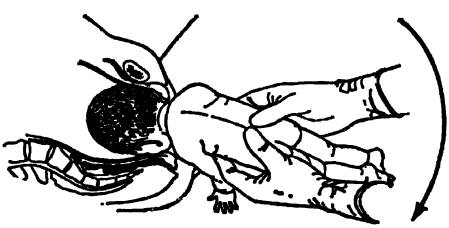
Extended arms. If the baby's arms are not folded across the chest they are likely to be stretched up alongside the head. It is not possible



1. The body is rotated anti-clockwise through 180°, keeping the back uppermost. The posterior shoulder now lies anteriorly.

2. The anterior shoulder is delivered.





3. The body is rotated clockwise through 180° still keeping the back uppermost. The second shoulder now lies anteriorly and is delivered.

Fig. 129. Birth of the arms using the Lovset manoeuvre.

for head and arms to enter the pelvis together, so the arms must come first and then the head. This is best achieved by Lovset's manoeuvre, which is shown in Fig. 129, with the baby in a right sacro-lateral position. The manoeuvre depends on the fact that the posterior shoulder is below the sacral promontory while the anterior shoulder is above the symphysis pubis. The obstetrician, grasping the baby's thighs with his thumbs over the sacrum, pulls the baby gently downwards at the same time turning him, back upwards, through a half circle (180°). The former posterior shoulder, now anterior, appears under the symphysis, while the other shoulder has been brought into the pelvic cavity. The baby is then turned back through a half circle, and the other arm is released in the same way. This procedure does not require an anaesthetic, it can be carried out by a midwife and, correctly performed, it is safe and successful, even in cases where the baby has one arm at the back of the neck (nuchal displacement).

Delay in the descent of the head. Sometimes the baby hangs by his own weight for a minute and the hair-line does not appear at the vulva. Probably the baby's head is extended and it is held up at the pelvic brim. The obstetrician will then perform the Mauriceau–Smellie–Veit manoeuvre of jaw flexion and shoulder traction. He straddles the baby across his left arm, slides three fingers into the vagina, and feels for the baby's mouth; then inserting the middle finger into the mouth and resting the other two, one on each malar bone, he flexes the head. The index and ring fingers of his right hand are hooked over the baby's shoulders, to apply traction while the middle finger presses onto the occiput to aid flexion. An assistant may apply suprapubic pressure. As gently as possible the baby's head is pulled through the cavity to the outlet, after which the trunk is raised to bring the mouth into view. The air passages are then cleared and the birth of the head completed in the usual way. The midwife can, in emergency, perform this manoeuvre, though it is not often needed. In a well managed breech delivery where the maternal pelvis is roomy and where traction on the breech is avoided, it is unlikely the head will become so extended as to cause this type of delay.

Breech Extraction

This method of delivery is sometimes used for the delivery of the second twin. Less commonly breech extraction may be necessary for prolapse of the cord, fetal distress, or following internal version for oblique or transverse lie.

The operation is not without risk and should not be attempted unless there is no cephalopelvic disproportion, the cervix is fully

dilated, the patient anaesthetized and a skilled obstetrician available. The obstetrician extracts the breech from the birth canal manipulating the fetus himself, in contrast to the movements of the fetus produced by uterine contraction when labour is normal.

Face Presentation

Face presentation is uncommon, occurring once in about 500 deliveries. The head and spine are fully extended but the limbs are flexed, so that the fetus lies in the uterus in a curious S-shaped attitude, the occiput against the shoulder blades and the face directly over the internal os.

In primary face presentation, which is present before the onset of labour, the fetus is often abnormal. In anencephaly, which is quite common, there is no vertex to present; in the rarer fetal goitre, the head cannot flex; occasionally there is excessive tone in the fetal extensor muscles and he maintains this extended attitude for a few days after birth.

Secondary face presentations develop in labour, often unaccountably. In a deflexed occipito-posterior vertex the bi-parietal diameter may have difficulty in passing the sacro-cotyloid diameter of the maternal pelvis. The bi-temporal diameter descends more quickly, the head extends and the face presents. Where the uterus is tilted sideways (lateral obliquity) the force of the uterine contractions may be directed towards the front of the head, so that the head extends as it enters the pelvis.

Diagnosis. Face presentation is not easily diagnosed in pregnancy. It should be suspected if a deep groove is felt between the fetal head and back. The heart sounds, heard through the anterior chest wall, may seem unusually loud and clear. An X-ray taken during pregnancy may by chance disclose an unsuspected face presentation.

In labour the high presenting part may give rise to suspicion. The diagnosis can be made on vaginal examination, when gentle palpation will reveal the orbital ridges; and the mouth with the gums. It is then possible to determine the position of the chin.

When a midwife diagnoses a face presentation she must inform a doctor. If the chin is lateral or posterior she should stress the urgency of the situation.

Mechanisms of the Face Presentations

There are six positions in which the face may present. The chin or mentum is the denominator.

Right mento-posterior (*RMP*) is an extension of the LOA The chin points to the right sacro-iliac joint.

Left mento-posterior (*LMP*) is an extension of an ROA The chin points to the left sacro-iliac joint.

Right mento-lateral (*RML*) is an extension of an LOL The chin is directed towards the right side of the pelvis.

Left mento-lateral (*LML*) is an extension of an ROL The chin is directed towards the left side of the pelvis.

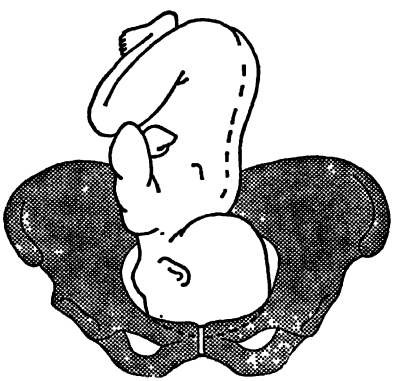


Fig. 130. Face presentation. Right mento-posterior.

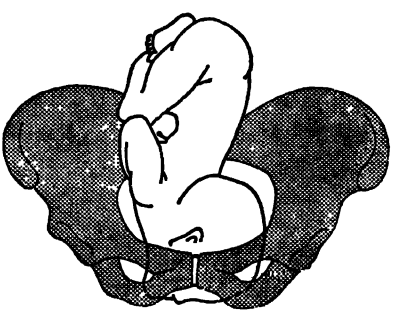


Fig. 131. Face presentation. Right mento-lateral.

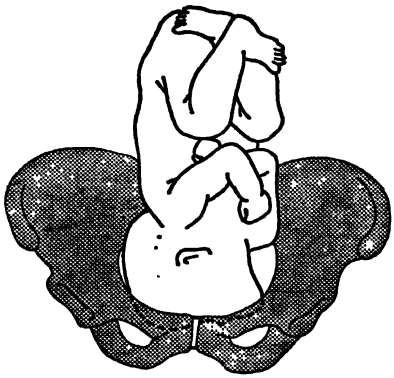


Fig. 132. Face presentation. Left mento-anterior.

Left mento-anterior (*LMA*) is an extension of an ROP The chin points to the left ilio-pectineal eminence.

Right mento-anterior (*RMA*) is an extension of an LOP The chin points to the right ilio-pectineal eminence.

Face presentation develops before the head is engaged in the pelvis. The left mento-anterior position is probably the commonest.

Mento-anterior mechanism. The extended head enters the brim of the pelvis, the face presenting; the chin points to the ilio-pectineal eminence and the sinciput to the opposite sacro-iliac joint. The

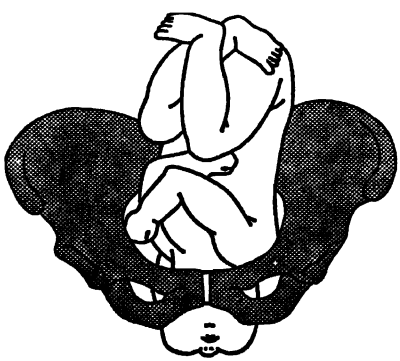


Fig. 133. The face appears at the outlet, the chin passing under the pubic arch.

sub-mento-bregmatic diameter (9·5 cm) engages; the face descends into the pelvis; the chin, being the lowest part, meets the resistance of the pelvic floor and is rotated through one-eighth of a circle to escape under the pubic arch, and the face appears at the vulval outlet. Further uterine contractions drive the vertex and occiput over the perineum, and thus, by a movement of flexion, the head is born. Restitution and external rotation take place.

Only if the chin is anterior can face presentation be born spontaneously. There is no mechanism by which the chin can be born when it lies at the back of the pelvis, such as is possible with a vertex presentation in a persistent occipito-posterior position. For the birth of a mento-posterior position the head and chest of the fetus would have to enter the pelvis together. This is impossible and obstructed labour will occur. However, spontaneous rotation of the head from the mento-lateral or mento-posterior to the mento-anterior position can and occasionally does take place. Spontaneous delivery may then occur.

In a face presentation with the chin to the front, and a normal pelvis and fetus, with good contractions, labour will probably progress normally.

Management

In a mento-anterior position labour often proceeds normally, though, as in any malpresentation, the membranes may rupture early, prolapse of the cord is possible, and labour is sometimes prolonged. In the second stage normal delivery is anticipated, but if there is delay the doctor will apply forceps.

Mento-lateral and mento-posterior positions are much more hazardous. Spontaneous delivery is unlikely, obstructed labour is possible and immediate treatment is thus essential.

The obstetrician may, either manually or with Kjelland's forceps, rotate the head to a mento-anterior position and carry out a forceps delivery. In a primigravida, where these manoeuvres are more difficult, a Caesarean section may be preferable.

At birth, though the baby is usually in good condition, his eyelids and lips are grossly oedematous, his whole face is congested and bruised, and his unsightly appearance could cause his mother considerable alarm and anxiety. Nevertheless, she will want to see him and if she cannot she will be even more anxious. She is therefore told how he looks and at the same time assured authoritatively that this disfiguring bruising and oedema will subside within a few days; while sucking, at first difficult, is usually normal in 48 hours.

Brow Presentation

This is less common than face presentation, occurring once in about 2000 labours. The causes are, with the exception of anencephaly, the same as in face presentation.

The head is midway between flexion and extension, with the mento-vertical diameter of 13 cm attempting unsuccessfully to enter the 13 cm transverse diameter of the pelvic brim. A small head might enter a large pelvis only to be arrested in the cavity. Brow presentation, undiscovered and untreated, can cause this and obstructed labour could develop.

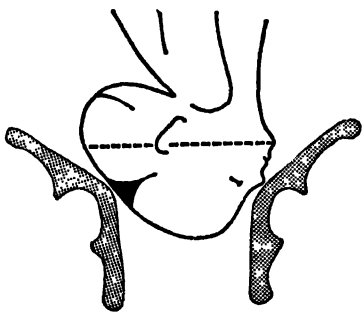


Fig. 134. Brow presentation.

Diagnosis. On abdominal examination the head is very high and the presenting diameter feels unusually large. On vaginal examination the presenting part may be too high to identify. If the brow is within reach, the orbital ridges are felt on one side and the anterior fontanelle on the other.

The midwife must quickly call a doctor, and a patient in her own home should be immediately taken to hospital. The safest treatment for mother and baby is delivery by Caesarean section.

Transverse Lie and Shoulder Presentation

The normal lie of the fetus is longitudinal. A transverse or oblique lie in pregnancy will, if not corrected, become a shoulder presentation in labour. *Shoulder presentation causes obstructed labour*, and must be prevented.

Causes of transverse lie. The commonest cause is laxity of the uterine

and abdominal muscles. Thus transverse, oblique, or often unstable lie is seen most frequently in women of high parity (grandes multiparae).

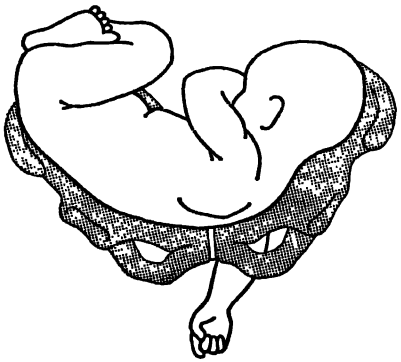


Fig. 135. Shoulder presentation with prolapse of arm.

Of various underlying causes, the most serious is placenta praevia. If, therefore, a patient has a persistent oblique lie, even though she has had no bleeding, she may have a placenta praevia. Other contributory factors are multiple pregnancy, hydramnios, an extremely contracted pelvis and occasionally a large uterine fibroid.

Diagnosis. A transverse lie is easily diagnosed in pregnancy from the shape of the uterus, which appears too broad, with a bulge on either side of the abdomen, while the fundus is unusually low. Palpation will reveal the fetal head on one side and the breech on the other, but there is *no presenting part* entering the pelvis. If this is found after the thirty-second week a doctor should be informed.

Treatment. The doctor will, by external version, correct the transverse lie to a cephalic presentation. This may have to be repeated several times as the mobile fetus may return to a transverse lie. A multigravida with such an unstable lie of the fetus is admitted to hospital 2 to 3 weeks before term, so that she can be under constant observation and have the lie corrected at the onset of labour.

If these precautions are not taken, when labour begins the fetal shoulder may be forced down towards the pelvis. The membranes are likely to rupture early and the cord to prolapse, while in addition the child's arm may also prolapse.

A midwife would recognize shoulder presentation by abdominal

examination, as described above; and by vaginal examination, when the shoulder is recognized by feeling the fetal ribs, and the hand (to be distinguished from the foot because she can 'shake hands with it').

The midwife should send urgently for a doctor, or, in domiciliary practice, for an obstetric 'Flying Squad'. The more advanced the labour, the more difficult is it to correct the lie; after the membranes have ruptured it may be impossible. In such cases, Caesarean section is necessary, and it may well be the safest mode of delivery even when the fetus is dead.

A midwife, with no doctor at hand, might find, after the birth of a first twin, that the second child was lying transversely. Immediate action is necessary, and she should correct the lie by external version and rupture the second bag of membranes, thus stabilizing the longitudinal lie and hastening the birth of the child.

Presentation and Prolapse of the Cord

Presentation of the cord means that a loop of cord lies below the presenting part of the fetus, the membranes being intact. When the membranes rupture the cord is then described as prolapsed. There is a 50 per cent fetal mortality from these dangerous conditions.

Cause. Two factors are usually present: a long cord and an ill-fitting

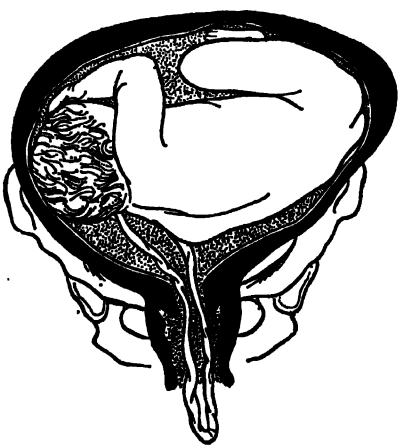


Fig. 136. Prolapse of the cord.

presenting part. The presenting part does not fit the lower uterine segment accurately in hydramnios, prematurity, a high, deflexed head and a flexed breech. Worst of all, in transverse lie, there is no presenting part.

Cord presentation. This is often not diagnosed, being discovered only by chance if a vaginal examination is made. The soft irregular rope-like cord is felt in the membranes, and is noted to pulsate at the same rate as the fetal heart. Since the membranes are still intact, the labour is unlikely to be far advanced. The midwife should place the patient in an exaggerated Sim's position with the foot of the bed raised on blocks, and call a doctor, who will probably carry out an immediate Caesarean section.

Cord prolapse. This occurs when the membranes rupture, prior to which the cord may or may not have been presenting.

Diagnosis. The cord may be visible at the vulva, when pulsations may be seen; it may be diagnosed if a vaginal examination is made when the membranes rupture (a wise proceeding if there is an ill-fitting presenting part); or it may be discovered if fetal distress has become manifest, and investigations are made to discover the cause.

Treatment. If there is no pulsation in the cord, and no fetal heart is heard, the fetus is dead, and there is no treatment. Delivery is awaited.

If the fetus is known, or even suspected to be alive, two essentials must be considered:

1. To keep the fetus in good condition.
2. To deliver the mother as quickly as possible.

This is achieved first by avoiding compression of the cord. The patient is put into an exaggerated Sim's position, the foot of the bed is raised, and it may be necessary for the midwife to introduce two fingers into the vagina and push up the presenting part during contractions.

If the cord is outside the vagina, it should be handled gently and kept warm; otherwise the vessels may go into spasm.

The mother should be given pure oxygen to inhale.

The mode of delivery depends upon the stage of labour:

In the first stage, Caesarean section is necessary.
In the second stage, forceps delivery is performed.

Late in the second stage, an episiotomy may be sufficient to effect a quick delivery, and the midwife should not hesitate to do it.

A multigravida on the verge of delivery should be encouraged to 'push' and the midwife may hasten delivery by pressure on the fundus.

Disproportion and Trial of Labour

The head is the largest part of the fetus, and if it has passed through the brim of the pelvis the rest of the fetus should pass through without difficulty. During the last few weeks of pregnancy it will sometimes be found that the head is not engaged, and cannot be made to engage.

Causes of non-engagement of the head. The head may fail to engage because the mother has a full bladder or a full rectum, or because the uterus and abdominal wall do not exert sufficient pressure on the head to make it enter the pelvis. The head, if deflexed, may present a larger engaging diameter and so fail to engage; this is likely to occur with an occipito-posterior position. Placenta praevia may displace the head from the pelvis; or, finally, the head may be too large or the pelvis too small, that is, true cephalo-pelvic disproportion may be present.

Diagnosis. The possibility that disproportion is present is much greater in a primigravida than in a multigravida with a history of previous normal deliveries, but the possibility can never be ruled out since the size of the fetus may have been smaller in previous pregnancies. It is difficult to assess the size of the fetus by palpation, but with experience it is possible to determine whether the fetus is unduly large for the duration of pregnancy.

If the head is not engaged by the thirty-seventh or thirty-eighth weeks of pregnancy, the patient should be referred to an obstetrician for an opinion, chiefly to exclude the possibility of disproportion. Further advice should also be sought for a patient with a history of difficult deliveries and stillbirth, or if in the present pregnancy the child is considered to be unduly large. The obstetrician will decide whether disproportion is present and its degree. This is done by estimating the degree of overlap of the head over the pelvic brim at the symphysis pubis, by estimating the size of the true conjugate from the diagonal conjugate if the promontory of the sacrum is reached, and by estimating the size of the outlet by noting the degree of prominence of the ischial spines and determining the width of the

subpubic angle. Finally an accurate estimation of the size and shape of the pelvis may be made by an X-ray pelvimetry.

Treatment. From these examinations the obstetrician is able to place the patient into one of three categories.

No disproportion is present and she may confidently await a normal labour.

There is definite disproportion, either because the pelvis is small or abnormal in shape, or because the child is unusually large. Vaginal delivery is out of the question and Caesarean section is necessary.

There is a slight degree of disproportion, which may well be overcome successfully in labour. These patients, provided they are otherwise normal, are admitted to hospital for *trial of labour*.

A trial of labour is an ordinary labour conducted in hospital with the special object of ascertaining if the contractions of labour will make the head engage, after which the labour will continue normally.

It is never possible to forecast exactly how labour will progress, since so many factors are uncertain, the features which cannot be predicted being:

The strength of the uterine contractions.
The moulding of the fetal head.
The 'give' of the maternal pelvis.
The mother's ability to tolerate labour.
The fetal reaction to strong contractions.

If the contractions are good, the fetal head moulds, the pelvic joints relax and the maternal and fetal condition remains satisfactory the trial may well be successful, labour ending with a normal or an easy forceps delivery.

If however, the contractions are not sufficiently strong, no 'trial' is possible.

If, with adequate contractions, the head fails to engage, the trial is unsuccessful.

If, above all, at any time, either maternal or fetal distress should arise, the trial is immediately discontinued, whatever progress has been made. No labour can be called successful if either mother or baby suffers adverse effects.

In the latter cases Caesarean section is carried out without delay.

The midwife's responsibilities include frequent abdominal examinations to determine descent of the fetal head, reporting to the obstetrician when the membranes rupture and keeping full records of the maternal pulse rate, blood pressure, urinary output and uterine contractions together with the fetal heart sounds. The obstetrician may

himself perform any vaginal examinations necessary to assess progress. Above all, it must be remembered this is not a trial of endurance, and should be terminated in a measurable length of time.

Obstructed Labour

Obstructed labour will occur in any case in which there is an insuperable barrier to the passage of the child through the birth canal. This may occur if the maternal pelvis is grossly contracted, or if the available space is occupied, by a large fibroid or an ovarian cyst. The fetus may be unusually large, or presenting abnormally. Shoulder and brow presentations, and persistent mento-posterior face presentations can all cause obstructed labour.

It is important to distinguish clearly between delay in labour when progress is slow, probably because the uterine contractions are not sufficiently strong, but delivery possible; and obstruction, when there is no progress in spite of good contractions, because delivery is mechanically impossible.

Obstructed Labour is Preventable

By good antenatal care and close observation in early labour, the causes of obstructed labour can be recognized and treated before

Fig. 137. Bandl's retraction ring.

obstruction can occur. Thus, an ovarian cyst is removed during pregnancy, a Caesarean section is planned in late pregnancy, a transverse lie is corrected at the onset of labour or earlier, and safe delivery is achieved, mother and child remaining fit and well.

Occasionally a patient receives no skilled care, possibly because she has not sought help, possibly for some other reason. She may then be

seen with evidence that labour is obstructed. She is in severe and continuous pain, greatly distressed, and looking very anxious and ill. The temperature is raised, the pulse is rapid; she may be vomiting and showing signs of dehydration.

When the abdomen is inspected the uterus appears closely moulded around the fetus, the liquor amnii having drained away. On palpation, the uterus is continuously hard instead of contracting intermittently. In advanced obstructed labour an oblique ridge may actually be seen running across the abdomen. This is Bandl's retraction ring, which denotes a marked difference in thickness between the tonically retracted upper uterine segment and the dangerously thinned lower segment, which is now in imminent danger of rupturing. The continuous retraction soon cuts off the fetal oxygen supply, hence at this stage the fetal heart sounds are no longer heard because the fetus is dead. The patient herself is in grave danger of dying from exhaustion or from rupture of her uterus.

A midwife, called to a patient and finding her in this desperate condition, should immediately call an obstetric 'Flying Squad'. She might slightly relieve the patient's pain by giving her an injection of Pethidine. The obstetrician will probably order morphine or papavereture (Omnopon), an intravenous infusion of dextrose will be set up, and the patient may be given an anaesthetic to damp down the excessively strong uterine contractions. Once her condition improves, she will be transferred to hospital.

In hospital, it is possible that she might be delivered by a destructive operation, such as craniotomy; though, even when the fetus is dead, many obstetricians feel that Caesarean section is safer. Not only is it less traumatic to the birth canal, but the obstetrician has an opportunity to make a close examination of the uterus, which may have been injured.

The midwife, conscious on the one hand of her responsibilities, and on the other, of her own limitations, might wonder if this alarming sequence of events could possibly develop in a patient in her care. However, if she keeps in mind the precepts of her training and conforms to the rulings of the Central Midwives Board, she is secure. The midwife is trained to look after normal patients, but to consult a doctor at the *first* indication of any departure from the normal pattern.

Thus, if the uterine contractions are normal, the presenting part descends steadily and the maternal pulse and fetal heart sounds remain strong and regular, she need not fear that labour is obstructed; but if, with good contractions, the presenting part fails to descend; or if, in any circumstances, the mother's pulse rate rises, or the fetal heart rate slows, she should immediately call a doctor.

Premature and Postmature Labour

Premature Labour

The principal known causes of premature labour are pre-eclampsia, multiple pregnancy and antepartum haemorrhage. In 50 per cent or so of premature labours no definite cause is found, though poor social conditions with malnutrition and anaemia may, in part, be responsible.

A child weighing 2500 g or less at birth is considered to be premature. Between 7 and 8 per cent of births are premature but prematurity accounts for 60 per cent of all perinatal deaths. The smaller the child the higher the mortality, so that very few babies weighing less than 1000 g survive.

Every effort must be made to avoid premature labour. Adequate nourishment and rest for the expectant mother should be advised. If the membranes rupture prematurely, rest in bed may prolong the pregnancy perhaps 1 or 2 weeks. Rest may also prolong a twin pregnancy.

If labour should begin before the thirty-sixth week the mother is best confined in hospital. Some authorities recommend that the child should be given an injection of phytomenadione (Konakion) to lessen any risk of haemorrhage. An episiotomy should be performed to decrease pressure on the premature head; forceps may be applied to protect the head during birth. Preparations should be made to combat asphyxia neonatorum, the baby being placed in an incubator.

Postmature Labour

The average length of pregnancy is 40 weeks or 280 days, calculated from the first day of the last menstrual period. Labour may begin a few days before or after this time. Often there is some confusion over the date of the last period and the patient is probably not overdue. If, however, it appears that the pregnancy has continued 7 days over the expected date the midwife should refer the patient to a doctor.

One danger of postmaturity is that the efficiency of the placenta decreases after 40 weeks. The transfer of oxygen from the mother to the fetus is thus impaired. This may cause fetal distress, particularly when labour begins. Another risk is disproportion from the increasing size of the child.

The decision to perform surgical induction will be made by the doctor only after careful consideration of each case. The possible risks to the fetus of postmaturity must be balanced against the risks to the mother of surgical induction, and even more the problem presented if

labour does not begin after induction. Failure of induction is less likely if induction is performed only when the cervix is soft, taken up, and beginning to dilate.

Pregnancy should certainly not be allowed to continue beyond term if it is complicated by essential hypertension or pre-eclampsia since poor placental function may already be present in these conditions. During labour the midwife should pay particular attention to the fetal heart. A timely Caesarean section or forceps delivery, if the signs of fetal distress are discovered, may save the fetus.

Further Reading

Donald, I. (1969). *Practical Obstetric Problems*, 4th edn. London: Lloyd-Luke.

26. MULTIPLE PREGNANCY AND LABOUR

In this country twins are said to occur once in about eighty labours. For the rarer types of plural birth an approximate and easy-to-remember scale has been constructed thus:

Twins:	once in 80 labours.	
Triplets:	once in 80^2 labours.	$80 \times 80 = 6400$.
Quadruplets:	once in 80^3 labours.	$80 \times 80 \times 80 = 512\,000$.

This is interesting, but not very important. The midwife will find it profitable to concentrate on the special problems of twin pregnancy. Exactly the same problems arise in greater degree in the triplets and quadruplets that she will rarely see.

Types

Twins can be binovular or uniovular.

Dizygotic binovular or fraternal twins arise from the fertilization of two ova by two spermatozoa. Thus two complete and separate gestation sacs develop in the uterus at the same time, each child having a cord, placenta, chorion and amnion. They may be of the same sex or brother and sister. They can be as similar or as unlike as any two members of a family.

Monozygotic, uniovular, or identical twins start as a single fertilized ovum, one ovum is fertilized by one spermatozoon, but, within a few days, the embryonic cell mass of the blastocyst divides into two identical halves. Each half develops into a fetus with its cord and amniotic sac, but they usually share a single placenta and chorion. Thus, they have exactly similar chromosomes and genes to determine their characteristics, so that they must be of the same sex, have

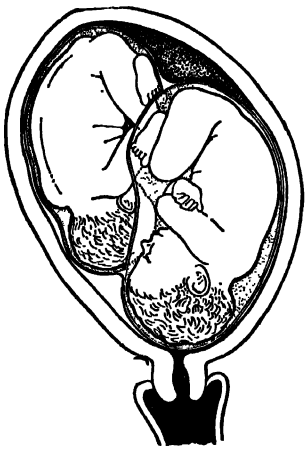


Fig. 138. Twins.

for example the same coloured eyes and the same blood groups and, generally, show a marked similarity. Very occasionally the division is incomplete and conjoined or Siamese twins are born.

Diagnosis of Twin Pregnancy

On abdominal examination:

Inspection. The uterus is larger than normal for the stage of pregnancy. If the dates are correct, this (especially if there is a family history of twins) might arouse suspicion by the twenty-second to twenty-fourth week.

Palpation. It is difficult to detect two fetuses before the twenty-eighth week. If the midwife feels *two hard round heads*, the patient has twins.

Three 'poles' may be felt. (A fetus has two ends or poles, a head and a breech. If more than two such poles are felt there must be more than one fetus.) A multiplicity of fetal parts is suggestive.

Feeling a *small* head (in this *large* uterus) should make the midwife suspect there may be another child though she cannot feel a second head.

Auscultation. The fetal heart sounds can be misleading, since one heart may be audible over a wide area. The best evidence is hearing fetal heart sounds in two widely separated areas with a silent zone intervening.

Often there is doubt, in which case an X-ray examination or ultrasonogram will establish the diagnosis and show how the fetuses are presenting.

Complications During Pregnancy

Minor ailments of pregnancy, such as heartburn and digestive disturbances, can be exaggerated. Pressure symptoms are increased. Dyspnoea, ankle oedema and varicose veins may be more troublesome. The large abdomen is cumbersome, backache may be marked, and the additional weight is tiring.

More serious complications are:

A very premature labour, at about the thirty-second week, when the babies have a poor chance of survival.

Pre-eclampsia, which is much more common than in single pregnancy.

Anaemia, which is a serious hazard, since the two fetuses make a much greater demand on the mother's supply of iron.

Hydramnios, which aggravates the discomfort by causing additional distension of the uterus.

Management in Pregnancy

Extra rest is essential. Rest in bed in hospital between the thirtieth and thirty-sixth weeks appears to prevent the onset of premature labour. It may also delay the development of pre-eclampsia and it certainly relieves much of the patient's discomfort. She can be observed closely and quickly treated if she becomes anaemic or if pre-eclampsia develops.

If, at the thirty-sixth week, she is well, she may return home; the principal hazard of premature labour is over.

Complications During Labour

Malpresentations occur more often than in single births. Nevertheless, most frequently both twins present by the vertex. The second commonest presentations are: first twin, vertex; second twin, breech. The third commonest: first, breech; second, vertex. The fourth commonest, two breeches. Transverse lie is uncommon.

There may be delay in the second stage and particularly in the birth of the second child. This is dangerous, since the uterus is smaller, the placenta constricted and the fetal oxygen supply decreased. The lie

or presentation of the second twin may change while the first is being born. Oblique or transverse lie is a serious development.

There is an increased risk of post-partum haemorrhage, since the placental site is so much larger; furthermore, the uterine contractions may become weaker in the third stage.

For these reasons, and because the babies may be very immature, hospital delivery is recommended.

Management of Labour

The midwife should inform a doctor of the twin labour. He should be available in the first stage and present during the second and third stages.

The midwife should be prepared for two premature babies.

First stage. This may be short, or of normal duration. There is no special management.

Second stage. This is conducted as usual, up to the birth of the first baby. Before she divides the cord the midwife ascertains that both clamps are firm. Ordinarily it is immaterial if bleeding occurs from the maternal end of the cord, but if the twins are uniovular, sharing a placenta, the unborn baby might bleed if the cord were not firmly clamped. The baby is marked Twin I.

As quickly as possible after this the mother is turned into the dorsal position and her abdomen is palpated to determine if the second twin lies longitudinally. This is essential, since a transverse lie would cause obstructed labour.

If the lie is longitudinal the midwife checks the fetal heart sounds and ruptures the membranes. The uterine contractions recur quickly and the baby advances rapidly. The midwife should, by gentle control, avoid too precipitate a birth.

Third stage. If a doctor is present, he will give an intravenous injection of ergometrine maleate 0·5 mg as the anterior shoulder of the second twin is born. If not, the midwife should ask an assistant to give one ampoule of syntometrine, intramuscularly with the anterior shoulder. When ready, the placenta is expelled in the customary way. As in any third stage, the midwife must be sure the uterus is well contracted and the bladder empty, or nearly so.

Examination of placenta and membranes. The midwife must make the usual examination for completeness.

If the babies are of different sexes they must be binovular twins and

the midwife must satisfy herself that there are two placentae and two complete sets of membranes. The two placentae may be obvious or they may be fused together and look like one.

If the babies are of the same sex, they may be either binovular or uniovular, and the midwife should determine this from her examination of the placenta. Often communicating blood vessels can be seen on the fetal surface of the placenta of uniovular twins.

Management of Complications

Transverse lie of the second twin. If no doctor is present the midwife should correct the lie by external version (not usually a difficult procedure) and rupture the membranes to stabilize the child. If she cannot correct the lie she should call a doctor, and leave the membranes intact.

If the doctor cannot correct the lie by external manipulation, he will rupture the membranes, grasp one of the child's feet and perform an internal podalic version followed by a breech extraction.

Delay in the birth of the second twin. The midwife will have ascertained that the lie is longitudinal and ruptured the membranes. She should call a doctor if the second child is not born within 20 minutes of the first. He will probably carry out a ventouse extraction, a forceps delivery or set up an intravenous infusion containing oxytocin.

Either fetal distress or maternal haemorrhage may arise before the birth of the second child. This is an indication to rupture the second sac of membranes immediately. This will hasten the birth of the child and haemorrhage will be easier to control.

Occasionally a placenta is expelled between the two babies. The mother is in danger from haemorrhage and the child from lack of oxygen, so the delivery should be completed as quickly as possible.

Once labour is complete the midwife must check that both babies have been adequately labelled.

Puerperium

The after care of the mother and babies differs very little from that of any other patient. There is a greater tendency to after pains and more profuse lochia.

Breast feeding is possible if the mother is keen and it is time saving, if after the first few days she can feed both babies together. This can be achieved by holding one on each side with their head pointing to the centre. The mother can then see both faces and control their feeding. The bodies need to be supported on pillows, and once the

mother is up and about a large armchair or sofa is the most comfortable. Some women prefer to bottle feed as they can share feed time with their husband or someone else.

However the mother chooses to feed her baby, two are more taxing than one. When she gets home and begins to be overtired it seems at times if there is always a baby crying and wanting attention. The Health Visitor will call soon after discharge, and both she and the husband should be alert for signs of tiredness and strain. A Home Help may be nccessary for a few weeks. The mother should also be advised that she is entitled to a double Maternity Grant.

27. COMPLICATIONS OF THE THIRD STAGE OF LABOUR

Post-Partum Haemorrhage

Post-partum haemorrhage is, to the midwife, the most serious of all the complications of midwifery. It happens without warning, the patient can lose blood with alarming rapidity, and often no doctor is present. The midwife, by her prompt and intelligent action can spare the patient dangerous blood loss, and perhaps even save her life. It is not surprising, thus, that the Central Midwives Board examiner often asks the candidate searching questions on this subject. Nor is it sufficient for the candidate to learn the procedure by heart and rely on this superficial knowledge. A thorough understanding of the subject is essential.

Post-partum haemorrhage is defined as excessive bleeding from the genital tract occurring any time from the birth of the child to the end of the puerperium. Primary haemorrhage refers to the first 24 hours; subsequently it is called secondary or puerperal haemorrhage. Post-partum haemorrhage is further classified according to its source. Most commonly the bleeding is from the placental site and results from poor tone of the uterine muscle, hence it is sometimes called atonic haemorrhage. Less frequently excessive bleeding occurs from a laceration of some part of the genital tract, when it is termed traumatic haemorrhage.

The word 'excessive' requires careful interpretation. Some kind of yardstick is useful and the midwife might keep the following grading in mind:

During and just after the third stage of labour:

150 ml is a normal loss.
300 ml represents a slightly excessive loss.
600 ml constitutes a post-partum haemorrhage.

Later in the puerperium, lesser amounts would be classified as excessive.

But blood lost at the end of labour is extremely difficult to measure. It stains sheets, towels and gowns; it mixes with liquor; it trickles to the floor and is mopped up; it clots and the clot is conscientiously collected and measured in a jug, but it is not always appreciated that the 360 ml clot is only the solid part of more than 600 ml of blood. These estimates are at the best approximate.

This, however, is less important than the effect on the patient of the blood loss. In this context, 'excessive' means **any amount, however small,** which adversely affects the patient.

Post-partum haemorrhage (PPH) unqualified, means primary haemorrhage from the placental site, this being the commonest and most dangerous type. Traumatic and secondary post-partum haemorrhage are described specifically by these names.

Primary Post-Partum Haemorrhage from the Placental Site

Cause. The immediate cause is failure of the uterus to contract and retract adequately. If the many uterine blood vessels are not squeezed or 'ligated' by compression from the muscle fibres surrounding them, blood loss can be rapid and dangerous.

It is not possible to predict accurately that any particular woman will have a post-partum haemorrhage, but the risk is increased in certain patients. These are:

- Women who have previously had a post-partum haemorrhage or a retained placenta. This may recur.
- Women of high parity, those who have had three children or more.
- Patients with twins and hydramnios; the over-distended uterus may not retract well.
- Anaemic women, including those who have suffered antepartum haemorrhage, either accidental or placenta praevia.
- Women whose labours have been prolonged and those delivered under general anaesthesia; the uterus is 'tired' and the anaesthetic may further diminish its contractions.
- Women with low-lying placentae.

Post-partum haemorrhage can also result from mismanagement of the third stage of labour.

- A full bladder can weaken the contractions and delay separation of the placenta.
- Massaging, squeezing or otherwise 'fiddling' with the uterus can disturb its rhythm, causing partial separation of the placenta.

Unless the uterus is empty it cannot retract completely, thus a partially separated retained placenta (whether or not the result of

mismanagement) or retained blood clot can themselves diminish the contractions and worsen the bleeding.

Finally, post-partum haemorrhage occurs as a complication of otherwise completely normal labours when even the most careful retrospective assessment fails to explain it.

The foregoing account deals only with post-partum haemorrhage resulting from inadequate contraction and retraction of the uterus. In rare cases a steady oozing of blood persists even though the uterus is well contracted, and the blood remains liquid. This rare condition of *hypofibrinogenaemia* (page 193) may complicate concealed accidental haemorrhage or amniotic fluid embolism and may follow prolonged retention in the uterus of a dead fetus. In all these conditions the midwife needs to call a doctor, so it is unlikely she would be in charge of a patient with hypofibrinogenaemia.

Prophylaxis. By routine haemoglobin estimations, anaemia in pregnancy should be disclosed. Anaemic patients should be given oral iron, folic acid and, where necessary intramuscular iron or even blood transfusions to try to bring the haemoglobin value up to 11·6 g or more before delivery.

Women who are specially liable to have a post-partum haemorrhage, as described above, should be booked for confinement in hospital, where special arrangements are made, firstly, to minimize bleeding and secondly, if it does occur, to institute immediate treatment.

A doctor is present at the delivery and, at the time the anterior shoulder is being born, he gives the patient an intravenous injection of ergometrine maleate 0·5 mg. This will, within 1 minute, stimulate very strong contraction of the uterus. The placenta separates immediately and can be quickly expelled, while minimal bleeding occurs. Occasionally, a placenta is retained, and is manually removed by the obstetrician. This is a much less serious problem than post-partum haemorrhage.

Many authorities believe that the third stage of labour should, for all patients, be managed in this way. The midwife, who is not necessarily expected to give intravenous injections, can give an intramuscular injection of Syntometrine, 1 ml (containing ergometrine maleate 0·5 and oxytocin 5 units) with the crowning of the head or the birth of the anterior shoulder. The result is that the third stage is shortened, the average blood loss is decreased and the incidence of post-partum haemorrhage is appreciably lessened.

Prophylaxis includes also good management of the first and second stages of labour, and conducting the third stage correctly.

Treatment of Post-Partum Haemorrhage (during the third stage)

While, at the first opportunity, the midwife must send an urgent message for medical help, she must stay with the patient and treat her while awaiting the doctor. Should the patient's condition deteriorate, the midwife would herself send a message to call an obstetric 'Flying-Squad'.

The first consideration is to stop the bleeding and this is achieved by making the uterus contract. The quickest way to do this is by massaging the uterus.

The midwife should therefore:

'Rub up' a contraction; by massaging the uterus, when, within a few seconds, it will become hard. Then:

Give an intramuscular injection of Syntometrine 1 ml which will make the uterus contract within 2½ minutes; or ergometrine maleate 0·5 mg and 1000 units hyaluronidase, which will act in 4 minutes.

When the uterus contracts, the midwife can ascertain whether or not the placenta has fully separated and descended into the vagina.

Placenta separated: the midwife can expel it by fundal pressure, or by cord traction, or

Placenta not completely separated: she should not attempt to expel it.

If and when the uterus relaxes it may again be massaged. If necessary a further injection of ergometrine maleate may be given within 10 minutes of the first.

If the bladder is distended (though this is avoidable) a catheter might be passed when the bleeding is controlled.

Shock treatment is somewhat limited in domiciliary practice. The foot of the bed may be raised, and the patient should be kept as quiet as possible. She may be given inhalations of oxygen.

Doctor's treatment. In domiciliary practice, the doctor might give an intravenous injection of ergometrine maleate and attempt to expel the placenta by cord traction. He would not attempt a Credé expression (which is shock-producing and obsolete) and it is unlikely he would carry out a manual removal in the patient's home. Neither, indeed, would the much better equipped obstetric 'Flying Squad', who generally prefer to resuscitate the patient, giving her an intravenous infusion of dextrose or a blood transfusion; and when her condition is improved, to transfer her to hospital for any further treatment needed.

Treatment in hospital. Usually, a manual removal of the placenta is

carried out. The patient is anaesthetized and put into lithotomy position, the intravenous dextrose or blood transfusion being continued.

The vulva is cleaned with chlorhexidine (Hibitane) lotion, 1: 2000 and swabbed with chlorhexidine (Hibitane) obstetric cream 1 per cent. The obstetrician, wearing elbow-length gloves, forms his right hand into a cone-shape and inserts it into the vagina. With his left hand on the abdomen (a sterile towel intervening) he steadies the uterus from above. It is helpful if an assistant holds the cord taut.

He follows the cord up to the uterus, locates the separated area of placenta, inserts his fingers between it and the uterine wall and gently strips off the remainder of the placenta. The assistant may then pull the placenta out of the vagina, but the obstetrician does not withdraw his hand until he has ascertained that there are no fragments of placenta left in the uterus.

Occasionally, the doctor is attempting to insert his hand into the uterus when he encounters a tight ring lying below the placenta, and imprisoning it. This is an hour-glass constriction of the uterus, produced by spasm of a ring of uterine muscle. It can be relaxed either by deepening the anaesthetic, or by allowing the patient to inhale amyl nitrite vapour.

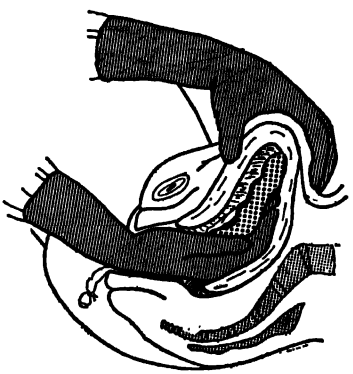


Fig. 139. Manual removal of the placenta.

Manual removal may be preceded or followed by intravenous ergometrine maleate, though if bleeding recurs or continues, the doctor may perform bimanual compression.

Bimanual compression. The right hand is introduced into the vagina, closed to form a fist, and pushed up in the direction of the anterior vaginal fornix. The left hand, on the abdominal wall, dips down

behind the uterus and pulls it forwards and towards the symphysis. The two hands are pressed firmly together thus compressing the uterus and therefore the placental site. The pressure is maintained until the uterus contracts and remains retracted.

Post-partum haemorrhage (after the completion of the third stage). Massage of the uterus and the administration of Syntometrine are

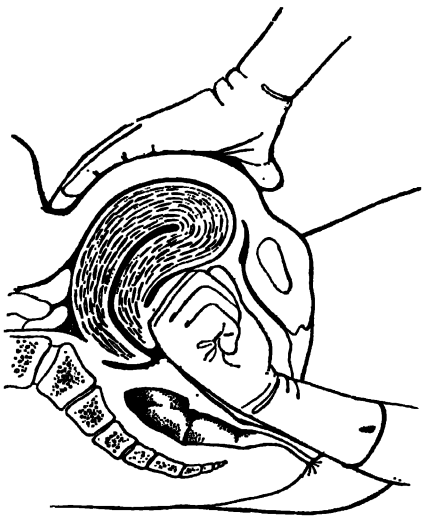


Fig. 140. Bimanual compression.

usually sufficient to control the bleeding. Occasionally the bimanual compression described above is necessary, though a modified form, with both hands on the abdomen, is nearly as effective.

'*External*' *bimanual compression.* The left hand dips down as far as possible behind the uterus, the right hand is pressed flat on the abdominal wall and the uterus is compressed and, at the same time, pulled upwards in the abdomen. The bleeding area is thus compressed while the pulling up of the uterus straightens the kinked uterine veins, and, by allowing free drainage from them, relieves the congestion and decreases the bleeding.

In a remote area without modern facilities, a midwife might need to perform either a manual removal or a bimanual compression. Where expert help is available she should concentrate on controlling the haemorrhage, and thus keeping the patient in good condition until help arrives.

Traumatic post-partum haemorrhage. A woman may sustain a severe blood loss from laceration of some part of the genital tract. Occasionally this arises from a perineal tear or an episiotomy, while lacerations involving the labia or clitoris often bleed freely. Deep lacerations of the vaginal walls, cervix, and, exceptionally, lower uterine segment will produce severe haemorrhage. This is much more likely to complicate a difficult or traumatic delivery than a normal one for which the midwife would be taking responsibility, though it sometimes follows a very rapid labour.

Superficial bleeding points are easily seen and treated by direct pressure.

A laceration of the cervix would be suspected if bleeding began the moment the child was born and continued steadily though the uterus was well contracted. It might be temporarily controlled by digital pressure or by the application of sponge or artery forceps.

For secondary post-partum haemorrhage, see 'Complications of the Puerperium', page 380.

Acute Inversion of the Uterus

This is a very rare but most serious complication of the third stage of labour. Inversion begins either from pressure on the fundus or from

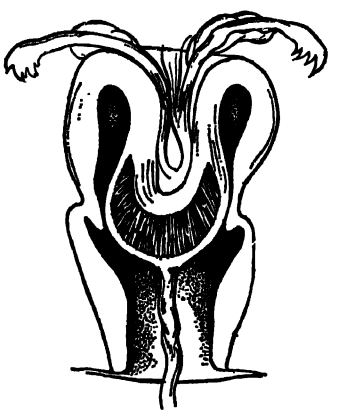


Fig. 141. Inversion of the uterus.

traction on the cord; when the uterus is relaxed; it is unlikely to happen spontaneously. Once inversion has begun, it may continue until the uterus is completely inverted. The condition is associated with

profound shock, and possibly haemorrhage, if the placenta has separated from the uterus.

The diagnosis is made by the palpation of a hollow in the fundus of the uterus if the inversion is slight, and complete absence of the uterus in the abdomen if it is complete, in which case the inverted uterus will appear at the vulva.

The shock is treated by an intravenous infusion of dextrose, blood transfusion, and an injection of morphine 15 mg intramuscularly; the foot of the bed is raised, and the patient is kept covered; the midwife will of course have sent urgently for medical aid. The uterus is pressed back into the normal position by vaginal manipulation under anaesthesia and ergometrine maleate 0·5 mg given intravenously. The replacement of the uterus should be performed as soon as possible, as shock will continue until this has been done.

Shock

Shock is collapse owing to circulatory failure. In midwifery it occurs most commonly as a result of haemorrhage, though it can be aggravated by pain, dehydration, anaemia, and probably by fear.

In midwifery the term *obstetric shock* has been used to describe post-partum collapse. It occurs in post-partum haemorrhage, in retained placenta, when it may have been aggravated by ill-advised efforts to express the placenta, in prolonged and difficult labour, and in severe trauma such as occurs in acute inversion or rupture of the uterus.

Changes in the Patient's General Condition

In the third stage the mother's pulse is usually slow and her blood pressure normal. The midwife should observe these features and preferably record them in graph form.

Signs of Deterioration

The pulse. A pulse rate of over 90 is not normal. As it continues to rise the volume grows weaker until the rapid, thready pulse of severe haemorrhage is noted.

The blood pressure. Though the patient is losing blood, for some time the compensatory mechanisms in her body will keep her blood pressure at a normal level. If the systolic pressure falls below 100 mmHg, there is cause for some anxiety. Readings of 90 and then 80 mmHg indicate seriously deepening shock.

Increasing pallor of the skin, which is covered with a cold sweat. The lips are bluish and the mucous membranes blanched.

The temperature falls to a subnormal level.

The respirations become deep and sighing. The patient is sometimes restless, and may complain of thirst or faintness. She may lose consciousness.

The midwife should call a doctor at the first sign of a rising pulse rate and if, in addition, the patient's blood pressure begins to fall, she should have the obstetric 'Flying Squad' called.

Whether the cause is clearly post-partum haemorrhage or whether some less obvious condition is present is immaterial. In either case the patient is in urgent need of resuscitative treatment.

The principles underlying the treatment are:

The administration of fluid. The collapse is due to lack of circulating blood, and the first requirement is to increase the blood volume. Blood of the correct ABO group and Rhesus type and cross-matched is undoubtedly best for haemorrhage. Until cross-matched blood is available, plasma substitutes may be used. Intravenous dextrose and saline are useful temporarily.

Other means of maintaining the circulation. The foot of the bed may be raised, thus allowing blood to gravitate towards the heart and the brain. Drugs such as cortisone or noradrenaline are sometimes effective.

Rest. The patient may benefit from the administration of morphine, which is valuable in allaying pain and apprehension. She should be kept as quiet and undisturbed as possible.

Oxygen. Especially if air hunger is noticeable, the patient benefits from inhalations of oxygen.

Avoiding warmth. The cold pale skin is evidence that the body's compensatory mechanism is at work. The superficial capillaries and arterioles are constricted and blood is being directed to the parts of the body where the need is greatest, that is the heart, the brain and the kidneys. To warm the skin until it is flushed may well undo this important compensatory mechanism and even deepen the shock to an irreversible degree.

28. THE PELVIC FLOOR AND ITS INJURIES

THE PELVIC FLOOR

The structures filling in the bony outlet of the pelvis, and extending from the peritoneum above to the skin below, are known collectively as the pelvic floor. In midwifery practice the most important of these structures are those which support the pelvic organs and prevent them from prolapsing.

From above, downwards, the pelvic floor consists of the following layers:

The pelvic peritoneum. This is described as hanging over the uterus and Fallopian tubes like a sheet hanging over a clothes line. In front, it forms the utero-vesical pouch and covers the upper surface of the bladder; at the back, it dips down behind the posterior vaginal fornix, forming the Pouch of Douglas and then passes over the rectum. The peritoneal coverings of the Fallopian tubes are called the broad ligaments, but in spite of their name, they do not act as supports.

The pelvic fascia. The connective tissue which fills in the space between the pelvic organs. This connective tissue condenses to form strong ligaments which support the uterus.

Transverse Cervical Ligaments

These ligaments are also known as the cardinal and Mackenrodt's ligaments. They extend fan wise from the cervix and vagina to the side walls of the pelvis. These are the principle direct supports of the uterus.

Utero-Sacral Ligaments

These run backwards and upwards from the cervix encircling the rectum to attach to the anterior part of the sacrum.

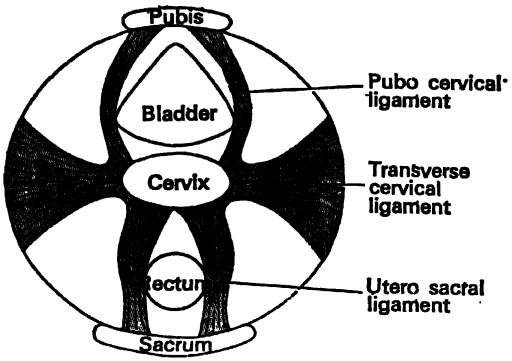


Fig. 142. Uterine supports seen from below.

Pubocervical Ligaments

These run from the cervix passing beneath the bladder to attach to the pubic bones.

These three pairs of ligaments act as a kind of hammock, holding the uterus at the level of the supra-vaginal cervix, so that while it is quite mobile, it cannot prolapse.

Round Ligaments

These originate near the fundus of the uterus passing through the inguinal canal and anterior abdominal wall to end in the labia majora. They assist in keeping the uterus in its normal anteverted (forward tilted) anteflexed (bent on itself) position (Fig. 143).

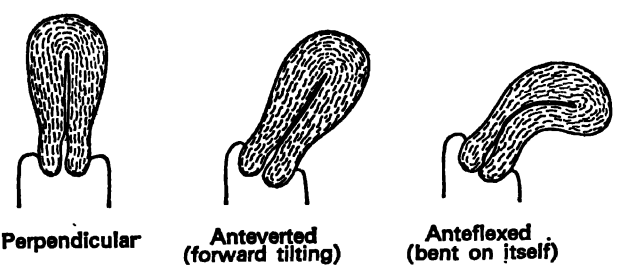


Fig. 143. Diagram to show how the normal position of the uterus is achieved.

The deep muscle layer. The deep muscle layer consisting of the two *levator ani* muscles. Each arises from the back of the pubic bone,

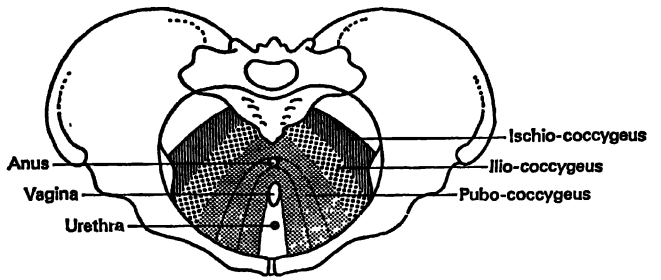


Fig. 144. The levator ani muscles (seen from above).

along the 'white line' of the obturator fascia, and from the ischial spine. They pass downwards and backwards around the vagina to meet in the perineal body, then around the anal canal, finally being inserted in the coccyx and lower sacrum. The two muscles thus form a strong muscular sling which effectively supports the vaginal walls, and, indirectly, the uterus. The anal canal is also strongly supported, and the bladder receives some support. In these two levator ani muscles, then, lies the main strength of the pelvic floor. Though three individual muscles, namely, *pubo-coccygeus*, *ilio-coccygeus* and *ischio-coccygeus* may be described, they can conveniently be considered together as forming one continuous sheet of muscle.

The superficial perineal muscles. These muscles which, though small, contribute appreciably to the total strength of the pelvic floor.

The two bulbo-cavernosus muscles extend from the perineal body around the vagina to the clitoris. They act like a sphincter around the vagina and urethra.

The two ischio-cavernosus muscles pass from the ischial tuberosities to the clitoris. Their fascia extends across the pubic arch to form the

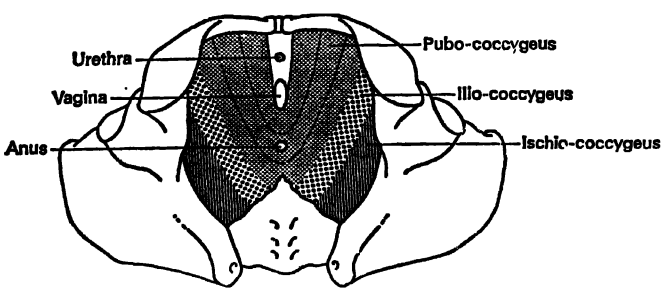


Fig. 145. The levator ani muscles (seen from below).

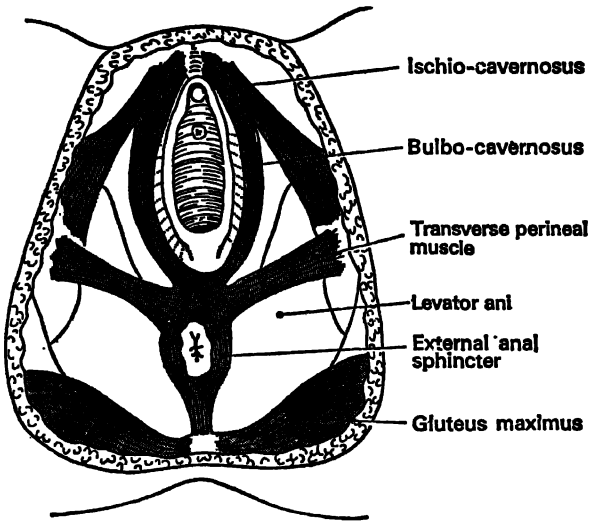


Fig. 146. The perineal muscles.

triangular ligament, which supports the neck of the bladder and assists in the control of micturition.

The transverse perineal muscles pass from the ischial tuberosities to the perineal body. They provide additional support transversely across the perineal region.

The external anal sphincter surrounds the anal orifice, being embedded in front in the perineal body and attached behind to the coccyx. It controls the passage of faeces and flatus.

Superficial Fascia and Fat

Skin. Neither of these has any supporting function.

The **perineal body** is a wedge-shaped mass of muscular and fibrous tissue lying between the lowest part of the vagina and the anal canal. It is an integral part of the pelvic floor, since it is the central point where both the levator ani and most of the superficial muscles unite. Injury to the perineal body thus weakens the pelvic floor as a whole, and even apparently trivial injuries should be regarded seriously.

Functions of the Pelvic Floor

The pelvic floor forms a diaphragm which closes the outlet of the

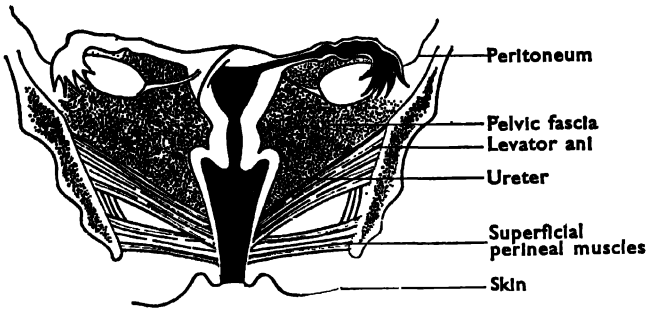


Fig. 147. The layers of the pelvic floor.

bony pelvis, and its primary function is to act as a support for the pelvic organs, namely the bladder, the uterus and the rectum.

The pelvic floor counteracts changes of intra-abdominal pressure, which occur when the abdominal muscles contract, as they do, in coughing, laughing or in lifting heavy objects. If, through childbearing, the bladder and urethral supports are weakened, coughing and sneezing will cause urine to dribble involuntarily from the bladder (stress incontinence).

During the course of pregnancy the pelvic floor becomes softened and relaxed. This incidentally, makes pelvic examinations easier for the doctor and less uncomfortable for the patient in late pregnancy than in early pregnancy; however, the purpose of this relaxation is to permit the tremendous amount of stretching which must occur in labour to allow the fetus to be born. Because of its remarkable elasticity, the pelvic floor is able, after labour, to resume its original supporting function in a surprisingly short time.

Injury to the Pelvic Floor

The pelvic floor may be injured in two ways:

By tearing or laceration.

By stretching.

Lacerations of the Genital Tract

Perineal Lacerations

Lacerations of the perineum are divided into three categories.

First degree laceration: involving the skin of the fourchette.

Second degree laceration (and episiotomy): involving the skin of the fourchette, the perineum and perineal body.

Third degree laceration: involving the skin of the fourchette, the perineum, perineal body and anal sphincter.

They are repaired with catgut sutures and occasionally nylon for the skin sutures. The area must be kept as clean and dry as possible to promote healing and sutures are removed from the fifth to seventh day.

Third degree lacerations are serious as involvement of the anal sphincter could lead to faecal incontinence. Some give no additional care, and others a complex treatment including a low residue diet, confining the bowels for several days and bed rest to assist healing.

Labial Lacerations

Lacerations of the labia are very superficial, but like skin grazes rather painful. They are not usually sutured but kept clean and dry, and analgesics given for the discomfort.

Vaginal and Cervical Lacerations

If these occur they are sutured. There is no treatment other than vulval toilet.

Episiotomy

An episiotomy is an incision through the perineum and perineal body, equivalent to a second degree laceration. As the necessity for episiotomy may become apparent late in labour The Central Midwives Board permit the midwife in the absence of a doctor to perform an episiotomy after the infiltration of the perineum if time permits.

Indications

Before a forcep or breech delivery.
To speed delivery if there is fetal distress.
To aid delivery if there is delay in the second stage due to a rigid perineum.
To prevent severe perineal lacerations.
When labour is premature to reduce the risk of intracranial damage.

Anatomical structures. When an episiotomy is made the scissors cut through the fourchette, posterior vaginal wall, perineal muscles and skin. The midwife must be able to locate the position of the muscles in this area (shown on page 321) when the perineum is distended and to know with certainty where the external anal sphincter muscle which extends for 2·5 cm around the anus, and the Bartholin's glands lie.

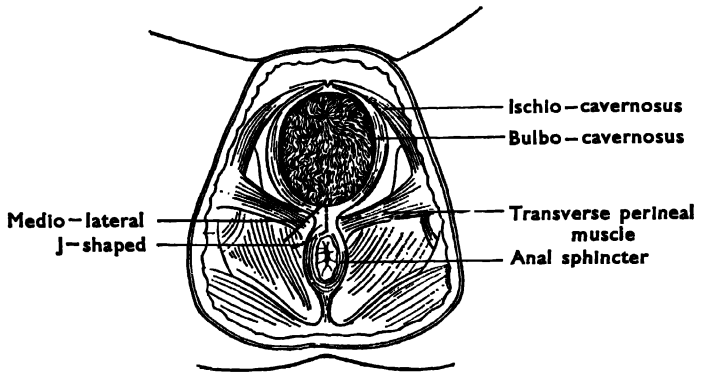


Fig. 148. Episiotomy.

Types of Incision

Medio-lateral episiotomy. This incision starts at the midline and runs backwards to a point midway between the ischial tuberosity and anus. This is recommended to the midwife as it avoids damage to Bartholin's gland and the anal sphincter, is easy to do and reasonably easy to repair.

J-shaped episiotomy. This begins in the midline and then turns outwards. It avoids the danger of involving the anal sphincter, but is more difficult to make and to repair.

Median episiotomy. This is a midline incision, easy to do, but is dangerous if it extends during delivery as it may damage the sphincter and anal canal. Its advantage in the midline is avascular and bleeds very little, it is also easy to repair.

Infiltration of the perineum. This may be carried out if time permits.

Requirements

Lignocaine solution ½ per cent.
10 ml syringe.
Gauge 21 needle 4 cm in length.

Method. Cleanse the skin with antiseptic and then in between contractions insert the gloved first and second fingers of the left hand towards the patient's right hand. Insert the needle into the midline of

the fourchette and inject about ½ ml lignocaine under the skin. Slowly advance the needle in the direction of the fingers, keeping the needle at the same depth below the skin. Inject more lignocaine as the needle advances for 4 cm. The fingers prevent damage to the fetal skull.

When the injection is completed the needle is withdrawn, and 5 minutes should elapse to give time for analgesia to become established. In an emergency it may be inadvisable to wait this long.

The incision. Use straight blunt-ended episiotomy scissors. The two fingers are inserted as before. The blades are opened and one blade is passed flat along the fingers. They are then rotated so that a deliberate cut can be made 4 cm long through the infiltrated area. The cut should be bold and deliberate, and if there was no analgesia made at the height of a contraction to minimize pain. The incision is through the posterior vaginal wall, perineal muscles and skin.

Medical aid should be summoned to repair the incision. The effect of the lignocaine lasts about 1 hour and the repair should be carried out if possible during this time.

Nursing care. As for a second degree laceration.

Stretching

Prolonged, repeated or extreme stretching of the pelvic floor muscles causes permanent damage in that they never regain their former tone and elasticity. If these muscles fail to support the pelvic organs, prolapse results. This may occur in the course of a prolonged or difficult labour, especially if the baby is very large. More commonly it occurs in women who have had many confinements (grandes multiparae).

In utero-vaginal prolapse, the vaginal walls are weakened and the uterus lies lower than normal.

In cystocele the upper anterior vaginal wall is lax and allows the bladder to bulge into the vagina.

In urethrocele the urethra bulges into the lower anterior vaginal wall.

In rectocele, the posterior vaginal wall is damaged, and the rectum bulges into the vagina.

To avoid extreme and prolonged stretching of these tissues episiotomy and sometimes forceps delivery are undertaken.

Further Reading

Smout, C. F. V., Jacoby, F. & Lillie, E. W. (1969). *Gynaecological and Obstetric Anatomy*. London: H. K. Lewis.

29. DRUGS AND THE MIDWIFE

Drugs used in midwifery are of extreme importance as they may affect not only the mother but also her unborn child. The medical practitioner when prescribing must remember that in the early weeks of pregnancy drugs may give rise to serious congenital defects or even death of the embryo. The Committee on Safety of Drugs (Dunlop Committee) was set up in the United Kingdom following the thalidomide disaster to ensure that such a tragedy should never occur again.

Drugs may also affect the neonate, as certain substances are passed in varying concentrations in breast milk. Sometimes, as with aperients and phenobarbitone, this is relatively harmless; but drugs which suppress thyroid activity such as carbimozole or thiouracil, or anticoagulants such as phenindione, may have much more serious effects upon the baby.

The midwife must be familiar with statutory obligations, the rules of the Central Midwives Board and the local rules of her employing authority regulating the control and administration of drugs.

Legislation

Dangerous Drugs

A certified midwife who has in accordance with the provision of the Midwives Act 1951, or the Midwives (Scotland) Act 1951, notified her intention to practice, is authorized to be in possession of:

Medicinal opium
Tincture of opium
Pethidine injection

Subject to the following requirements being met:

1. She must obtain a Midwives Supply Order signed by the Medical Officer of Health for the Local Supervising Authority or a person

authorized by him, in practice usually the non-medical Supervisor of Midwives.
2. She shall not obtain any amount greater than that specified in the midwife's supply order.
3. The order must specify:
   (a) The name of the midwife.
   (b) The name of the drug.
   (c) The purpose for which it is required.
   (d) Total quantity to be procured.
4. The midwife must sign the poisons register kept by the pharmacist.
5. The midwife must enter in her drug book:
   (a) The name of the drug and quantity supplied.
   (b) The name and address of the supplier
   (c) The date, name of patient, quantity administered.
6. She must keep every drug in a locked receptacle which can be opened by only her.
7. Midwives may not lend or borrow dangerous drugs.

These rules are contained in the Dangerous Drugs (No. 2) Regulations 1964, Part II, Section 13, para 4 a & b.

Control of Dangerous Drugs and Poisons in Hospital (Aitken Report)

This advises midwives working in hospital, that unless they carry out the procedure as laid down above (which would in fact be most unusual) they are not permitted to give Dangerous Drugs on their own authority. They are subject to the same rules as any nurse or ward sister in hospital, giving drugs only when they are prescribed by a doctor.

Aitken Report, Section VI, para 84 & 85.

Central Midwives Board Regulations

1. A midwife must comply with the requirements and regulations of the Dangerous Drugs Act.
2. The midwife may not use on her own responsibility any drug including an analgesic unless she has been thoroughly instructed in its use, dosage and method of administration either during or after her training.
3. A practising midwife must record in her personal register of cases the date and time of each occasion on which she administers any drug other than a simple aperient.
4. A midwife should carry in addition to simple aperients the

following drugs, and a hypodermic syringe for the administration of some of them.

Antiseptics.
Cardiac and respiratory stimulants.
A preparation of ergot for intramuscular injection.
Sedatives and analgesics.

Section E and the Code of Practice

Local Rules

This will vary with Local Supervising or Hospital Authorities. For example certain authorities permit the midwife to hold a store of 12 ampoules of pethidine and others 18; some allow the use of oxytocic drugs before the completion of the third stage of labour and others do not. The midwife must familiarize herself with regulations in her own area.

APERIENTS

Aperients must be given with care at any time, the idea is to augment the normal rhythm not disturb it. In pregnancy because progesterone reduces the activity of plain muscle, constipation occurs. Aperients are often necessary but they must be gentle because of the predisposition to haemorrhoids.

Senna B.P.

Senna is a safe preparation, but infusions made from the leaf or pod tend to be of varying strength.

Senokot

Dose 1 to 2 tablets.
1 to 2 teaspoonfuls of granules.

Senokot is a proprietary brand of standardized senna, which does not vary in potency. It is pleasant to take and does not cause griping—Senna is excreted in breast milk so will affect the baby if given in the puerperium.

Liquid Paraffin B.P.

Dose 10 to 30 ml orally.

Liquid paraffin is suitable for temporary use, for instance in the puerperium if there are painful haemorrhoids. It is not recommended

for continuous use in pregnancy as it has the disadvantage of causing seepage and soiling clothing. Also over a long period it may interfere with the absorption of fat soluble vitamins A, D and K.

Magnesium Hydroxide Mixture (*Milk of Magnesia*)

Dose 25 to 50 ml orally.

A useful aperient if taken occasionally, either alone or with liquid paraffin.

Bisacodyl B.P. (*Dulcolax*)

Dose 5 to 10 ml orally.
10 ml per rectum.

Bisacodyl is a 'contact' aperient, which softens faecal mass. It is effective and safe in pregnancy and the puerperium as it is not absorbed. In many units bisacodyl suppositories have replaced the soap and water enema with good effect.

HAEMATINIC SUBSTANCES

Iron

Iron is an essential component of haemoglobin and is necessary not only for the mother but also for the growing fetus. Most women show some degree of iron deficiency anaemia during pregnancy and routine administration of an oral preparation is adopted by most medical practitioners. Iron often causes nausea and it is therefore wiser to begin its administration in the second trimester with meals when the symptoms of morning sickness have passed. Where the haemoglobin is very low or the date of delivery imminent, intramuscular or intravenous preparations may be used.

Ferrous Sulphate Compound Tablets B.P.C. (*Fersolate*)

Dose 60 to 120 mg three times a day.

Ferrous Gluconate B.P.

Dose 300 to 600 mg three times a day.

Folic Acid B.P.

Dose 5 to 20 mg orally, daily.

Folic acid is a member of the vitamin B group and is necessary for

maturation of the red blood cell. Folic acid deficiency anaemia occurs infrequently in late pregnancy giving a clinical picture similar to that of pernicious anaemia. The condition occurs more frequently with increasing parity, multiple pregnancy and low social status. Women with folate deficiency tend to have babies of low birth weight and such women often have a poor obstetric history, with a high incidence of abortion and antepartum bleeding.

HYPOTENSIVES

Hypotensive drugs are used in pregnancy to lower the blood pressure. Where hypertension exists before pregnancy and drugs are administered early they can be used without hesitation, but when the symptoms develop later, as in pre-eclamptic toxaemia, there appears to be some risk of causing fetal anoxia. It is thought that the placenta has become accustomed to functioning at a higher pressure, and therefore is less efficient when this pressure is reduced. Dosage must always be carefully adjusted as any sudden reduction in blood pressure can cause fetal death.

Reserpine B.P. (S.4B)

Dose 0·25 to 1 mg orally, daily.
Calming as well as hypotensive effect.

Methyldopa B.P.

Dose 500 to 4000 mg daily.
Commencing with small doses.

Guanethidine B.P.

Dose 5 to 10 mg daily.
Gradually increasing to the needs of the patient.

DIURETICS

Diuretics may be used as part of the symptomatic treatment of the oedema of pre-eclamptic toxaemia. Care must be exercised if these are used together with hypotensive drugs as diuretics enhance their action. It is usually necessary to add a potassium supplement, if given over a prolonged period.

Frusemide B.P. *(Lasix)*

Dose 40 to 120 mg orally, daily.

Thiadiazine Group

Chlorothiazide B.P. (S.4B) (*Saluric*)

Dose 500 to 1000 mg orally, daily.

Hydrochlorothiazide B.P. (S.4B) (*Hydrosaluric*)

Dose 25 to 100 mg orally, daily.

Chlorthalidone B.P. (S.4B)

Dose 100 to 200 mg orally, alternate days.

Other Drugs

Isoxuprine Hydrochloride (*Duvadilan*)

Dose 40 mg per 200 ml saline, by intravenous infusion.
10 mg orally or intramuscularly.

Isoxuprine hydrochloride is given in premature labour to inhibit uterine contraction. The effect is brought about mainly by its influence on the receptors stimulated by the sympathetic nervous system. Large doses cause a rise in heart rate and a fall in blood pressure, and therefore the pulse and blood pressure should be checked frequently, especially during intravenous administration. In the event of a marked fall in blood pressure it is recommended that the patient be turned into the lateral position. In some patients it causes nausea and vomiting.

Treatment is usually commenced by slow intravenous infusion followed, as contractions cease, by intermittent intramuscular doses and finally oral administration.

Chlormethiazole (*Heminevrin*)

Dose 0·8 per cent solution intravenously.

Chlormethiazole is a hypnotic and anticonvulsant; it is a derivative of aneurine but has no vitamin activity. It is used mainly in the treatment of alcoholism and acute mania but latterly has found a place in the treatment of eclampsia. Given by a continuous intravenous infusion it appears to prevent fits occurring and some workers have used it in the pre-eclamptic state as a prophylactic measure.

DRUGS USED IN LABOUR

Hypnotics

Hypnotics are usually given in early or prolonged labour to ensure sleep and rest.

Chloral Derivatives

These can be given in mixtures or syrups which have an unpleasant taste and are gastric irritants, both factors which predispose to nausea and vomiting. They have been largely replaced by compound preparations containing chloral produced in tablet form.

Syrup of Chloral B.P.C. (S.4B)

Dose 2·5 to 10 ml.
Contains 20 g in 100 ml.

Mothers Mixture

Dose 15 to 30 ml.
15 ml contain Chloral hydrate 1 g.
Potassium bromide 1 g.
Tincture of opium 1 ml.

Dichloralphenazone Tablets B.P. (S.4B) (*Welldorm*)

Dose 650 to 1300 mg orally.
Tablet contains 650 mg.

Triclofas Tablets B.P. (S.4B) (*Tricloryl*)

Dose 500 to 2000 mg orally.
Tablet contains 500 mg.

Barbiturates

It is generally agreed that barbiturates with a shorter action are most useful in labour as their use avoids the unpleasant after effects of headache and dizziness, particularly when uterine contractions become frequent and further sleep is difficult.

Butobarbitone B.P. (S.4A) (*Soneryl*)

Dose 100 to 200 mg orally.

Amylobarbitone Sodium B.P. (S.4A) (*Sodium Amytal*)

Dose 100 to 200 mg orally.

Analgesics

Pethidine Injection B.P. (D.D.A.)

Dose 50 to 150 mg intramuscularly.

Pethidine is a powerful analgesic and antispasmodic; it is the most widely used analgesic in the obstetric field, relieving the pain of labour without diminishing the force of uterine contraction. It is used during the first stage of labour to produce analgesia and relaxation and takes effect in 10 to 15 minutes. Pethidine is safe as it has only a minimal effect on the baby and is considered by many to have no effect at all unless there is already some degree of fetal anoxia.

The intramuscular route is used because absorption following oral administration is slow and vomiting may occur. The midwife may repeat the dose in 4 hours when necessary unless she expects the patient to deliver within the following 2 hours, or there are signs of fetal distress. In most normal deliveries 200 mg should prove adequate and therefore many local authorities insist that a medical practitioner is called if more than this amount is required. It is not, however, a Central Midwives Board regulation, and in hospital practice much larger doses may be ordered.

Pethilorfan (D.D.A.)

Dose 1 to 2 ml intramuscularly.

Contains Pethidine 100 mg.
Levallorphan 1·25 mg in 2 ml.

This is a proprietary compound in which the depressant effect of pethidine is offset by the stimulant levallorphan. Theoretically this is good, but the amount of levallorphan reaching the fetus is unpredictable.

Opium Derivatives

Narcotics may be given on the authority of a medical practitioner and are used when labour is prolonged, especially in the inco-ordinate types of uterine inertia. They pass the placental barrier and will

depress the fetal respiratory centre and should not be given if delivery is expected within the next 2 hours. They may also be used to good effect where there is antepartum bleeding or in severe pre-eclamptic toxaemia.

Morphine B.P. (D.D.A.)

Dose 10 to 15 mg subcutaneously or intramuscularly.

Papaveretum B.P.C. (D.D.A.) (*Omnopon*)

Dose 20 to 40 mg subcutaneously or intramuscularly.

Tincture of Opium B.P. (D.D.A.) (*Laudanum*)

Dose 0·25 to 2 ml.
Contains 1 per cent anhydrous morphine.

Tincture of opium may be given by the midwife during labour on her own authority. She is advised to remember the dangers stated above and also to realize that tincture of opium is unpredictable in its action and has little if anything to recommend its use in preference to the far safer drug pethidine.

Tribromoethanol (S.4B) (*Avertin*)

Dose 60 to 80 mg/kg body weight by rectal infusion.

Tribromoethanol is given as a basal narcotic in severe pre-eclampsia and eclampsia. The solution must be freshly prepared and kept at 40°C in a vacuum flask until required for use. If the temperature is exceeded the compound breaks up and produces hydrobromic acid which is irritant and toxic and may burn the rectum. The solution should be tested with the Congo red indicator supplied with the drug and if a colour change occurs when mixed the solution should be discarded.

Paraldehyde B.P. (S.4B)

Dose 15 to 30 ml in saline by rectal infusion.

Paraldehyde may also be used in severe pre-eclampsia and eclampsia.

Tranquillizers

Tranquillizers are often given alone or in conjunction with pethidine during labour. They are anti-emetic, potentiate the analgesic, relieve

anxiety and apprehension, and help the over-anxious patient to rest. They seem to have no adverse effect on the mother or the fetus although they pass the placental barrier in large quantities. It has, however, been suggested that large doses may reduce uterine contraction and so prolong labour.

Tranquillizers in common use:

Chlorpromazine Hydrochloride B.P. (S.4B) (*Largactil*)

Dose 25 to 30 mg.

Promazine B.P. (S.4B) (*Sparine*)

Dose 25 to 30 mg.

Perphenazine B.P. (S.4B) (*Fentazin*)

Dose 5 to 10 mg.

Promethazine Hydrochloride B.P. (*Phenergan*)

Dose 25 to 50 mg.

OXYTOCIC DRUGS

These are substances named after the first member of the group, oxytocin, a hormone secreted by the posterior pituitary gland which causes the uterus to contract.

Oxytocin B.P. (S.4B) (*Pitocin, Syntocinon*)

Dose 0·5 to 1 ml (5 to 10 units) intramuscularly or intravenously.

Oxytocin may be given diluted in an intravenous infusion to induce labour or as the treatment of hypotonic uterine inertia. This method allows delicate control as the rate can be varied and the infusion turned off for periods if desirable.

The contractions produced by a small dose may be powerful enough to cause fetal asphyxia or intra-uterine death, therefore the fetal heart must be listened to at regular intervals while the infusion is in progress. In the presence of malpresentation or cephalopelvic disproportion such contractions can cause rupture of the uterus.

Oxytocin may be given intramuscularly or intravenously to control post-partum haemorrhage; its action is swift but its effect is not as prolonged as that of ergometrine.

Intermittent doses given before delivery may cause a sustained powerful contraction which could result in fetal death.

Buccal preparations. These tablets are used sublingually as oxytocin is destroyed by the gastric juice. They exhibit the same dangers as the above, since their action is unpredictable but they are used by some to induce labour.

Pitocin is a proprietary brand of oxytocin.

Syntocinon is a proprietary brand of synthetically produced hormone.

Oxytocin Sprays

Sprayed into the nose 2 to 5 minutes before the baby is put to the breast, to relieve engorgement of the breasts.

Ergometrine Maleate B.P. (S.4B)

Dose 0·25 to 1 mg orally, intramuscularly, or intravenously.

Ergometrine maleate has a powerful action on the uterus especially during and immediately after labour, when it produces rhythmic contractions. Its action is less rapid but more prolonged than that of oxytocin. Ergometrine is given to prevent and control haemorrhage during childbirth, especially if an anaesthetic has been used and hence uterine tone is poor. It is most usually injected intramuscularly with the crowning of the head or the birth of the anterior shoulder, or intravenously where there is increased risk such as antepartum haemorrhage, post-partum haemorrhage or grande multiparity. It may be injected into the uterine wall by the surgeon during Caesarean section. Ergometrine may be given orally post-partum to ensure good contraction of the uterus and it is especially useful to the domiciliary midwife who has to leave her patient. Finally it may be given as a course over two or three days where there are heavy lochia or the uterus is failing to involute. Intramuscular ergometrine is often given with 1500 units of hyaluronidase as this speeds the rate of absorption.

Syntometrine (*S.4B*).
A proprietary preparation containing:

Oxytocin 5 units.
Ergometrine 0·5 mg in 1 ml.

Dose 1 ml intramuscularly or intravenously.

Syntometrine is said to combine the best of its two constituents: it acts quickly because of the oxytocin and the action is prolonged by

the ergometrine. Its use is confined to the prevention and treatment of post-partum haemorrhage.

Hyaluronidase B.P. (*Hyalase*)

Dose 1 mg (1000 units).

Hyaluronidase hastens the absorption of fluid or drugs given by subcutaneous or intramuscular injection, It is prepared by adding 1 ml of sterile water (or 1 ml of ergometrine) to 1 mg of powder, and 1000 units will facilitate the absorption of up to 1000 ml fluid.

RESPIRATORY STIMULANTS

Respiratory stimulants have a limited use in the resuscitation of the asphyxiated neonate. They are of use only if there is a mild degree of asphyxia. The preparations used may be run on to the tongue where they are rapidly absorbed by the mucus membrane, or be given by intramuscular injection.

Ethamivan Mixture (*Vandid Oral Solution*)

Dose premature infants 0·25 ml; 3 drops orally (5 per cent solution).
Full term infants 0·5 ml; 5 to 12 drops orally (5 per cent solution).

Nikethamide B.P. (*Coramine*)

Dose 0·25 to 0·5 ml orally or intramuscularly (25 per cent solution).

Nalorphine Injection B.P. (*Lethidrone*)

Dose newborn 0·25 to 1 mg into the umbilical vein.

Nalorphine is the specific antidote to morphine and its derivatives, and is useful in the event of sudden delivery after a dose of morphine or pethidine if the baby exhibits signs of respiratory depression.

SYNTHETIC OESTROGENS

Synthetic oestrogens are given because of their action in depressing the lactogenic hormone and inhibiting lactation. If they are used after lactation is established the breasts must be expressed and a firm binder applied.

Hexoestrol B.P.C. (S.4B)

Dose 1 to 3 mg orally.

Hexoestrol Dipropionate (S.4B)

Dose 10 to 15 mg intramuscularly, one dose.

Stilboestrol B.P. (S.4B)

Dose 5 to 10 mg three times a day, 5 to 7 days.

Stilboestrol may also be given as a single dose (50 to 100 mg) in the treatment of breast engorgement, it is unwise to repeat the dose as it may cause suppression of lactation.

OTHER DRUGS USED IN OBSTETRICS

Human Fibrinogen B.P.

Dose 2 to 4 g in 200 ml water.

Human fibrinogen is a sterile white powder derived from liquid plasma to which has been added thrombin. It is reconstituted by adding sterile pyrogen free distilled water. The mixture should be gently rocked and not shaken as froth will impede further solution. Reconstituted fibrinogen should be used immediately and discarded after 3 hours. It is used in the treatment of the excessive post-partum haemorrhage which occurs in afibrinogenaemia and hypofibrinogenaemia when owing to the total or partial absence of fibrinogen the blood is unable to clot.

Phenazopyridine Hydrochloride (*Pyridium*)

Dose 1 to 2 tablets.

Phenazopyridine is actually a urinary analgesic; it colours the urine orange or red, a fact which is used in obstetrics to determine whether the fluid being passed is urine which will be coloured, or liquor amini which will not.

Trypsin and Chymotrypsin

Dose 1 to 2 tablets four times a day.

These are two pancreatic enzymes which are used to reduce oedema and haematoma of the perineum following laceration or episiotomy.

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30. ANALGESIA IN MIDWIFERY PRACTICE

Analgesia means a condition in which there is an insensibility to pain. Certain drugs produce analgesia and are known as analgesics.

The analgesic drugs may be divided into two groups: first are those drugs that are given by mouth or by intramuscular injection and which are relatively slowly absorbed. These drugs have an effect lasting for several hours and are given during the first stage of labour, but since they can pass through the placenta to the fetus, and may depress the respirations of the baby after delivery, they should not be given towards the end of the first and during the second stages of labour. Morphine and Pethidine belong to this group, and the effect of all these drugs may often be enhanced by the addition of hypnotics, that is drugs producing sleep, such as chloral hydrate.

Second are the drugs which are used mainly to relieve pain in the late first and in second stages of labour. For this purpose it is necessary to use drugs which act quickly and are powerful in action and of which the effects wear off within a few minutes so that the respirations of the newborn child are not depressed. These drugs produce their rapid effects by absorption through the lungs and are known as inhalation analgesics. Administration of these drugs in large dosages will produce anaesthesia.

Anaesthesia is a condition in which there is not only complete insensibility to pain but also loss of consciousness. Midwives are not permitted to administer anaesthetics.

They may, however, administer inhalation analgesics, subject to the approval of the Central Midwives Board. The Board has approved trichoroethylene and air, given from an Emotril or a Tecota apparatus; and nitrous oxide and oxygen, from a Entonox apparatus, methoxyflurane from a Cardiff Inhaler. The patient does not lose consciousness, but can hear, see, and follow instructions; and so can assist in the birth of her child. She will also have the satisfaction of hearing its first cry.

Attempts to relieve the pains of childbirth have been made since

ancient times. Theocritus writes: 'For then the daughter of Antigone, weighed down with throes, called for Lucina, the friend of the woman in travail, and she with kind favour stood by her and in sooth poured down her whole limbs an insensibility to pain, and so a lively boy like to his father was born.' Midwives in ancient and medieval times possessed a great knowledge of herbs. Much of their time was spent in preparing pills and potions with which to assist the woman in labour. The midwife was a highly respected member of the community and had many privileges, including free access to gardens, fields and livestock.

It was in 1847 that James Young Simpson of Edinburgh introduced chloroform for anaesthetic purposes. He used it for the relief of pain in childbirth. In 1853 Queen Victoria availed herself of an anaesthetic during the birth of her seventh child, Prince Leopold. She expressed herself as being greatly pleased with the relief of the pains of childbirth and wished that she had been able to have the benefit of anaesthesia during her previous labours. The anaesthetic used thus became known as 'chloroform à la reine' and was much in demand.

It was not until the 1930s that efforts were made to bring relief to all classes of mothers. Since then, first, nitrous oxide and air later, Trilene and air and, more recently, nitrous oxide and oxygen have been made available and approved by the Central Midwives Board for midwives to use.

A midwife is required to have special instruction in the essentials of obstetric analgesia and the Board must be satisfied that she is proficient in the use of the various apparatuses.

The patient receiving the analgesic must be medically fit, a doctor having signed a certificate to this effect some time during her pregnancy. In the event of her subsequent illness, the midwife must ascertain that the certificate is still valid or ask for her to be examined again.

Training in Administration of Inhalation Analgesia

The Central Midwives Board has laid down these rules:

Rule 17 (*b*). During either the first or second period of training a pupil-midwife shall receive theoretical and practical instruction in anaesthesia and analgesia in midwifery practice as follows:

she must receive sufficient theoretical and practical instruction

(i) from a consultant anaesthetist in three lecture demonstrations:

(ii) from the midwifery teacher;

to ensure that she is competent to administer appropriate analgesics on her own responsibility and to participate in advanced

techniques under the supervision of a doctor.

This instruction must be given before the pupil-midwife enters for the second examination and certificates to this effect must be submitted to the Central Midwives Board.

Inhalation Analgesics

To be suitable for use in labour, an analgesic drug should fulfil certain requirements:

1. It should effectively relieve the pain experienced in normal labour.
2. It should not slow down the course of labour.
3. It should be perfectly safe to the mother.
4. It should have no adverse effect upon the fetus.

Nitrous Oxide and Air

A mixture of 50 per cent nitrous oxide and 50 per cent air, was intro-

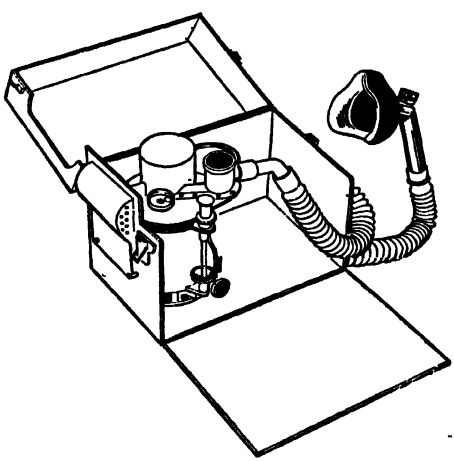

Fig. 149. The Emotril inhaler.

duced in the 1930s, and was for many years the only inhalational analgesic approved by the Central Midwives Board for use by midwives. It was found to be generally satisfactory, being effective in relieving pain in the late first stage and in the second stage of labour.

It does not affect the progress of labour, it is easily self-administered, the mixture of 'gas' and air is almost colourless and not unpleasant and it is harmless to a healthy patient. But the overwhelming disadvantage of nitrous oxide and air is that the mixture inhaled contains only half as much oxygen as atmospheric air, that is approximately 10 per cent instead of 20 per cent. This oxygen-poor mixture has long been known to be unsuitable for patients whose oxygen-carrying capacity is impaired, for example those with cardiac disease, anaemia and some respiratory diseases. More recently it has become evident that the mother's reduced oxygen intake may cause the fetus to become hypoxic, particularly in cases where placental insufficiency is present, such as pre-eclampsia or post-mature labour. Since the introduction of safer alternatives therefore, the use of nitrous oxide and air is discouraged.

Trichloroethylene and Air

Trichloroethylene (Trilene) vapour in air has been used for 20 or more years. The Central Midwives Board has approved for use by midwives the Emotril and the Tecota Mark 6 Trilene inhalers. These machines deliver an absolutely constant mixture, which is unaffected

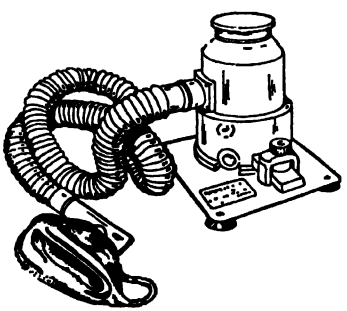

Fig. 150. The Tecota Mark 6 inhaler.

by any change of temperature or alteration in position. The Trilene vapour may be inhaled at a normal strength of 0·5 per cent (99·5 per cent of the mixture being air), or at a weaker concentration of 0·35 per cent (with, of course, 99·65 per cent air). Thus the patient's intake of oxygen is virtually unaltered.

Trilene is a very effective analgesic which does not affect the course of labour. It is self-administered. The apparatus is easily portable and the Trilene is cheap and economical. It is blue in colour for easy

recognition. It is in fact similar to dry-cleaning fluids and has the same characteristic smell, which most patients do not find unpleasant. Because of its higher oxygen concentration, Trilene vapour is safe for the mother and does not endanger the fetus. It has a slight cumulative effect and, after prolonged inhalation, the patient may become sleepy and rather unco-operative, but this is easily reversed by changing to the weaker concentration, or by discontinuing the inhalation during a few contractions. Trilene is so simple, compact and self-contained that it is very useful for domiciliary practice and ideal for use in a country where facilities for refilling cylinders are not available.

Nitrous Oxide and Oxygen

The Central Midwives Board has approved for use by midwives the Entonox apparatus, whereby the patient inhales a mixture of 50 per cent nitrous oxide and 50 per cent oxygen. The nitrous oxide and

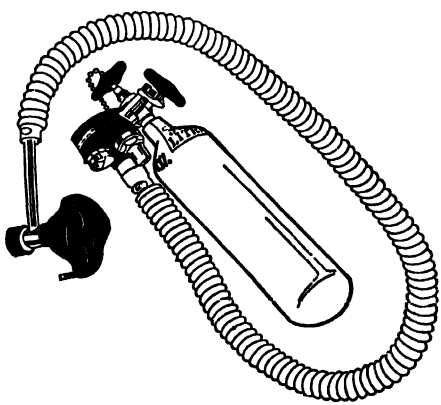

Fig. 151. The Entonox inhaler.

oxygen are pre-mixed in a single cylinder to which is attached a simple 'demand valve,' with corrugated tubing and face mask similar to the other apparatuses. This mixture has the advantage of combining 50 per cent nitrous oxide, which gives good pain relief, with an ample proportion of oxygen, perfectly safe for mother and child. The apparatus is quite easily portable, and the mixture is stable at all ordinary temperatures. If the cylinders are stored out of doors, and the temperature falls below freezing point, the gases may separate,

but they re-mix when the cylinder is warmed. The cylinder is blue with a white shoulder, and has a non-interchangeable cylinder valve which safeguards against the use of a wrong cylinder.

With all these approved apparatuses, the technique of administration is the same.

Methoxyflurane (Penthrane)

The Board approves the use of a concentration in air of 0·35 per cent given in a standard apparatus the Cardiff Inhaler, which is similar in appearance to the Tecota Mark 6.

Methoxyflurane is used in a similar way to trichloroethylene and nitrous oxide mixtures. Extensive trials have been carried out in the last few years with varying results. Methoxyflurane seems to be most effective in the late first stage and second stage of labour. It is of special use for the primigravida, when for clinical reasons pethidine is best avoided, and for the multigravid patient. It can be safely administered by the patient and tends to give her tranquillity and relaxation while retaining the ability to co-operate. A few patients dislike the smell and some experience slight nausea and vomiting. On a few occasions patients may become rather too drowsy. There is no evidence that fetal respiration is depressed and Apgar scores at birth are at an acceptable level.

Technique of Administration

The woman should be instructed in the antenatal period. She should be assured that she will not lose consciousness at any time and will be fully aware of the birth of her baby, but that the pain and discomfort will be considerably lessened. It is important not to raise hopes too high. Some women expect inhalation analgesics to take away every sensation of labour and are disappointed when this does not happen.

Before beginning the administration, the midwife should show the patient how to fit the mask over her face so that it fits closely. Some anaesthetists recommend the removal of dentures. Others believe that a complete denture should not be removed, since the patient's cheeks would fall in and the mask would not fit accurately.

The patient should breathe into the mask as soon as she suspects a contraction is about to begin; she should not wait for the contraction itself and should take four to five deep breaths fairly quickly so that analgesia is greatest when the contraction is at its height. Between contractions she should rest. During the second stage, she should take

a few deep breaths into the face piece and then use her expulsive powers.

It is difficult if not impossible to anticipate at what stage of labour the analgesia should be begun. It should certainly not be given too early, but neither should it be withheld if the mother is distressed. It may be used as an interim expedient, until analgesics are obtained, for instance. Both primigravid and multigravid women require it when the os is nearing full dilatation, if not before; the primigravida may need it much earlier.

During the second stage many mothers prefer to put the machine on one side, and then continue with it at the actual moment of birth. It is better than having no analgesic if the midwife has to perform an episiotomy and it is also useful if the expulsion of the placenta is proving painful.

After the mother is delivered, and the analgesia is completed, the face piece should be washed well and dried, and the machine should be tested and made ready for use before being put away.

Regional and Local Analgesics

Local analgesics often called local anaesthetics act within a limited area, providing analgesia without anaesthesia. Their action blocks the impulses passing along sensory motor fibres.

Stimulation of the central nervous system may occur if there is excessive absorption, and may lead to nervous tremor and even convulsions. Inadvertent injection into a blood vessel may cause circulatory collapse.

Epidural Analgesia

This is the introduction of a local analgesic into the peridural space. Sensory nerve fibres from the uterus enter the cord at the level of eleventh and twelfth thoracic segments. It is particularly suitable in prolonged labour and for mid-cavity forceps deliveries. There are certain disadvantages, the main ones being nausea, vomiting and hypotension. Epidural analgesia should only be used in a hospital where frequent recordings of the blood pressure and fetal heart rate can be made.

Two routes are possible:

Epidural block—between second and third lumbar vertebrae as in a lumbar puncture, but without puncturing the meningeal sac.

Caudal block —through the sacral hiatus (the opening at the

lower end of the sacrum) this is much more difficult and used less often now.

Lignocaine 1 to 2 per cent with adrenalin 1 in 200000 is given, and

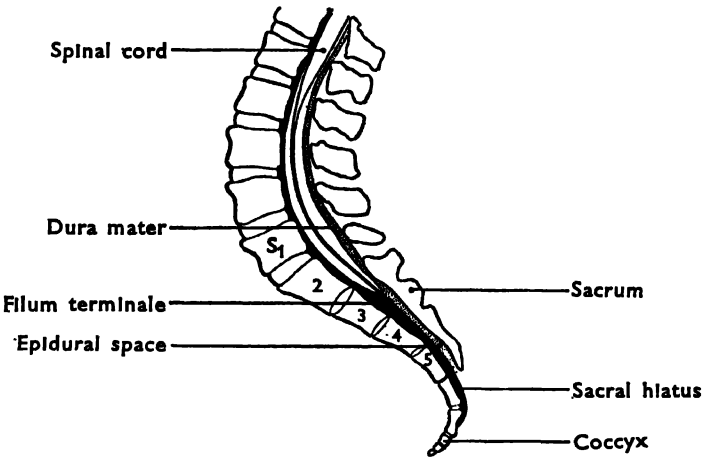

Fig. 152. The epidural space and sacral hiatus.

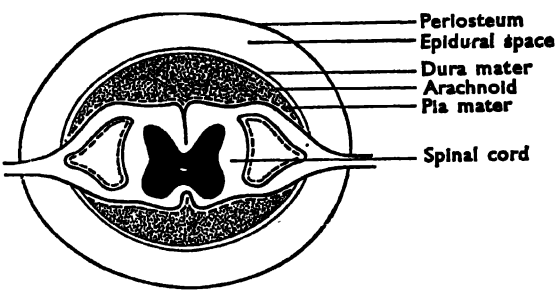

Fig. 153. The epidural space.

in some epidural blocks a fine catheter is inserted into the peridural space so that 'top ups' can be given as required. Such analgesia is of course the province of the doctor, but it is the midwife's responsibility to observe the patient's condition and record the blood pressure.

Paracervical Nerve Block

Infiltration of Lee Frankenhauser's plexus through the lateral fornix

(Fig. 154) 10 ml of 1 per cent lignocaine with adrenaline 1 in 2000000 being given on each side. The needle is introduced through a special guard. This eliminates the pain of cervical dilatation, but the uterine contractions and perineal stretching can still be felt.

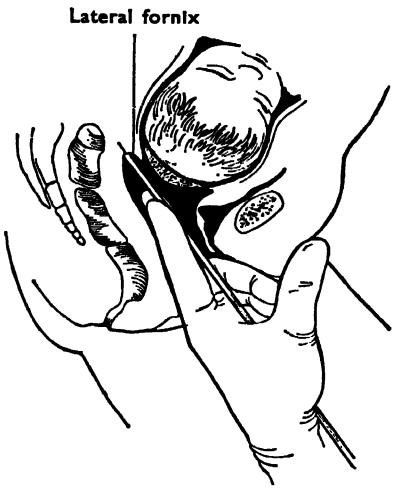

Fig. 154. Paracervical nerve block.

The disadvantage of this method is the limited area affected and the short period of effectiveness. There is also a danger of injecting into a blood vessel.

Pudendal Nerve Block

Infiltration around the pudendal nerve, as it passes across the ischial spine. This provides analgesia of the vagina and perineum and is suitable for forcep deliveries, breech delivery and repair of episiotomies. Ten millilitres of 1 per cent lingocaine is usually used. The fingers are inserted first and used to guide the needle, no guard is required (Fig. 155).

Perineal Infiltration

This is used for the repair of episiotomies and lacerations. A fan-like injection is made from the centre point of the fourchette using lignocaine 1 per cent.

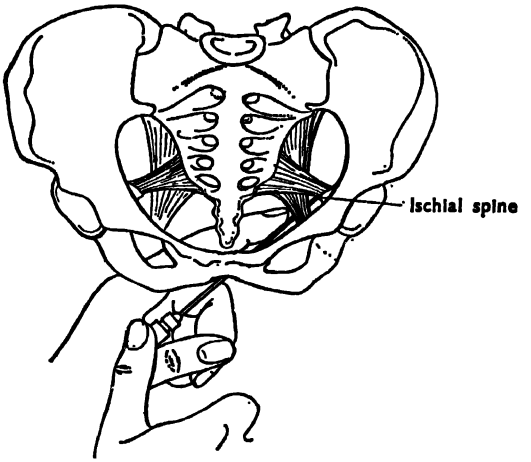

Fig. 155. Pudendal nerve block.

Lignocaine Hydrochloride B.P. (*Xylocaine*

Lignocaine hydrochloride is a potent and safe analgesic and the one most frequently used by obstetricians. It is non-irritating and causes no vasodilatation. Solutions of 0·5 to 2 per cent are common strengths for infiltration.

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31. OPERATIONS AND MANOEUVRES IN MIDWIFERY

THERAPEUTIC ABORTION

This operation is carried out during the early months of pregnancy in cases where the obstetrician has decided that the continuation of pregnancy would be dangerous to the mother's physical or mental health. The consent of both husband and patient must be obtained in writing, and it is usual for a doctor to operate only after obtaining a second medical opinion.

The indications are few; serious constitutional disease such as acute nephritis or severe hypertension, certain psychiatric disorders, possibly severe rubella in early pregnancy.

Procedure

The uterus may be evacuated per vaginam in the first 12 weeks of pregnancy or by abdominal hysterotomy after the twelfth week.

INSERTION OF A SHIRODKAR STITCH

Patients who have had repeated abortions which can be shown to be due to cervical incompetence, that is a laxity of the cervix which causes the cervical os to dilate very easily.

Procedure

A suture is inserted into the cervix, rather like the purse-string suture in an appendicectomy. This holds the cervix closed and can be removed just before term, or earlier if labour commences. The treatment is successful in many cases.

VERSION

Version is the operation of turning the fetus in utero to obtain a more favourable lie or presentation. Three kinds of version are described. External version, usually during the antenatal period but sometimes in labour before the rupture of the membranes; internal version and rarely, bipolar version when the patient is in labour.

External Cephalic Version

Indications

To convert a breech to a cephalic presentation (see Breech Presentation, page 280).

To correct a transverse lie, usually in a multigravida. The fetus is easily turned and often reverts to the transverse lie. If the lie continues unstable the patient is admitted to hospital so that the lie can be corrected at the onset of labour.

To correct a transverse lie in a second twin. If the midwife is in charge of the patient, she should correct the lie and then rupture the membranes.

Internal Podalic Version

This is performed when the patient is in labour and the os is fully dilated (Podalic, from Greek *podos*—foot).

Indications

To convert a malpresentation which it is not possible to deliver as such to a presentation which is more easily delivered, for example a shoulder to a breech in circumstances where Caesarean section is impracticable.

To deliver the second of twins, the shoulder presents.

Procedure

With the patient under an anaesthetic a hand is inserted into the vagina and uterus, and by manipulation on the abdomen with one hand and by internal manipulation with the other, a foot is grasped and drawn down, so that the presentation is converted to a breech.

Bipolar Podalic Version

This was a somewhat similar procedure, performed early in labour,

with two fingers in the uterus. If, however, the cervix is only two fingers dilated, there is opportunity to transfer the patient to hospital for Caesarean section so this difficult manoeuvre is no longer attempted.

INDUCTION OF LABOUR

Indications

The commonest indications for induction of labour are pre-eclampsia, essential hypertension, postmaturity, mild diabetes mellitus and some cases of Rhesus incompatibility.

Procedure

Induction of labour can be either medical or surgical.

Medical Induction

A medical induction is likely to be successful only if the pregnancy is at or past term. The number of occasions on which this method is employed is limited by the uncertainty of success and if there is a sufficiently good reason for induction the doctor will probably use surgical induction. The patient is given an enema, which is followed by a hot bath. Some authorities favour buccal Pitocin, tablets containing Pitocin which are dissolved under the tongue, the drug being to some extent absorbed through the buccal mucosa.

Oxytocin can be given intravenously to help the induction of labour. It may be given immediately after the membranes have been ruptured to induce labour, or alternatively 24 hours after rupture of the membranes if labour is not established by then. Oxytocin (Pitocin) or synthetic oxytocin (Syntocinon) 1 unit in a litre of 5 per cent glucose is given by intravenous infusion, at first at 10 drops a minute and gradually increasing to a maximum of 40 drops. This is continued until labour is established. If no effect is produced the strength of the oxytocin may be increased to 2 units in a litre or 4 units in a litre. Intravenous oxytocin even when diluted over 1000 times and given very slowly, can produce powerful and prolonged contractions of the uterus. If this should happen the infusion must be slowed or stopped. The woman must be under constant supervision since powerful contractions, if allowed to continue, could produce fetal hypoxia or even rupture of the uterus. Supervision is particularly important during the first ½ hour after the infusion is commenced

and again if the strength is increased. With the introduction of the automatic infusion unit the control of oxytocin can be so delicate and so exact that the dangers have been minimized. The automatic cut out prevents excessive dosage and the midwife does not have to keep the patient under constant supervision. This means her husband or a friend may be with her for company and support. Excessive sensitivity of the uterine muscle producing powerful contractions of the uterus and leading to fetal distress is most likely to appear during this time.

Surgical Induction

It is not usually necessary for an anaesthetic to be given for the surgical induction of labour. The patient should, however, be fully prepared for an anaesthetic, with a pre-anaesthetic drug given, and the bladder emptied; the fetal heart sounds should be listened to. The doctor first 'sweeps' the membranes, that is he inserts a finger through the cervical canal and sweeps it gently round the lower uterine segment, separating the chorion from the decidua. He then ruptures the forewaters, using Kocher's forceps.

A hind-water rupture with a Drew Smythe cannula is occasionally performed.

Requirements

Sterile towels, leggings, cap, gowns, gloves, dressings and pads.
Sterile bowls, receivers, gallipot.
Chlorhexidine (Hibitane) lotion 1:2000 and chlorhexidine (Hibitane) cream 1 per cent.
Catheters, towel clips.
Sponge holders.
Sims' speculum.
Drew Smythe cannula, fitted with stilette withdrawn slightly, Kocher's forceps.
Jug to measure the amount of liquor withdrawn.

After-Care

The fetal heart sounds should be listened to soon after the induction, and the sterile pads should be changed frequently. Great care must be taken now that the membranes are ruptured that the risk of infection is reduced as much as possible. If the os was easily dilatable and the cervix soft at the time of induction, labour will probably start within 12 hours, but if the os was closed it may be longer.

If labour does not commence within 24 hours a systemic antibiotic is commonly given.

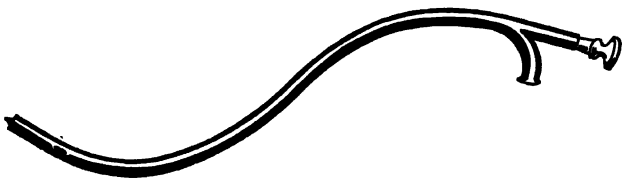

Fig. 156. Drew Smythe cannula.

FORCEPS DELIVERY

Indications

Forceps delivery is one of the commonest of obstetric operations. The main indications are:

Delay in the second stage of labour; the most frequent causes being poor uterine contractions, deep transverse arrest, persistent occipito-posterior position, and sometimes a rigid pelvic floor.

Fetal or maternal distress.

To spare the mother muscular effort as is necessary in severe pre-eclampsia, eclampsia, hypertension, heart disease and tuberculosis.

To protect the child, as in the birth of a premature baby, or in breech delivery with forceps applied to the after-coming head.

In case of outlet disproportion a 'trial of forceps' may be attempted. This is carried out in the theatre, which is fully prepared for Caesarean section, should it be necessary. The obstetrician applies

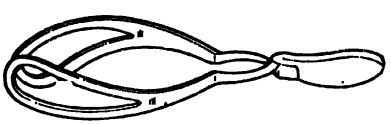

Fig. 157. Obstetric forceps.

forceps, exerts gentle traction, and notes if the fetal head descends easily. If so, he continues, completing the forceps delivery. If descent is difficult, he removes the forceps and proceeds to deliver the patient by Caesarean section.

Whenever possible, a pudendal nerve block, which provides good

regional anaesthesia, is used. Sometimes a general anaesthetic is needed, and the patient should be fully prepared with suitable premedication. Her stomach must be empty, but labours are nowadays managed with the possibility of an anaesthetic in mind, and this should not present any problem.

Requirements

Sterile towels, leggings, cap, gown, gloves, dressings and pads.
Sterile bowls, receivers, gallipot and jug.
Chlorhexidine (Hibitane) lotion 1:2000 and chlorhexidine (Hibitane) cream 1 per cent.
Catheter with jug to receive urine.
Sponge holding forceps, 2.
Towel clips, 6.
Obstetric forceps.
For an outlet forceps, e.g. Wrigley's forceps.
For a forceps rotation, e.g. Kjelland's forceps.
Otherwise any one of a variety of axis traction forceps, but since only gentle traction is employed, the special handles are not used.
For the pudendal nerve block the doctor will use a 10-ml syringe with a 15-cm (6-in.) needle and 1 per cent lignocaine.
Episiotomy scissors.
Ergometrine 0·5 mg drawn up in a syringe.

Requirements for Repair of the Perineum

Artery forceps. Scissors.
Needle-holder and dissecting forceps.
Needles: round-bodies half curved for tissue; half-curved cutting for skin.
Sutures, catgut and nylon.

Preparation of the Patient

The patient should be told what is about to happen. Long socks should be put on to protect the ankles and give some warmth to the legs. The patient is placed in the lithotomy position and it is necessary for the delivery bed to be fitted with leg rests to support the heels. It is the midwife's responsibility to see the patient is in the correct position. Both legs must be flexed simultaneously on to the abdomen and the feet moved to the outer sides of the poles and the feet placed in the stirrups. This is most important, as moving each leg separately causes sacro-iliac strain. Care must be taken to see that the legs are

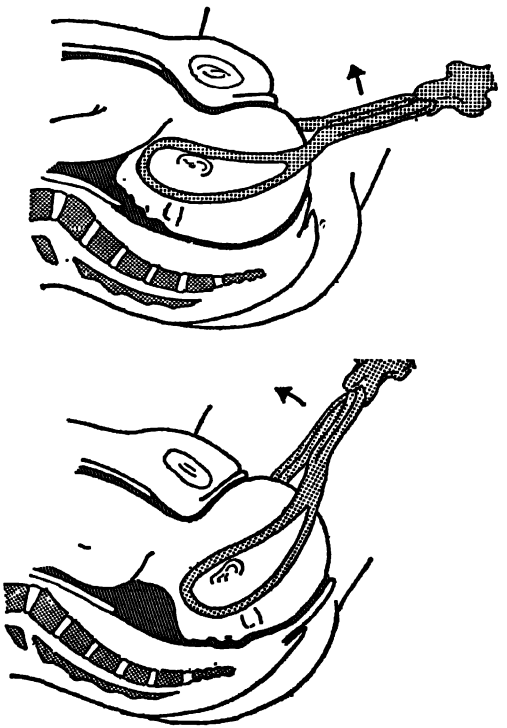

Fig. 158. Forceps delivery.

fully abducted, otherwise pressure from the leg rests may obstruct the venous return and cause thrombosis. When in position the bottom part of the bed is lowered and the patient's buttocks lifted, not dragged, to the edge of the bed. The obstetrician can now arrange his towels and proceed.

Following delivery the baby should be observed over a period of 24 hours for signs of cerebral irritation.

VENTOUSE EXTRACTION

The Malstrom vacuum extractor or ventouse is a simple suction apparatus which may be used to accelerate labour, either in the first or the second stage, local anaesthesia being employed.

It consists of a rounded metal cup with a chain and traction handle

attached and a suction pump. The cup is applied to the fetal head and, by suction, the scalp, in the form of an artificial 'caput' is drawn into the cup, which is thus firmly fixed. Traction is then applied to coincide with the uterine contractions.

In the first stage the head is pulled down on to the slowly dilating cervix, in an effort to stimulate stronger contractions. In delay in the second stage, delivery is hastened.

The large caput succedaneum, described from its shape as a 'chignon', gives the baby a bizarre appearance. It subsides quickly, leaving a circular bruised area which clears more slowly.

After any instrumental delivery the baby may be asphyxiated and need resuscitation. The following equipment should be at hand:

A tray or table on which the baby can be placed.
Oxygen. Mucus extractors.
A small laryngoscope and endotracheal tubes.
Drugs: Nalorphine injection (*Lethidrone*).
Ethamivan mixture (*Vandid*).
Phytomenadione injection (*Konakion*).
Syringes and needles.

In the 'Resuscitaire' apparatus all these requirements are conveniently assembled.

CAESAREAN SECTION

Indications

There are many indications for Caesarean section, some of the more common ones being:

Disproportion.
Placenta praevia.
Prolonged labour.
Severe pre-eclampsia or diabetes.
Either maternal or fetal distress before the second stage of labour.

The classical Caesarean section, with a longitudinal incision in the upper uterine segment, has now been almost entirely superseded by the lower segment operation, which is very much safer. The scar in the uterus is much less likely to rupture in a subsequent pregnancy. If infection does occur, it is usually limited to the pelvis.

Caesarean section can be performed before labour begins, or in the first or, occasionally, the second stage of labour, when it may follow a 'trial of forceps'.

Although Caesarean section has a higher death rate than normal delivery, it is much safer for the mother than a very difficult vaginal delivery. For this reason it may be the best way to deliver a woman even when the fetus is dead.

Preparation

The preparation for an elective Caesarean section is commenced on the day of operation. The abdomen, vulva and perineal area are shaved. The bowel is emptied by the use of an enema or suppositories. followed by a shower or bath. The bladder should be emptied by catheter just before the patient is taken to the theatre. A spigot is inserted in the catheter which is left in place and the bladder emptied again immediately before the operation. The anaethetist usually orders a hypodermic injection of atropine 0·6 mg.

Requirements

Anaesthetic trolley.
General laparotomy set, and in addition obstetric forceps. (The small Wrigley's forceps are used as a rule.)
Ergometrine, 0·5 mg for injection into the uterine muscle or intravenously.

After-Care

The pulse-rate and blood pressure should be checked frequently and the wound and vulval pad inspected for bleeding. The patient is not left until she is conscious, when she is given an analgesic drug such as papaveretum (Omnopon) 20 mg. This may be continued 6-hourly for the next 48 hours.

After this, analgesic drugs and hypnotics should be sufficient to relieve discomfort and to obtain sleep at night. If the woman is unable to pass urine, catheterization will be required. A light diet is given as soon as the patient wishes to take it.

On the second day an aperient, such as magnesium hydroxide (Milk of Magnesia) may be given, followed, if necessary, by a bisacodyl (Dulcolax) suppository on the third morning.

The patient should get up on her first day and she should be encouraged to practise breathing and leg exercises, and to move around as much as possible, as there is a risk of thrombosis.

Clips are removed on the sixth day, stitches on the tenth. A dressing, if used, may be left in position for a few days longer. The patient leaves hospital about the twelfth day if no complications have arisen.

The baby is received by a midwife and often an anaesthetist or paediatrician in the theatre. Any necessary resuscitative techniques are carried out. Once the condition is satisfactory the surgeon's permission should be asked to remove the baby to a nursery. The baby is usually nursed in the cot for 24 to 48 hours, and observed for signs of cerebral irritation.

Complications

Haemorrhage. The amount of blood lost during the operation varies. It may be great and the patient may return to the ward with a blood transfusion in progress. The most serious complication is the unsuspected continuation of intraperitoneal bleeding after the operation. The midwife must record the pulse and blood pressure ¼ or ½ hourly for several hours after the operation. If the pulse rises or the blood pressure begins to fall or if there is excessive vaginal bleeding, or if recovery of consciousness is delayed, a doctor should be notified immediately.

Infection. Infection may cause peritonitis, and the danger signs, for which the midwife should be constantly on the alert, may occur about the third day. These are a rising pulse-rate, pyrexia, vomiting, abdominal pain and distension. Inability to pass flatus or to have the bowels open signifies that the bowel has become paralysed and this is called paralytic ileus. This is a very serious complication. Sulphamezathine, penicillin or other antibiotic drugs are given to overcome the infection, intravenous fluids are given, and aspiration of the stomach with a Ryle's tube is continued until the paralytic ileus recovers and the patient is able to take fluids by mouth without vomiting.

Pulmonary embolism. There is always a possibility of pulmonary embolism whenever a laparotomy has been performed. Collapse and even sudden death may occur from this on the tenth to fourteenth days. Exercises, leg movements and early ambulation have helped to reduce the incidence of this complication.

Lung complications. Lung complications, such as collapse of a lung or bronchopneumonia are not common. The better care of patients prior to anaesthesia and improvements in anaesthetics are helping to reduce these complications.

PART FIVE
THE PUERPERIUM

32. PHYSIOLOGY AND MANAGEMENT OF THE PUERPERIUM

The puerperium is the period from immediately after the end of labour until the reproductive organs have returned to their pre-gravid condition. It usually lasts from 6 to 8 weeks. The lying-in or early post-natal period is the 9 or 10 days after delivery when the patient is under the care of the midwife either in hospital or at home. Sometimes she goes home 48 hours after delivery and is then attended by the district midwife.

The Central Midwives Board regulations state that 'the lying-in period' means a period of 'not less than 10 days nor more than 28 days after the end of labour during which the continued attendance of the midwife on the mother and child is requisite'.

During the puerperium certain physiological changes take place:
The involution of the uterus and other soft parts of the genital tract.
The discharge of the lochia.
The secretion of milk in the breasts (Chapter 38).

Involution

The term involution means the return of the uterus to its normal size, tone and position. The vagina, the ligaments of the uterus and the muscles of the pelvic floor also return to their pre-pregnant state during the process of involution. If the ligaments of the uterus and the muscles of the pelvic floor do not return to normal and are permanently weakened, a prolapse may occur later. During the process of involution the lining of the uterus is cast off in the lochia and is later replaced by new endometrium. After the birth of the baby and the expulsion of the placenta, the muscles of the uterus constrict the blood vessels, so that the blood circulating in the uterus

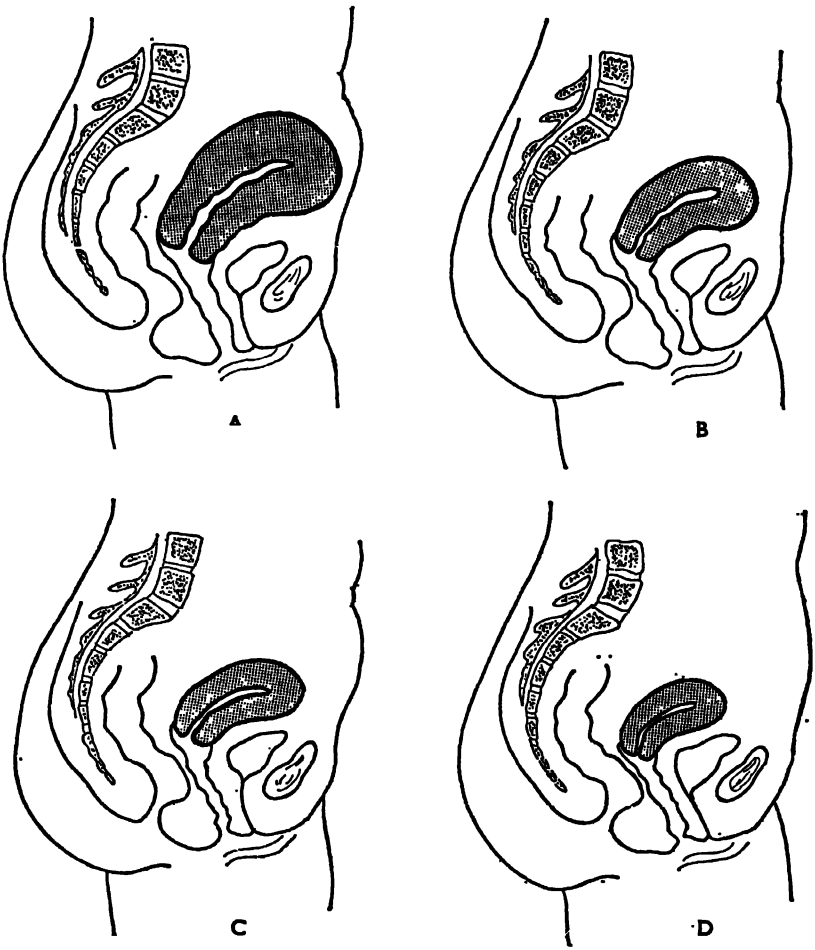

Fig. 159. A, The uterus at the end of labour; B, a week after delivery; C, 2 weeks after delivery; D, 6 weeks after delivery.

is considerably reduced. Redundant muscle, fibrous and elastic tissue has to be disposed of. The phagocytes of the blood stream deal with the last two by phagocytosis, but the process is usually incomplete and some elastic tissue remains, so that a uterus which has once been pregnant never returns to its nulliparous state. Muscle fibres are digested by proteolytic enzymes, a process known as autolysis. The

lysosomes of the cells being responsible for this process. The waste products then pass into the blood stream to be eliminated by the kidneys.

The decidual lining of the uterus is shed in the lochia. The new endometrium grows from the basal layer, beginning to be formed at the tenth day and completed in about 6 weeks.

The process of involution takes at least 6 weeks to complete and during this time the weight of the uterus decreases from 1000 to 60 g, and the size of the uterus decreases from 15 × 11 × 7·5 cm to 7·5 × 5 × 2·5 cm. At the end of a week the uterus weighs about 500 g and the cervix is reforming and closing and will admit one finger.

The rate of involution can be measured by the rate of descent of the uterus fundus. On the first day the height above the symphysis pubis is just over 12 cm. There is a steady decrease in the height of the fundus of about 1 cm a day so that by the seventh day the fundal height is about 5 cm, and by the tenth day the fundus is barely palpable at the level of the symphysis pubis.

The rate of involution varies from patient to patient and tends to be slower in a woman of high parity. Involution may be unduly slow if there is retention of placental tissue or blood clot, particularly if it is associated with infection.

By feeling the uterus each day, the midwife may note the steady decrease in its size. The practice of measuring and charting daily the fundal height, once popular, is gradually declining. Careful observation of the lochia will probably reveal whether or not involution is progressing normally.

The Lochia

The lochia are the discharges from the uterus occurring after childbirth and persisting for the first three or four weeks of the puerperium. The changes in the lochia have been described in three stages: lochia rubra, lochia serosa and lochia alba, names which describe the changes in colour of the lochia. The lochia consist at first of blood, coming chiefly from the placental site, mixed with shreds of decidua (lochia rubra). After a few days the lochia become brownish in colour, consisting of altered blood and serum and containing leucocytes and organisms (lochia serosa). Towards the end of the second week the discharge is yellowish-white in colour consisting of cervical mucus and leucocytes and organisms (lochia alba).

Commonly, however, the lochia remain blood-stained for over 3 weeks before finally ceasing. There may be some increase of blood during the second week, and no special treatment is required for this. The most important point to note is whether there is persistent

excessive loss or sudden profuse loss. This is almost always due to retained placental tissue and must be reported to the doctor. Normal lochia are not offensive. Offensive lochia and pyrexia may indicate uterine infection and will require investigation by the doctor.

Management of the Puerperium

Hygienic Care

The patient is usually allowed up for toilet purposes the day following delivery, and may take a bath or a shower. If for any reason she is confined to bed a blanket bath should be given to ensure she is clean and comfortable. The large placental site is a potential area of infection and because of this the cleanliness of baths, lavatories and bidets is of the utmost importance. It is the responsibility of the midwife to see that they are safe for the patients use.

Perineal Care

The care given to the vulva and perineal area varies widely from hospital to hospital but the basic principles remain the same. The

Fig. 160. A bidet.

area must be kept clean and dry and free from infection. The area must be inspected daily if there are perineal sutures to see that healing is taking place. Vulval pads must be changed frequently. Care is given two or three times a day and following a bowel action.

Where possible the use of a bidet is the most satisfactory method, as the patient can use it herself each time she uses the lavatory. It is desirable that the temperature of the water should be thermostatically controlled and that the patient understands its use. The midwife

must make certain the patient knows just what to do, where to put her used vulval pads, how to operate the bidet and how to dry the vulva afterwards. A soft, sterile paper towel is very suitable and easily disposed of.

Other methods include vulval swabbings and washing with soap and water.

Non-absorbable sutures are removed about the sixth or seventh day.

The Temperature

The temperature of the patient must be taken regularly. It is usually taken twice daily for 3 days, and thereafter daily until discharge. Even the smallest rise of temperature should be reported and investigated. There is always a strong suspicion of infection, and it may be wise to isolate the patient.

The Pulse

The normal pulse rate is from 72 to 80/min. An increase in the pulse rate is a most important sign of the onset of sepsis.

Micturition

The bladder should be emptied within 8 hours of delivery. A diuresis occurs during the first few days and the patient will pass urine more frequently. Sometimes the bladder is numbed by injury or pressure during labour, and the patient is unaware that the bladder needs emptying. The bladder can contain only a certain amount of urine even when distended, and when that capacity has been reached the sphincter of the bladder relaxes and urine escapes. This condition is known as retention with overflow. However, retention should never be allowed to progress to this state. The midwife should suspect that retention is present by the woman's complaint of difficulty or inability to pass urine. Examination of the abdomen may show the presence of a soft rounded suprapubic swelling which often displaces the uterus upwards and to the right side. It is one of the most important duties of the midwife during the postnatal period to make sure that the bladder is completely emptied, and if the mother has difficulty in using a bedpan, she may try the 'sanichair' or be taken to the lavatory. Catheterization may be necessary, but it should if possible be avoided. However excellent the technique, there is a risk that infection may be introduced.

Bowels

During labour the patient has taken little diet and she has probably had an enema. She may well not have a bowel movement for a day or two after delivery. Once she is up and about the normal rhythm will probably return. A mild aperient should be given on the first and second evening after delivery, and a suppository on the third morning if there is still no bowel action. The presence of haemorrhoids is not uncommon and the pain they cause may be eased by an anaesthetic cream or suppository. If they have prolapsed an ice pack may help to reduce their size.

Diet

This should be arranged on common-sense principles, as child-bearing is not an illness. While the patient is in bed, the food must be light and easily digested. In a healthy, well-balanced woman her own inclinations as to diet are as a rule fairly safe to follow. Her appetite usually returns very quickly after labour is ended and she has had some sleep. Protein foods are important, particularly if she is breast feeding, and generous amounts of meat, eggs and cheese should be given.

Excess fruit should be avoided as substances from this will pass to the baby in the milk and may cause diarrhoea. The daily fluid intake should be 2½ to 3 litres, of which at least 600 ml should be milk. Most nursing mothers appreciate a milky drink at about 22.00 hours just before or after having given the last feed to the baby. This helps her to settle and sleep well.

Sleep and Rest

The patient should have sufficient sleep and rest during the lying-in period. As soon as she is comfortably settled, a quiet atmosphere must be secured so that she can sleep without disturbance. Inability to sleep must be regarded with concern and a doctor should be consulted promptly. Hypnotics may be needed, and should be given without hesitation. Undue anxiety, sleeplessness, and a lack of appetite should be regarded as serious, for they may be the forerunners of puerperal psychosis.

In addition to a good nights sleep, rest during the day is important. With early ambulation the mother cares for her baby from the beginning and sufficient attention is not always paid to the fact that she is not resting. Standing about chatting to other patients should be avoided. A rest should be encouraged during the afternoon,

preferably in the prone position as this aids drainage from the uterus and vagina.

Medicines

Even in the normal puerperium some medicines are needed, notably hypnotics, and sometimes aperients, as mentioned above, and iron preparations. Ferrous sulphate or ferrous gluconate tablets may be given routinely, and are especially important in patients who were anaemic in pregnancy, or who are now anaemic following excessive blood loss.

Haemoglobin Estimation

Anaemia is common in the puerperium and many authorities advocate routine haemoglobin estimations 4 or 5 days after delivery, to ensure that such anaemia is diagnosed and treated. Earlier than this reduces the value because of the haemodilution of pregnancy. The diuresis of the first 24 hours reduces the blood volume and alters haemoglobin estimation.

Clothing

The brassière should be comfortable, fitting well and giving the breasts adequate support. The mother will probably wear it at night as well as during the day. The nightdress should have a front opening, to make breast feeding easier. A washable cotton or nylon dressing-gown is useful. After a few days ordinary clothing may be worn, especially in hospitals with day-rooms and gardens.

Posture during the Lying-In Period

During the first few hours the mother usually lies with only one or two pillows. After this she sits up with three or four pillows to promote free drainage from the uterus. She is encouraged to move about in bed, moving her legs and exercising her feet from the very beginning, provided that the perineum was not torn severely. Even if it were so, she might move discreetly and not too energetically. She may need an air-cushion or special mattress if the perineum or vulva are painful. By exercises and by allowing her to be up and about soon after delivery the incidence of thrombophlebitis through stasis has been much reduced, and the mother derives a feeling of well-being from this early activity.

Post-Natal Exercises

Exercises are of value in giving the patient a sense of well-being, in maintaining a good circulation and lessening the possibility of venous thrombosis; and, more specifically, in restoring the muscle tone of the abdominal wall and the pelvic floor. If done under the supervision of a trained physiotherapist, and particularly to music, they are of great value, and patients seem to enjoy them greatly. Certain patients, such as those suffering from heart lesions, should not be allowed to perform all the exercises, though even they may be encouraged, on medical advice, to take gentle exercise (page 169).

Breasts and Nipples

The baby is put to the breast about 6 to 8 hours after its birth if everything is normal, and at alternate feeding times for the next 12 hours. Subsequently feeding may be at 4-hourly intervals, or a more elastic 'on demand' system may be preferred. Supervision is necessary at every feed until the milk supply is adequate, the baby is feeding well, and the mother is confident. Breasts and nipples should be washed before each feed and inspected by the midwife afterwards. If a nipple is sore, it should be treated early before it becomes cracked. Tincture of benzoin should be applied on soft sterile linen, and the breast milk should be expressed by hand meanwhile. When the nipple is fully healed, the child may again be put to the breast. The breasts should always be well supported.

Engorgement and tension may cause great discomfort about the third or fourth day. Early engorgement, which is vascular, may be relieved by small doses of stilboestrol, which 'damps down' milk production. When the breasts are engorged with milk, some of the milk should be withdrawn, either by hand expression, or with an electric pump. Once the milk is flowing more easily the baby will as a rule suck readily.

Massage and expressing of the colostrum in the antenatal period by keeping the ducts of the breast open may prevent engorgement in the puerperium. It is maintained that this pain and discomfort of the breasts is often the cause of reluctance to feed the baby, especially as the baby finds feeding at a hard, painful breast difficult, if not impossible.

General Care in the Lying-In Period

Up to the mid-1940s it was customary for the mother to lie in bed for 10 or 12 days after delivery. During this time she was greatly dependent

on the midwife, who would blanket-bath her, make her bed, bring her meals and bed-pans, bath and care for her baby and, at the end of 10 days, help in her gradual convalescence and rehabilitation.

During the Second World War, earlier rising, often of necessity, gradually became more widespread. This early ambulation was soon shown to have many advantages. It diminished the risk of venous thrombosis, aided in the normal emptying of bladder and bowel, eliminated the muscular weakness that resulted from prolonged inactivity, gave the mother a sense of well-being rather than of illness, permitted her to enjoy a daily bath, and enabled her to undertake earlier the full care of her baby.

More recently, the greatly increased demand for hospital beds has in many instances, necessitated earlier discharge. A mother discharged after only 48 hours is transferred to the care of a domiciliary midwife; but one going home 7 or 8 days after delivery may be fending for herself until the health visitor calls. Such developments encourage the mother to take greater responsibility for her baby and herself and she has grown much less dependent on the midwife for the kind of nursing care that was given to her mother when she was born. Instead, the midwife is called upon rather to give guidance and instruction, in order to help the mother through this phase of rapid adjustment and rehabilitation.

At the same time, with an increasing awareness of the psychological needs of the mother, the midwife is conscious that the first week of the puerperium is a time of particular emotional instability. The most equable woman is readily depressed and dispirited over small matters, and the more highly-strung mother is in an agony of apprehension about her baby's most trivial setback. It is here that a kindly and sensible midwife can do much to restore the mother's sense of proportion and set her fears at rest.

Thus the midwife's role in the lying-in period nowadays is largely to advise and educate the mother in the care of her baby and herself, to listen patiently to the fears she expresses, to answer her questions and, throughout, to give her encouragement and reassurance. This is an exacting and highly responsible task for a competent and thoughtful midwife.

The Discharge of the Patient from the Hospital

The mother should be discharged at about the tenth day of the puerperium, having been taught to bath and handle her baby. If she is breast feeding successfully she may continue the routine begun in hospital; she should be told that her supply of breast milk may slightly diminish when she begins her home duties. She will know that

the health visitor will call and she will be advised to take her baby to a welfare clinic. If she is artificially feeding her baby, she receives instruction in the preparation of the feeds and the sterilization of the bottles and teats. A date will be arranged for her to attend the post-natal clinic. In hospital practice it is usual for a doctor to examine the mother and baby before they are discharged.

Post-Natal Visit

At this visit the obstetrician makes sure that the patient has fully recovered from parturition, and that the organs have returned to their normal state and that lactation is satisfactorily established.

She takes the opportunity, to advise on family planning (Chapter 33) if necessary and looks for signs of carcinoma in the breast and cervix (Chapter 34).

33. DISORDERS OF THE PUERPERIUM

During the puerperium most women suffer from some discomfort, but in a few instances a serious disorder may occur. These must never be taken lightly and the doctor should be informed at the earliest opportunity.

DISCOMFORTS

After Pains

After pains are pains caused by the contraction of the uterus and are more common in the multipara than the primipara. They may occur at any time, but are commonly associated with breast feeding. The baby suckling stimulates the production of oxytocin (page 417). A mild analgesic such as paracetamol is usually effective. If after pains occur regularly at feeding times, the pain can be anticipated by giving an analgesic 20 minutes before a feed.

Soreness of the Perineum

The perineum is always bruised and tender after delivery, but pain may be increased if sutures are present or if there is oedema. Paracetamol or some other mild analgesic may be useful and a cold compress or saline pack will reduce the oedema. The midwife must help the patient to find a comfortable position. Air-rings often cause more discomfort as they tend to press on the sore area. The patient needs sympathetic understanding as often there is nothing to be seen externally when the pain is quite severe.

Haemorrhoids

After the straining in the second stage of labour haemorrhoids

sometimes become prolapsed and tender. This is an extremely painful condition and some analgesic will be required. Local treatment may include the application of an anaesthetic cream (Anusol), ice-cold compress or saline packs. In some instances the doctor may replace the haemorrhoids, but this is difficult until the oedema subsides. Constipation must be avoided and liquid paraffin should be given twice daily to ensure a soft stool.

SERIOUS DISORDERS

Venous Thrombosis

Two forms of thrombosis occur in the leg veins during the puerperium. The commoner of these is a thrombophlebitis of a varicose vein, the less common a phlebothrombosis of a deep vein.

Thrombophlebitis

In thrombophlebitis a clot has formed in an inflamed and often varicosed vein. Because of the inflammatory process the clot is securely anchored to the vein and is not likely to become detached. Many expectant mothers develop varicose veins in the legs, sometimes very severely. Early in the puerperium the mother complains of pain in the leg and a red curving line can be seen on the skin over the vein. The vein is firm on palpation from the clot lying within it. A supporting bandage is applied from the toes to the groin and the patient is encouraged to move around. Other treatment varies, some obstetricians favour antibiotics and an analgesic, others prescribe butozolidine by mouth to decrease the inflammation. Local applications such as kaolin poultice or glycerine and ichthammol paste are still used by some. The inflammation usually subsides within a few days.

Phlebothrombosis

This is a less common but much more serious condition. A clot has formed in the deep veins of the calf, the femoral and sometimes the iliac veins, and there is a serious risk of fragments becoming detached and causing a pulmonary embolus. It is very similar to the condition which may occur after a pelvic or abdominal operation. The woman may complain of pain in the leg, and later the leg may become swollen, in some cases markedly so. As the condition improves and the venous return from the leg is re-established the swelling subsides,

but if the thrombosis is very extensive the swelling may continue for weeks, even months. The most dangerous condition is one in which there is no warning that a clot has formed until the clot becomes detached from the leg vein and is carried up the inferior vena cava to the heart and then into the pulmonary artery. This is called pulmonary embolism. If the clot is a large one this artery is completely blocked and death rapidly occurs. Smaller clots will pass on into the lung and cause pulmonary infarction.

Consultants vary in their method of treatment but it is generally accepted that the patient is nursed in bed until the pain disappears. The foot of the bed should be elevated and the weight of the bedclothes removed from the legs by using a cradle. Anticoagulant therapy may be commenced to prevent further clotting. Intravenous heparin is given with an oral anticoagulant for the first 36 to 48 hours and then discontinued. Oral anticoagulants such as phenindione (Dindevan) or ethyl biscoumacetate (Tromexan) are given for as long as required. Their dosage is based on the daily estimation of the prothrombin time. Careful observation for bleeding is always necessary, but particularly so after delivery as bleeding from the placental site could be excessive. The colour and amount of lochia must be recorded.

Pulmonary Embolus

Pulmonary embolus is one of the four most common conditions causing maternal death. Often the onset is silent and the results catastrophic. Because of this no venous thrombosis however slight should be ignored.

Only 35 years ago infection of the birth canal (puerperal sepsis) ranked first among the causes of maternal mortality. Fortunately this is not now the case, though puerperal sepsis is still occasionally responsible for serious illness and death.

At the present time, urinary tract infection is in many respects the most dangerous complication both during and after the puerperium. This common condition is now recognized to be the cause of much ill health, while in some instances it materially shortens the patient's life.

Breast infection is less common, but, in those unfortunate women who develop abscesses, extremely distressing and often difficult to treat.

Nor is the recently delivered mother very well able to resist incidental infections. Thus she may easily fall a victim to influenza, brochitis or gastroenteritis.

Disorders of Micturition

Urinary Incontinence

Retention with Overflow

The reasons for difficulty in micturition leading to retention of urine in the early days of the puerperium have already been described. If this remains undiscovered, urine will dribble away from the distended bladder. This form of incontinence is called retention with overflow. The uterus will be pushed upwards and to one side, and when a catheter is passed the bladder may be found to have contained 1 litre or more of urine. An indwelling catheter may be required for several days before the tone of the bladder is restored.

Stress Incontinence

A second form of incontinence is known as stress incontinence. The bladder can be emptied normally, but a sudden cough or strain causes a brief dribble of urine from the bladder. This is due to the stretching and weakness of the supports of the neck of the bladder and urethra caused by the birth of the baby. The immediate treatment in the early days of the puerperium is pelvic floor exercises, but this condition may develop months or years after childbirth. It is usually accompanied by a vaginal prolapse, and an operative repair will then be required.

Urinary Tract Infection

This is common for several reasons. During pregnancy there is physiological dilatation of the ureters and stasis within them. If the urine is infected, this can lead to pyelonephritis, which, though apparently cured, tends to recur after delivery. In the puerperium, the patient may have difficulty in emptying the bladder completely. Perineal lacerations and stitches make micturition painful, while the abdominal wall is so lax that the patient may be unaware that her bladder is distended. Retention of stagnant urine predisposes to infection. The organism responsible is almost always *Escherichia coli.*

Diagnosis. The onset may be any time within the first few days after delivery. In cyctitis there is suprapubic pain and increased frequency of micturition, with a moderate rise of temperature but a relatively slow pulse rate. In pyelonephritis the onset is often sudden with pain radiating from the loin to the groin. High temperature (40°C)

accompanied by rigors may occur. Repeated vomiting, anorexia and general malaise are usually present. The urine may appear opalescent, is usually acid in reaction and contains protein derived from pus cells and epithelial cells. The odour is offensive often with a fishy smell. A mid-stream specimen and a high vaginal swab will be sent for bacteriological examination and sensitivity tests. The diagnosis is made on the finding of pus cells and bacteria in the urine.

Nursing and Treatment. The patient is urged to drink at least 3000 ml daily, and the fluid intake and urinary output is recorded. Because an alkaline urine discourages the growth of *E. coli* the urine is rendered constantly alkaline by a mixture of potassium citrate and sodium bicarbonate 4-hourly, ordered by the doctor. The patient is given a course of the sulphonamide or antibiotic to which the bacteria are sensitive. Alternatively, nitrofurantoin or hexamine mandelate may be prescribed.

Treatment should be continued until the infection is cleared and a further specimen of urine sent for investigation at the post-natal visit. If this infection is not completely cleared up the patient may, in the future, suffer much ill health. Consequently at this time every effort is made to render the urine sterile.

Uterine Infection

Owing to the large placental site and possible lacerations of the genital tract conditions are favourable for the growth of organisms. Such an infection following childbirth or abortion is known as puerperal sepsis. As recently as the 1930s this was a major cause of maternal death but the incidence has declined owing to several factors. First, the increased standard of midwifery care, secondly the *Streptococcus pyogenes* (haemolytic streptococcus) has become much less virulent, and finally the discovery of penicillin.

Because of its danger puerperal sepsis was a notifiable disease. From an Act originating in 1889 puerperal fever became a notifiable disease and the medical practitioner was required to notify the Medical Officer of Health of any pyrexia of 38°C or above. After 80 years, and many amendments, this has been revoked by the Health Services and Public Health Act 1968.

The midwife however, is still obliged to summon a doctor if there is a rise in temperature above 36·9°C on three successive days, if there is a continuously rapid or rising pulse rate, or any other abnormality.

In domiciliary practice the midwife must also inform her Local Supervising Authority that she has called Medical Aid.

Sites of infection. The placental site is the most important. It is a large unhealed vascular area, providing the warmth, darkness and moisture in which many bacteria thrive. Lacerations in any part of the genital tract can become infected. This includes episiotomy wounds, and tears of the perineal body, vaginal walls and cervix.

Infecting organisms and their source. The bacteria may be normally present in the birth canal without gaining entrance to the tissues. Examples are the anaerobic streptococcus, the *Streptococcus faecalis* and sometimes the *Clostridium welchii.* All these organisms may be present in the vagina of a perfectly healthy woman.

The bacteria are sometimes present in some other part of the woman's body than the genital tract. *Escherichia coli,* a normal inhabitant of the bowel, can easily gain entrance to the birth canal; or the patient may have septic spots or a boil, and carry staphylococci on her hands to the vulval region.

Most puerperal infections, however, come from some source other than the patient herself. Doctors, midwives and other attendants with colds and sore throats may disperse Lancefield Group A β-haemolytic streptococci by droplet infection, and so, indeed, may carriers who have no clinical infection. The infected droplets are deposited on the exposed vulva, or conveyed there by instruments, gloves or dressings. β-haemolytic streptococci are the highly invasive organisms which cause scarlet fever and acute tonsillitis. They may similarly cause very severe puerperal infection.

In some hospitals it has been demonstrated that more than 50 per cent of medical and nursing staff are symptomless nasal carriers of *Staphylococcus pyogenes.* As well as causing various infections in babies, these staphylococci can give rise to mild or sometimes severe puerperal sepsis.

Factors predisposing to infection. If the patient is tired, malnourished or anaemic, her powers of resisting infection are lessened. She is in even worse shape after a prolonged labour, or following ante- or post-partum haemorrhage. A difficult and traumatic delivery leaves in its wake bruised and damaged tissue where anaerobic bacteria will flourish, while retained fragments of placenta—dead tissue in the uterus—are an even better culture medium for these anaerobes.

Clinical features. These vary according to the virulence of the organism responsible and the patient's resistance.

Local uterine infection. Typically on the third or fourth day after delivery the patient's temperature is 39°C and her pulse rate about

100. She may have a headache and feel feverish. Her uterus is subinvoluted and her lochia red, profuse, and, in anaerobic and coliform infections, offensive.

The patient is isolated and the doctor inquires about her symptoms, reviews her labour, and examines her. A high vaginal swab and a mid-stream urine specimen are sent to the laboratory for culture of the organism and tests to ascertain its sensitivity to sulphonamide and antibiotic drugs. Although this is fairly obviously a uterine infection, the urinary tract may also be infected and the urine is always examined. A blood count and possibly a blood culture may be required. A broad spectrum antibiotic may be started immediately, though later, when the bacteriologist's report is received, it may be changed for another which is more suitable.

The patient is nursed sitting upright, to aid drainage from the uterus. For a day or two, her appetite may be poor, though it usually improves when the pyrexia subsides. She should take plenty of fluids, including milk, and sufficient protein in her food. She will benefit if she can sleep well and she will probably need a hypnotic.

It is usual to record the temperature and pulse rate 4-hourly and to keep a fluid balance chart.

The breast secretion tends to decrease in pyrexial conditions, improving as the pyrexia subsides. So long as her breasts are comfortable no treatment is indicated. The baby is temporarily artificially fed and may later revert to breast feeding.

The pyrexia usually subsides within a few days and the patient is soon feeling much better.

Spread of infection. If the bacteria are more virulent, or the patient's resistance less good, or if treatment is delayed, the infection can spread through the uterus to the pelvic cellular tissue (pelvic cellulitis). The infection may spread via the peritoneum (pelvic peritonitis) or along the Fallopian tube to the ovary (salpingo-oophoritis).

Occasionally virulent bacteria such as *Clostridium welchii* enter the blood stream giving rise to an overwhelming septicaemia. The patient is extremely ill with a swinging temperature, rigors, vomiting, and sometimes anaemia and jaundice. Antibiotics must be started as early as possible, since the patient's condition can deteriorate with alarming rapidity.

When a patient acquires an infection, mild or severe, it is heartening to know that there is available such a wide range of antibiotic drugs that her infection can soon be cured. She would have been better still, however, not infected at all, and the importance of maintaining a high standard of aseptic technique cannot be emphasized too strongly.

Retained Products of Conception

Small shreds of membrane and sometimes shreds of placenta may be retained in the uterine cavity. The placenta and membranes are examined following delivery and if the placenta is thought to be incomplete a digital exploration of the uterine cavity under anaesthetic will be carried out before the patient leaves the delivery room. If the membranes are incomplete a record of this is made in the patient's case notes, and in most instances the membrane is expelled spontaneously within a day or two of delivery. If the lochia are heavy this may be aided by the oral administration of ergometrine maleate 0·5 mg three times a day for 2 to 3 days.

Secondary Post-Partum Haemorrhage

A profuse haemorrhage occurring after the first 24 hours of the puerperium is known as a secondary post-partum haemorrhage. In most cases this is owing to a portion of the placenta being retained in the uterus. As an emergency treatment ergometrine maleate 0·5 mg or Syntometrine 1 ml may be given intramuscularly to produce contraction of the uterus and thus control the haemorrhage. The midwife should make certain that the bladder is empty, and the doctor must be sent for. The cavity of the uterus must then be explored under anaesthesia and the retained fragment of placenta removed by the doctor. Blood transfusion may be necessary.

Breast Infection

The organism causing acute mastitis or flushed breast is the *Staphylococcus pyogenes*. It is the organism responsible for common skin infections, such as boils and whitlows, and infection of cuts and abrasions. It is able to enter and infect the breast through a crack on the nipple which has been produced by sucking. Or in hospital, the child may be harbouring staphylococci in his nose, and, during feeding, deposit them on the nipple, whence they enter the ducts of the breast and set up infection. This is sometimes called epidemic mastitis.

Usually this occurs in the second week of the puerperium and the mother complains of pain in the breast. The temperature is raised and one section of the breast is red, hard, and tender. The nipple may or may not be cracked. With treatment the condition may subside and breast-feeding can be continued, but if treatment is delayed (as may happen if the mastitis arises after the patient's discharge from hospital) the infection continues and an abscess forms in the breast.

Prevention

The nursing care of the mother is aimed chiefly at prevention of the condition, and begins when the expectant mother is seen for antenatal care, when instructions are given for the care of the nipple. The nipples should be carefully cleansed before a feed and protected from rubbing on the clothing. If breast-feeding causes pain it should be omitted for 24 hours. If this symptom is neglected a fissure or crack may develop which may take 2 to 3 days to heal. If a cracked nipple occurs it should be treated by temporarily stopping breast-feeding from that breast; the milk should be expressed by hand and it is usual to apply compound tincture of benzoin to the nipple. The breast should be well and carefully supported, and analgesic drugs will probably be needed. The period of rest usually allows the crack to heal, and breast-feeding can then be continued. It should be restarted gradually, and each feed should be supervised until the baby is feeding for its full time without causing pain to the mother, and without causing the crack to reappear.

Treatment

If acute mastitis does occur, the doctor will immediately order an antibiotic to which the staphylococci are likely to be sensitive; the milk is expressed from the affected breast, but is not fed to the baby. When the mastitis subsides, breast-feeding can be recommenced.

Breast abscess is preventable, though it is sometimes seen in neglected mastitis. When it occurs there will be a fluctuant swelling under the flushed area. In this case the breast must be incised and drained, and it is wiser to discontinue breast feeding.

Intercurrent Infections

It is possible for a woman to develop any pyrexial illness, entirely unconnected with her confinement, in the early puerperium.

Respiratory tract infections are fairly common, especially in winter, but more rarely a woman may, shortly after delivery, develop any pyrexial condition whatever, from acute appendicitis to mumps. The treatment is very much the same as in any other circumstances. Isolation and disinfection are of vital importance, in order to protect other mothers and babies.

Psychiatric Disorders

Psychiatric disorders of any kind whatever may affect childbearing

women. They are uncommon in pregnancy, rare in labour, commonest in the puerperium, but can arise later in the lactation period.

A calm and placid woman, happily married and secure, may weather the emotional storms of pregnancy, labour and the puerperium, without more than an occasional attack of 'blues'. One who is temperamentally more anxious and nervous may find the same degree of emotional strain intolerable. For a woman with a history of mental instability the stress of pregnancy and labour may initiate a recurrence of mental illness.

Psychiatric disorder manifests itself most commonly in the early puerperium, while the patient is still in hospital. Patients with eclampsia and those with puerperal infections seem specially prone to mental illness.

The first sign is almost always insomnia. The patient is persistently wakeful, and may be bright and lively or unusually talkative. Sometimes other patients notice that she is behaving peculiarly or the husband realizes that his wife's behaviour is not normal. Soon she may show a dislike of the midwife, the baby, or her relatives. She can injure herself or the child. She refuses food, drink and drugs, and resists all attempts at feeding. She may become violent, with manic outbursts, or unhappy and perpetually weeping.

Women who are not sleeping well should, without hesitation, be given a hypnotic. This applies in pregnancy, and with even more force in the puerperium. Indeed, many authorities advocate the routine giving of a hypnotic for the first three nights after delivery. This may have prophylactic value in calming down the more nervous and highly strung patient.

If a patient is sleeping badly, a doctor should be informed at once. Unless he is satisfied, he will have her seen by a psychiatrist and, if necessary, arrangements are then made for her transfer to a psychiatric hospital where she can receive the highly specialized treatment necessary.

Meanwhile, special precautions are necessary, lest this patient injure her baby or herself. She will need constant supervision, and should be nursed in a ground floor room. Nothing with which she might hurt herself should be left in the room. This includes instruments, lotions, thermometers, knives and forks. She must be tactfully persuaded to eat, drink and take her drugs. She will probably be better if her baby is left with her (provided there is someone else in the room) rather than that he should be taken right away. He will probably be artificially fed, but she might be persuaded to give him his feed. She will be given a hypnotic such as Amytal 200 mg 6-hourly, and if, at an early stage, this enables her to get some sound sleep, she may improve much more quickly.

The great majority of these patients make a complete, albeit slow recovery.

Emergencies of the Puerperium

Any medical or surgical emergency may occur in the puerperium, for example, acute appendicitis or pneumonia, and the midwife should always be ready to detect any departure from the normal course of events so that medical attention may be obtained.

The fact that labour is over does not mean that the mother is out of danger when pregnancy has been complicated by serious illness. A mother with heart disease may develop heart failure in the puerperium, a diabetic patient may pass into diabetic coma and a mother with severe pre-eclampsia may still have eclamptic fits up to 48 hours or more after delivery.

Torsion of an ovarian cyst is particularly liable to occur in the puerperium, and if a cyst is known to be present it is at this time that it should be removed.

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34. FAMILY PLANNING

Family planning as we discussed earlier involves more than just the use of contraceptive techniques. However the midwife must have a knowledge of their techniques if she is to offer her patient sound advice. During pregnancy and in particular in the early puerperium many women are receptive to advice and help; this should never be forced upon them, but because some are reticent about such matters, opportunities should be created for such discussion.

The National Health Service (Family Planning) Act of 1967 permits local authorities to provide family planning facilities. Some have done this by developing new clinics, and others by giving existing Family Planning Association Clinics financial help. General practitioners, obstetricians, gynaecological and obstetric clinics are also available for advice. Perhaps of all these the post-natal visit is the one most suitable for this kind of advice. It has only one disadvantage, that is the patients most in need of advice either do not attend the post-natal clinic or they are already pregnant again. To this end some authorities have set up a home visiting service to go to the patients in their homes.

Wherever the patient seeks advice certain points must be observed. She must be assured absolute privacy and time to discuss her needs. There are many methods of contraception available but they must be acceptable to her and her husband on social, religious and aesthetic grounds. It is not for the midwife or doctor to impose their beliefs, but merely to make available the necessary advice.

Male Contraception

Condom or Sheath

Although these names are often interchanged a condom is thin and disposable, and a sheath thicker and washable.

They are worn over the penis during intercourse to trap the seminal fluid. They are the commonest method of contraception used as they are cheap, easily obtainable from chemists and slot machines and require no fitting or advice. They are reasonably effective although

leakage can occur if they are damaged. They must be fitted over an erect penis and some find this aesthetically undesirable. Some have a small bulge at the end which accommodates the semen (2 to 3 ml) with less risk of rupturing. The failure rate is less when used with a spermicidal cream.

Coitus Interruptus

Coitus interruptus is the withdrawal of the penis from the vagina before ejaculation takes place, it is one of the oldest methods known. This method is far from reliable as it is wholly dependant on timing and control by the husband, and in any case a little semen often leaks out before ejaculation. In addition to this the psychological strain placed on both partners is very great and often leads to frustration and unhappiness. It is not a method to be recommended.

Female Contraception

Rhythm Method (Safe Period)

This is the only method acceptable to some people. The safe period refers to the time during the menstrual cycle when conception cannot take place. It is known that ovulation occurs 13 to 15 days before the onset of the next menstrual period and fertilization is possible up to 5 days before and 2 days afterwards. Allowing an extra day either end intercourse should be avoided for these 12 days during the cycle. Theoretically this is very easy, but in practice, to determine the exact time of ovulation takes time and patience. The help and advice of a doctor is necessary and he will require the patient to record certain information.

Either the temperature must be taken before rising every day for at least 3 months; or a calendar kept to record the menstrual flow over 8 to 12 months. A slight rise in temperature over 48 hours denotes ovulation. From this information the doctor can calculate the times in the month when intercourse should be avoided. It is a long and tedious process, but if the patient is anxious to use this method she will co-operate. The disadvantages being it does not allow for menstrual irregularities and emotional upsets which may alter the cycle, and allow the woman to conceive. It is also unreliable during lactation and the menopause.

Occlusive Caps

These devices cover the cervix and mechanically obstruct the entrance

of spermatozoa. They must be fitted by a doctor and must be checked for fit at intervals, especially after childbirth or loss of weight.

All caps are made in a variety of sizes and must be fitted individually. The patient is taught how to insert the cap, how to check that it is in position, how to remove it and care for it. She is sent home with written instructions, a practice cap and a tube of cream. She is asked to return a week later with the cap in position. She is warned not to rely on the cap as an adequate contraceptive in this period. At the next visit the doctor is able to check the fit and to test the patient's ability to insert the cap in the correct position. Nervousness at the first visit often causes vaginismus (spasm in the vagina) and a large enough cap may not be given. At this visit a new cap is supplied together with a spermicidal cream with a similar base to the one tried out in the practice tube. The patient is seen at regular intervals and a new cap supplied as necessary.

Diaphragm (Dutch cap). These are shallow rubber caps which fit across the vagina from the posterior fornix to a ridge behind the pubic arch. They are made of thin rubber with a flat or coiled spring in the rim.

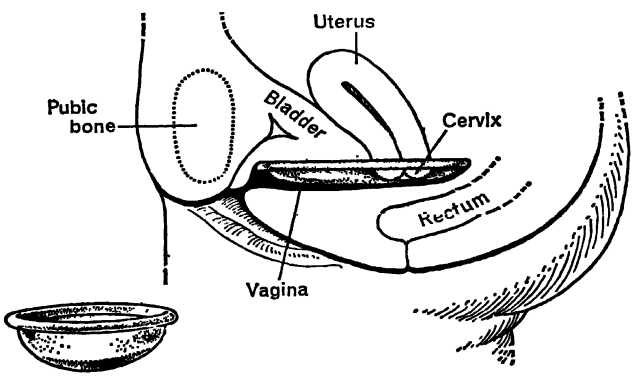

Fig. 161. Schematic side view of the diaphragm cap in position.

They can be obtained in a variety of sizes from 50 to 100 mm in diameter. They can only be used if the muscle tone of the vagina and perineum are good. The cap is inserted into the vagina squeezed between the fingers and when in position the cervix should be located with the fingers to make certain it is behind the cap. Spermicidal cream should always be used with the cap. The cap is removed by hooking the rim out with the finger (Fig. 161).

Vault cap. The vault cap or Dumas cap is bowl shaped, thin in the centre and thicker at the edges. It clings to the vaginal vault by suction. They can be obtained in five sizes 50 to 74 mm in diameter.

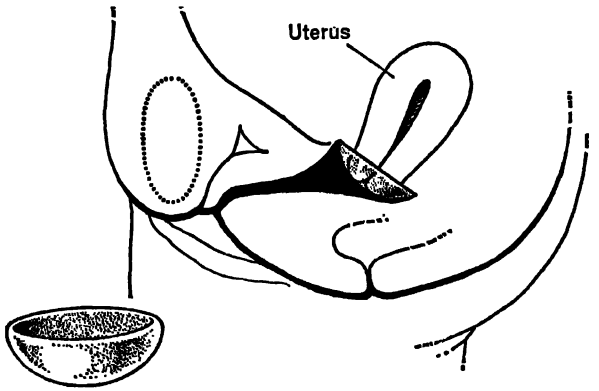

Fig. 162. The Dumas cap.

It is essential when using a vault cap that the cervix is healthy and the tone of the vault good. Spermicidal cream should be used. The cap is removed by inserting a finger between the cap and the vault and relieving the suction (Fig. 162).

Cervical cap. The cervical cap or vimule covers the vaginal portion of the cervix rather like a thimble. They can be obtained in three sizes

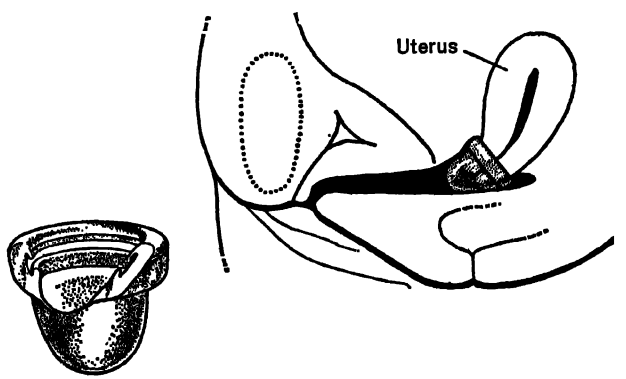

Fig. 163. The cervical cap.

45 to 51 mm in diameter. They can only be used if the cervix is long and of equal diameter at any level. It is also necessary for the patient to be able to reach it easily. Spermicidal cream should be used. The vimule usually has a thread attached and is removed by pulling this (Fig. 163).

Removal of Caps

All caps should be left in position for at least 6 hours and preferably longer after intercourse as secretion tends to collect behind them, the patient should be advised to remove the cap sitting on the lavatory. After use the cap should be washed with soap and water and dried carefully. It may be powdered with unscented talcum if desired.

Chemical Contraceptives

There are a variety of chemical substances which kill or inactivate spermatozoa. They are incorporated in jellies, creams, pastes, pessaries and aerosol foams. Directions vary and the directions should be studied carefully so that the correct amount is used. The moistness of the vagina varies in different individuals, therefore the consistency of some products suit them better than others. The right substance is often arrived at by trial and error. Sometimes it is the presentation of the substance, colour, dainty pack or delicate perfume which appeals to the user. There is quite a high proportion of failures with chemical contraceptives alone, but in conjunction with a sheath they are very effective.

Intra-Uterine Devices

Intra-uterine contraceptive devices are small plastic devices which are placed in the uterine cavity by means of a special introducer. There are several designs (Fig. 164), the common ones being:

A loop	Lippes loop
A spiral	Margulies spiral
A bow	Birnberg bow
A double spiral	Saf-T-Coil

Their mode of action is uncertain, but a likely explanation is that tubal motility is increased and the ovum reaches the uterine cavity before it is sufficiently developed to embed.

Lippes loops are favoured by most obstetricians as they are easily inserted and prove effective. Plastic is inert and only a few women expel the device. This usually occurs around the time of menstruation

within the first 6 months following insertion. Menstruation is often heavier and prolonged for several cycles, but should subside, if it does not a doctor should be consulted.

Pregnancy occurs in a small number of cases, and the device is often delivered with the placenta. In certain conditions which include

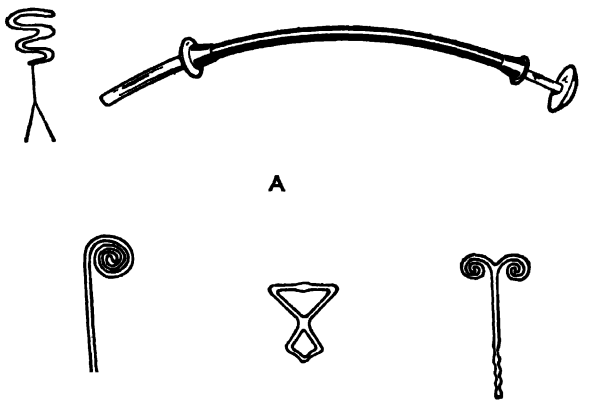

Fig. 164. Intra-uterine contraceptive devices. A, Loop and introducer, B, Spiral. C, Bow. D, Double spiral.

pelvic disease, submucus fibroids, cervicitis, menorrhagia or suspected malignancy, the use of intra-uterine contraceptive devices are contra-indicated.

Oral Contraception

Oral contraceptives act by inhibiting ovulation, either by suppressing the pituitary output of follicle-stimulating hormone, or by interfering with the action of the hormone on the ovarian follicle.

The timing of administration is important, for if the follicle begins to ripen ovulation will occur. For complete efficiency the course should begin on the fifth day after the commencement of the last menstrual period and continue for about 20 days. This is followed by 7 days without tablets during which time withdrawal bleeding occurs. It is imperative that the instructions given with the various products are carefully followed as there are slight variations in the number of days tablets are taken.

There are two basic kinds of formula, the oestrogen–progesterone

combination which is the most efficient of all and the sequential tablet which consists of two distinct kinds of tablet, usually of different colours. One contains oestrogen and is taken for two-thirds of the course, the other contains progesterone and is taken for the remainder of the course. This is said to produce a more physiological effect, certainly over a long period the total amount of hormone taken is less, but it does occasionally fail and pregnancy occurs.

Oral contraceptives have certain side-effects which include weight gain, nausea, breast heaviness and headache, but these diminish in time. They are contra-indicated when there is known thrombotic disease or carcinoma of the breast, and usually if there is liver damage. In diabetes mellitus stability may be affected and it may be necessary to adjust treatment.

Because of these contra-indications if the doctor advising the patient on contraception is not her general practitioner, it is customary to write and ask if he has any objections before commencing the treatment. A cervical smear is taken from all patients and repeated at regular intervals. The patient is also asked to fill in a small record card which has a place to indicate the date, whether a tablet was taken, if spotting occurred, when bleeding occurs and this is seen by the doctor at each visit.

Although these substances have now been used for several years the far-reaching effects of oral contraception have not yet been fully determined. Therefore detailed and accurate record keeping is of great value.

Sterilization

Tubal ligation in the female, or ligation of the deferent duct in the male, are permanent methods of contraception. In the older couple who have completed their family it may be the ideal choice. It must be carefully discussed with both partners and would not be undertaken unless they were both absolutely sure that this was what they wished to be done. The emotionally stable couple will accept sterilization without regret. but those of neurotic disposition may use the operation to rationalize disturbances that arise later in life.

Vasectomy

This is the ligation of both deferent ducts (vas deferens). In some cases the husband prefers to be sterilized as it is a safer procedure than tubal ligation. It can be done as an outpatient procedure under local analgesia. As spermatozoa may survive in the ducts for some

time, the couple should take contraceptive precautions for 6 months after the operation.

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35. CARCINOMA OF THE UTERUS AND BREAST

Many women still die from carcinoma, the uterus and breast being the organs most often affected.

Carcinoma of the Cervix

Even before any symptoms arise, carcinoma of the cervix can be diagnosed by cervical cytology, that is by microscopic study of cells shed from the cervical epithelium. At many post-natal and gynaecological clinics routine examinations are carried out. A blunt wooden

Fig. 165. Ayre spatula.

spatula (Ayre's spatula) is passed gently over the surface of the cervix, a smear is made from the material, and the abnormal cells can be recognized. The patient can then be kept under observation and treated at a very early stage.

This mode of diagnosis has become the subject of much publicity and routine checks should soon become widespread. The midwife should know what service is available in the area in which she works. She must be prepared to answer the questions of her more enlightened patients and give advice to those who are less knowledgeable.

Later, the symptoms are irregular bleedings or a blood-stained, watery discharge. Some women, unaware of the significance of such bleeding, do not seek a doctor's advice, but may consult a midwife who thus has the important responsibility of urging an early examination. In the majority of cases the disease develops after the menopause, though younger women may also develop it. Very occasionally the first symptoms occur during pregnancy. Irregular bleeding will occur. If this happens early in pregnancy it will usually be due to a

miscarriage. If it is late in pregnancy it will usually be due to antepartum haemorrhage, either accidental or from a placenta praevia, but the doctor will examine the cervix to exclude the possibility of a polypus or carcinoma. In the rare cases in which carcinoma is present immediate treatment, hysterectomy or radiotherapy, or both, is essential.

Carcinoma of the Body of the Uterus

Here the midwife is less likely to be consulted, as the condition occurs in nulliparous women, most commonly after the menopause. The same ruling applies that a doctor should be consulted about any irregular vaginal bleeding, either before, at the time of, or after the menopause.

Cancer of the Breast

Any lump in the breast must be regarded seriously and medical advice must be obtained. Much suffering and anxiety can be averted by early diagnosis and treatment of any swelling, however small, in the breast, whether it be painful or not. Even if the lump should prove to be benign, it is better that the patient should have been examined. A swelling in the breast during lactation is usually due to a breast abscess, but, rarely, carcinoma of the breast arises during lactation. The growth may spread very rapidly.

It cannot be too strongly emphasized that carcinoma is curable if recognized and treated early.

36. DOMICILIARY CARE

Under the National Health Act 1946, which came into force in 1948, the midwifery services, domiciliary and otherwise, became part of the National Health Service, with the local health authorities administering and supervising the domiciliary service. At present about three-quarters of the confinements in this country take place in hospitals or nursing homes and the remaining quarter are home confinements.

There are circumstances in which the midwife would be well advised not to undertake a home confinement. Insanitary conditions or overcrowding will make the home unsuitable for confinement. A woman who has had three or more previous confinements is better delivered in hospital. If the mother is anaemic or has a serious illness such as heart disease, tuberculosis or diabetes, she should be referred to hospital. A history of previous delivery by forceps or Caesarean section, or of labour complicated by post partum haemorrhage makes subsequent confinement in the home dangerous. If during the pregnancy, complications should develop, for example pre-eclampsia, a malpresentation, hydramnios, ante-partum haemorrhage, Rhesus incompatibility or the possibility of disproportion, or if twin pregnancy is diagnosed, the mother should be booked for hospital delivery. Women over 35 and primigravidae over 30 should be delivered in hospital; indeed, many authorities advise hospital confinement for all primigravidae.

Home delivery may thus be considered only for a healthy woman under 35, expecting her second or third child, if her previous obstetric history is normal, her present pregnancy uncomplicated and her home suitable.

Such a patient may book a midwife and attend a local health authority ante-natal clinic, which her midwife will also attend. and she will be under the care of the clinic doctor and the midwife. As the clinic doctor does not necessarily attend domiciliary confinements the midwife must ascertain that the patient's family doctor or a local general practitioner obstetrician will be available if needed. The midwife will attend and look after the patient during labour and the

lying-in period and advise her to return to the clinic for a post-natal visit.

The patient may book her general practitioner and the district midwife. In this case doctor and midwife together undertake the patient's ante-natal care, either in her home or in the doctor's surgery. The midwife should in all cases visit the patient's home early in pregnancy, and if she decides that the home is unsuitable for the confinement, she should either report to the patient's doctor or to the supervisor of midwives, and alternative arrangements, such as admission to maternity home or hospital will be made.

Arrangements in the Home

The midwife must be prepared to give advice about the room in which the patient is to be delivered. If there is any choice, this room should be fairly large and near the bathroom and lavatory. Adequate heating is essential, especially if the baby is to be born during the winter months. In an unheated bedroom a new-born baby can become dangerously chilled even in summer. Good ventilation and lighting, both natural and artificial, are necessary.

A single bed is best, with a firm mattress, as sagging in the middle creates difficulty in managing the delivery. If the mattress sags badly, a board should be placed under it. The position of the bed in relation to the fire and the light should also be arranged beforehand and it should be so that the midwife can work conveniently. Unnecessary furniture is best removed, but the room should be comfortable and restful. A plastic-topped table is useful, if available. Any polished surface which the midwife will use for lotion, bowls, etc., should be covered with a thick cloth and a large sheet of plastic.

It is important to inquire about the accommodation available for the children and the husband during labour and the lying-in period. Arrangements should be made for a suitable woman to be in attendance to assist the midwife. Home helps are available on application to the appropriate authority, that is the local health authority, which is responsible for organizing an efficient home help service. Payment is according to the means of the patient and may be very little. The local health authority will supply a sterile maternity outfit. This varies in different areas, but contains almost all the sterilized dressings likely to be needed. Typical contents are:

2 gamgee accouchement sheets.
1 double sheet of waterproof brown paper.
12 large and 12 small maternity pads.
Small packets of wool or wool swabs.
Cord powder, ligatures and dressings.

The patient is advised to send for the midwife as soon as labour begins, if a 'show' occurs, or if the membranes rupture. The midwife must give her telephone number.

The Midwife's Bag

The minimum requisites for the midwife's bag are listed, but an experienced midwife will add other items according to circumstances and her method of work.

Two bags are essential; one for deliveries only, and a nursing bag for daily visiting.

Contents of Delivery Bag

The bag lining should be boilable.

Disposable paper caps and masks; sterile swabs and dressings; cord ligatures or clips; vulva pads and paper towels.

2 sterile gowns. 2 plastic aprons.

2 kidney dishes, 2 bowls, 2 gallipots, disposable or polypropylene, 500-ml jug.

Funnel, tubing, rectal catheter, 2 pairs sterile rubber gloves, urethral catheters, finger-cots, nail-brush.

Spring balance, urine-testing apparatus, medicine and minim measures, mucus extractor, ruler.

2 2-ml syringes, preferably disposable, clinical thermometer, lotion thermometer.

2 pairs artery forceps, 2 pairs scissors, blunt-ended, 1 pair dissecting forceps.

Sphygmomanometer, binaural stethoscope, fetal stethoscope, razor.

Sparklet apparatus with oxygen.

Lotions:

A chlorhexidine preparation (Hibitane, Savlon) as a lotion and cream.

Drugs:

Syntometrine or ergometrine with hyaluronidase.

Pethidine or Pethilorfan.

Nikethamide.

Chloral hydrate or dichloralphenazone (Welldorm) tablets.

Contents of Nursing Bag

The bag lining should be boilable.

Sterile swabs, dressings and a few vulval pads.
Disposable caps and masks.
Clean gown.
500 ml measure, kidney-dish, lotion bowl and gallipot, disposable or polypropylene.
Funnel, tubing, and rectal catheter, 2 pairs rubber gloves, catheters, nail-brush.
Spring balance, medicine and minim measures, clinical thermometer and lotion thermometer, ruler.
1 pair dissecting forceps, 1 pair scissors.

Lotions:
Chlorhexidine (Hibitane) or other antiseptic.
Chlorhexidine (Hibitane) 1 per cent in 70 per cent spirit or hexachlorophane (Sterzac) powder or other application for umbilical cord.
Aspirin tablets.
Codeine compound tablets.
Senokot.
Ergometrine ampoules and syringe.
Ergometrine tablets for oral administration.

Requirements for Mother and Baby

For district work the midwife should ascertain before the expected date of confinement what articles are likely to be available in the house. The patient needs a sterilized outfit from her local maternity and child welfare centre.

A supply of clean newspapers, brown paper and a sheet of plastic.
A clean kettle and possibly a clean saucepan.
In addition to the cot and linen:

Baby clothes.
Bathing utensils for the baby.
Bedclothes.
Toilet articles and nightwear for the mother.

Care of the Patient in Domiciliary Midwifery

Antenatal Care

This differs in no way from that of a patient who is having her baby away from home.

If any complication such as pre-eclampsia should arise, the patient is admitted to hospital. In most cases she would then remain in hospital for delivery.

Care During Labour

The principles are exactly the same as for normal labour in hospital. The midwife soon learns to adapt the various procedures she has learned in hospital to the particular circumstances of the home.

If sterilized packs are obtainable from the Central Sterile Supply Department of a hospital and, so far as is possible, disposable equipment is used, preparation for vaginal examination or delivery is very simple. Otherwise bowls and gallipots may be boiled in a large saucepan. Some delivery bags include a metal compartment which can be used as a sterilizer.

If possible a scrubbed wood or laminate-topped (Formica) table should be available. The former may be spread with a clean paper towel: the latter may be mopped with chlorhexidine solution.

If the patient has only polished furniture, care should be taken not to spill antiseptics on it or to mark it with bowls of hot water. It may be covered with several thicknesses of towel or blanket and then a large sheet of plastic. Only the articles required as occasion arises should be taken out of the bag, and they should be kept covered as far as possible.

A basin, soap and nail-brush for scrubbing up are essential; another basin is necessary for the patient. A second small table or chair is also useful, covered in the same way as the first. All necessary articles should be placed together in the order in which they may be required. Paper bags are useful for soiled dressings and swabs.

Care should be taken to give the patient's bed adequate protection.

Baby clothes should be warmed and put ready for use, together with the materials for the initial cleansing.

The woman in attendance should be clearly instructed as to what services will be expected of her, and her co-operation should be secured in advance.

A reliable person should be in charge of the patient and the home during the lying-in period. Home helps who have had experience in this type of work are invaluable, if a relative or friend is not available.

The detail of the conduct of labour is just as in hospital.

The midwife will have ascertained the doctor's wishes with regard to being called. He may visit the patient early in labour. He may wish to be present during the delivery or he may prefer the midwife to call him only if some complication arises.

If the labour should proceed smoothly, the midwife may conduct the delivery alone, or with a pupil midwife. Afterwards she will make the patient comfortable and examine and then clean and dress the baby very much as in a hospital labour ward.

Before leaving the patient—usually 1½ hours or so after delivery, she should ascertain that the mother's pulse rate and blood pressure are normal, her uterus well contracted, preferably her bladder empty and her blood loss minimal. The baby should be warm (and in a warm cot) his respirations regular, his colour good, and his umbilical cord not bleeding.

If *any* abnormality should arise at any time during the labour, the midwife should without delay consult the patient's doctor. For most abnormalities, such as a rising blood pressure, prolongation of the first stage, delay in the second stage, etc., it is strongly advisable that the patient be transferred to hospital. If, then, she is perfectly well after delivery and the baby healthy, she may be transferred home again in about 48 hours.

The Puerperium

Visiting. A visit should always be paid about 6 hours after the completion of labour, or as near to this time as possible. With normal cases the visits should be twice a day for a few days and once a day afterwards. If at any time the temperature and pulse show an inclination to rise in the morning or there is any other condition requiring close supervision, an evening visit should be made. As a rule the mother gets up for increasing periods from the first or second day and most midwives pay their last visit on or shortly after the tenth day (the lying-in period being defined as a period of not less than 10 days and not more than 28 days after the end of labour, during which the continued attendance of the midwife on the mother and child is required). This enables them to observe the effect on the patient of moving about and resumption of duties, and also to inquire as to the existence of any pain in the leg, breast, or abdomen.

The midwife asks the mother if she has slept, how she is feeling and if she has passed urine. She will probably have had some food. Her temperature and pulse rate should be taken and the state of her uterus and lochia noted. The vulva may be swabbed.

The midwife should observe the baby's colour and respiration, inspect his cord, note if he has passed urine and meconium and if any caput and moulding present at birth is subsiding. She will probably put him to the mother's breast, note how he feeds, and give advice about future feeds.

Subsequent visits are again in many respects similar to hospital care. The doctor should be consulted about any abnormality.

The midwife notes how the mother feels, takes her temperature and pulse rate, feels her uterus and observes the lochia. She inspects the patient's breasts, again advising her about the child's feeds. She gives

counsel also about diet, the taking of iron tablets, and the practice of post-natal exercises. Many domiciliary patients are reluctant to spend much time in bed, and must be strongly advised to have enough rest.

Each day the midwife notes the baby's general condition and inquires about his behaviour, feeding, stools and urine. She may bath or wash him for a few days, until the mother takes over this duty, and she should at the same time inspect carefully his skin, cord, eyes and mouth, to determine if he is free from infection.

At the last visit, the midwife should advise the mother when to take the baby to a welfare clinic, and when the mother herself should attend her doctor for a post-natal examination.

The midwife may arrange to meet the health visitor at the patient's home on the occasion of this last visit, this type of contact being appreciated as a rule by all concerned.

PART SIX
THE BABY

37. THE NEWBORN BABY

CARE AT BIRTH

The first consideration is the establishment of breathing, and for this the air passages must be clear. The fetus has been living surrounded by liquor amnii, making slight movements with his respiratory muscles ('practising' breathing, as it were) and some liquor thus enters the upper respiratory tract. There may, in addition, be other material, such as mucus, a little blood or vernix, and possibly meconium in the liquor and thus in the air passages.

Accordingly, when the baby's head emerges the midwife should gently wipe the nostrils and mouth clear of mucus, and when he is born she places him on the bed, keeping his head fairly low, to help the liquor to trickle out of the air passages. By now he may be crying vigorously or the midwife may need to clear the pharynx of the more tenacious mucus, using a soft rubber mucus extractor.

As soon as respiration begins the baby's colour, hitherto rather bluish, changes quickly to a rosy pink. Sometimes the peripheral circulation is a little uneven, and the baby's skin may be mottled or his hands and feet bluish, but this is not usually important.

The second essential is without delay to clamp and cut the umbilical cord, so that the baby is not exposed to undue chilling. Two pairs of artery forceps are used, one being placed 7·5 cm (3 in.) and the other 12·5 cm (5 in.) from the umbilicus. The cord is then cut between the clamps with blunt-ended scissors, the end being covered with a sterile gauze dressing.

In hospital, a third necessity is to label the baby with the mother's name, before he leaves the labour room bed. Various types of wristlet and anklet are used, one simple method being to prepare beforehand a length of tape, marked clearly with the mother's name. As soon as possible after birth this is checked by the mother and then fastened round the baby's wrist.

Throughout these procedures the baby's need of warmth, rest and gentle handling should be borne in mind. The midwife will already have noted that he is healthy and, on cursory observation,

normally developed. Detailed examination will come later. Meanwhile, he is quickly wrapped in a warm sterile towel and placed in a warmed cot, lying on his right side and without a pillow. If hot water bottles are used they should be well covered and in pockets in the cot lining. An electric pad should be removed before placing the baby in the cot.

While his mother receives attention the baby is left to rest. His colour and respiration are noted frequently, and periodically the cord is inspected. Bleeding, though unlikely, is not impossible. Once she has been made comfortable, the mother will be glad to cuddle her baby for a few minutes and he is then put to rest again for an hour or so, after which he is examined and made presentable.

Examination

The midwife should have all her equipment at hand, so that the baby is not exposed an unnecessarily long time. The room should be warm: not less than 21°C.

The baby is noted to be breathing regularly, he is pink and plump, with abundant subcutaneous fat and a smooth skin covered, chiefly in the skin creases, with a white greasy substance, vernix caseosa. He has a variable amount of hair and blue-grey eyes which may, later, change their colour. Though his limbs move actively he tends to keep them flexed. There may be a small caput towards the back of his head, and sometimes the shape of the head has been distorted by moulding.

The baby is now weighed and measured. He is usually found to weigh about 3500 g and to measure 50 cm from crown to heels. His head circumference is 30 to 35 cm, his chest circumference the same or slightly less.

He is carefully inspected and examined to be sure that he is, so far as can be ascertained, normally developed. The midwife observes his skull formation, the width of the sutures and the size of the fontanelles. She looks closely at his eyes and ears, noting development and symmetry. Small pink marks on the eyelids or the nape of the neck ('stork bites') are common and since they soon fade, unimportant. Haemorrhages under the conjunctiva are bright red and look alarming, but they, too, soon disappear.

It would be difficult to overlook a harelip, but the mouth should be examined, the hard palate being felt with a finger and the soft palate inspected. Tongue-tie, in which the frenulum appears to anchor the tongue to the floor of the mouth restricting free movement, often causes the mother anxiety. She may be reassured about this, since it hardly ever causes adverse effects.

The midwife inspects the chest and abdomen, noting at this time the baby's respirations and the state of the cord. Occasionally an umbilical hernia is found though it rarely needs treatment. Femoral hernia, inguinal hernia and hydrocele are sometimes noted, and a doctor should be consulted about any unusual swelling.

In baby boys the penis is inspected, but no attempt is made to retract the foreskin from the glans. Almost always the child is seen to pass urine easily and nowadays few paediatricians recommend circumcision. An oiled catheter or, if the temperature is to be taken, a thermometer may be introduced to ascertain if the anal canal is patent.

The baby's back is inspected, and a finger run down the spine will reveal any unevenness. The limbs move freely and the midwife should flex the thighs and abduct them through nearly 90° to satisfy herself that the hip joints are normally developed.

The feet and ankles are carefully inspected. Mild degrees of talipes are common, and the midwife should, if she has reason to suspect this, consult a doctor immediately. The earlier these deformities are corrected, the better. Finally, the fingers and toes should be counted. It is surprisingly easy to overlook extra digits.

Although the foregoing account seems long, most babies are normal and a methodical examination takes little time. Some kind of cleaning is now carried out. Antiseptic creams and lotions are sometimes recommended, but the time-honoured bath remains popular. Whatever method is used gentle wiping is desirable and vigorous rubbing should be avoided. Vernix, except it be very abundant, or between skin folds, should not be removed, since it protects the skin from infection.

Bathing the Baby

For this the midwife will have ready a shallow bath of water at 38°C., neutral curd soap, sterile water and wool swabs for washing the baby's face, zinc and castor oil cream. If dusting powder is to be used, an antispetic preparation, such as hexchlorophane (Sterzac) is advisable. Materials for dealing with the cord and warm clothing are at hand.

The baby is wrapped in a towel and his face is gently wiped and dried with wool swabs. Then his hair is soaped, rinsed and dried. The midwife then soaps his trunk and limbs, rinses him in the bath and dries him gently but thoroughly; not by rubbing which would injure his skin, but by 'blotting', paying special attention to all the skin creases. Dusting powder may be used, but is not a necessity.

There are many ways of dealing with the cord, one being to apply a

sterile plastic clamp (Hollister clamp) 1 cm from the umbilicus, cut the cord short, and apply an antiseptic. 1 per cent chlorhexidine (Hibitane) in 70 per cent spirit may be painted on or 1 per cent hexachlorophane (Sterzac) powder may be applied. An alternative is to tie the cord with nylon tape, apply a keyhole dressing, bury the cord stump in a drying powder and apply a binder consisting of a 7·5 cm crêpe bandage.

Zinc and castor oil cream, petroleum jelly or baby cream are applied to the buttocks to protect the skin and facilitate the removal of meconium, and a napkin is put on. The baby is now dressed in a gown and wrapper. These are made of boilable material, carefully handled, being brought from laundry to linen room and thence to ward in clean covered containers. Some authorities believe the baby's first clothing should be autoclaved.

Daily Observation and Care

Within a few hours of birth the baby should be moved from the nursery to the ward to be with the mother, where he will spend most of his time. This enables her to get to know him, and to learn how to look after him.

General Condition

Colour. The well marked pink colour noted at birth is evidence that the haemoglobin value of the blood is unusually high, 19 g/100 ml being normal at birth. This extra haemoglobin was needed before birth, when the oxygen supply was relatively poor, but is now more than sufficient. The baby thus destroys old erythrocytes in greater quantity than he manufactures new ones, and his colour becomes gradually somewhat paler. If his liver function is not sufficiently mature to deal immediately with the released bilirubin he may show slight transient jaundice. If, however, the baby is more than slightly jaundiced, or if he is pale or cyanotic, a doctor should be consulted as the baby may be ill.

Muscle tone. The baby is active and vigorous, kicking energetically though when he lies quietly he is usually in a flexed attitude, as he was before birth. He should not be kept too tightly tucked up, but rather given freedom to move.

Behaviour. At first the baby does not distinguish night from day, sleeping, waking, crying, feeding and sleeping again fairly regularly throughout the 24 hours, but sleeping most of the time. By the time

he is 4 or 5 weeks old he is usually sleeping longer at night and more wakeful in the day time, and up to this time he probably needs a night feed.

His principal needs are food and fluid, sleep, warmth and mothering. His only mode of expression is crying. For most of the time his cot should be beside the mother's bed. If, when he cries, she rocks the cot or picks him up and cuddles him, this is the expression of a normal mother's instinct to tend and protect her child. It should be encouraged rather than repressed, since it gives the baby a feeling of security, the mother gains the satisfaction of expressing her natural instincts and a closer relationship between mother and baby is quickly established.

Feeding is discussed on pages 413–434.

The baby commonly passes urine soon after birth and, subsequently, fairly frequently. If he fails completely to pass urine, there may be some obstruction, the possibility of dehydration must be investigated.

Stools. During the first 3 days or so the baby passes meconium, the substance present in the bowel before birth. It is greenish-black in colour, consisting chiefly of digestive secretions, shed epithelial cells from the alimentary tract and mucus. Its colour comes from the bile pigment present. As the baby takes food the residue mixes with the remaining meconium and the stool changes to a greenish-brown (the 'changing' stool). The passage of meconium indicates the lower bowel is patent, whereas the passage of a changing stool indicates the whole gastro-intestinal tract is patent. By the fourth or fifth day the stool of the breast fed baby is bright yellow, soft, usually frequent and generally acid, with a typical vinegary odour.

Vomiting. The baby may swallow liquor amnii, blood, mucus or other foreign material shortly before birth. If, after birth, he vomits watery fluid or mucus, possibly streaked with blood, it is usually of no importance. A thriving baby taking large feeds may regurgitate a little milk. This effortless posseting after feeds is also unimportant. Vomiting other than this may well be abnormal and is associated with feeding errors, intestinal obstruction, infection, either of the alimentary tract or elsewhere, intracranial birth trauma, and a variety of diseases.

Temperature. Some authorities believe there is little point in taking daily temperature readings, since in the first week or so it is so variable that it is no guide to the presence of infection. Others consider the temperature should be recorded daily, not particularly to

detect infection but to ascertain how the child is able to maintain his body temperature. Routine temperature recordings might well be useful in showing evidence of hypothermia.

Weight. A baby weighing 3500 g at birth might be expected to lose 200 to 250 g in the first 3 days after birth. During this time he takes little food, but he passes meconium and loses fluid in passing urine, and from the skin and in respiration. Once he is taking more food he gains weight, reaching or passing his birth weight by about the tenth day. After leaving hospital he continues to gain about 30 g a day.

Babies in hospital are usually weighed every few days, though the practice is not really necessary; it is possible by other observations to decide if the child is thriving. The mother tends to be greatly concerned about her baby's weight curve, and it may allay her anxiety if she is told the baby's weight, or if she can weigh him and find out, rather than remain in ignorance.

Infection

Though the newborn child rarely develops such childhood ailments as measles and chicken pox, he has little resistance to common bacteria and readily acquires staphyloccal, streptococcal and pneumococcal infections. In hospital there is a particular risk of infection with penicillin-resistant staphylocci and of cross-infection from other babies.

There are three main factors concerned in avoiding infection:

To keep the baby's skin in a healthy condition and intact, so that if bacteria should be deposited upon him there is no portal of entry whereby they could invade the tissues.
To limit the bacteria in the baby's surroundings.
To adopt a barrier-nursing technique to avoid cross-infection.

Skin. The midwife should make every effort to avoid trauma to the child's skin or, indeed, to any superficial tissues. Accordingly, the vernix is allowed to remain on his skin, since it will help to protect the skin surface. He may be cleaned with an antiseptic cream rather than immersed in water. Cleaning procedures in general are kept to a minimum, but whether or not the child is bathed, the skin creases should be inspected daily. The buttocks and groins in particular need thorough but gentle cleaning. Clothing should be of a soft, non-irritating material, e.g. cotton or a cotton and wool mixture.

The umbilical cord stump is treated once or twice daily with an antiseptic and drying preparation. Chlorhexidine (Hibitane) 1 per

cent in 70 per cent spirit and hexachlorophane (Sterzac) powder are popular. When the cord separates, an antiseptic is applied to the umbilicus until the scar is healed.

Eyes. Usually the eyelids are wiped at birth; after this the baby's eyes are inspected every day. If clean, they are left alone.

Mouth. The mouth is similarly inspected, and if it remains clean no treatment is necessary. The same applies to the ears.

Nose. The nostrils are also inspected and, if clean, left alone. If there is any mucus or other material visible the surface only is wiped, wool swabs and water being used. On no account should twists of wool be inserted into the nares.

By this means the child's skin, eyes, ears, nose and mouth are kept clean but protected from injury and thus from infection. Meanwhile efforts are made not to bring pathogenic bacteria in contact with him.

Sources of Infection

The infant may be infected in a number of ways.

Attendants. The nose, throat or skin of those dealing with the baby may harbour dangerous organisms (staphylococci and streptococci). This includes not only the midwife and the doctor but the mother herself.

Hands and clothing. Infection may be carried to the infant by the hands or clothes of the attendant. Again the midwife, doctor or mother may be responsible. The hands may carry infection from one baby to another or convey skin infection or gastro-intestinal infection from the attendant to the baby.

Dust. The air and dust in maternity wards and nurseries contain many bacteria, one of which, the staphylococcus, is most liable to cause infection.

Fomites. Infection may be spread by unsterilized instruments, bowls, and dressings. Clothing and napkins may be the source. In hospital, feeding bottles and teats are very rigorously sterilized and feeds are usually distributed from a special feed kitchen. This is, nowadays, an uncommon source of infection.

Cross-infection. The close proximity of a number of babies in a

nursery makes the spread of infection from one baby to another extremely easy. If one baby should become infected the infection may spread to others and become an epidemic. It will be spread by the methods already mentioned, namely, by the attendant's hands, by the use of communal equipment and through the air and dust.

Prevention of Infection

The midwife should always have in mind the possible sources of infection. The nursery technique for bathing, changing and feeding the baby is designed to limit all the possible sources of infection.

Infection from the attendant. No person having a cold, sore throat, boil, or indeed any other infection should attend a newborn baby. Some authorities still believe that a mask, covering the nose and mouth of the attendant, affords the child valuable protection against infection of the upper respiratory tract. Many, however, feel that masks are not as useful as was formerly thought. If, moreover, they are not correctly worn, that is handled, while being worn, they constitute a danger rather than a protection. If masks are worn, the mask technique of the wearer must be irreproachable.

Hands and clothing. Facilities for washing the hands must be available both after personal toilet and in the nursery. Preferably disposable paper hand towels should be used. The hands must be washed before and after attending to each baby. Antiseptic hand cream, applied to the hands after washing, is valuable. The mother should wash her hands and breasts before feeding the baby.

Dust. The ward and nursery should be adequately ventilated. Cleaning must be thorough but it should be done in such a way that dust is not scattered around the room. Floors are cleaned with vacuum cleaners having filters which prevent bacteria from passing in the air out of the machine. Damp dusting is advisable. Babies are taken out of ward or nursery during cleaning. Cots, trolleys and tables can be wiped over with dilute antiseptic.

Fomites. All instruments and bowls used for the care of the baby should be sterilized. Dressings must be sterile. Clean linen and napkins in adequate quantities must be available at all times for the baby. The midwife should give the mother every encouragement to establish and maintain breast feeding. If she is unsuccessful, or prefers artificial feeding, scrupulous attention will be required to clean and sterilize feeding bottles and teats by boiling, autoclaving or the use of

an antiseptic, for example, hypochlorite solution (Milton), and to prepare the artificial food in sterilized containers.

Cross-infection. The number of babies in a nursery should be kept as small as possible, with adequate space for each cot. The greater the number of babies and the more crowded, the greater the risk of cross-infection. Individual equipment for bathing, changing and feeding should be provided, disposable articles being used whenever possible.

Any baby suspected of infection should be removed from the nursery for isolation nursing in a separate room.

The main routine care of the baby involves changing the napkins, bathing and feeding. Soiled linen and napkins should be handled as little as possible; placed in containers and subsequently dealt with away from the nursery. Whilst the baby is being bathed, care must be taken to prevent abrasions of the skin of the baby which might allow the entry of bacteria. Great care must also be taken of the eyes and cord, the other two places liable to infection.

The Progress of the Baby

Weight. The normal child has doubled his birth weight by the fifth to the sixth month. He gains about 100 g weekly from the fifth month onwards and trebles his birth weight by the end of his first year.

Measurements. The average length of a newborn baby is 50 cm. At 6 months he measures about 60 cm, and at the end of his first year he measures about 70 cm.

The circumference of the head and chest at birth are almost the same: 30 to 35 cm; sometimes the chest is slightly smaller. At 6 months the head and chest are about 40 cm, and at the end of the first year about 45 cm.

Teeth. The two lower central incisors usually erupt at about the sixth or seventh month, and after a few weeks the two upper central incisors appear, followed by the two lateral incisors in the upper jaw. Occasionally the lower lateral incisors come through before the first birthday, so at the end of the first year the average baby has six or eight teeth. This is the usual order in which the first teeth appear, but there are wide variations even in normal babies. The first tooth may appear as late as the tenth month, and they then may not come through in the order given above.

A healthy baby suffers a little inconvenience from teething; one who is not well may suffer some disturbance, especially if the digestive or respiratory tract is affected.

Behaviour. For the first 2 months, the baby should sleep the greater part of the 24 hours. His cry should be lusty, but crying should not be excessive. At 6 weeks he should begin to smile, and at 3 months to take notice of his surroundings. At 6 months the baby should be sitting up but still needing support, at 9 to 10 months crawling, and he should be starting to walk at about a year.

It must be emphasized that these 'milestones' are only approximate, and that many perfectly normal babies show wide variations from this pattern.

Further Reading

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38. THE BREAST AND BREAST FEEDING

The breasts are usually two in number situated on the anterior chest wall on either side of the midline. They lie above the pectoralis muscle. At birth they consist of a nipple and a few rudimentary ducts. No further development occurs until puberty, when under the influence of the ovarian hormones the breasts enlarge and take on the characteristic rounded contour. Full maturity is only reached during pregnancy and lactation. After the menopause the breasts tend to atrophy and much of their adipose tissue is lost.

The mature breast extends from the second to the sixth rib and from the sternum to the axilla. It is hemispherical in shape radiating upwards and outwards in a tail-like structure called the axillary tail. It is this tail that often becomes swollen during the early puerperium causing discomfort. It is also this tail that necessitates the extensive area removed in a radical mastectomy. About the centre of each breast is an area of sensitive erectile tissue, the nipple, which is pink in colour but darkens in pregnancy. The nipple is surrounded by a pinkish area known as the areola.

The Breast is Composed of:

Glandular tissue.
Fibrous tissue.
Adipose tissue.

The breast is divided into sections or lobes by fibrous tissue called septae. The septae run from behind the nipple towards the pectoralis muscle and are an important factor in localizing infection should it occur.

Each lobe is composed of branching glands and ducts (compound glands) embedded in connective tissue and fat and is richly supplied with blood during lactation. In each breast at maturity there are from fifteen to twenty lobes, which are subdivided into smaller lobes, or

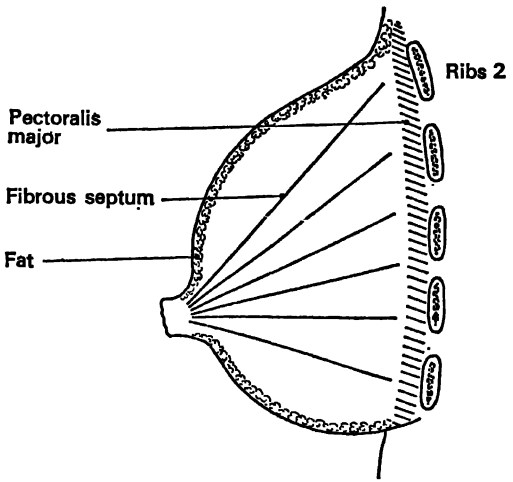

Fig. 166. Diagram of the supporting structures of the breast.

lobules, each of which has its own small duct leading to a main duct, the lactiferous duct. The orifices of the main ducts may be seen in the nipple immediately after the baby has released it after sucking. The lactiferous duct widens into a small reservoir or ampulla just behind the nipple, and opens by an ejectory duct onto the surface (Fig. 167).

Each lobule is a collection of alveoli. Each alveolus is composed of

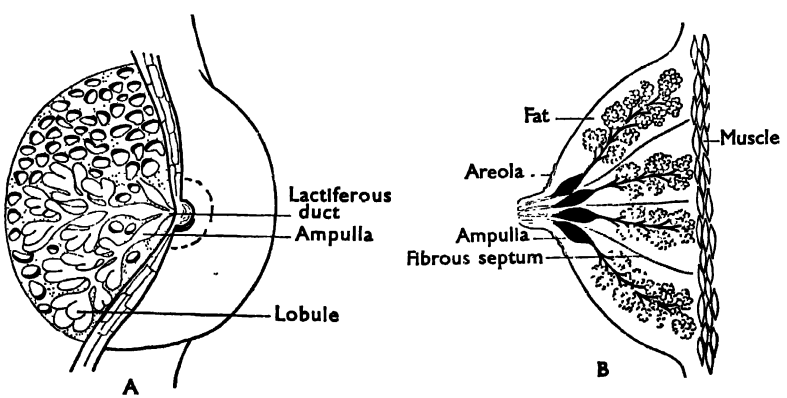

Fig. 167. The breast. (Left) Lobes seen from the front. (Right) Diagrammatic sagittal section.

acini cells which secrete milk and are surrounded by myo-epithelial cells (basket cells) which contract and expel the milk into the ducts. In order that the milk shall not escape from the breast when the baby is not sucking, certain muscle fibres in the nipples have a special action in that one set contracts and thereby empties the ducts and another set acts as a sphincter and closes them. The nipple is covered with

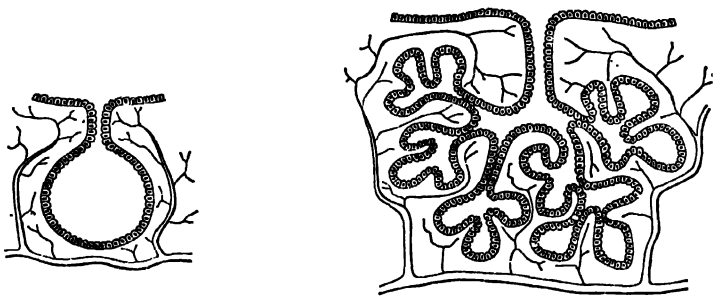

Fig. 168. Structure of the breast (diagrammatic). A, Single alveolus. B, One lobule.

sensitive erectile tissue and becomes more prominent when handled or when the infant holds it in his mouth.

The glandular tissue, with its acini cells is the functioning part of the breast. It is capable of selecting from the blood in the breast the necessary constituents for preparing milk. The structure of the breast is sometimes referred to as resembling a bunch of grapes closely packed together, the grapes and the stalks corresponding to the groups of secreting glands and the ducts.

There is a rich blood supply from the internal and external mammary and upper intercostal arteries. Blood drains from the breast into a circular vein behind the nipple and thence into the internal mammary and axillary veins. The lymphatic drainage is extensive and the lymphatic drainage of the two breasts communicate freely, this accounts for the rapid spread of malignant growth from one breast to another. The breast has a poor nerve supply and its function is controlled by hormones.

Breast Changes during Pregnancy

Around the sixth week of pregnancy the breasts become nodular and lumpy due to the growth and enlargement of the ducts and alveoli.

Oestrogens are responsible for the growth of the duct system, and progesterone for the increase of alveoli. The patient often complains of tenderness and tingling similar to that experienced before a menstrual period. Vascularity increases and the veins are more apparent.

By the twelfth week the nipples have become more prominent and

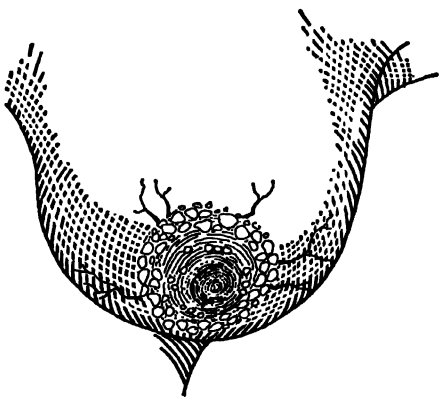

Fig. 169. The normal (left) breast during pregnancy.

the primary areola has become pigmented. Approximately eighteen small swellings appear in the areola, these are Montgomery's tubercles, enlarged sebaceous glands which lubricate and protect the nipple during suckling. Colostrum is present and in a primigravida this is diagnostic of pregnancy. By the twenty-fourth week there is further pigmentation around the primary areola known as the secondary areola. The breasts usually enlarge about 10 cm overall and increase 1500 g in weight, these two factors must be taken into account when buying a brassière. The brassière needs to be 10 cm larger than usual, and the straps at least 2 cm wide to support the weight without cutting the shoulders.

Physiology of Lactation

Under the influence of oestrogens and progesterone the breasts have developed during pregnancy and the production of milk has been inhibited by oestrogens. At the end of the third stage of labour hormone production is reduced by the delivery of the placenta. During the next 48 hours the levels of oestrogen and progesterone fall and this stimulates the anterior pituitary gland to produce the lactogenic hormone. This acts on the acini cells in the breast and the

production of milk begins. The milk formed is propelled along the lactiferous ducts and some is stored in the ampullae which lie just under the areola. When the baby sucks he takes the nipple and areola into his mouth and partly by a vacuum which is created, but mostly by a champing action of his jaws, milk is pushed into his mouth and he swallows. As the ampullae and lower ducts are emptied, the myo-epithelial cells contract and push milk from the alveoli into the ducts. Stimulation of the nipple sets up a neuro-hormonal reflex and the posterior pituitary gland releases oxytocin. The oxytocin is carried in the bloodstream to the breast where it causes the myo-epithelial cells to contract and propel milk along the ducts, this is called the draught reflex. The mother is often aware of the passage of milk towards the nipple, following which milk may flow from the nipple. Oxytocin also stimulates contraction of the uterus and there may be accompanying abdominal pains ('after pains'), and an increase of lochia whilst feeding.

The Importance of Breast Feeding

Breast milk is the ideal food for the newborn baby. The breast-fed baby usually makes steady progress and is less liable to infection, and if an infection, for example gastroenteritis should occur, the baby has a better chance of recovery than if he were artificially fed.

During lactation the glandular secreting cells have the selective power to obtain the raw material for milk from the mother's blood-stream. The right amount of protein, fat, sugar, mineral salt and vitamins are present to meet the requirements of the growing baby. There is a deficiency in iron, but the baby has partially prepared for this by storing iron in the liver during the last 3 months of intra-uterine life. If the supply of iron in the mother's blood is insufficient for herself and the fetus, the mother may become anaemic, and the doctor will usually prescribe iron in some form to remedy this deficiency.

The Essentials for Successful Breast Feeding

Conscientious and thorough ante-natal care in preparation for breast feeding (page 160).

A desire of the mother to breast feed, and confidence in her own ability to do so.

A stabilized nervous system, with freedom from worry and pain.

A well-formed and active breast and a healthy nipple, with no pain from engorgement or abrasions.

Vigorous sucking on the part of a healthy infant, emptying the breast at regular intervals.

In a primiparous patient, supervision in the first few days.

The Management of Breast Feeding

Breast feeding should be a happy, satisfying experience for both the mother and baby, but all too often it develops into a three-sided battle between the midwife, the mother and the baby. This is unnecessary, and with careful thought and preparation can be avoided.

Every mother must be allowed to decide for herself how she wishes to feed her baby and the sooner the decision is made the better for all concerned. No one should be forced to breast feed, some women find the idea distasteful, others have a husband who will not tolerate her breast feeding. These are not unusual reactions and should be understood not criticized. Other women for social and economic reasons wish to return to work and rather than disorganize an established routine wish to start off with artificial feeding. Above all, the midwife needs to recognize the woman who breast feeds in hospital because she feels she must, but gives up the moment she gets home. This creates problems for herself and the baby. Breast feeding in many cultures is taken for granted whereas in others, such as our own, it has phases of being socially acceptable.

If breast feeding has been decided upon, the next step is to find a position which can be maintained comfortably for 20 minutes or so. This may be lying on one side, sitting upright well supported by pillows, or any other that the patient and midwife can devise. During the first day or two after birth if the perineum or haemorrhoids are causing pain, an analgesic such as paracetamol should be given ½ hour before feeding.

The baby's napkin is changed and he is brought to his mother wrapped in a shawl. The best results are obtained if in the early days she is allowed to play with and fondle him before attempting to feed. She needs to get to know her baby, and he his mother. All too often patients say they did not feel the baby was theirs in the hospital. This is quite wrong and must be avoided. Once ready to feed she cradles him in her arm and uncovers the breast on that side, a low-cut nightdress or a shoulder fastening one makes this easier. The nipple and areola are placed in the baby's mouth. Some babies grasp the nipple vigorously and suck immediately, others need the mouth to be opened with gentle pressure on the chin. Some babies manage well if the breast is kept away from the nostrils so that they can breathe, while others find it easier if the breast is compressed between the mother's thumb and forefinger to give an area on which to grip.

It is important to allow plenty of time, especially during the first feed, for confidence to be established. The primipara often needs help and encouragement and the midwife should be at hand if required. Half way through the feed the baby should be sat upright to bring up his wind, there must be a straight line from the stomach to the mouth to achieve this. An alternative, preferred by some, is to hold the baby upright with his head resting against the mother's

Fig. 170. The correct position for breast feeding.

shoulder, this proves satisfactory but she is wise to protect herself in case the baby regurgitates down her back.

The process is then repeated on the other breast. After feeding the nipples are carefully dried and a supporting binder applied. If the breasts are overfull the mother should be taught how to hand express the milk to make herself comfortable. Brassières are better reserved for later in the puerperium as they sometimes cause oedema, particularly the type with a circular hole through which the nipple protrudes; also there is often difficulty in maintaining an adequate supply of clean garments.

Other positions may be used, some babies seem to prefer feeding with the feet towards the mother's axilla and some feed in a different position on each breast. This matters little so long as they are comfortable. At subsequent feeds the baby should commence at alternate breasts, this ensures that each breast is thoroughly emptied at alternate feeds. In the case of twins, some mothers can manage to feed them both together, provided there is adequate support for their bodies.

If lactation is to be adequate the mother must increase her fluid

intake during the first 3 days to at least 3500 ml a day, of which at least 600 ml should be milk in some form. The diet should contain an adequate amount of protein.

Routine of Breast Feeding

Most babies settle down well to an approximately four-hourly feeding régime. The baby should be left to rest for 6 to 8 hours after birth. Subsequently his feeds may be as follows:

1st day: 2 minutes at each breast, 8 hourly
2nd day: 4 minutes at each breast, 4 hourly
3rd day: 6 minutes at each breast, 4 hourly
4th day: 8 to 10 minutes at each breast, 4 hourly.

The baby is likely to need a night feed for the first 3 to 4 weeks of life, or possibly longer. It should be given for so long as the baby wakes up and 'demands' it. Sooner or later he will begin to sleep through the night.

For the first two or three nights an artificial feed may be given by the midwife. This allows the mother to have a good rest. After this she may, if she wishes, give the child a breast feed when he wakes.

Four-hourly feeds are usually given at 06.00, 10·00, 14·00, 18.00, 22.00 and 02.00 hours, approximately. It is better that these times should not be adhered to rigidly; indeed, the more elasticity is possible, the sooner will the baby himself establish a regular routine.

Thus, if the baby wakes ½ hour before his feed is 'due' he should be fed then. It would be quite wrong to allow him to cry until a prescribed time in an attempt to fit him into a routine. All too often the result of this kind of management is that after ½ hour's crying the baby is too tired to feed properly and the mother too worried to enjoy feeding him. He falls asleep in the middle of the feed, only to wake 2 hours later, hungry and fretful once more. Before long the mother is so anxious that her milk supply diminishes and complementary feeds are needed. Both mother and baby have been made thoroughly unhappy, and the whole regrettable sequence might well have been avoided by a little initial elasticity over feeding times.

Some authorities, indeed, prefer an 'on demand' feeding régime, whereby when the baby wakes up and cries the mother feeds him, without regard to the time. With a little sensible advice the mother soon differentiates her baby's odd whimper from his cry of hunger, and, before long the baby will establish a fairly regular pattern, waking every 3, 3½ or 4 hours and feeding well at these times.

In hospital, the best plan is probably the approximate 4-hourly schedule described above. Small babies, that is those under 2500 g may need 3-hourly feeds, and very large hungry babies may not last

4 hours from feed to feed. The occasional baby who is not feeding well may then be tried on 'on demand' feeds.

The baby is changed after feeding, though most babies require attention before as well. No baby will suck properly if he is uncomfortable. As a rule the act of sucking causes an action of the bowels or bladder, thus making a second change necessary. The changing after the feed must be done with a minimum of disturbance; otherwise the child may vomit.

Until breast feeding is well established, which may take up to 4 weeks, complementary feeds or even supplementary feeds may be necessary.

A complementary feed is one given to complete a feed which has been insufficient from the breast. The baby is test-weighed, and the deficiency is made up with a prepared milk mixture immediately after the breast feed.

A supplementary feed is one given by a bottle instead of a feed from the breast.

Test feeding. A baby that is not gaining weight should be test-fed with reliable scales which register accurately to 10 g. He is weighed before and immediately after the breast feed. The napkin should not be changed until after the feeding is finished. Any deficiency in milk must be made up by a complementary feed, that is, a small feed to complete the amount required. It should follow *immediately* after the breast-feed, and if expressed breast milk is not available, dried milk is generally used for complementary feeding.

Test feeding must be done for at least one whole day. Experience has shown that the first feed in the morning is usually the largest and the midday one the smallest. From the total taken in 24 hours (excluding the night feed, which may be counted as an optional extra) may be calculated how far the child is short of his probable requirement.

Diminishing secretion of milk. This is a temporary condition which may occur particularly when a mother has to shoulder the whole burden of the household as soon as she reappears in the family circle. This sudden increase in mental and physical work brings about a state of fatigue which the breasts share in common with the rest of the body. If this is explained to the mother and if for a few days she gives a small complementary feed to the infant in addition to her own milk, she will probably find that her breast milk will return after she has overcome the sudden strain. It is during the third or fourth week

after birth that the mother is most likely to be persuaded to take him from the breast or to put him on supplementary feeds, which, since they are given in the place of a breast feed instead of in addition to it, are not so likely to bring about an increased supply as the mother's general condition improves. The fact that human milk is sometimes of a bluish tint inclines some people to decide that it is of an inferior quality, when, in fact, this is the normal appearance.

If a mother is unable to satisfy her infant during his first few weeks she is very much tempted to try various foods. Sometimes a child will have been fed on several kinds before he is 6 weeks old.

As soon as the mother has recovered from the strain of resuming her household work, the milk as a rule comes back in its normal amount, it being the amount rather than the quality which is affected in these circumstances. The artificial feeds can then be discontinued. If the full supply of milk does not return the family doctor or a clinic should be consulted. Almost certainly the mother needs more rest, this being particularly the case if she is having disturbed nights because the child is fretful.

A nursing mother should never feed her baby when she is flurried or over-tired. It is better to take a few minutes rest first.

The return of menstruation need make no difference to breast-feeding.

On discharge from hospital the mother can always consult the Health Visitor or her general practitioner with these problems.

The Problems of Breast Feeding

All the milk secreted by the breast should be removed at each feed. If this is done the breast will continue to secrete. If the milk is not removed or incompletely removed the secretion will gradually decline and disappear. All efforts to establish and maintain breast feeding are guided by this principle.

The incomplete emptying of the breast may be due to poor sucking by the baby:

Prematurity.

After a difficult labour or forceps delivery, particularly if there has been a cerebral injury.

Respiratory infection, even if of minor degree, for example a cold producing nasal obstruction by mucus.

Congenital abnormality particularly malformation of the lip, palate and jaw, such as hare lip, cleft palate and poor development of the lower jaw.

Soreness of the mouth produced by a thrush infection or injury to the mucosa by over-vigorous removal of mucus from the throat at birth.

If the baby cannot empty the breast it must be emptied manually or by electric pump, and the milk fed to the baby. When the baby has recovered his health, or if the weakness is due to prematurity, when he is strong enough, breast feeding can be established. Of the greatest importance is the prevention of the above abnormalities of the newborn baby. Every effort must be made to avoid premature labour, the baby must be handled during normal and forceps delivery, as gently as possible and trauma to the mouth must be avoided. The baby must be protected from infection.

Some Fault in the Breast

Retraction or fixation of the nipple.
Engorgement.
Failure of the draught reflex.

Retraction or Fixation of the Nipple

One of the most common causes of incomplete emptying is retraction of the nipples. It should be possible for the baby to draw the nipple well into the mouth. The breast is then emptied by rhythmical compression by the jaw of the baby on the breast tissue behind the nipple. The milk is thus expressed from the dilated milk ducts. Any 'sucking' —sucking is really a 'champing' movement of the jaws—is applied to the skin of the areola. As a result the baby obtains the milk easily and the nipple does not become cracked. If the nipple cannot be drawn forward, however, a sequence of events leading to failure of breast-feeding will occur. First the baby may grasp the nipple but will be unable to draw it into his mouth. He 'bites' on the nipple causing an abrasion which may later develop into a painful fissure or crack. The pain of feeding the baby will probably inhibit the reflex expulsion of the milk from the deeper parts of the breast to the ducts, and thus the breast becomes engorged. Hence the breast is not emptied and lactation decreases and disappears. Meanwhile the baby becomes frustrated and fretful.

This unfortunate sequence can usually be prevented by care beginning early in pregnancy. The late Dr Waller, an eminent paediatrician, devoted many years of his life to the study of breast feeding. He introduced a simple method to detect and treat nipple retraction. The finger and thumb are placed over the areola, which is slightly depressed into the breast. The finger and thumb should then be able

to close behind the nipple, which can be drawn forward. The finger and thumb imitate the action of the upper and lower jaw of the baby. If the nipple retracts into the breast, treatment must be given or the baby will have difficulty in feeding. This fixation can only be overcome by prolonged stretching of the restraining tissue. This can be achieved by the use of Woolwich breast shells (Waller shells). The hole in the shell is placed over the nipple and the shell is pressed against the breast by a well fitting brassière. The shells are worn for short periods at first and later throughout the day.

Engorgement of the Breasts

This condition may occur on the second evening or third morning after delivery. The patient complains of pain and tenderness in the breasts which on examination are flushed, tense and hot to the touch. The temperature and pulse may be raised. This early engorgement is due to lymphatic and venous stasis, and not as is often thought to milk in the alveoli. Analgesics should be given for the pain, and hot bathing or a warm bath may soothe and help stimulate the circulation. If the breasts are very tense the baby finds difficulty in suckling which leads to frustration on his part and distress for his mother. It is sometimes wiser, because of this, to omit one or two breast feeds until the breasts are softer. Some authorities give a dose of oestrogen such as stilboestrol, to depress the lactogenic hormone for a short period and so relieve the tension. The condition subsides within 24 to 48 hours, and can be prevented by good antenatal care. Unsympathetic handling of the situation may completely destroy the mother's confidence and result in her giving up breast feeding. Explanation and support are most important as is the control of pain.

Engorgement occurring a little later may be due to the failure of the milk to flow freely. The breast will become hard, 'knotty' and painful. If the obstruction is not overcome quickly the milk cannot be removed from the breast and the secretion of milk may diminish. This may be prevented by manual expression of colostrum from the breasts during later pregnancy and during the puerperium before lactation commences, and sometimes before and after feeds until feeding is established. All primigravidae and mothers who have had previous difficulty with breast-feeding may, with advantage, be taught the correct method to express the colostrum or milk. There are two stages in manual expression. First the whole breast is grasped between the two hands, which are then moved towards the nipple, gently compressing the breast and driving the milk through the ducts towards the nipple. This is repeated four or five times. Then the finger and thumb grip the breast behind the nipple and with rhythm-

ical closing of the finger and thumb the milk is driven from the terminal dilatations of the milk ducts out from the nipple.

Failure of the Draught Reflex

A mother who is highly strung and worried or who allows her desire to feed to turn into anxiety will experience more difficulty than one who is calm and confident that she can breast feed. This confidence may be the result of her own conviction and experience but it can be inspired and sustained by a good nurse. The mother's worry may be of such a nature that a nurse is unable to deal with it, especially if it is concerned with private affairs, but a tactful nurse can sometimes ease the situation with a little sympathetic understanding. The mother who has no desire to breast feed, but has been ill-advisedly persuaded to try, will suffer such inner conflict that the 'draught' reflex will never operate satisfactorily. Supervision at each feed is necessary with many primigravidae and with multigravidae who abandoned breast-feeding with previous babies. Once it is seen that the mother can handle her baby at feeding times she is best left alone. Pain may interfere with the reflex expulsion of milk, particularly pain from a cracked nipple, but pain from perineal stitches, after-pains, or haemorrhoids may affect the mother.

Suppression of Lactation

If a mother declines to breast feed, or if for some medical reason such as diabetes mellitus this is not desirable, or in the event of still-birth or neonatal death lactation must be suppressed. If measures can be adopted before the breasts fill on about the third day it will be much easier, but this is not always possible.

The rules are very simple, the breast must be emptied of any milk, then a really firm binder is applied. No additional fluids should be taken, and according to the obstetrician one of the following may be used:

- Magnesium sulphate 8 g in half a tumbler of hot water each morning until the breasts are soft. This produces a fluid stool and reduces lactation.
- An injection of hexoestrol dipropionate 15 mg once, to be repeated if necessary; or stilboestrol 5 to 10 mg orally three times a day for 5 to 7 days. Oestrogens inhibit the lactogenic hormone and so reduce lactation.

If during treatment the breasts fill and are painful, analgesics such as paracetamol should be given, but only under extreme circumstances

should the breasts be expressed as this commences the cycle again and slows the process.

Types of Milk

Colostrum

This is a yellowish fluid consisting of:

Protein (lactalbumin) 6 per cent.
Sugar 3 per cent.
Fat 2·5 per cent.
Mineral salts and water.

Colostrum is very rich in protein but contains less fat and sugar then true milk. Only a few fluid millilitres are secreted for each feed. True milk replaces the colostrum about the third day.

Colostrum requires little digestion and is readily absorbed into the baby's bloodstream. Colostrum is gradually replaced by milk. About the third day a small quantity of caseinogen is present, which, in combination with the rennin of the stomach forms soft, flaky curds. As the stomach learns to digest casein it becomes educated to the process of digestion.

Cows and Human Milk

		Human		Cows	
		per cent		*per cent*	
Protein	Caseinogen	0·5	1·5	3·0	3·5
	Lactalbumin	1·0		0·5	
Sugar	Lactose	7·0		4·5	
Fat		3·5		3·5	
Salts		0·2		0·75	
Water		87·8		87·75	
Total		100		100	
Lactalbumin to caseinogen		2 to 1		1 to 6	

The protein of milk is of two kinds, lactalbumin and caseinogen. Of these caseinogen forms a hard indigestible curd, and lactalbumin a soft, flaky curd when rennin acts upon it in the baby's stomach. So it will be realized that human milk, which contains so much more lactalbumin in proportion than cows' milk, is much more suitable for a baby. Very little iron is present in either human or cows' milk.

39. ARTIFICIAL FEEDING

Although breast feeding is the method of choice, artificial feeding may be adopted for any one of a variety of reasons.

Reasons for the Adoption of Artificial Feeding

Breast feeding may be definitely contra-indicated. The main reason is some serious illness of the mother. The most important is active pulmonary tuberculosis, in which the baby has so little resistance to the disease that he should not come into contact with the mother for some weeks. Severe heart disease, severe diabetes mellitus, and puerperal psychosis are other conditions in which breast feeding is inadvisable. Local conditions of the breast, such as inverted nipples, or a previous breast abscess are similarly contra-indications.

In certain rare conditions such as galactosaemia and phenylketonuria the baby is unable to digest breast milk (or indeed any other milk) and must be given specially prepared food.

Breast feeding may be attempted, but abandoned.

Artificial feeding may have to be begun because the baby cannot suck normally. This will occur if the baby has a cleft palate or hare lip or if the child is very immature.

Another problem which the midwife and doctor have to solve is that which occurs when, despite all efforts to increase the secretion of milk, the end of the lying-in period is in sight and the baby has to be constantly fed by complementary feeds. In these circumstances it is better for complete bottle feeding to be established whilst mother and baby are under constant supervision, rather than to persevere with a procedure which is becoming more and more tiring and discouraging to the mother.

The mother may not wish to breast feed. There is a large group of mothers who abandon or never attempt breast feeding because of physical or temperamental inability, or because of social commitments. Economics play a part in the decline of breast feeding also. Women are being encouraged to work in factories, and dried foods are available cheaply.

The Baby's Requirements

When considering any diet these factors must be taken into account:

The calorific requirement.
The fluid requirement.
The balance of ingredients.

Calorific Requirement

The average baby will thrive satisfactorily on an intake of 110 calories per kilogram of body weight per day. Thirty millilitres of cow's milk contains approximately 20 calories.

A 3·5-kg baby will require 385 calories in 24 hours, that is 575 ml of milk, or 115 ml per feed for five feeds.

Fluid Requirement

In order to keep a healthy infant hydrated he requires 165 ml per kilogram of body weight per day.

A 3·5-kg baby will require 577 ml of fluid, thus when whole milk is given both the calorific and fluid requirements are met. Care must be taken when reconstituting evaporated or powdered milk to see that the fluid added is adequate.

Balance of Ingredients

Human milk is balanced to suit the need of the baby just as cow's milk is balanced to meet the needs of the calf. If the latter is used for a baby it must be modified.

Feeding a Baby Artificially from Birth

It should be realized that the level of 165 ml per kilogram body weight daily of milk at full calorie value must be reached gradually. The tendency nowadays is to work up fairly quickly to full feeds and most authorities recommend that full strength mixtures may be started from birth.

Taking as an example a baby weighing 3·5-kg at birth, the following régime is suggested. The baby should be offered these quantities, though if he does not take the full feed, it is not important. For the first 2 days he may need some water between feeds.

1st day	30 ml milk 8-hourly
2nd day	45 ml milk 4-hourly

3rd day	60 ml milk 4-hourly
4th day	75 ml milk 4-hourly
5th day	90 ml milk 4-hourly
6th day	115 ml milk 4-hourly

Vitamins. From 4 weeks, orange juice and cod-liver oil should be given, starting with the concentrated orange juice diluted four times and sweetened, and giving very little to begin with. Once the baby's digestion has become accustomed to this, that is in about 2 weeks, if the baby has shown no digestive disturbance, cod-liver oil may be given. As the baby finds more difficulty in digesting fat than any other form of food only a drop or two should be given at two feeds a day to begin with. It should be put straight on the baby's tongue or on the teat, but it should not be added to the feed. The amount can be increased gradually as the baby learns to tolerate it.

Methods used in artificial feeding. The normal baby is able to suck and to swallow and can be bottle fed. An ill or premature baby may not be able to suck but can swallow and is then fed by spoon or Belcroy feeder. If the baby can neither suck nor swallow, tube feeding must be used.

Types of Milk

Cow's milk. Almost all artificial food used in this country is some form of cows' milk, modified to suit the baby's digestion.

Cows' milk contains more protein than human milk, and the casein is less easily digested. The fat content is about the same but in cows' milk the fat is suspended in a relatively coarse emulsion and is not well tolerated. The carbohydrate content is less than that of human milk. Babies tolerate carbohydrate well.

In modifying cows' milk, these differences must be borne in mind. It is not essential to try to reproduce the exact proportions of the different constituents. It *is* important to give the baby feeds that he can digest and which are of the same calorie value as human milk. The main features of modification of cows' milk are the addition of water, which dilutes the protein and fat, and the addition of carbohydrate, which restores the calorie value. Fresh milk may be easily modified, though most mothers prefer dried or evaporated milk.

Fresh milk. In this country the milk comes from tuberculin tested cows and is usually pasteurized but sometimes sterilized. Most housewives buy pasteurized milk.

Channel Island milk contains a higher proportion of fat and is

rather more expensive. The high fat content makes it unsuitable for very young babies.

The chief advantage of using fresh milk is that it is always at hand. It is very convenient when only an occasional supplementary feed is needed. The disadvantages are that it is easily contaminated, it is difficult to keep fresh in a household without a refrigerator and it is bulky and inconvenient if the mother has to travel with the baby.

Though the milk is pasteurized, and probably perfectly safe, it is advisable that it should be boiled before it is given to a baby of less than 1 year old. As well as sterilizing the milk, the boiling renders the casein more easily digestible.

To make one feed for a 3·5-kg baby the following modification would be adequate:

90 ml milk	(60 calories)
30 ml boiled water	
4 g (1 teaspoonful) sugar	(15 calories)

This gives a 120 ml feed of 75 calories, which may be increased as the baby gains weight.

A simple way to increase the feed is to continue with 30 ml water and 4 g sugar, but to add more milk. Thus, the next change would be:

120 ml milk	(80 calories)
30 ml water	
4 g sugar	(15 calories)

This gives a 150 ml feed of 95 calories, which may be offered to the baby as soon as 120 ml fails to satisfy him. He then has the opportunity, similar to the breast fed baby, to take a large or small feed as he pleases.

Again, when he demands more than 150 ml he may be offered a 180 ml feed. The same formula will serve: 30 ml water, 4 g sugar and the remainder (150 ml) milk.

Dried milk. Preparations of dried milk are very popular in this country. They are easily obtainable and often generously subsidized, so that the mother can buy them cheaply. The tins and packets are convenient to store and not too cumbersome if the mother has to travel. The powder remains fresh and is not easily contaminated. The milk is cooked, that is it has been dried by a heating process which renders the protein much more readily digestible. Dried milks are supplied with a special measure. One measure, loosely filled with the powdered milk and levelled off with a knife, mixed with 30 ml of water reconstitutes the milk to what it was before drying. It may then be modified as necessary.

Three main types of dried milk are available:

Half-cream dried milk. The milk is partly skimmed, thus half the fat is removed. Most half-cream milks have added sugar, so that the mother has only to add water. The exception is the government sponsored National Dried Milk, which has no added sugar.

Full cream dried milk, which is whole milk, dried. A full cream National Dried Milk is available.

Most of these preparations have added vitamin D.

The half-cream milks are usually satisfactory for the first few weeks of life. Full cream milk is generally suitable for babies over 5 kg, though many babies of less than this weight thrive on it.

Specially modified dried milks. These are prepared for babies who cannot tolerate ordinary foods or who need special supplements, e.g. lactic acid milk and whey are available for babies with digestive disturbances, and milk with lactose extracted is prepared specially for babies with galactosaemia. They would be used only on medical advice.

Dried milk feeds are simple to prepare. To make one feed for a 3·5-kg baby, the following formula would be suitable:

4 measures of half-cream National Dried Milk	(64 calories)
120 ml of boiled water	
4 g (1 teaspoonful) sugar	(15 calories)

The powder should be added to the water (not the water to the powder) and the mixing is carried out with a fork or whisk. Alternatively a Horlicks mixer, with a perforated plunger, or a shaker may be used. This gives a homogeneous solution in which the fat is not likely to separate, forming a layer on the top. The mixing should be careful and thorough. so that no lumps are formed. The milk may be poured through a fine strainer.

Evaporated milk. This is either half-skimmed or whole milk from which approximately two-thirds of the water has been removed by heating. The concentrated milk is then canned. Evaporated milk is becoming more popular in this country. It is convenient to store and, in the unopened tin, it lasts indefinitely. It is also very easy to prepare, since it needs no more mixing that a cup of tea. Full cream evaporated milk contains about 50 calories per 30 ml, half cream, 40 calories.

A suitable mixture could be prepared as follows:

240 ml full-cream evaporated milk	(490 calories)
480 ml boiled water	
20 g (5 teaspoonsful) sugar	(75 calories)

This would give 720 ml of a mixture containing approximately 20 calories per 30 ml. It would be sufficient for a 3·5 to 4 kg baby for 24 hours, allowing for a night feed.

If the mother has a refrigerator it is practical and time-saving to prepare feeds for 24 hours at one time. The feeds are bottled and capped and kept in the refrigerator. The mother has then only to warm the feed and replace the cap with a teat.

Equipment Required

A mother artificially feeding her baby would need the following equipment:

Three, or better still six, upright glass or polypropylene bottles with rubber caps and teats.
Graduated toughened glass or Perspex jug.
Fork or whisk for mixing dried milk. } or
Knife for levelling dried milk powder. }
Dessert spoon for mixing evaporated milk.
Teaspoon for sugar.
Small covered bowl for teats and bottle caps.
Bottle brush.
For boiling, a saucepan (with lid) large enough to hold the equipment, which may then be stored in the saucepan between feeds, or
For sterilization by immersion, a glass or plastic container similarly with lid and of large enough size.

Sterilization

In hospital, equipment may be sterilized by autoclaving or by immersion in hypochlorite 1:80 solution. Some authorities advocate terminal sterilization of feeds.

In the home, equipment may be sterilized by boiling or by immersion in a 1:80 solution of hypochlorite. The equipment remains in the hypochlorite from feed to feed and as the solution is harmless, the bottles need not be rinsed before feeds.

Precautions

Increase both strength and quantity of feed by degrees, the change from half-cream to full-cream dried milk should be gradual.

The temperature of the feed should be 36·5 to 37·5°C and can be tested by allowing the milk to drop onto the back of the hand. It should feel warm but not hot.

Hold the baby in a comfortable position and hold the bottle so that no air enters the teat.

Hold the baby up, leaning slightly forwards, after the feed, to enable him to bring up wind.

Signs that a Child is Thriving

Appearance. The skin is warm and the colour good, the muscles feel firm and the skin elastic. Eyes and hair are bright. The fontanelle begins to close, and is closed by the time the child is 18 months old. Teeth begin to appear from 5 to 8 months onwards. The expression is intelligent.

Behaviour. The cry is lusty, but is not prolonged; the baby is vigorous, takes food eagerly, sleeps well, and is generally contented. The child begins to sit up at about 6 months, to crawl at about 8 to 10 months, and takes his first steps at about 1 year.

Digestion. There is no apparent discomfort after feeds, and no vomiting. The urine is normal, and the stools are normal in number and colour, and cause no soreness of the buttocks.

Weight. There is a gradual gain in weight and, although it may be more in the first few weeks, an average weekly gain of 150 to 200 g is maintained.

Causes of a Baby not Thriving

Errors in the proportion or quantity of feeds. Investigation has shown that many infants are underfed and weight gain and general well-being are thus seriously impaired. The baby must have 110 calories per kg of expected weight per day, and he should gain at least 150 g per week. Errors and underfeeding can arise if dried milk is measured in teaspoonfuls instead of by the measure provided and fluid in tablespoonfuls instead of in millilitres. There is little risk that a healthy baby will be overfed.

Excessive dosage of vitamin D combined with artificial feeding on dried cows' milk, which contains three to four times more calcium than breast milk, can be followed by an excess of calcium in the blood. The baby may suffer from constipation, vomiting, and failure to gain weight. 500 to 1500 units of vitamin D daily is sufficient to prevent rickets.

Infection. Acute infection of the gastro-intestinal, or respiratory

tract will usually be associated with obvious illness requiring immediate treatment, but in urinary tract infection the clinical picture is much less clear-cut. It may be suspected if the child fails to thrive.

A thrush infection of the mouth may cause the baby to refuse to feed properly.

Constitutional disease. Congenital abnormalities, for example malformation of the heart, may be associated with failure to thrive. Some abnormalities such as those of the urinary tract may be revealed only by special investigations. Iron deficiency anaemia is particularly common in premature infants and may be a cause of failure to thrive; it can be readily remedied by iron therapy.

Some of the constituents of normal food appear to act as poisons for certain susceptible babies. Some babies cannot convert lactose to glucose, the product of the intermediate stage of conversion, galactose, accumulating in the blood. This produces toxic effects on the liver and brain. The condition is diagnosed by testing for galactose in the urine. Signs of the condition will appear in the first 2 weeks of life with persistent jaundice and wasting. This condition can be cured by giving feeds not containing lactose.

Coeliac disease begins after weaning and is due to intolerance of gluten; it can be cured by a correct diet.

Mixed Feeding

Mixed feeding is commonly started when the baby is about 4 months old. The rule about gradual changes still applies and at first only very small quantities of egg yolk or cereal (Farex) are offered. By degrees finely sieved vegetables, or one of the many tinned baby foods may be introduced. The baby's likes and dislikes will soon become evident.

As he takes more mixed food, so his breast or bottle feeds are gradually replaced by the meals he takes, at 09.00, 13.00 and 17.00 hours. He may enjoy a drink of orange juice or rose hip syrup when he wakes in the morning, and he will probably take a breast or bottle feed last thing at night. Most babies like to continue this late feed for several months after they are taking ordinary meals. A baby may be 9 or 10 months old before he begins to 'sleep round the clock'.

40. BABIES OF LOW BIRTH WEIGHT

By international agreement at Geneva in 1937 a baby was described as being premature if at birth he weighed 2500 g or less. In 1961 a World Health Organization Expert Committee on Maternal and Child Health recommended that the concept of 'prematurity' should give way to that of 'low birth weight'.

The '2500 g and under' yard-stick is still useful for distinguishing babies who may need specialized care.

About 7 or 8 per cent of the babies born in this country fall into this low birth weight group, but more than half of all the neonatal deaths occur among these small babies.

Causes of Prematurity

No cause can be found for 40 per cent of premature births, but the commonest known causes are pre-eclampsia and antepartum haemorrhage. Serious general disease of the mother such as cardiac disease, chronic nephritis, or essential hypertension, and illness associated with a high temperature may also cause premature birth. The fetal causes are twins and congenital abnormalities. Premature labour may be induced by the doctor because of pre-eclampsia, diabetes, or Rhesus incompatibility. Premature births are more common among social classes 4 and 5 and this illustrates the effect of nutrition and physique upon pregnancy.

Because so many premature babies die, the way to avoid this would be to avoid prematurity where this is possible. Thus early detection and treatment of pre-eclampsia may be of value. Rest and non-interference in cases of suspect placenta praevia does much to prolong the pregnancy, while patients with twin pregnancy benefit from rest in bed in hospitals between the thirtieth and thirty-sixth weeks, and have bigger babies. The use of the Shirodkar suture to treat cervical incompetence has prevented many late abortions and very premature labours, while improvements in social services may gradually reduce

the number of premature labours in women of poor physique and nutrition.

Good use, too, can be made of the many special units where premature babies receive skilled care. Any woman starting labour before the twenty-sixth week should be transferred to hospital for delivery.

During labour, while the mother may need analgesic drugs, these are used cautiously. Large doses of Pethidine may depress the child's respiratory centre, and nitrous oxide and air could deprive the child of an adequate oxygen supply.

An episiotomy, and possibly a forceps delivery will do much to protect the baby's poorly ossified cranial bones and the attached membranes and blood vessels. An incubator, warmed and flushed with oxygen, is ready to receive the baby.

A premature infant is seriously handicapped in that he is not fully able to adapt himself to his new environment. Apart from the fact of being born before full time, we have also to consider that the premature birth may be because of some unsatisfactory condition of the mother, which adds greatly to the difficulty of rearing the child.

A 28-week-child weighs from 1 to 1·25 kg. His length is usually 35 cm. At 36 weeks the child weighs 2·25 to 3·75 kg, and measures 45 cm. He has a much better chance of living than one born at the twenty-eighth week.

Appearance

The premature baby is easily recognized, the head is large in proportion to the body and he has a small triangular face with a pointed chin and worried expression. If very small he may be reluctant to open his eyes. The sutures and fontanelles are widely spaced, and the skull bones soft. The skin is red and wrinkled owing to the absence of subcutaneous fat and he is covered with a soft downy hair called lanugo. The limbs are thin, the nails short, the chest small and soft, the abdomen large and the umbilicus appears to be low set. The genitalia are small and the testes may not have descended into the scrotum. The baby may be feeble and drowsy and the sucking reflex may be poor. The cerebral centres are underdeveloped with the result that the circulatory system may be unstable and there is poor control of body temperature. The respiratory centre is not fully developed and the baby may have cyanotic attacks, especially after feeding. There is little or no immunity to infection and a greater tendency to bleeding than in the mature baby.

The Problems of Prematurity are

To establish and then maintain adequate respiration.

Prevention of dehydration
Maintenance of body temperature without restricting respiratory excursions.
Establishing an adequate feeding programme.
Prevention of infection.

Care of the Premature Baby

The nursing care given to the premature baby is of vital importance as his very survival depends on the quality of care he receives. This care is supervised by a paediatrician and the baby is usually admitted to a special care nursery. The temperature of the nursery should not be less than 21°C. Many will be nursed in an incubator as this allows a more precise control of temperature and humidity. The baby is nursed naked in the incubator, this relieves the chest of the weight of clothes and aids respiration, it also allows adequate observation. The temperature of the incubator is maintained at 32°C, the maximum possible humidity is achieved, which in practice is rarely more than 75 per cent, and oxygen can be given if required.

To Establish and Maintain Respiration

The more premature a baby, the less developed are all his functions. The baby born at term has strong respiratory muscles and the nerve centre in the medulla controlling respiration is fully developed. In the premature baby the muscles may be weak and the respiratory centre incompletely developed. Thus it may, in the first place, be difficult to establish satisfactory breathing, or the child may be apparently well, breathing regularly and becoming pink, but later having apnoeic attacks, when his colour is grey and his condition poor.

In the early stages continuous observation is necessary and careful records kept of colour, rate and regularity of respiration. It must be noted if there is any rib recession, any unequal movement of the chest and whether periods of apnoea occur. The temperature of the baby and the incubator, the pulse rate and whether twitchings or fits occur should also be recorded. It may be convenient to use an apnoea alarm mattress.

If the baby is cyanosed the air passages should be cleared and oxygen given.

There is a condition called retrolental fibroplasia, which results in blindness and has been shown to be due to too high an oxygen tension in the blood. This cannot occur if the baby is cyanosed, but if he is pink the concentration should be limited to 30 per cent. It is not the external concentration that causes damage but the tension of

oxygen in the blood. If the cyanosis persists, or if resuscitation is difficult the paediatrician may require blood samples to be examined for acidity, bicarbonate content and gas tension. Depending on the results intravenous therapy may be commenced. Correction of the blood may relieve asphyxia and prevent acidosis (page 455).

Prevention of Dehydration

The feeble premature baby will not take in adequate fluids and care must be taken to meet this need either by the intravenous or oral route. The skin should be observed for dryness and elasticity and the fontanelle for any sign of depression.

Maintenance of Body Temperature

The baby is often inactive, and may have very little subcutaneous fat. Moreover the nerve centre controlling the body temperature is underdeveloped. These factors make the baby's temperature unstable, so that he tends to take on the temperature of his surroundings. It is important, therefore, to take as much care to see that the baby does not become overheated as to see that he is kept warm.

To preserve heat, the baby should be handled as little as possible at birth and subsequently. He need not wear any clothing, but may lie on a napkin. The rectal temperature is recorded 2- to 4-hourly and may at first be subnormal, 33° to 34°C. After a week or more it rises to 36° or 37°C, and, once this temperature is maintained, the child may be taken out of the incubator and nursed in a cot. The cot and room temperature can be reduced as the baby progresses. Bathing is introduced only when the baby weighs 2 kg, and then very gradually; until then the face and buttocks are washed with plain water, when necessary. Room temperature should be between 21° and 24°C and the humidity maintained at 65 per cent—measured with a hygrometer.

Feeding the Premature Baby

It has been recognized that the premature baby requires longer to recover from the effects of birth than a mature baby. Nevertheless, he should not be left for long without food. The digestive capacity of the premature baby is not fully developed and the child must be given small frequent feeds preferably of breast milk. Food must be introduced very carefully, and the more premature a baby, the greater the skill and discrimination required in its feeding. His progress is gauged by his weight, by the character and number of stools, and by reactions to feeding technique, whether cyanosis occurs or whether he seems to tire when sucking.

Technique of feeding. Bottle feeding is the method of choice if the baby is vigorous. If this is not possible a straight catheter size 4 E.G./10 F.G. moistened with water may be introduced into the stomach through the nose or mouth. Paediatricians may vary as to whether the tube is passed at each feed or left in position for long periods. The non-irritant property of polythene has facilitated leaving tubes of all kinds in position for much longer. The pupil midwife should always be supervised by an experienced midwife when passing an intragastric tube until she has mastered the technique. Although the tube is easier to pass than on an adult the dangers are greater. If a tube is left in position the baby should be under constant observation as the close proximity of the oesophagus and trachea makes it very easy for fluid to spill over into the lungs and cause pneumonia if the tube moves out of position. Similarly, if a feed has been commenced with a bottle it should never be finished by tube in case the baby vomits and inhales as the tube is introduced. When a tube has just been passed, or at the commencement of a feed when it is in position a few millilitres of sterile water should be introduced before the milk feed, if the tube is misplaced water is less irritant than milk. A saline funnel can be used as the reservoir or the barrel of a large syringe. The feed must be allowed to enter the stomach by gravity, and the piston of the syringe should never be used.

Fig. 171. Belcroy feeder.

A Belcroy feeder may be used if the baby does suck but tires easily. The larger end is the teat and the smaller one a bulb which is squeezed as the baby sucks, this ensures a larger mouthful with the minimum of effort. This again requires skilled handling otherwise milk can be squirted down the trachea.

Dietary requirements. The baby born at term requires 110 calories/kg body weight in 24 hours. The premature baby, who has to catch up on growth as well as maintain progress may require 130 to 200 calories/kg according to size. This raises a problem as many babies cannot manage the volume of fluid this entails. Extra protein such as Casilan may be added to increase the calories.

The fluid requirement must be met and this should be 200 ml/kg/day by about the tenth day. Finally, the balance of ingredients must be considered, expressed breast milk either from the mother or a milk

bank, is the food of choice. If the mother can maintain her milk supply, the baby will be able when he is strong enough, to be put to the breast. If breast milk is not available then dried or evaporated cow's milk may be substituted.

Régime of Feeding

If respiration is satisfactory, about 4 hours after birth the baby is offered 5 to 10 ml of water or ½-strength breast milk. Feeds are given 2- or 3-hourly according to weight. If the baby is feeding satisfactorily the amount is increased daily, and by the second to third day full strength milk is given.

As a rough guide:

Babies up to 2000 g	12 feeds, 2-hourly
2000 to 2250 g	8 feeds, 3-hourly
2250 to 2500 g	7 feeds, 3-hourly
2500 to 3000 g	6 feeds, 3-hourly
3000 g or more	5 feeds, 4-hourly.

Progress is assessed by weight, and the baby must be weighed regularly, this need not be daily with a very small baby. The stools indicate the baby's capability for dealing with its food. After a feed the baby should be observed very carefully, apnoeic attacks and death may occur through vomiting and inhalation of vomit. To help prevent this the head may be raised by inclining the incubator tray after a feed.

Supplements to the diet. Vitamins are started as early as the baby's condition will allow. There is a need for vitamin D to protect against rickets. Vitamins A and D, in whatever form they can be tolerated by the baby, and vitamin C should be given. It is often recommended that vitamin B in some form should be added. For small babies, a vitamin concentrate, such as Abidec, is satisfactory and may be started when the weight reaches about 2000 g. Iron is poorly tolerated and not normally given until the baby is several weeks old. It is given in the form of iron and ammonium citrate mixture, starting with very small doses and increasing the amount and strength as the baby becomes used to it.

Prevention of Infection

In a special care unit all personnel entering must wear a gown and mask and wash their hands carefully before and after handling each

baby. Anyone with the slightest infection (a cold or boil) must be excluded. In purpose built units there may be mechanical ventilation, with built-in bacterial filters and a positive pressure air lock so that contaminated air is not sucked into the nursery, rather, nursery air is pushed out into the corridor. The incubators themselves serve to isolate the baby and these are disinfected between occupants. Wherever possible disposable items such as paper towels, napkins, gastro-intestinal tubes and other utensils are used. Thermometers, cord powder, cream for the buttocks should be for individual use, and either be sterilized when the baby leaves or thrown away where applicable. The slightest sign of pyrexia, slowness to feed or deterioration in colour should be regarded as a serious sign, investigated and treated without delay. The margin between life and death in a premature baby is very narrow and one cannot afford to delay.

As the baby grows he will be removed from the incubator to a cot in a slightly cooler nursery. Here the mother will be taught how to bath and care for him, and breast feeding may be commenced if her lactation is satisfactory. If the mother had been discharged home in the meantime, she may be readmitted to a mother and baby unit for this purpose. Premature babies are usually discharged when they weigh 2500 g, providing their condition is satisfactory.

COMPLICATIONS

Various complications are more likely to occur in the premature baby than in the mature infant, and these are all related to the immaturity of the various systems, or of the nerve centres controlling them, in proportion to the period of gestation.

Asphyxia and Apnoeic Attacks

Asphyxia at birth is a common complication of prematurity and the initial establishment of respiration may be difficult (page 452). Many premature babies however, develop difficulties of respiration and die within a few hours or days of birth. In the very premature, 24 to 26 weeks gestation, this may be due to the fact the lungs have not developed sufficiently to support life. In the more mature it may be due to damage of the respiratory centre at birth, or following long periods of apnoea and oxygen lack, to atelectasis when the alveoli have failed to expand, or having done so have collapsed and air cannot enter due perhaps to inhalation of vomit or feeds. Finally, it may be due to the respiratory distress syndrome (see page 456).

Haemorrhage

Intracranial haemorrhage is common even after what has seemed an easy delivery. Its occurrence is facilitated by intra-uterine hypoxia, and by the poor skull ossification and fragile blood vessels. Premature babies are specially liable to haemorrhage into one of the lateral ventricles of the brain (intraventricular haemorrhage), which may well be fatal. If the baby survives he is cared for like any baby suffering from intracranial damage—quiet, as little disturbance as possible, feeding given with as little effort as possible to the baby and possibly some form of sedative.

Haemorrhagic disease. The premature baby is liable to develop haemorrhagic disease. Bleeding may occur into the bowel, producing melaena, or from the vagina or umbilicus. It appears 2 to 4 days after birth and is due to a deficiency of prothrombin, which is essential for blood clotting. Vitamin K is required for the production of prothrombin by the liver. This vitamin is formed in the intestine but not until a few days after birth. In the meantime vitamin K_1 must be given. Some authorities recommend that vitamin K_1 in the form of phytomenadione (Konakion) 0·5 mg should be given at birth, prophylactically, to all premature babies. Others prefer to give it, with a blood transfusion, if necessary, if haemorrhagic disease occurs.

Infection

Infection occurring in a premature baby is very serious, for resistance is lower than in the baby born at term. There is a greater risk of bronchopneumonia because the lungs may not expand fully for some time, and then may become infected by inhaled food. Infection of the eyes, particularly with the *Staphylococcus pyogenes*, is liable to occur. Thrush may occur, and may extend beyond the mouth, making the baby take feeds very reluctantly, and it is thought that it may cause sore buttocks. If gastroenteritis should occur, it is a very serious condition. The treatment, as in every other complication, will be ordered by the doctor: extra fluids, antibiotic drugs, and the regulation of feeds; all feeding and treatment must be given with as little disturbance as possible.

Dehydration

This is more likely to occur than in the mature baby, as the premature baby requires more fluid, but has not much capacity and often has not the ability to take his full quota. This may be one of the

indications for giving one or two tube feeds during the day, for it is often found that a premature baby sucking from a bottle may become too tired to finish his feed completely. If the need for fluids is urgent, as in infection, a saline infusion may be given through a scalp vein.

Jaundice

'Physiological' jaundice may be more marked and may take longer to disappear. The immature liver of the premature child fails to excrete the bile pigment resulting from the breakdown of red blood cells. The baby then becomes jaundiced, lethargic and reluctant to feed. The serum bilirubin is estimated, since in deep jaundice conjugation may not be taking place and the rising unconjugated bilirubin may lead to kernicterus (page 484). This, as in blood incompatibility, can be avoided by exchange transfusion.

Anaemia

Anaemia is common in the premature baby. The shorter intra-uterine period prevented the accumulation of an iron store. The immature gastro-intestinal system does not easily digest iron supplements. The rapid rate of growth and increase in circulation is too fast for the bone marrow to manufacture the necessary cells. He may need a blood transfusion, though he may on the other hand make good progress in spite of a low level of haemoglobin. Very small premature babies do not tolerate iron readily.

Congenital Malformations

Congenital defects are commoner in low birth weight than in mature babies. This is partly because malformed babies tend to be small for the period of gestation and partly because they are often born prematurely.

Blindness

Some years ago it was noted that there was a high incidence of blindness in premature babies weighing under 1500 g. The cause was *retrolental fibroplasia*, a condition in which an opacity forms behind the lens in the vitreous body. The condition begins in the retina and later fibrous tissue forms in the vitreous body behind the lens. Hence the name. It has been shown that high oxygen concentrations can cause this disease, and it is possible to prevent the development of

retrolental fibroplasia by not giving small babies oxygen unless they need it, and never giving a concentration of more than 30 per cent, if the baby is pink.

Rickets

The premature baby is particularly liable to develop rickets and it is for this reason that vitamin D is given from about 2 weeks after birth and continued for 2 years.

Dysmaturity

The dysmature baby or one suffering from the retarded fetal growth syndrome is a baby whose weight is less than one would expect for the period of gestation. One-third of all babies of low birth weight fall into this category, the majority are born after the thirty-seventh week.

Causes of Dysmaturity

The growing fetus is entirely dependent upon its placenta for nutrition, elimination and respiratory exchange, any dysfunction of the placenta will cause retarded fetal growth and so a dysmature baby.

Placental dysfunction is usually associated with conditions such as pre-eclampsia, essential hypertension and chronic nephritis. In all these conditions spasm of the spiral arterioles reduces the intervillous blood flow and so reduces the exchange across the placental barrier. Other conditions associated with placental dysfunction are severe cardiac disease, severe anaemia and prolonged pregnancy (for diagnosis of placental dysfunction see page 225).

Appearance

The dysmature baby tends to be long and scraggy. The head is in proportion with the body, but there is a lack of subcutaneous fat. His skin texture and colour is normal. The baby looks anxious and tends to suck its fist as though it were ravenously hungry. His weight is not in proportion with his length.

Management

The dysmature baby in most cases has systems mature enough to support him. He has been deprived of food in utero and in most cases will thrive well after birth.

Depending on his size he may be placed in a special care unit for initial observation, but once feeding is satisfactorily instituted he can be transferred to an ordinary nursery. The baby is able to digest normally so he can be breast fed or artificially fed in the usual way. A régime of 3-hourly feeds throughout the 24 hours is likely at the beginning and he may well take larger feeds than his weight suggests. Consequently his weight gain is very fast.

The problem arises when the baby is not only dysmature but also premature and this is a not uncommon complication. For this reason the dysmature baby is often cared for in the same way as a premature baby until his weight has increased.

Further Reading

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Crosse, Mary (1966). *The Premature Baby,* 6th edn. London: Churchill.

41. HYPOXIA (ASPHYXIA) IN THE NEWBORN

The satisfactory transition from fetal life to that of the newborn infant, is the greatest hazard the baby has to overcome. It necessitates a very rapid change from the warmth and shelter of the uterus, to the cold uncertain world outside. Survival depends on the baby's ability to make this transition.

Physiological Changes

In utero the fetus relies on the placenta to carry out its respiratory, nutritional and excretory functions. It has no need of lungs, little need for liver function and is mostly concerned with pumping blood to the placenta so that the necessary exchange can take place.

The fetal circulation has been adapted for this purpose. It differs from the adult circulation in that blood is oxygenated in the placenta and not in the lungs. This is a less efficient method and therefore requires several modifications:

Larger and more numerous red cells (6 to 7 million/mm^3).
A higher haemoglobin content (20·7 g/100 ml) to pick up the maximum amount of oxygen.
A modified form of haemoglobin (HbF) which is active in the slightly more acid blood.

Certain additional structures:

Ductus arteriosus.
Ductus venosus.
Foramen ovale.
Two hypogastric arteries.

Circulation before Birth

Oxygen diffuses from the maternal blood into the choriodecidual space and so to the placental villi, the vessels of which unite to form

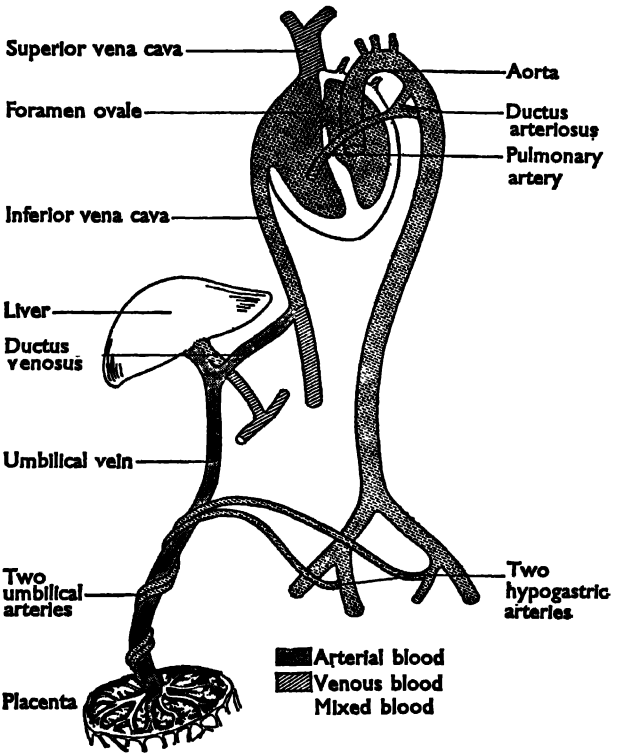


Fig. 172. Fetal circulation.

the umbilical vein. The umbilical vein travels in the cord to the fetus. After passing through the abdominal wall it divides into two branches. One branch joins the portal vein in the liver and so carries nourishment and oxygen directly to the fetal liver. The blood in the liver is collected by the hepatic vein and enters the inferior vena cava. The second branch, the main vessel known as the ductus venosus, passes directly to join the inferior vena cava. The oxygenated blood now mixes with a small amount of deoxygenated blood coming up from the lower trunk and legs but this does not seriously affect the oxygen content of the blood brought by the ductus venosus. The blood now enters the right atrium and is deflected through the foramen ovale to the left atrium. After passing from the left atrium through the mitral valve into the left ventricle, the blood leaves the

heart via the aorta. The coronary vessels supplying the heart and the branches to the head—which means the brain and vital centres—and to the upper limbs are given off at this point. Blood from the head and neck, running through the superior vena cava into the right atrium is directed across the flow coming from the inferior vena cava through the tricuspid valve to enter the right ventricle which it leaves by the pulmonary artery. The lungs are inactive so the majority of blood by-passes the lungs through a large vessel the ductus arteriosus which connects the pulmonary artery to the aorta at a point below which branches are given off to the head and arms.

The descending aorta supplies the organs of the abdomen and lower limbs. The two internal iliac arteries, right and left, give off two branches, the hypogastric arteries, which enter the cord at the umbilicus, becoming the two umbilical arteries, and carry the deoxygenated blood back to the placenta.

The fetal blood circulates very rapidly and therefore oxygen is being constantly renewed.

Circulation after Birth

Physiological changes after birth are brought about by inspiration and severing of the cord.

The severing of the cord stops the blood flow in the umbilical vessels, the hypogastric arteries and the ductus venosus. The large volume of blood returning to the fetus ceases and this reduces the venous pressure in the inferior vena cava and right atrium. Simultaneously the stretching of the lung substance on inspiration and with it the blood capillaries, sucks blood from the right ventricle into the pulmonary circulation, further reducing right sided pressure. The pulmonary veins are now returning blood to the left atrium and the pressure on the left side rises and eventually exceeds the pressure on the right side with the consequent closure of the flap-like foram n ovale. The blood from the right ventricle finds it easier to pass to the lungs and tends to rush past the ductus arteriosus. As the pulmonary arterial pressure falls the systemic arterial pressure rises slightly, consequently the flow through the ductus arteriosus is reversed and now becomes left to right. The ductus contracts over the next few hours and flow gradually ceases, later the structure becomes a small ligament. On rare occasions the vessel fails to occlude producing a patent ductus arteriosus, which because of reverse flow from aorta to pulmonary artery causes pulmonary congestion. The ductus venosus and hypogastric arteries eventually become ligaments. The terminal capillaries are not well formed in the new born and the extremities tend to appear blue.

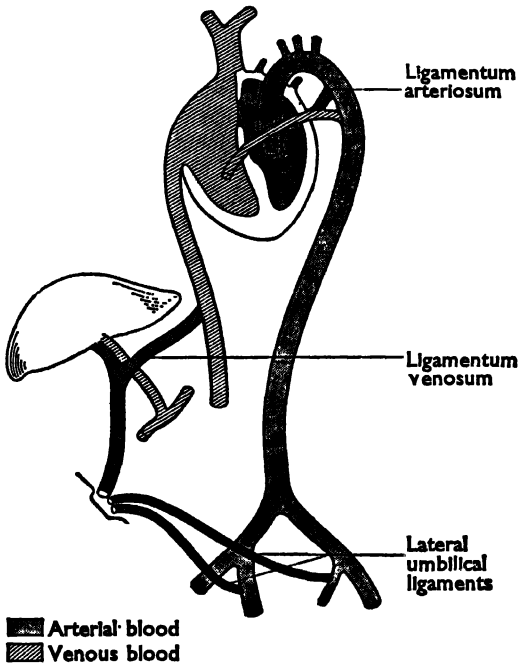


Fig. 173. Circulation after birth.

The Lungs in Utero

The lungs begin as epithelial tubes surrounded by mesoderm, which develop into primitive alveoli. By 24 to 26 weeks the capillary network is developing and the lung is capable of some gaseous exchange but may not be adequate to support life.

A little before this about the twentieth to twenty-sixth weeks a lipoprotein called surfactant is produced. This reduces surface tension where gas meets tissue and facilitates lung expansion.

Establishing Respiration

As the fetal chest passes through the vagina it is squeezed and this probably forces liquor from the alveoli into the upper respiratory

tract where it is aspirated by the midwife. Peripheral stimulation from handling, the cool air of the delivery room and the mucous catheter on the naso-pharynx bombard the higher centres. During the latter part of labour the fetus is hypoxic and when the placenta separates with the birth of the fetal head the oxygen content of the blood begins to decrease whilst the carbon dioxide tension rises. This causes chemoreceptors in the carotid arteries to set up a powerful reflex stimulus in the respiratory centre. The inspiratory centre is excited and this causes the baby to inspire, the lungs fill with air and intra thoracic pressure alters. The presence of surfactant aids the distension of the air sacs and the uptake of oxygen.

Hypoxia then is the main stimulant to inspiration, but in a minority of babies the degree of hypoxia is so great that it depresses rather than stimulates the respiratory centre and asphyxia occurs.

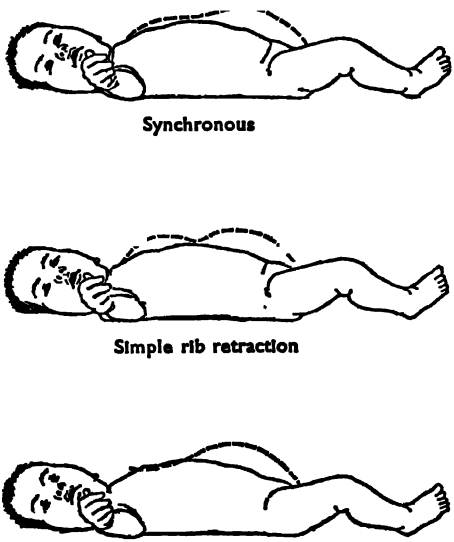


Fig. 174. Types of respiration seen in the newborn.

In order to maintain effective oxygenation there are four essentials:

1. The air passages must be clear of mucus.
2. Adequate respiratory exchange must take place in the alveoli. The alveoli must be properly expanded, and there must be no barrier between the air and the epithelium.

3. Circulation must be adequate to transport oxygen to the vital centres.
4. The respiratory centre must be active and not depressed by drugs.

The preparation of the delivery room and the care given during labour are all directed to this end.

Prevention of Hypoxia at Birth

When the fetal head emerges from the birth canal the nose and naso-pharynx are cleared of mucus. The baby is laid down with the head lower than the body and the neck extended to allow secretion to drain out. The majority of babies cry within 60 seconds of birth and need nothing further. The remainder need further investigation and treatment.

Apgar Score

Virginia Apgar described a simple way of recording the babies condition 1 minute after birth by observing the heart rate, respiratory effort, muscle tone, reflex irritability and colour and giving a score to this.

Sign	0	1	2
Heart rate	Absent	Slow (below 100)	Fast (above 100)
Respiratory effort	Absent	Slow Irregular	Good Crying
Muscle tone	Limp	Some flexion of extremities	Active
Reflex irritability (stimulation of foot or oropharynx)	No response	Grimace	Cry, cough
Colour	Blue Pale	Body pink Extremities blue	Completely pink

The first two, heart rate and respiratory effort are the most important.

A score of 7 to 10 indicates no depression.
4 to 6 indicates mild to moderate depression.
3 or less indicates severe depression.

Causes of Continuing Hypoxia

The trachea and bronchi may be obstructed by mucus, meconium, blood or liquor. This is likely to be most marked when fetal hypoxia has occurred. The shortage of oxygen and the rise of carbon dioxide will stimulate the respiratory centre and respiratory movements will be anticipated in the uterus, thus liquor, meconium, mucus and blood can be drawn down into the trachea and bronchi.

Some of the drugs given to relieve pain in labour may depress the respiratory centre in the baby, pethidine especially if given in large doses, morphine and papaveretum. General anaesthetics given for a forcep delivery or Caesarean section may do the same.

Intercranial haemorrhage resulting from a tentorial tear may cause pressure on the cerebellum and medulla and so may reduce or even prevent medullary activity. As the respiratory centre lies in the floor of the fourth ventricle within the medulla, respiration is affected.

The brain cells are particularly sensitive to oxygen lack. If deprived of oxygen these cells die, although the margin is fortunately greater than the 3 to 4 minutes in the adult. Destruction of the brain cells may result in cerebral palsy or mental subnormality in babies who have prolonged hypoxia at birth. In the premature baby the respiratory centre is immature and the respiratory muscles weak, both factors predispose to hypoxia.

Recognition of Hypoxia

In the past hypoxia has been classified according to the colour of the baby (blue or white) a better and more meaningful classification is mild or severe.

Mild Hypoxia

Colour	Deeply cyanotic.
Respiratory effort	Tries to breathe, cries vigorously.
Muscle tone	Good, pupils contracted.
Reflex irritability	Good.
Heart rate	Strong, rather slow.
Apgar score	4 to 6.

Severe Hypoxia

Colour	Greyish white, lips and gums blue.
Respiratory effort	Absent—no attempt to breathe.
Muscle tone	Limp, pupils dilated.
Reflex irritability	None.
Heart rate	Slow becoming weaker—absent.
Apgar score	0 to 3.

These two states are merely differing degrees of the same condition. As mild hypoxia becomes more marked, the circulating oxygen is being used up and there is no replenishment, the medulla is affected by oxygen lack, the circulation fails and death occurs.

If this sequence of events occurs before the baby is born, it would be clinically recognizable as fetal distress and the baby would be born with severe asphyxia.

Treatment

The initial treatment is the same whatever the degree of hypoxia.

Clear the air passage.

Lower and extend the head to ensure a patent airway.

Give oxygen, this is gently directed around the baby's nose and mouth from a funnel or face mask. Oxygen does not stimulate respiration, but if the baby does gasp he derives greater benefit than from breathing air. In the majority of cases the baby begins to breathe and the cyanosis disappears.

Severe Cases

If the baby does not respond in one minute the midwife should send for a doctor. Meanwhile, place the baby on a resuscitation table lying flat with the head slightly lowered and extended.

The heart rate should be continuously monitored by a second person.

A small laryngoscope should be passed over the tongue to the posterior pharynx.

When the larynx and vocal cords come into view a fine endotracheal tube can be introduced between the vocal cords into the trachea. Further aspiration of mucus can be made before attaching the catheter to the oxygen supply. This is connected to a water manometer; from which can be seen the pressure of the oxygen.

Intermittent positive pressure insufflation is commenced at a pressure of 20 cm of water (cm H_2O). This directs oxygen into the baby's lungs and as it closely resembles ordinary respiration can be a life

saving measure. Insufflation should continue until spontaneous respiration is established and the heart rate exceeds 100 beats/minute.

If the heart rate does not increase, gentle regular external cardiac massage may be required. Using the first and second fingers, the middle third of the sternum is depressed about 1 cm (five compressions followed by two ventilations) until the heart rate increases.

Throughout these procedures the baby should be handled gently and kept as warm as possible. Once the condition improves the baby may be transferred to the special care nursery where he can be observed carefully for the next 24 hours.

In domiciliary practice, only simple equipment is available, and medical aid is not immediately at hand. Fortunately severe hypoxia is not common in home confinements, and for most purposes the sparklet resuscitator or the Samson Blease neonatal inflating-bag is adequate.

Mouth to mouth breathing may be effective, and if better facilities are not available, should be attempted.

The object is to direct air from the attendant's mouth into the baby's air passages, and is thus a very much cruder variant of endotracheal insufflation. A tube or small airway is placed in the baby's mouth, the midwife fills her cheeks with air and then blows it gently into the baby's mouth. The baby's nostrils may be pinched and a hand placed over his stomach to prevent air escaping through the nose or filling up the stomach.

Respiratory stimulants have little effect, sometimes Ethamivan 0·5 ml (5 to 10 drops) may be dropped into the baby's mouth.

If the respiratory depression is known to be the result of drugs such as morphine or pethidine, levallorphan (Lorfan) 0·25 mg or nalorphine (Lethidrone) 0·25 to 1 mg may be given into the umbilical vein or intramuscularly.

Summary. Most babies with mild asphyxia recover rapidly, normal respiration being quickly established. In some, the first breaths are feeble and infrequent and breathing improves more gradually. A severely asphyxiated baby may make only occasional gasps for 20 or 30 minutes, and it can be several hours before regular breathing is established. Or the gasps may become less and less frequent and ultimately cease; or the baby may appear to have established breathing but die suddenly with an apnoeic attack 24 to 48 hours later. Finally, in the most severe cases the baby never breathes and the heart beats become more and more feeble and then cease altogether. A large proportion of these fatal cases are found either to have an intracranial haemorrhage or are premature or both.

Acidosis

The normal blood pH in the adult is 7·35 to 7·45, and in the fetus 7·30 to 7·35, showing blood is a slightly alkaline fluid. Minute alterations of pH are associated with serious disorders of metabolism. When the pH falls the blood is more acid and a state of 'acidosis' exists.

It has been shown that such acidosis in the fetus usually results from hypoxia, this may cause intra-uterine death, or the baby may be born in a hypoxic state and be extremely difficult to resuscitate.

Respiratory Acidosis

This is the result of acute hypoxia, there is certain interference with the exchange of oxygen and carbon dioxide due for example to cord compression or separation of the placenta. Carbon dioxide rises and is retained in the blood as carbonic acid (often called the respiratory acid) with the result that the pH falls. This type of acidosis may be reversed if there is adequate oxygenation, if not it becomes chronic and leads to a metabolic acidosis.

Metabolic Acidosis

This is due to a chronic state of hypoxia. Oxygen deprivation may have been present for some weeks where there has been long standing placental insufficiency, or it may follow acute respiratory acidosis if that is not corrected. The tissue oxygen reserves are exhausted and carbohydrate can no longer be broken down to carbon dioxide and water to be eliminated in the normal way. Anaerobic metabolism takes place with an incomplete breakdown leaving an accumulation of metabolic acids, such as lactic acid. Either of these conditions occurring in labour are difficult to treat but once the baby is born active steps can be taken. Analysis of the blood with the Astrup apparatus indicates the type and severity of the acidosis.

In respiratory acidosis the pH is low, pressure of carbon dioxide (P_{CO_2}) is raised and the standard bicarbonate and base deficit are little changed. This means the situation can be corrected by reducing the carbon dioxide. Clearing of the air passages and adequate ventilation will soon correct the levels.

Metabolic acidosis is more difficult to correct, the pH is low the P_{CO_2} may or may not be raised, but the standard bicarbonate will be low and the base deficit high. This means that the buffers of the blood, which neutralize acid particles have all been used up and the condition can only be treated by a very delicate balancing of sodium

bicarbonate given as an intravenous infusion and the acid particles in the blood. Constant Astrup readings are required and adjustments made as necessary. Glucose is usually given with the bicarbonate to prevent hypoglycaemia.

	Normal range	Respiratory acidosis	Metabolic acidosis
pH	7·30 to 7·35	Falls	Falls
P_{CO_2} (mmHg)	35 to 45	Raised over 45	Little changed
Standard bicarbonate (mEq/litre)	21 to 25	Little change	Low 18
Base deficit (mEq/litre)	5 to 6	Unchanged	Raised 15

Respiratory Distress Syndrome

This condition is responsible for many neonatal deaths and the cause is unknown. The onset occurs in the first few hours of life. The incidence is highest in the premature baby, where there has been pre-eclampsia or antepartum haemorrhage in pregnancy, where delivery has been by Caesarean section or where the mother is a diabetic. In some cases there has been hypoxia at birth but in many breathing was established quickly.

Signs of Onset

The baby tends to lie limply with the legs flexed and abducted. He looks pale and worried often with moisture on the forehead and the eyes open, there is very little spontaneous movement. The respiratory rate is raised to 60 to 100/minute, accompanied by paradoxical breathing, the abdomen rises while the chest sinks. There is marked intercostal and sternal recession and a noisy expiratory grunt. This may continue for 24 to 48 hours during which time the condition gradually deteriorates, pallor increases, the circulation fails and death occurs. At post mortem the lungs appear collapsed and congested and the alveoli are lined with a hyaline material.

Treatment

Careful observation of all babies following severe asphyxia, especially those with a predisposition to the condition.

Adequate oxygenation when dyspnoea is present.

Nursing in an incubator, which gives easy access and better facilities for continuous observation.

Clear records of the type and rate of the respiration, the pulse rate and colour.

Minimal handling.

Correction of the acid–base balance to prevent acidosis, this means frequent observation of blood samples for acidity, bicarbonate content and gas tension and the correction with intravenous glucose and bicarbonate.

Feeding as soon as possible usually by naso-oesophageal tube as the baby is using up his energy store very rapidly, and losing fluid as water vapour from the lungs.

Mild and moderate cases usually recover and the prognosis is good. But many still die despite the most up to date treatment.

Further Reading

Sahling, E. (1966). *Foetal and Neonatal Hypoxia* (translated by F. E. Loeffler). London: Edward Arnold.

42. CONGENITAL ABNORMALITIES

Malformations

Although heredity plays a part in the incidence of some abnormalities, such as webbed fingers and extra fingers and toes, for many congenital malformations no cause has yet been discovered. Some malformations are associated with hydramnios in the mother, the relationship of which to the development of the fetus is not yet fully known. It is now well recognized that an attack of rubella in early pregnancy may disturb the baby's normal development. It is possible that other virus diseases may have similar effects. Irradiation with X-rays during the first three months of pregnancy may harm the fetus. Drugs, too, administered to the mother in the early weeks of pregnancy can affect the baby's development. The most notorious example is of course thalidomide, but even some tranquillizers and hormone preparations may not be entirely free from risk.

Many malformations are due to lack of union in the mid-line of the body. If one examines the child from the tip of the coccyx and up the spine, then looks at the head, the face, and down the front of the body, the various points where malformations are possible may be noticed. Other malformations occur away from the mid-line, usually on the limbs.

Abnormalities of the Central Nervous System

Spina bifida, anencephaly and hydrocephalus are the common abnormalities of the central nervous system and form a large percentage of all abnormalities. Hydramnios has often been present in the mother before the birth of infants with these abnormalities.

Spina Bifida

This is a congenital defect of the posterior laminae and spinous processes of one or more vertebrae. It may be a simple bony defect

giving rise to no symptoms, and occasionally only found accidentally in later life when that part of the spine has been X-rayed for some reason. It may involve a protrusion of the meninges—a meningocele, or the protrusion of the cord—a meningomyelocele. The latter is the most serious as often areas of spinal cord are found in isolated patches of the protruding meninges and restoration to normal function is unlikely. The condition usually affects the lumbosacral region of the spine. Commonly the skin is stretched or completely absent over the bulging meninges. Cerebrospinal fluid may leak from the swelling. Talipes is often present and sometimes complete paralysis of the lower limbs, and hydrocephalus also occurs often. These grossly abnormal children, if they survive, may be greatly helped by modern surgical treatment. If a meningocele is present, it should be covered by a sterile dressing, and a doctor should be informed of the condition.

Cerebral Meningocele

A meningocele may also occur in the skull. The meninges bulge through a defect in the skull bones, usually in the region of the posterior fontanelle.

Anencephaly

In this condition the vault of the skull is absent and there is almost no development of the brain, which is exposed and appears as a dark red mass of tissue. Spina bifida often accompanies anencephaly. The fetus has large protruding eyes and wide shoulders; the face presents during labour. It is associated with hydramnios, and the fetus, usually a female, does not survive.

Hydrocephalus

The head is unduly large as the result of an increase in the amount of cerebrospinal fluid, which distends the brain. The cranial bones are soft, the fontanelles are large, and the sutures are wide. This condition may cause obstructed labour unless diagnosed early. On abdominal palpation the head feels large, and is above the brim or the breech may present. X-rays and vaginal examination will confirm the diagnosis. In a severe case the head must be perforated and the cerebrospinal fluid drained off before delivery can be effected. In milder cases the child is alive and the condition may be successfully treated surgically.

Microcephaly

A very small vault to the skull. There are two types, one in which the brain has failed to grow, and the other in which the sutures have ossified prematurely and constricted the growth of the brain. This latter type could be treated by dividing the sutures, but diagnosis is difficult and therefore treatment not instituted quickly enough. If the child survives it is mentally deficient.

Abnormalities of the Alimentary System

Hare-Lip and Cleft Palate

The deformity may be either complete or partial. The soft palate only may not be affected, and this may not be noticed for some days if the deformity is slight. Usually, however, the cleft involves the upper jaw and lip. The sucking powers vary according to the degree of the cleft. Special teats may be obtained for applying to a nipple shield for breast feeding or to the bottle if the child is artificially fed. The surgeon usually decides to operate when the child is in good condition, feeding well and gaining weight.

Congenital Hypertrophic Pyloric Stenosis

During the second or third week of life a child suffering from this condition will begin to vomit. It is often a first-born male child. Vomiting is projectile in character, and on examination of the child's abdomen the doctor may feel a tumour, which is the thickened pyloric sphincter. Some babies are treated medically, feeds being preceded by drugs such as atropine methonitrate (Eumydrin) to relax the sphincter; but it is more usual for the treatment to be surgical, that is Rammstedt's operation, in which the sphincter but not the mucous lining is divided.

Duodenal Atresia

In this condition part of the duodenum is closed and projectile vomiting will occur as soon as the child begins to be fed. Characteristically, the vomitus contains bile. If the condition is recognized quickly and, in this, the midwife may be instrumental, a surgeon may perform a gastrojejunostomy to bypass the obstruction.

Oesophageal Atresia

In this malformation the upper end of the oesophagus ends blindly

in a pouch and the lower end is usually connected with the trachea. The condition should be suspected if the child dribbles mucus from the mouth. If this happens it is important not to give a feed; the doctor should be notified. A polythene tube will be passed over the baby's tongue into the oesophagus and down towards the stomach. The tube should not be too soft or it may curl up at the back of the

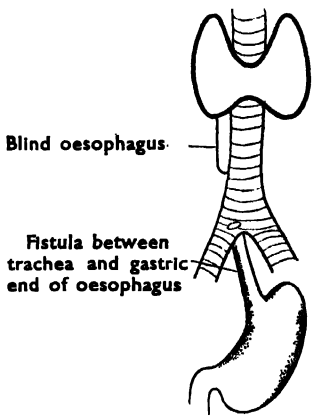


Fig. 175. Oesophageal atresia.

throat or in the blind pouch and give the appearance of having satisfactorily reached the stomach. If in doubt, and particularly if there has been a history of hydramnios, a radio-opaque X-ray should be taken. If a feed is given it will regurgitate from the closed oesophagus into the trachea and the child will become cyanosed. Early operation may be life-saving; thus it is important to recognize the abnormality early.

Imperforate Anus

If meconium is not passed during the first few hours, the nurse should insert a soft catheter into the rectum. If any resistance is felt, or meconium is not passed, a doctor must be summoned. The condition will cause intestinal obstruction, from which the child will die unless an operation is performed.

Meconium Ileus

In this condition, which results from fibrocystic disease of the

pancreas, obstruction occurs because the bowel is blocked with thick, dense (inspissated) meconium.

Hirschsprung's Disease

The colon is grossly distended because it lacks some of the nerve supply which controls peristalsis. Again, evidence of obstruction may soon be apparent.

Congenital Umbilical Hernia (Exomphalos)

Exomphalos is a protrusion of the abdominal organs, chiefly intestine, through an opening in the abdominal wall at the umbilicus. It is present at birth and an operation to repair the hernia should be performed as soon as possible.

Acquired Umbilical Hernia

Following the separation of the cord a small protrusion may be seen at the umbilicus. This is due to a temporary weakness of the abdominal wall and no treatment is required.

The hernia gradually disappears as the child grows older.

Abnormalities of the Genito-Urinary System

Imperforate Urethra

In rare cases the urethra, which leads from the bladder, is closed and retention of urine arises as a consequence. The bladder may become distended, but this condition must not be waited for. A doctor should be asked to examine the child if it does not pass urine a few hours after birth.

Phimosis

This is a constriction of the prepuce, but it is very rare for the prepuce to be so tight that urinary retention occurs.

Hypospadias

A malformation in which the urethra opens on the under-surface of the penis.

Epispadias

The urethra lies open anteriorly along the shaft of the penis.

Renal Agenesis

That is absence of the kidneys, this is a rare and fatal condition. The baby fails to pass urine and if on examination has low set ears and furrows under the eyes renal agenesis should be suspected. It is commonly associated with only two vessels in the umbilical cord.

Problems of Sex Determination

True hermaphroditism, in which both male and female genital organs are present, is very rare. In *pseudo-hermaphrodites* a small penis can be confused with a large clitoris, while a bifid scrotum may resemble the labia majora. A doctor must be consulted. He will verify the sex. if necessary by a chromosome examination.

Abnormalities of the Heart and Blood Vessels

These include patency of the ductus arteriosus or foramen ovale and faulty development of the great vessels, the aorta arising from the right ventricle. In *coarctation* the aorta is markedly constricted.

Depending on the severity of the abnormality the child is either intermittently or constantly cyanosed and needs oxygen. Later, surgical treatment may be decided upon.

Abnormalities of the Limbs

Talipes or Club Foot

This deformity is due to the contraction of certain muscles or

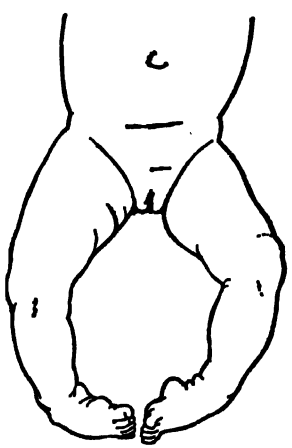


Fig. 176. Talipes equino-varus.

tendons, In some cases, especially the milder ones, it is positional, related to the child's position in the uterus, with restriction of movement. With early treatment by the physiotherapist, these minor deformities are quickly cured. Exercises, massage and splinting, begun early and continued for several months or even years, will correct even the severe abnormalities.

Syndactyly (Webbed Fingers and Toes)

In this condition the fingers or toes are held together by folds of skin, or in serious cases there may be bony fusion.

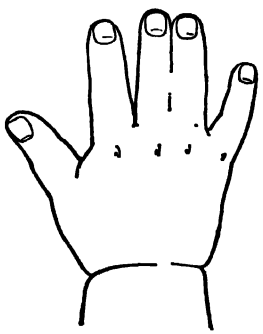


Fig. 177. Syndactyly.

Supernumary Digits (Polydactyly—Extra Fingers and Toes)

There is a tendency for these abnormalities to be hereditary.

Missing or Deformed Fingers, Toes or Limbs

In the minor degrees the deformity is confined to one or more fingers or toes, but in severe degrees the whole limb may be small or deformed. The most severe and tragic cases of limb deformity occurred in the babies of mothers who had been given the drug Thalidomide in early pregnancy. Other drugs, including tranquillizers and steroids, have been suspected of causing abnormal limb development. Many obstetricians prefer their patients not to take drugs in early pregnancy while many patients aware of the risk firmly refuse to take drugs.

Amelia	Absence of one or more limbs.
Ectromelia	The absence of part of a limb.

Phocomelia Absence of the long bones of a limb—there may be a rudimentary or well developed hand or foot springing from the shoulder or hip respectively.

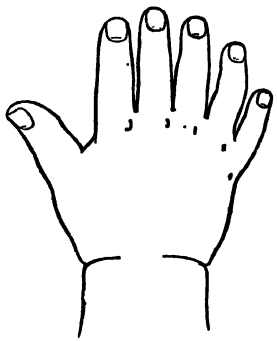


Fig. 178. Polydactyly (extra digits).

Congenital Dislocation of the Hip

In this condition one or both hips are abnormally developed. It is more common in girls and should be suspected when flexion and abduction of the hip to 90° is not possible. If treatment is started early the results are good. Routine examination at birth commonly includes the flexing and abducting of the thighs whereby this malformation can be diagnosed. Early treatment can thus be planned.

Abnormalities of the Skin

Naevus or Birth Mark

This is a congenital blemish of the skin due either to dilatation of small blood vessels in the skin or to a pigmented area of the skin. 'Strawberry' naevi are small red, raised and clearly outlined. They usually appear after birth and often grow larger, though they finally disappear spontaneously. The anxious mother should be reassured on the point. The doctor will probably advise her against having any treatment.

'Port wine stains' are flat purplish areas, often extensive and, if on the face, disfiguring. They do not disappear, but special make-up foundations make them less obvious.

'Mongolian Blue Spot'

These are slate-blue patches usually found over the sacral area,

although they may be found elsewhere. They occur in children of Asian parents and sometimes those of Mediterranean stock. No treatment is required.

Abnormalities with Generalized Effects

Down's Syndrome

Down's syndrome (mongolism) is due to the presence of an extra chromosome. Mongol children are always mentally deficient, and although they are backward in all respects they have likeable and pleasant dispositions. The condition is recognized usually by the eyes which are slanting with prominent epicanthic folds. The head is small and the occipital region flattened. The mouth is small, the gum margins thick and the tongue tends to protrude. The nose is broad and flat. The hands are short, particularly the terminal phalanx of the little finger, and there is a deep crease across the palm. The feet are also broad and short, with wide deviation of the great toe and a plantar crease between the first and second toes. The skin tends to be dry and the muscles hypotonic. There is no treatment that will cure this condition, and such children will need care and attention all their lives. Congenital heart defects are common in mongol babies, who may then survive only a few weeks or months.

This defect is more common in older women when the incidence can be as high as 1 in 50. There are two forms of Down's syndrome which can be distinguished after studies of the chromosomes. In the common one, 21-trisomy, when forty-seven chromosomes are present, the mother has no greater risk than any other mother of having a subsequent child affected. In the rarer form the extra 21-chromosome joins with the head of chromosome 15 giving forty-six chromosomes—the normal number, but with one abnormal chromosome. This variety though rare, has about a 30 per cent chance of recurrence in a future pregnancy.

Further Reading

Ellis, R. W. B. & Mitchell, R. G. (1968). *Disease in Infancy and Childhood.* Edinburgh: Livingstone.

43. BIRTH INJURIES

While it is possible for the child to sustain injury during normal labour, such injury is far more likely to occur in a labour complicated by some mechanical difficulty. Birth injuries range from small bruises and abrasions to tentorial tears causing intracranial haemorrhage. By good antenatal care and skilful labour management many birth injuries may be avoided.

Head injuries are the most common. They include:

Intracranial injury, i.e. tentorial tears causing intracranial haemorrhage.

Cephalhaematoma.

Nerve injury, causing facial paralysis.

Fracture of the skull, either a linear or a depressed fracture.

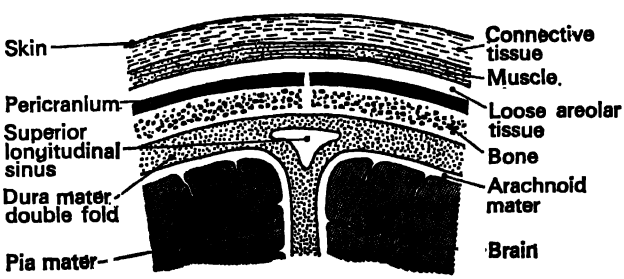


Fig. 179. Cross-section through the skull.

Other injuries include:

Injury to brachial nerve roots, causing paralysis of the arm (Erb's palsy).

Sternomastoid haematoma.

Dislocation of joints.

Fractured limbs and ribs.

Injury to internal organs (occasionally the liver or kidneys, through faulty handling in a breech delivery).

Tentorial Tears

As the fetal head passes along the birth canal it is moulded by contact with the pelvis and the resistance of the pelvic floor, there being a certain amount of cranial stress during the process. The effect is to reduce some diameters and to elongate others. Normally the fetal skull can stand this moulding without any damage to the cranium, brain, or supporting membranes, as during normal birth the compressing forces act gradually. If, however, the head is extended or is larger in diameter than normal, or if the child is premature so that the bones are soft, or if the forces act suddenly (as in a precipate labour or particularly in a breech presentation), then cranial injuries are more likely to occur. A limit of pressure is reached, so that further

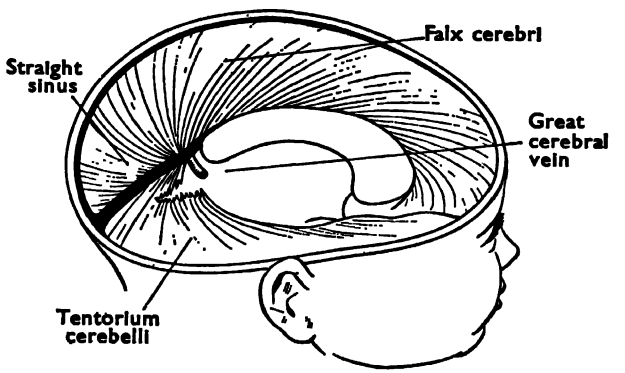


Fig. 180. Diagrammatic section through the skull with right side of brain removed.

stress on the cranium results in something giving way, the most likely structure being the dura matter. The tentorium cerebelli lies at the back of the skull near the occipital region at right angles to the falx cerebri. The falx cerebri occupies a vertical and longitudinal position and divides the two hemispheres of the brain. The pressure on the front and back of the skull forces the bones of the cranium upwards, drawing the falx cerebri with them; this in turn pulls on the tentorium cerebelli, which tears. This tear is not usually the source of the bleeding; it is the tearing of a large vein, the great cerebral vein (the vein of Galen) which opens into the commencement of the straight sinus which lies at the junction of the falx cerebri and the tentorium cerebelli.

Intracranial Injury

When injury is slight, and is not accompanied by haemorrhage, the symptoms are probably due to oedema of the brain. If carefully nursed, the baby will usually survive if no other complications arise.

Signs of intracranial injury. The baby may be asphyxiated at birth, and recovers only slowly from the effects of birth. At first he may be limp and lack tone but later he may be hypertonic and irritable. He does not suck well, sometimes vomits and may have apnoeic attacks. He is often unusually wakeful, though quiet, lying for long periods with eyes open and wrinkled brow. Even when asleep he may twitch and move restlessly; he may have a shrill cry, and may hold his hands clenched, with the thumbs held inside the fist. The fontanelle may be tense.

Care of a baby suffering from cerebral injury. At birth, as always, the baby should be handled gently, and a clear airway should be ensured by using a mucus extractor. The baby is nursed in an incubator, the head slightly raised, and kept absolutely quiet. The doctor may order phytomenadione (Konakion) 1 mg which is given intramuscularly to make the blood clot more readily and thus possibly to stop the haemorrhage. After about 12 hours, tube-feeding may be started, with small feeds of breast milk. Oxygen is given if cyanosis occurs. The doctor may order 30 mg chloral hydrate, 8-hourly, or phenobarbitone, 8-hourly. When the baby's condition has improved, as shown by colour, movements, and general behaviour, he may be transferred to a cot and, later, go to the ward with his mother.

Cephalhaematoma

A swelling will be seen on the head, owing to the escape of blood between the skull and the pericranium from the rupture of small blood vessels during labour. This may occur during an apparently normal labour. It is usually situated over a parietal bone, but can never cross a suture because the pericranium under which the blood collects envelops each bone separately. Occasionally two swellings may be seen separated by the sagittal suture. The swelling does not as a rule appear until a few hours after birth, and it may increase in size during the next day or so. No local treatment is required, and aspiration is contra-indicated, lest it should introduce infection. The swelling takes several weeks to disappear, and because of this the mother may need reassurance.

Fig. 181. Double cephalhaematoma.

It is important not to confuse cephalhaematoma with caput succedaneum.
The following comparison may be helpful:

Cephalhaematoma	**Caput succedaneum**
Haematoma	Oedema
Caused by trauma	Caused by pressure
Appears after birth	Present at birth
Tends to increase in size	Tends to reduce in size
Does not pit on pressure	Pits on pressure
Cannot cross a suture	May cross a suture
Persists for 6 to 8 weeks	Disappears in 24 hours

The midwife's duty in these cases is to reassure her patient by explaining that the condition is only a temporary one, that it does

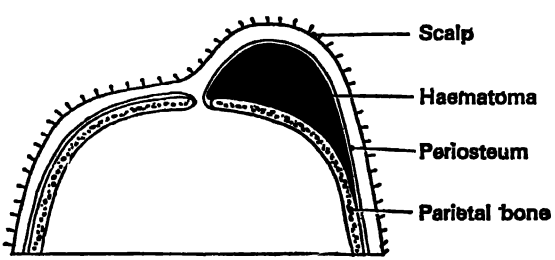


Fig. 182. Cephalhaematoma.

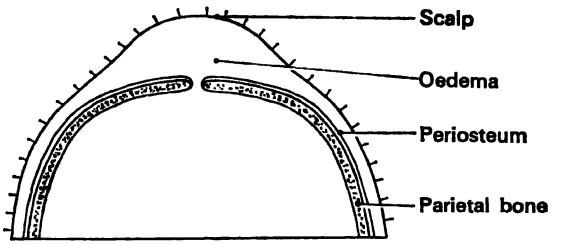


Fig. 183. Caput succedaneum.

not affect the child's brain and is in fact outside its skull, and that it will eventually disappear.

Facial Paralysis

This is a form of paralysis which arises owing to an injury to a branch of the seventh cranial nerve. It is caused by the application of forceps which may press on the facial nerve as it emerges from the skull near the angle of the jaw. The affected side is not the one which is drawn up, but the opposite one, which shows no movement when the child cries; the eye remains open, and the corner of the mouth droops. The baby may feed badly if the paralysis is extensive. Full movement of the face often returns within ½ hour. Sometimes it takes several hours, or even days. Almost always the baby recovers completely.

Fig. 184. Left-sided facial palsy. The right side is active when the baby cries, but the left side is relaxed.

Fractured Skull

This is uncommon. Occasionally the mother has an ankylosed sacro-coccygeal joint and the immobile coccyx so compresses the head during delivery that when the head emerges a small depressed fracture is seen, usually of one frontal bone. The bone recovers its contour spontaneously.

Sometimes a head undergoes unusual moulding, is X-rayed and a small linear fracture of a cranial bone is seen.

In neither case are symptoms likely to be present, and these fractures need no treatment.

Erb's Palsy

This is caused by injury to the brachial plexus. The nerves derived from the brachial plexus control the arm and some of the neck and chest muscles. Dragging on the neck in cephalic or breech presentations may result in injury to the nerves, in which case the arm hangs loosely with the palm turned backwards. The doctor, who should be consulted without delay, may have the child's arm loosely fastened

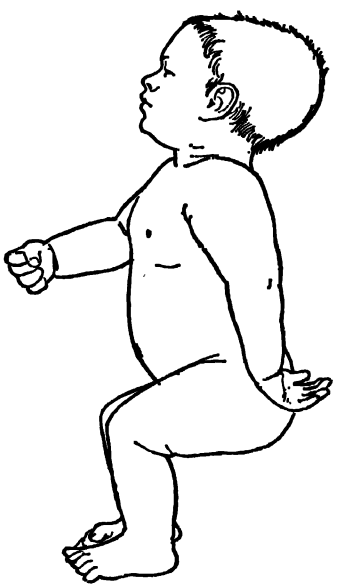


Fig. 185. Erb's palsy.

to the cot in an over-corrected position. Physiotherapy is of great value. Recovery is sometimes slow but usually complete.

Dislocations and Fractures

The femur, humerus or clavicle may be fractured in a labour in which intra-uterine manipulations have been necessary. In a mismanaged breech delivery the child's hip may be traumatically dislocated.

Sternomastoid Haematoma

A swelling may occur in the sternomastoid muscle after traction has been used to deliver the head or shoulders. It may occur in a breech or cephalic delivery. A blood vessel is torn, very slow oozing of blood occurs and it may be a week before the mother notices the swelling. It takes several weeks to subside, but it is very rarely that the child is left with permanent shortening of the muscle. Such shortening twists the head to one side causing torticollis (wry-neck).

44. INFECTIONS OF THE NEWBORN

Ophthalmia Neonatorum

By this is meant a discharge from the eyes of an infant within 21 days of birth.

It became notifiable in England and Wales in 1914. The severe forms are preventable. It was the cause of 50 per cent of blindness in children but, since notification and routine treatment of the eyes of the newly born were instituted, the incidence of severe ophthalmia greatly diminished.

Nowadays, mild ophthalmia is common, but severe ophthalmia is fortunately, rare. In many instances no bacteria are found. This is probably because they are small in number or have disappeared. The most common organism found is the staphylococcus, but the streptococcus, *Escherichia coli*, viruses and occasionally the gonococcus may be responsible.

Causes. Predisposing causes are prematurity or weakness lowering the baby's resistance to infection, and the fact that in the first few weeks of life the baby secretes no tears, so that dust and bacteria do not get washed away.

Infection before birth. This is very rare but can occur where the membranes have ruptured early and, through lack of adequate precautions pathogenic bacteria have entered the birth canal.

Infection during and after birth. This is more common. It may arise from trauma during a face presentation or forceps delivery, which cause bruising or abrasion through which micro-organisms could enter. If the mother had a vaginal discharge infective material in the birth canal may collect around the eyelids and lashes, and when the baby opens his eyes the bacteria gain entry. This is especially dangerous in gonorrhoea. Handling of the baby by an attendant with a

cold or septic focus may infect the baby. Dust in the atmosphere containing bacteria, contaminated toilet requisites and towels may also infect the baby.

Preventive treatment. In 1881 the obstetrician, Credé, recommended the instillation of silver nitrate eye drops for the newborn child to prevent gonococcal ophthalmia. This was most successful, and the treatment continued until 1942, but is not now necessary. Treatment is firstly preventive by the medical treatment of the mother during pregnancy in all cases of vaginal discharge. No one with a cold or with any other infective condition should be allowed in contact with the baby.

Some authorities recommend that when the baby's head is born, the eyelids should be quickly and very gently swabbed with sterile dry wool swabs. Others prefer to omit this procedure, and not to touch the child's eyes.

Slight discharge from one eye may occur at any time during the first 10 days of life commonly about the third or fourth day. The conjunctiva may be slightly inflamed. Rarely there is profuse discharge, the conjunctiva and eyelids being grossly inflamed and oedematous.

Management. The midwife must report immediately any discharge from or inflammation of the eyes, however slight. This includes that commonest of all neonatal infections, the so-called 'sticky eye'.

A conjunctival swab is sent to the laboratory to ascertain the infecting organism and the antibiotics to which it is sensitive. Meanwhile the eye is bathed with sterile half-strength saline. Many authorities recommend the immediate use of aureomycin ointment since it is effective against most conjunctival infections. Others prefer to await the laboratory's report before prescribing treatment. Often the culture is sterile and the child's eye is clear within 48 hours. In more severe cases the appropriate antibiotic is used. (For gonococcal ophthalmia see page 221.)

Infection of the Umbilical Cord

Cord sepsis is uncommon, since the antiseptics with which the cord is swabbed or sprayed are most effective in preventing infection with the staphylococcus, the organism most commonly responsible. Occasionally slight inflammation of the base of the cord is noted. This clears quickly if the cord is swabbed three or four times daily with the antiseptic generally used. Exceptionally, a case of severe cord infection occurs. The baby becomes extremely ill with jaundice,

vomiting, diarrhoea and rapid dehydration. Here antibiotics and intravenous fluid must be given immediately or the baby will die.

Infection of the Alimentary Tract

Thrush

Thrush is diagnosed by the presence of white spots on the tongue and inside the cheek and the roof of the mouth. If these spots disappear leaving a clean surface, they are only milk curds. True thrush spots are the result of the growth of a fungus, *Candida albicans*, (*Monilia albicans*) and if the infection is severe they may even bleed. The fungus tends to spread to the stomach and intestine and causes loose and offensive stools, giving rise to sore buttocks. There may be difficulty at feeding times, because the baby's mouth is sore. Treatment with nystatin mixture or nystatin in honey 1000000 units (in 1 ml) four times a day for 4 to 7 days is effective. Swabbing the mouth with 1 per cent aqueous solution of gentian violet is also good but does tend to stain clothing and bed linen. The mother must be warned as the violet colour stains the baby's lips and tongue.

Thrush occurs fairly commonly in newborn infants; as often in those breast fed as in artificially fed babies. It has been noted in the babies of mothers who have or have had monilial infections and for this reason special attention should be paid to hand washing and the technique of feeding.

Gastroenteritis

This is uncommon but extremely dangerous. It is highly infectious, and for this reason an outbreak in a nursery in which several babies are nursed is a catastrophe

The causative organism may be one of the *Salmonella* group, especially if there is also an outbreak of diarrhoea and vomiting in adults. Certain strains of the *Escherichia coli* have been shown to cause gastroenteritis which spreads from one baby to another very rapidly and may have a high mortality. Severe infections by staphylococci are sometimes noted. Diarrhoea may arise in babies receiving antibiotic therapy for another infection. Often no pathogenic organism is discovered when the stools passed by the baby are examined in the laboratory. It is thought that a virus infection is responsible in these cases.

Signs and symptoms. The baby's appetite is poor, he loses weight and he looks pallid or greyish in colour. Soon his stools become frequent

and watery, yellow or green. His temperature may be raised or normal. He may vomit and he rapidly becomes dehydrated and extremely ill.

Prevention. It is obvious that preventive measures are of the utmost importance in lowering the number of deaths due to this infection. Breast feeding should be encouraged, and where this has to be abandoned, clean methods of preparing and giving food should be taught.

Treatment. A baby in hospital must (with his mother) be strictly isolated. It cannot be emphasized too strongly that each affected baby, and everything used in its care, must be segregated from other babies and from equipment used for other babies. If more than one baby is affected the closing of the department is essential. No newly born babies must be admitted until all the mothers and babies have been discharged and the department has been disinfected.

Specific treatment is ordered by the doctor. Dehydration occurs rapidly and it may be necessary to begin treatment with intravenous glucose saline. It is customary for a biochemist to examine the child's blood and to recommend how the correct balance of blood electrolytes should be restored, while antibiotics are needed to combat the infection. When the child's condition improves, feeds of glucose, breast milk, or Nestle's milk 1:12 may be started. The baby may then make a gradual return to normal feeds.

Syphilis

See page 219

Infection of the Respiratory Tract

The newborn child has little resistance to infection—even to organisms which have little serious effect on the adult. A 'cold' of no significance to an adult may lead to a fatal pneumonia in a newborn baby. Organisms which do not usually cause pneumonia such as *Escherichia coli*, *Staphylococcus pyogenes* and *Streptococcus viridans* can become the responsible organism in the newborn. A virus may occasionally be responsible. The resistance of the lungs to infection may be lowered if meconium or vernix have been inhaled during birth. The inhalation of regurgitated milk has the same effect. The premature baby has little resistance to infection, and the cough reflex which helps to clear the air passages and to keep the lungs expanded, is deficient.

When infection of the respiratory tract has occurred the baby

develops rapid respirations and cyanotic attacks may occur. The temperature is not always raised. The diagnosis may be confused by the occurrence of diarrhoea and vomiting, which may also cause further deterioration in the baby's condition. In severe cases, rapid deterioration and death occur.

Prevention of infection is of the first importance. Anyone with a cold or sore throat should be excluded from the department.

If a baby should become infected, he should be isolated from other babies. Preferably, he should be nursed in an incubator. The doctor will probably order a broad spectrum antibiotic such as chlortetracycline (Terramycin) or ampicillin and cloxacillin (Ampiclox). The baby should be handled as little as possible. Breast feeding should be continued if possible, although it may be necessary for the milk to be expressed and for the feeds to be given by bottle. If this exhausts the baby, tube feeds of expressed breast milk may be given. Careful observation of the respiratory pattern and presence or absence of cyanosis is important. Slight elevation of the head and shoulders may help breathing.

Urinary Tract Infection

Pyelonephritis can occur in the newborn baby. The infecting organism is usually *Escherichia coli.* The signs are somewhat indefinite, but the child is clearly not well, refuses feeds and looks pallid or greyish in colour.

Vomiting with frequent loose stools may occur. The temperature may be raised, but is often normal.

The diagnosis can be made only by the collection and examination of a specimen of urine. This is obtained in a special plastic bag fastened inside the child's napkin. Pus cells and bacteria will be found in the urine if urinary tract infection is present.

The nursing is of great importance. The baby must be given sufficient fluid to overcome the dehydration. Sulphonamides may be used to overcome the infection or an antibiotic to which the organism is sensitive. Recovery from the infection is usually rapid but sometimes the infection recurs and the possibility that there is a congenital abnormality of the urinary tract must then be considered.

Follow up of some kind by the family doctor or hospital should be instituted until they are satisfied the infection is not likely to recur.

Infection and Abnormalities of the Skin

A rash is abnormal and should be regarded as potentially serious. A possible source of infection is a septic focus (ear, mouth, nose,

skin) of the mother or the person in attendance. A septic finger can be responsible. Infection may spread from another baby already affected, and, occasionally, in domiciliary work, impetigo may spread from older children.

Pyodermia

Small spots or pustules appear on the skin, as a result, almost always, of staphylococcal infection. They must not be disregarded, as they may spread rapidly, especially in a premature or weakly baby. The baby should be isolated, and a doctor notified.

Miliaria or Sweat Rash

This is due to obstruction of the sweat glands and is thus not really an infection. It is seen in babies who become overheated. Fewer cot blankets, less clothing and more fresh air may help. The skin may be dabbed with calamine lotion or sprinkled lightly with a sterile dusting powder.

Paronychia

This is a staphylococcal infection of the nail bed. Often the child has sucked his fingers and the skin is damaged, giving the bacteria a portal of entry. The baby should be prevented from sucking his fingers, and should wear loose linen mittens, which are changed frequently. These mittens should be carefully made so that there are no loose cottons inside as these can wind around the fingers and cut off the blood supply. The doctor should be informed. Occasionally antibiotic drugs will be required to control the infection.

Chafing or Intertrigo

This is caused by friction between two skin surfaces and is usually seen in the groin or axilla and in the folds of the neck. It indicates that the child's skin has not been adequately dried after being washed or bathed. The energetic removal of vernix caseosa may also very well be the cause. After a bath, the folds in the skin should be dried by a dabbing movement with a soft towel. Where chafing has occurred, drying and a very light dusting with an antiseptic powder will heal the lesion.

Napkin Rash

This is usually confined to the area covered by the napkin, but the

heels, legs and the back may also be affected. The skin may be reddened or become wrinkled and shiny. In more severe cases vesicles or pustules may form or the skin may become raw and moist. The skin is affected over the convexities, the flexures usually escaping. The condition is produced by prolonged contact with the skin of napkins soaked in urine and faeces. The urea in urine is rapidly converted to ammonia by bacteria present in the faeces. The ammonia is an irritant to the skin. A napkin rash is therefore usually an ammoniacal dermatitis. The development of a napkin rash should be prevented by frequent changing of napkins. The buttocks should be cleansed before applying a clean napkin washed and boiled to remove ammonia and destroy bacteria. A zinc and castor oil cream may be applied to protect the skin. If a napkin rash has occurred it may be cured by using these preventive measures but the rash may heal more quickly if the buttocks are not covered by the napkin but left completely exposed to the air. The child lies on his side on the napkin, the trunk and legs adequately covered, in a warm room or in the open air if the weather is fine.

Sore Buttocks

Redness and excoriation may be produced around the anus and buttocks by frequent loose stools. This is more likely to occur in babies artificially fed than in those breast fed. This condition is very painful and great care is needed in its treatment. The buttocks should be washed with swabs of absorbent wool and well dried with a gentle dabbing. If soap is used it must be pure and non-irritating.

Midwives vary in their treatment of sore buttocks, numerous remedies are available and each will have their own favourite.

After cleansing, the area can be covered with creams such as zinc and castor oil, or zinc and castor oil with compound tincture of benzoin, titanium dioxide paste (Siccolam), silicone cream or spray. Substances such as gentian violet, cod liver oil, compound tincture of benzoin or egg white may be painted on. An oxygen jet may be blown gently on to the area for 5 to 10 minutes a day, or the area left exposed with the baby lying prone.

An Anglepoise lamp may be used in conjunction with exposure of the area. The lamp should be arranged 33 cm away from the buttocks in such a position that if it is knocked or falls it avoids the baby. This method not only dries the area it provides warmth for the baby. The midwife should remember the buttocks are a large area and when they are exposed heat is lost and the baby's temperature may fall, to prevent this the cot should be placed somewhere warm, away from draughts. If sore buttocks last for more than a day or two,

medical advice as to the cause and treatment should be sought. Premature babies are very prone to sore buttocks. Feeding must be investigated, as the feed may not suit the baby. Thrush infection seems often to cause sore buttocks, and the mouth should therefore be examined carefully, especially if the buttocks remain persistently red.

Pemphigus Neonatorum

This is one of the most serious forms of infection in the newborn. Because of its seriousness and its highly contagious character, it is wise for the midwife to consider any skin lesion associated with the formation of a blister or pus as a possible case of pemphigus and to treat it accordingly. She is required by the Central Midwives Board rules to call in medical aid without delay if a watery blister, a pustule, or a rash appears on the body of a child.

The causative organism is a staphylococcus of a particular phage type, which probably comes from the skin of the attendant, but must gain entry through a broken skin surface.

Blisters, which soon become filled with pus and break, leaving a raw surface, appear on the head or trunk. The infection spreads in the superficial tissue, large areas soon become involved, and the blisters run into one another. The baby becomes very ill. Complete isolation of mother and baby is essential, and isolation techniques should be carried out conscientiously. In an epidemic it will be necessary to close down a maternity unit until no more cases are reported and the department has been thoroughly cleaned and disinfected.

Treatment. After the exudate from the blisters has been cultured, systemic treatment with antibiotics will be necessary, and efforts must be made to combat the dehydration which occurs. The child must be kept warm by light porous clothing, and his hands should be prevented from reaching to the blisters or his eyes.

Other Abnormalities

Haemorrhagic Disease of the Newborn

This is an uncommon condition in which the baby loses blood, usually from the alimentary tract, but sometimes from other sources, because his blood lacks sufficient prothrombin, a substance concerned in the clotting of blood.

The bleeding begins without apparent cause on the second, third

or fourth day after birth. The baby may vomit dark blood (haematemesis), he may pass altered blood in the stool (melaena), or sometimes he may bleed from the mouth or nose. Melaena is easily distinguished from meconium by putting the napkin in water. In melaena the water turns pink, while meconium causes a green stain. The bleeding may be slight, but occasionally it is severe, leaving the baby pale and weak.

It is treated by giving intramuscular injections of vitamin K_1 (Konakion), 2 mg daily for 4 days. Vitamin C may also be given. If the baby has had a serious haemorrhage, a blood transfusion will be necessary.

In these ways the blood prothrombin is raised to a normal level and the baby's condition improves. By the fourth day he will be making his own supplies of prothrombin, so the trouble will not recur.

Cold Syndrome

All babies may become chilled if not kept in a reasonably warm atmosphere. Hypothermia occurs when the temperature falls below 28°C and may have serious consequences. The baby tends to look red and rosy and unfortunately this is often mistaken for a sign of good health, the skin is cold to the touch and solid with oedema. The midwife is well advised to take the baby's temperature using a low reading thermometer whenever the skin feels cold. Prevention of the condition is important, in winter some form of heating is needed in the bedroom at night, and the mother should be warned of the danger before she leaves hospital. When the condition is present, the baby must be warmed gradually. If a diagnosis is made treatment is usually successful.

Engorged Breasts

In both sexes the breasts sometimes become swollen a few days after birth. In a baby girl there may also be vaginal bleeding. Both conditions are due to hormones acquired from the mother, and neither condition requires treatment.

Abnormal Stools

In the breast fed baby, the stools are soft, bright yellow, have an acid odour and are frequently passed. An occasional greenish stool in a thriving baby is common, and may be disregarded. The frequency diminishes as the baby grows older and sometimes infrequent,

otherwise normal stools are noted in quite young babies, when no anxiety need be felt.

The stools of the artificially fed baby are rather drier, harder and paler than those of the breast fed infant. Sometimes the stools are really dry and hard and this may be corrected by giving a little more sugar with the feeds. Frequent loose stools containing curds suggest that the child may be overfed, while loose frothy stools occur when there is too much sugar in the feed.

On the other hand, frequent watery stools, yellow or green, must raise the suspicion of gastroenteritis, and in this case it is wise to isolate the baby and his mother, until the cause of the diarrhoea has been diagnosed. It should be borne in mind that frequent loose stools and occasional vomiting occur in association with such conditions as otitis media and urinary tract infection.

The Cry of an Infant

Although a baby should cry lustily on occasions, the crying should not be prolonged. If this occurs the mother or midwife should investigate every likely cause. Feeding errors, a baby too hot or too cold, an ear with the free border turned under, a soiled napkin, thrush, a pin unfastened and noise or distraction around the cot or pram are some of the causes of crying. An ill baby cries weakly, grunts, or moans; colic will cause a baby to cry strongly with the legs drawn up, and a baby with intracranial injury may have a shrill piercing cry.

45. JAUNDICE AND RHESUS ISO-IMMUNIZATION

Jaundice

Jaundice is a symptom, not a disease and is often seen in the newborn. Jaundice is caused by deposits of bilirubin in the skin and becomes clinically apparent when the serum bilirubin rises above 5 mg per cent.

When red cells are broken down, bilirubin is released into the bloodstream in a fat soluble state sometimes called *indirect* or *unconjugated* bilirubin. It is transported to the liver where it is changed by glucuronic acid into water soluble *direct* or *conjugated* bilirubin. This change is brought about by an enzyme glucuronyl transferase:

$$\text{Bilirubin (fat soluble)} + \text{Glucuronic acid} \xrightarrow[\text{glucuronyl transferase}]{\text{In the presence of}} \text{Bilirubin glucuronide (water soluble)}$$

The conjugated bilirubin can now be excreted through the kidney and intestine and is eliminated.

Unconjugated bilirubin on the other hand, because it is fat soluble cannot be eliminated and if for any reason conjugation does not take place, then the bilirubin is deposited in fatty tissues. Nervous tissue contains a high proportion of fat, particularly areas of the brain known as the basal ganglia. If bilirubin is deposited there it gives rise to irreversible changes resulting in spasticity. This condition is known as kernicterus, a condition characterized by muscular twitchings, hypertonicity of limbs and neck retraction, and later some neuromuscular defect such as athetosis, or possible mental retardation. Kernicterus however, is preventable.

Most paediatricians are anxious if the serum bilirubin levels rise above 15 mg/100 ml, but it is the ratio of conjugated to unconjugated bilirubin that is of most significance.

Causes of Jaundice

'Physiological' Jaundice

In order to obtain sufficient oxygen from the placental circulation the fetus has a greater number of red cells than the adult, some 6 to 7 million instead of the 4 to 5 million of the adult. This large number of red cells is not required after birth and they are destroyed in the first few weeks of life. During the destruction of the red cells bilirubin is formed, conjugated by the liver and excreted. If the liver functions normally the child will not become jaundiced, but if the liver function is immature bilirubin will not be excreted quickly enough and jaundice will appear.

This type of jaundice commonly appears about the third day, is slight and fades by the seventh or eighth day. The child is a typical orange-pink or bronzed colour and clearly not anaemic. His general condition is good. If the jaundice conforms to this pattern, no anxiety need be felt. If, however, it arises earlier, becomes deep, or if the child's condition is adversely affected, a doctor must be consulted without delay.

Jaundice of Prematurity

This is an exaggeration of the condition described above. In premature babies it is not surprising that jaundice is deeper and more prolonged. Occasionally the serum bilirubin reaches a high level and an exchange transfusion is necessary (see below).

Obstructive Jaundice

This is a rare condition and is due to congenital obliteration of the bile ducts. It is eventually fatal.

Haemolytic Jaundice

Haemolysis of the red cells due to iso-immunization to the Rhesus factor or the ABO groups will result in jaundice, the former being the more common.

Rare Forms of Jaundice

Infective jaundice may result from umbilical cord sepsis or virus hepatitis. Galactosaemia and toxoplasmosis are other rare causes, and very infrequently a case of hereditary spherocytosis (acholuric jaundice) is seen in the neonatal period.

Rhesus Iso-Immunization

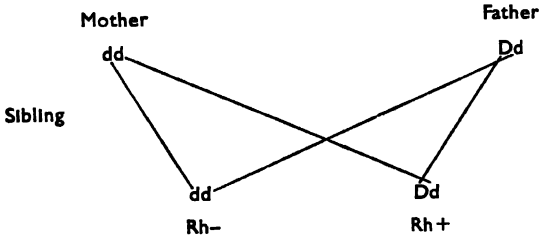
The population can be divided into two groups by determining whether the red cells contain a protein antigen known as the Rhesus factor. Of the European population approximately 85 per cent have this antigen and are Rhesus positive (Rh+) while 15 per cent are without the antigen and are Rhesus negative (Rh—). In the Asiatic races the incidence of Rhesus negativity is less.

The Rhesus factor is a complex antigen with three pairs of genes named cde/CDE. It is the pair named D which are likely to cause iso-immunization.

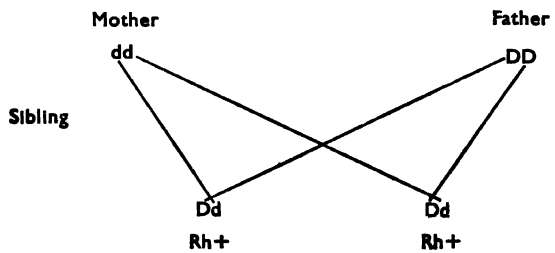
They may be shown:

Rhesus negative	dd	
Rhesus positive	Dd	Heterozygous
	DD	Homozygous

The Rhesus grouping is genetically determined, a heterozygous father having one positive and one negative gene may transmit either to his children, his children may be Rhesus positive or Rhesus negative.



The homozygous father having two positive genes will transmit only positive genes and all his children will be Rhesus positive and could be affected by haemolytic disease.



In 10 per cent of all pregnancies the woman is Rhesus negative, but a problem arises in only about 0·5 per cent of cases. This is accounted for first, by some husbands being Rhesus negative and some being Rhesus positive heterozygous. Secondly, antibodies are rarely produced in a first pregnancy and it is the second or subsequent child who is affected.

How Iso-Immunization Occurs

Very occasionally a Rhesus negative mother forms antibodies from a previous infection or transfusion of Rhesus positive blood. This is unlikely nowadays as the consequences of such an action is known. Nevertheless one must always enquire in the antenatal period if the woman has ever had a blood transfusion. More usually sensitization

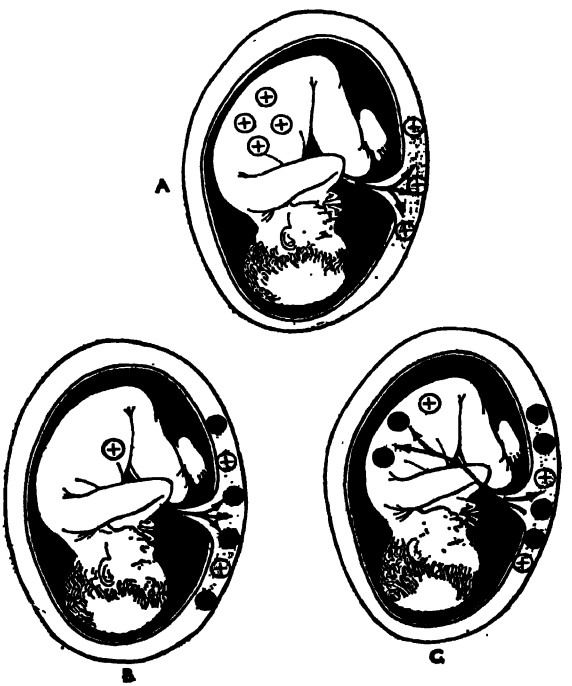


Fig. 186. Antibody formation. (A) transfer of Rh antigen (0) to maternal circulation. (B) Antibody formation (0) in Rh negative mother. (C) Transfer of Rh antibodies to the fetus.

occurs in some way from the Rhesus positive fetus. It is known that fetal red cells do enter the maternal circulation during pregnancy, but in such small amounts that they are destroyed before iso-immunization can occur. In labour, particularly when the placenta separates a much larger transfer may occur and this may provoke antibody production.

In a subsequent pregnancy antibodies circulating in the maternal bloodstream may pass through the placenta and destroy the fetal antigen, at the same time causing haemolysis of the fetal red cells (this will only occur if the fetus is Rhesus positive). This haemolysis leads to anaemia which may progress to a condition called hydrops fetalis where there is severe oedema, enlargement of the liver and spleen which eventually results in intra-uterine death. The placenta too, is grossly oedematous weighing about one-third of the weight of the fetus.

Jaundice at birth is rare, but may appear during the first few hours. This is because until this time the mother has been dealing with the excess bilirubin from the broken down red cells. The bilirubin now in the bloodstream is unconjugated and must now be dealt with by the baby. The quantities may be too great and the bilirubin rises to dangerous levels. There is a danger of kernicterus unless treatment is commenced.

Investigations. Certain routine investigations are made in the antenatal period. The maternal ABO and Rhesus groups are determined and if the blood is Rhesus negative further specimens are examined throughout pregnancy for the presence of antibodies. Arrangements are made to admit the patient to a hospital with day and night laboratory facilities, where an exchange blood transfusion can be given to the baby if required.

If no antibodies are detected there is nothing further to be done. If antibodies are present further investigation depends on whether or not they are increasing. Further investigations may include amniocentesis with a view to a possible intra-uterine transfusion.

Indications for amniocentesis are:

Previously severely affected baby or stillbirth.
High antibody titre.
Polyhydramnios.
Diminished fetal movements.

Amniocentesis may be carried out at any time after the twentieth week of pregnancy and may have to be repeated every 7 to 10 days until delivery (for procedure see page 227). If the findings are such that the fetus is at grave risk a decision has to be made as to whether

he is likely to survive if delivered. From the thirty-sixth week onwards this poses no problem, but earlier than this the baby may be too premature to survive. The alternative is intra-uterine transfusion.

Intra-Uterine Transfusion

The amount of blood given depends on the size of the fetus, this must be estimated as accurately as possible. Rhesus negative blood of the same group as the mother is given and the amount estimated at 60 to 70 ml/kg fetal weight. The donor blood is introduced into the fetal peritoneal cavity, where it is absorbed by the lymphatic system transferred to the thoracic duct and so into the subclavian vein. The blood is absorbed quickly and by the third day is in the fetal circulation. The mother generally notices the increased fetal activity once the blood has been absorbed.

Method. On the day previous a contrast medium such as urografin is introduced into the amniotic cavity. This will be swallowed by the fetus and become concentrated in the gut. The next day the patient is given a pre-medication such as pethidine and promethazine and taken to the X-ray department. After the skin has been prepared and anaesthetized, the skin is nicked and a Tuohy needle is inserted through the abdomen, uterine wall and into the amniotic cavity. The fetal gut can be seen on the television screen and the needle directed to the lower quadrant of the fetal abdomen. A fine nylon catheter is passed through the needle and when it is in place the needle is withdrawn. The blood is now given, taking about 30 minutes depending on the quantity. At the conclusion of the transfusion, the catheter is removed and the wound sealed with colloidon. Careful record of the fetal heart is kept throughout. The mother usually rests in bed for the next 24 hours. Transfusions may be repeated as necessary. Delivery will be induced at about 35 weeks in severely affected cases, and later where the fetal health is satisfactory.

After delivery. Cord blood is taken and examined immediately for:

Haemoglobin level.
ABO and Rhesus group.
Serum bilirubin level.
Coombs' test.

On the findings the future care is determined. The baby may be unaffected, but if it is careful observation will be required for the next few days. Most paediatricians agree that a serum bilirubin level

of 5 mg/100 ml or higher, or a haemoglobin level of 11·9 g/100 ml at birth warrants an immediate exchange transfusion. Similarly, a serum bilirubin level rising to 15 mg/100 ml should be treated. It must be pointed out that the faster the rise the more serious the condition.

Exchange Blood Transfusion

Packed cell Rhesus negative blood is given, 160 to 200 ml/kg body weight.

The basis of this treatment is to exchange some 80 per cent of the baby's blood for donor blood which will not be haemolysed by the maternal antibody. The method varies from unit to unit and may be a continuous infusion, or an intermittent exchange. Whatever the method the amount given is just a few millilitres more than the amount removed. However slowly and carefully the procedure is carried out the baby is subjected to great stress. The procedure takes about 2 hours and the heart rate should be monitored throughout. Oxygen must be available in case it is needed and the baby protected from heat loss.

Subsequent Care

The baby is kept in the special care unit until it is certain no further exchange transfusions are required. The mother should be brought to see him wherever possible and allowed to hold him if at all possible. Before discharge a small 'top-up' transfusion may be given to make sure he is not anaemic when discharged. Oral iron should be commenced at an early date.

Prognosis

Providing the bilirubin levels have not risen too high, the danger of kernicterus should have been avoided and the outlook is satisfactory.

Prevention of Rhesus Iso-Immunization

For many years research has been going on to find a method to prevent Rhesus iso-immunization. Workers in Liverpool have succeeded in separating anti-D immunoglobulin from the blood of women with Rhesus antibodies and this is used as the basis of immunization. Unfortunately, there is insufficient anti-D immunoglobulin available, and at the present time it can only be offered to mothers at most risk.

An injection of anti-D is given 36 to 60 hours after delivery. The immunization process is complete within 10 days.

Further Reading

Race, R. R. & Sanger, R. (1968). *Blood Groups in Man*, 5th edn. Oxford: Blackwell Scientific.

APPENDIX

46. A SHORT HISTORY OF MIDWIFERY

In English the word midwife means *With Woman.*
In French the midwife is called *Sage Femme* (meaning wise wom
In Latin the word *Cum-mater* is used for midwife.

The history of midwifery is a long and interesting one. Women of all ages and countries have done noble work as midwives. Socrates' mother was a midwife. Biblical references to midwives have always been to their honour. We read in Genesis and Exodus of a maternal death, of a case of obstructed labour, and of babies born before the arrival of the midwife. In Exodus i, 16–21, it is recorded that the King of Egypt called together the midwives. The name of one was Shiphrah, and the other Puah. The King said: 'When ye do the office of a midwife to the Hebrew women, and see them upon the stools, if it be a son, thou shalt kill him, but if it be a daughter, then shall she live.' The midwives feared God and were not willing to destroy the Hebrew women's sons, and so did not do as the King of Egypt commanded, but let the male children live. The King of Egypt called for the midwives and said to them: 'Why have ye done this thing, and have saved the men children alive?' The midwives said to Pharaoh: 'Because the Hebrew women are not as Egyptian women; they are lively and are delivered ere the midwives come unto them.' Therefore 'God dealt well with the midwives and gave them houses.'

In Genesis xxxviii, 27–29, we read that during a twin labour the child put out its hand (transverse lie with prolapsed arm), the midwife took the hand and bound upon it a scarlet thread. The child withdrew its hand and his brother was born first. Afterwards, the second child was born with the scarlet thread upon his hand.

The maternal death of Benjamin's mother is recorded in Genesis xxxv, 17–18. She was journeying to Bethlehem and she had a hard labour. The midwife said unto her: 'Fear not; thou shalt have this son also.' He was born alive, but Rachel, his mother, died.

In the second century Soranus of Ephesus wrote a book for midwives, and for fourteen centuries it was the only book to which they

could refer. Midwives handed down their knowledge from one generation to the next. The stool used for labour was also handed down. Until the end of the sixteenth century midwifery was practised entirely by women, and sometimes, for attendance on royal ladies, they received as much as £100. In the seventeenth century male midwives began to take up midwifery. It was during this period that obstetric forceps were introduced. The medical male midwives gradually gained ground, though there was great opposition and competition from the midwives and from some of the general public. By the middle of the eighteenth century the number of male midwives had increased in number, amongst them William Smellie. Smellie, a Lanark man, came to London and there, while attending, over several years, many hundreds of poor women, made detailed studies of normal labour. He gave practical and theoretical teaching to many doctors. He made models for his demonstrations, and was the first person to describe accurately the relation of the fetal head to the mother's pelvis and the mechanism of labour, and the numerous case histories he wrote are, even today, remarkably accurate.

The midwives, already resentful of the intrusion into their domain of the male midwives, were at first particularly opposed to Smellie, on account of his interest in normal cases.

Princess Charlotte, daughter of George IV died in childbirth, and her son was stillborn—this led later to Victoria ascending the throne of England, Queen Victoria is thought to have been the first Queen of England to be delivered by a medical man.

Before the time of Henry VIII the medical profession was controlled by the Church. Doctors were licensed by the Bishops as also were the apothecaries and the midwives. Later the medical faculty began to manage their own affairs, and gradually the midwives were excluded. Several efforts were made by eminent men to secure recognition and instruction for midwives. In 1616 Peter Chamberlen, one of a famous family of male midwives, proposed to James I that some order be laid down by the State for the instruction and civil government of midwives. A further attempt was made in the next generation by Dr Peter Chamberlen, his nephew, to secure recognition for midwives, but it was not successful. A similar proposal was also put forward unsuccessfully, in 1687, by Hugh, the son of Dr Peter Chamberlen, being opposed by the College of Physicians in London. Had these proposals been accepted the status of English midwives would have been established over 300 years ago, instead of its having to wait until 1902 when the first English Midwives Act was passed.

The inventor of obstetric forceps was probably Peter Chamberlen or his brother, also named Peter and the father of Dr Peter Chamber-

len, in the sixteenth century. The forceps were kept as a secret, which was passed down from father to son for 150 years, so that their use by other medical men was postponed for a long time. Eventually, however, in 1733, after the death of the last of the Chamberlens, a description of the forceps was published, and ultimately, in 1819, a number of forceps were discovered hidden beneath the floor-boards of an attic in a house that had been owned by Dr Peter Chamberlen and his descendants.

The practice of midwifery by male midwives was greatly frowned upon, and professional feeling expressed itself strongly. The Royal College of Physicians passed a bye-law prohibiting any person practising midwifery to its Fellowship. It was remarked during this period that midwifery was 'an act foreign to the habits of a gentleman.' Also that 'it is an imposture to pretend that a medical man is required at a labour.'

Dr Willughby records that in 1658 his daughter, who was a midwife, was anxious about a case in which the breech was presenting. At his daughter's request, unknown to the lady, he crept into the chamber on his hands and knees and examined the lady without attracting her notice. He advised his daughter to bring down a foot, which she did, but as she was aware of the possible complications, she asked her father to carry out the rest of the work.

Many medical men had from time to time pressed for the instruction and recognition of midwives. Dr Aveling in his book on English midwives gives the names and dates when these efforts were made:

Andrew Boorde	1547
Peter Chamberlen	1616
Peter Chamberlen	1633
Hugh Chamberlen	1687
Society of Apothecaries	1812
Ladies' Obstetrical College	1864
London Obstetrical Society	1871
General Medical Council	1872

In 1812 the Society of Apothecaries made an unsuccessful appeal to Parliament for the recognition of midwives and a petition was presented, but Parliament was so prejudiced against midwives that the committee of the House of Commons would not allow the name to be mentioned.

Charles Dickens laid much unpopularity upon midwives by the creation of Sairey Gamp and Betsey Prig in his novels. These types certainly existed, and Dickens depicted them with the best of intentions, for he hoped thereby to draw public attention to the type of

person sometimes entrusted with the care of the sick, having in view the need for better nursing. A fine description of a village midwife is given by Laurence Sterne in *Tristram Shandy*. In this story the midwife was a woman of fine character and capabilities. Though the good type of midwife at this period may not have carried out the management of labour and the nursing of her patient according to our present-day standards, she gave of her best ungrudgingly and for little pay and has left on record a fine example of service to others.

From time to time educated women, daughters of medical men and clergymen, entered the ranks of midwives and the Ladies' Obstetrical College was founded in London in 1864. Florence Nightingale was a pioneer in the efficient training of midwives. In 1862 she organized a small training school in connection with King's College Hospital. The wards were inconvenient and the scheme was not a success. Miss Nightingale speaks of the Female Medical Society of her time as follows: 'A society has already existed for years, the object of which, according to its programme, is to provide educated women with proper facilities for learning the theory and practice of midwifery, and the accessory branches of medical science.' She stated that these ladies were the best accoucheurs hitherto accessible to the British public.

The training consisted of:

1. Attendance at lectures during the winter sessions.
2. Attendance during the intervening summer upon a clinical practice at a lying-in hospital or maternity charity with personal attendance on twenty-five deliveries.

At the suggestion, first made in 1866, of Dr Farr, Superintendent of the Statistical Department in the Office of the Registrar General, the London Obstetrical Society, founded in 1858, undertook in 1869 to investigate and report on the causes of infant mortality. One recommendation of the report was that an Examining Board should be established, so that midwives might be tested and be granted a diploma. Failing action on the part of the Government, the Society thereupon decided, on the proposal of Dr J. A. Aveling, to issue a diploma to successful candidates after training and examination in midwifery. A Board for the examination of midwives was constituted, and the first examination was held in 1872, for which six candidates sat. This training and examination was voluntary, and though the diploma gave a mark of distinction, it was not recognized by the Government. These examinations were held by the London Obstetrical Society until 1905. The qualifications for the London Obstetrical Society examination were as follows:

A certificate of moral character.
Age not under 21 or over 30.
Proof of having attended no fewer than twenty-five cases under supervision satisfactory to the Board of Examiners.
Proof of having attended a course of approved lectures.
A written and an oral examination.

During the last 25 years of the nineteenth century several lying-in hospitals began to train midwives and to issue certificates. Reference to the examination papers set shows that some of them were not at all of a simple character. Some of the questions were similar to those set for the present-day midwifery pupil.

The General Medical Council from 1872 onwards made great efforts to secure State recognition of midwives. The Midwives Institute was set up in 1881 with the object of gaining for midwives some form of state recognition. The sum of £1000 was raised by the Institute as a guarantee fund, which provided for the expenses incurred in drawing up the various Bills. The Midwives Institute promoted and obtained the introduction of the first Bill to Parliament in 1890. The Bill reached its second reading but was blocked at its third reading. A further seven Bills were introduced, unsuccessfully, the last of these in 1900 by Mr Heywood Johnstone. He introduced it again in 1902 and, this time, it passed all stages and received the Royal assent on 31 July 1902.

The 1902 Midwives Act is entitled 'an Act to secure better training and supervision of Midwives.' By this Act the Central Midwives Board was set up. Its powers and duties were defined, it was authorized to frame rules regulating the training and practice of midwives, to conduct examinations, to issue certificates and to maintain a roll of certified midwives. Thus the title of midwife was, for the first time, protected. Three years' grace was given during which the London Obstetrical Society continued to examine midwives and issue them with certificates, and the Central Midwives Board held its first examination in June 1905. It is now the only examining body for midwives. When the Midwives Act came into force, 3 years' grace was given to enable those midwives holding the London Obstetrical Society or other certificates to register with the Central Midwives Board, and those midwives with good records, who had not sat for an examination, were enrolled on application and on payment of a small fee. This grade of midwife was usually called 'a bona-fide' midwife. After 1905 no midwife could legally practise as a midwife unless she had previously enrolled or passed the examination of the Central Midwives Board. There were, thus, at this time three grades of midwives:

1. Those possessing the London Obstetrical Society certificates or other certificate approved by the Board.
2. Bona-fide midwives.
3. Those who had passed the examination of the Central Midwives Board.

Amendments were made to the main Act of 1902 in 1918, 1926, 1927 and 1936. Midwives were permitted to add S.C.M. (State Certified Midwife) after their names in 1936. Since the passing of the Midwives Act, 1902, the period of training of midwives has been increased, and various additions to the rules have been made from time to time. After 1936 the period of training was further increased, a trained nurse being required to take a 12 months' course, and a nurse who was not on the general part of the State Register a 2-year course of training.

The 1936 Act required Local Authorities to provide a domiciliary midwifery service in their area, the object being to provide every expectant mother with the services of a qualified midwife in her own home.

The Local Authorities could either organize their own midwifery service or arrange with the Welfare Councils or voluntary organizations for the employment of midwives. It would then be illegal for any unqualified person to attend a woman in childbirth.

The status of the midwife was greatly enhanced by the new midwifery service. Provision was made for a definite and progressive salary, for equipment, uniform, off-duty time, holidays and pension.

The Act gave the Central Midwives Board power to provide for the training and for the examination of midwifery teachers.

By 1942 a shortage of midwives and nurses had become apparent, largely because, following the outbreak of war in 1939, there were many calls on the services of women, and the armed forces claimed a large number of nurses, some of whom had dual qualifications.

The government set up a committee under Lord Rushcliffe to inquire into the conditions, status, and salary of nurses and midwives. In 1943 the Rushcliffe report was published and the government acted upon the proposals for better salaries and conditions of service, e.g. accommodation. Action on the Rushcliffe Report did not solve the problem, however, and in 1949 the Report of the Working Party on the Recruitment and Training of Midwives was published. Many and varied were their proposals to improve, amongst other things, the status and the training of midwives and midwife teachers.

In 1950 certain amendments to the Midwives Acts became law, the most important of which was that which permitted the certification

in England of midwives certified in any part of the world, with or sometimes without further training. Other amendments made alterations in the constitution of the Central Midwives Board and empowered the board to make rulings regarding the wearing of uniforms by midwives.

The Midwives Act, 1951, consolidated all previous Acts, so that now there is only one Midwives Act.

The National Health Service Act was passed in 1946 and implemented in 1948. Institutional midwifery became the responsibility of the Regional Hospital Boards and the Boards of Governors of Teaching hospitals, while the local health authorities became responsible for domiciliary midwifery. For the first time a patient having a home confinement could have the services of a general practitioner obstetrician without charge. This has brought the doctor and midwife into closer co-operation in their complementary roles.

Furthermore, over the years, many other health workers—paediatricians, physicians, radiologists, anaesthetists, biochemists, physiotherapists and many others—have entered the field of midwifery. Thus, far from working in a lone capacity, the midwife is now a member of a substantial team, all working together for the better health of mother and child.

Further Reading

Aveling, J. A. (1872). *The History of British Midwifery* (Reprint). London: Hugh K. Elliott.

47. BLOOD PRESSURE AND URINE TESTING

The Blood Pressure

Blood pressure is a term used to indicate the pressure exerted by the blood at a given point in the circulatory system. Blood pressure is not a disease, as it is commonly understood to be. It is indeed a necessity in order that the various parts of the body may receive nourishment and oxygen from the bloodstream as it circulates in the tissues. The pressure within the arteries is maintained by the force of the heart beat. The force arises from the left ventricle of the heart, which pumps the blood into the arteries. Elastic tissue in the arterial walls enables the arteries to expand as the blood is forced into them.

There is a diminution of pressure onward through the arteries, arterioles, capillaries, and veins back to the heart again. Each contraction of the heart forces blood into the arteries. In the aorta it travels at the rate of 30 cm/second, and in the capillaries it takes a minute for the blood to travel 2·5 cm. This slower rate in the capillaries gives time for blood to reach every cell in the tissues, and to nourish them. The blood makes a complete circle in the large vessels in less than half a minute. There is about 5·5 litres of blood in the body of an adult.

Systolic pressure is the pressure in the arteries when the heart is in a state of contraction, the 'peak' of its force.

Diastolic pressure is the pressure in the arteries during the relaxation period of the heart.

The blood pressure is recorded in millimetres of mercury. The instrument used for estimating blood pressure is known as a *sphygmomanometer*. The pressure in the brachial artery is usually measured.

Method of Taking the Blood Pressure

The patient should be in a comfortable position and mentally and physically relaxed, with her forearm resting on a flat surface, palm

upwards, on the table or bed. The covered inflatable bag, about 10 cm wide, is applied evenly as a bandage over the upper arm and thus over the brachial artery, which lies at the inner border of the biceps muscle. The rubber tube attached to the pressure bag is connected with the sphygmomanometer and there is a release screw attached to it.

When the binaural stethoscope is used, care should be taken that the ear-pieces are directed *forwards*. The small hole is then directly over the external auditory meatus, and the sounds are clearly transmitted. The brachial artery is palpated in the ante-cubital fossa, just above the elbow, and the bell of the stethoscope is applied to this point. There will be no sound heard through the stethoscope as no pressure has yet been applied to the artery. The release screw is tightened and the rubber bag inflated by squeezing the bulb. This brings external pressure on the brachial artery, so that it is obliterated and the radial pulse disappears at the wrist. The pressure in the bag is equal to that in the manometer, the pressure being indicated by the mercury driven up the column to a certain point. The inflation is then continued to a point about 20 mmHg above the level at which sound can be heard. The screw valve is then slowly unscrewed so that the air is gradually released and the column of mercury steadily falls. When the first faint beat of the pulse is heard through the stethoscope the pressure in the manometer is again observed. This marks the systolic pressure.

Systolic pressure. During the contraction of the heart the pressure within the arteries rises. This is followed by a resting period and a corresponding intra-arterial fall in pressure, so that each pressure wave brings about a 'peak' followed by a depression. The crest of the wave coincides with the contraction or systole of the heart, while the resting time, or pause, is coincident with the diastole of the heart, and produces the minimum of diastolic pressure. This pressure represents the measure of the burden, or load, which the aortic valve and arteries must bear, and great importance is attached to it in medicine. The systolic pressure indicates the superadded load which fluctuates within certain limits, according to the needs, various activities, and influences operating at the time. In pre-eclampsia the systolic pressure is raised, In eclampsia, it may be over 200 mmHg. The normal systolic blood pressure is from 105 to 125 mmHg. The average pressure in health is 120 mmHg. Slight variations apart from ill-health are common.

Diastolic pressure. The diastolic pressure may be taken as follows: after taking the systolic pressure continue to let the air slowly out of

the bag. There should be a difference of 40 to 50 mmHg between the systolic and diastolic pressures. The normal diastolic pressure varies between 60 and 80 mmHg.

The pulse will be heard as a definite 'slapping' sound, which, at first, grows louder (at the same time the column of mercury can be seen to oscillate in time with the pulse). The sound then grows softer and the intermittent 'slapping' noise is noted to change to a continuous 'swishing' sound. This indicates that the brachial artery is no longer constricted, even during diastole, and the diastolic pressure is recorded at the level where the change of sound was observed.

Urine

Normal urine consists of:

Urea, derived from nitrogenous waste substances.
Small quantities of uric acid.
Salts: chlorides, phosphates.
Ammonia.
Pigment, derived from bile.
Water.

Normal urine is acid; it may be alkaline for a short period after meals but its normal acidity is soon re-established. The reaction of urine should always be tested as soon as it is passed, because urine, on standing, always becomes alkaline. Blue litmus paper turns red if the urine is acid and red litmus paper turns blue if the urine is alkaline.

Before testing the urine there are some observations to be made and reported by the midwife.

Colour. This will vary according to the amount of urine passed. If the fluid intake is small or sweating is excessive, the urine will be scanty and concentrated, and consequently darker in colour. If the fluid intake is considerable, the urine becomes pale in colour. Some drugs may alter the colour of the urine.

Odour. Where infection is present, as in cystitis or pyelonephritis, an offensive smell may be present, owing to bacterial decomposition. Where acetone is present, as in severe vomiting, or in diabetes mellitus, it gives to the urine a sweet smell, often compared to that of new-mown hay or apples.

Deposit. The presence of pus, mucus, and urates is the common cause of turbid urine. The nurse should notice whether the urine is cloudy

when passed or becomes cloudy on standing. Should the urine be turbid, it should be filtered.

Phosphates form a white cloud when alkaline urine is heated.

Pus produces a cloudy urine, or, in large amounts, a milk-white deposit which collects at the bottom of the specimen glass.

Mucus forms a cloudy deposit of a light flocculent character.

Urates form a light pink-coloured deposit as the urine cools.

Testing Urine

The specimen should be recently voided and uncontaminated. To avoid contamination, by vaginal discharge, a mid-stream specimen of urine is sometimes obtained.

Specific gravity. This is a measurement of the density or the amount of solid matter in solution compared with that of water, which has a specific gravity of 1000. Normally urine is 1010 to 1020. Dilute urine has more water and fewer solids, so the specific gravity is low, and when it is concentrated, the reverse applies. Urine containing sugar has a high specific gravity. It is measured with an urinometer, which must be floated in the urine, clear of the container. The depth to which the instrument sinks can be judged accurately by taking the reading with the surface of the urine at eye level.

As the proportion of solids in urine varies during the day, an accurate specific gravity reading is only possible with a 24-hour specimen.

In health the amount passed is about 1·5 litres in 24 hours, but again this varies with the amount of fluid taken in, the temperature of the surrounding air and the activity of the skin.

Abnormal Constituents of Urine

These are protein (chiefly albumin), sugar, ketone bodies (chiefly acetone), blood, pus and bile.

Test for protein. 1. *Albustix test.* An Albustix strip is dipped into the urine. If it remains yellow, there is no protein. Varying shades of green indicate the presence and approximate quantity of protein. This test is easy and quick, and thus useful in a busy clinic. If protein is found, the finding may well be confirmed by proceeding to one of the older, more laborious, but very accurate tests.

2. *Hot test.* The urine, if cloudy, should be filtered. A test tube is three-quarters filled and the upper part is boiled. If a cloud forms and disappears on the addition of 3 drops of 2 per cent acetic acid, it was due to phosphates, a normal constituent. If the cloud remains, protein is present.

3. *Cold test.* Again, it is preferable that cloudy urine should be filtered. An inch of urine is poured into each of two test tubes. To one is added 3 drops of 25 per cent solution of salicylsulphonic acid. If only a trace of protein is present it is more easily judged if the two test tubes are held up against a dark background.

Quantitative protein tests. When a woman has severe pre-eclampsia, it may be necessary to discover quickly if her proteinuria is worsening. Rapid estimation is possible, usually in the laboratory, either by coagulating the protein and centrifuging the urine, or by a protein turbidity test, using a weak solution of salicylsulphonic acid.

For day to day ward observation of proteinuria, Esbach's quantitative test, though crude, is sometimes useful. The special test tube is filled with urine to the mark 'U'. Esbach's reagent (a picric acid and citric acid solution) is poured in up to the mark 'R', the rubber cork is fitted, the tube gently inverted once or twice, but not shaken. It is then placed in the wooden stand, covered and marked with name, date and time. Twenty-four hours later the height of the precipitate is read and recorded in grammes of protein per litre of urine. The specific gravity should not be more than 1010 so, if necessary, an equal quantity of water is added to the urine and the recorded result doubled 24 hours later.

Protein in the urine. If protein is found in the urine in early pregnancy it is suggestive of pre-existing renal disease, such as chronic nephritis. At any time, but fairly commonly in mid-pregnancy, the urine is found to contain protein, the protein being present partly as a constituent of pus, in urinary tract infection. In late pregnancy the most likely cause of proteinuria is pre-eclampsia.

Proteinuria is *always* a cause for anxiety, and whenever a midwife discovers this condition she should without delay have the patient seen by a doctor.

Tests for sugar. 1. *A Clinistix strip* is dipped in the urine. If, within 1 minute, a blue colour develops, glucose is present. This test is specific for glucose.

2. If sugar is present a quantitative test should be performed, using *Clinitest tablets.* Into a test tube put 10 drops of water and 5 drops of urine. Drop in one tablet and wait 15 seconds. The solution changes colour to green and then to orange, comparison with the chart showing the quantity of sugar present.

3. *Uristix strips* may be used for quick testing in a busy clinic. One strip shows if either protein or glucose is present.

4. *Benedict's test* is similar, but takes longer. To 5 ml of Benedict's solution (copper sulphate) add 8 drops of urine. Boil for 2 minutes. A change of colour through green and yellow to reddish orange indicates an increasing amount of sugar.

Sugar in the urine. During pregnancy this may or may not be normal. Consequently, further investigation is necessary. When a woman is found to have sugar (glucose) in her urine, she will have either a fasting blood sugar test or a glucose tolerance test, which will reveal the reason.

1. Renal glycosuria means that the renal threshold for sugar is lower than usual, the blood sugar is normal and the patient is perfectly well.

2. Alimentary glycosuria means that the liver is slow to convert glucose to glycogen for storage. The blood sugar is slightly raised temporarily and sugar is passed in the urine. This patient is usually well and requires no treatment though she may be a pre-diabetic.

3. Diabetes mellitus is an uncommon, but serious problem in pregnancy.

Tests for ketone bodies. 1. *Acetest tablet test.* With a pipette place one drop of urine on a tablet. The white tablet changes colour to pale lilac or deep purple, depending, as in the Rothera test, on the amount of acetone present.

2. *A Ketostix strip*, dipped in the urine, will reveal the same type of colour change.

3. *Rothera's test.* Quarter-fill a test tube with urine. Add ammonium sulphate crystals to make a saturated solution, i.e. until no more will dissolve. Dissolve two sodium nitroprusside crystals in a little hot water and add to urine. Pour strong ammonia gently into the test tube. A change of colour to pale or deep purple proves that acetone is present. The deeper the colour and the more quickly it appears, the greater the amount of acetone.

Ketones in the urine. This signifies carbohydrate starvation and consequent disordered fat metabolism in which ketone bodies (acetone and diacetic acid) are present in the blood and excreted in the urine.

1. This occurs when 'morning sickness' is worsening to hyperemesis gravidarum, and of course, in actual hyperemesis.
2. It is found in conjunction with glucose in diabetes mellitus.
3. In any complication of pregnancy characterized by persistent vomiting, such as severe pyelonephritis, ketosis may arise.
4. During labour, ketosis may be noted:

(*a*) In prolonged labour, when, in anticipation of an anaesthetic, food and glucose drinks are withheld. Ketosis is especially liable to develop when vomiting occurs.

(*b*) Even in otherwise normal labour. A woman who has missed meals at home while in early labour may, on admission to hospital, be so far advanced in her labour that food and fluid should not be given.

Ketosis is readily corrected by the administration of glucose—if necessary, by the intravenous route.

Urates. Urates are seen as a pink deposit which looks like brick-dust, and which is dissolved when the urine is heated. Urates are not abnormal, and they are often noted after great muscular effort, such as labour. Sometimes the 'brick-dust' stain appears on the baby's napkin, alarming the mother, who fears it may be blood. She can be confidently reassured.

Tests for blood. 1. *Occultest.* Place one drop of urine on the centre of the filter paper square. Put one tablet on the moist area and drip two drops of water on the tablet. If blood is present, a diffuse area of blue appears on the filter paper.

2. Urine which contains blood looks smoky, or even red.

Pour 2·5 cm of the urine into a test tube. Add 2 drops of tincture of guaiacum, mix and add 1 cm of ozonic ether. A blue ring appearing at the junction of the fluids indicates that blood is present.

If there is any possibility that blood is present, microscopic examination of the urine would be more valuable than ward tests.

Pus. The urine is suspect if it is cloudy; often it has the characteristic odour of *Escherichia coli*–infected urine. The only reliable test is to look at a drop of *unfiltered* urine under a microscope, when pus cells may be seen.

Bile pigments. 1. Alternatively, 5 drops of urine are placed on an Ictotest mat, one tablet is put on the mat, and two drops of water are dripped on to the tablet. If bile pigments are present the mat turns bluish purple within 30 seconds.

2. The urine looks dark in colour, with a faintly greenish tinge. When a test tube is three-quarters filled and shaken vigorously, the froth is noted to be yellow.

Deficiency in Normal Constituents

Test for urinary chlorides. In severe vomiting there may be a diminution in urinary chlorides, and this is detected by the Fantus test. Ten

drops of urine are placed in a clean dry test tube, one drop of 20 per cent potassium chromate is added, and a 2·9 per cent solution of silver nitrate is added, drop by drop, the drops being counted. The number required to produce a red colour in the precipitate is the number of grammes of chloride per litre of urine. The findings in this test vary with the output of urine, but generally if the urinary chloride content is less than 5 g/litre it is felt that chloride deficiency is present.

The tests most commonly carried out in antenatal clinics and wards are those to detect protein, sugar and ketone bodies. In the antenatal clinic the patient's urine should be tested for protein and sugar at every visit. Acetone tests should be carried out if the patient reports vomiting or if she appears dehydrated. All the urine that is passed during labour should be tested for acetone. Tests for bile and blood are not often necessary.

Urea clearance test. This test is a test of renal function. After a dry breakfast (at which tea but not coffee may be given), the patient empties the bladder completely, and the specimen is discarded. Exactly 1 hour afterwards she again empties the bladder completely, and the whole of the specimen is sent to the laboratory. A specimen of blood is taken from a vein at the same time and sent to the laboratory. An hour later the bladder is emptied again, and the entire specimen is sent to the laboratory. From the volume of urine excreted and the urea content of it and from the amount of urea in the blood sample the ability of the kidney to excrete urea is estimated according to a formula devised by Van Slyke.

Glucose tolerance test. This is used to diagnose pre-diabetes and diabetes. No food or drink is given after 21.00 hours on the evening preceding the test. In the morning a sample of blood is withdrawn and sent to the laboratory for estimation of blood sugar and, at the same time the patient empties her bladder, the urine being discarded. She is given a solution of 50 g of glucose in 100 ml of water to drink. Further samples of blood are withdrawn at 30-minute intervals for 2 hours, and the bladder is emptied on each occasion. Each sample of blood, and each specimen of urine is sent to the laboratory clearly labelled with the time each specimen was obtained in addition to the name.

Patients with diabetes have a persistently high blood sugar. In prediabetics the blood sugar is slow to return to normal. Those in whom the glycosuria is due to lowering of the renal threshold for sugar have usually a normal blood sugar, even when there is a trace of sugar in the urine.

48. GLOSSARY

Abortion. Expulsion of the fetus from the uterus before the twenty-eighth week of pregnancy, the fetus not being born alive.

Abruptio placentae. Premature detachment of the normally situated placenta causing accidental haemorrhage.

Accidental antepartum haemorrhage. Antepartum haemorrhage owing to separation of a normally situated placenta.

Achondroplasia. An inherited condition of shortness of long bones, causing dwarfism.

Adnexa. Appendages. The ovaries and Fallopian tubes.

Agglutinin. An antibody able to agglutinate (glue together) the specific cells (antigens) which stimulate its production.

Anoxia. Lack of oxygen.

Ante. Prefix meaning 'before'.

Antenatal. Before birth.

Antepartum haemorrhage. Bleeding from the birth canal after the twenty-eighth week of pregnancy and before the birth of the fetus.

Anteversion. The state of being tilted forward.

Anti. Prefix meaning 'against'.

Antibody. A substance formed by the body in response to the introduction of an antigen into the body. The antibody will react with, and only with, the antigen which has stimulated its production, e.g. Rhesus antibody will haemolyse Rh+ red blood cells.

Antigen. A substance which when introduced into the body stimulates the production of an antibody.

Anuria. Suppression (complete stoppage of the secretion) of urine.

Asphyxia. Suffocation. Asphyxia neonatorum. Failure to breathe at birth.

Asynclitism. Engagement of the fetal head with the sagittal suture in the transverse diameter of the brim; with either the anterior parietal bone in advance (anterior asynclitism) or the posterior parietal bone in advance (posterior asynclitism).

Atelectasis. Imperfect expansion of the lungs following birth.

Atresia. Without a hole. Absence or closure of a usual opening or canal, e.g. duodenal or oesophageal atresia.

Autogenous infection. Infection acquired from within the body and not from an external source.

Bartholin's glands. The greater vestibular glands which lie one on each side of the vaginal orifice. Described by Caspar Bartholin. Danish anatomist 1655–1738.

Bi. A prefix meaning 'two'.

Bicornuate. Having two horns. An abnormality of the uterus.

Caesarean section. An operation by which the fetus is extracted through an incision in the abdominal and uterine walls.

Caput. A head.

Caput succedaneum. An oedematous swelling which forms during labour on the presenting part of the fetus.

Carneous mole. A fleshy mass of organized blood clot formed round a dead ovum in utero; a missed abortion.

Caul. Originally a cap or net. To be born in a caul means that the child is born with the membranes covering the head.

-cele. A suffix meaning a tumour usually containing fluid. A cystocele is a protrusion of bladder into the vagina. A meningocele is a protrusion of meninges containing a cerebrospinal fluid.

Cephalic. Pertaining to the head.

Cervix. A neck, e.g. *cervix uteri*, the neck of the uterus.

Chromosomes. Threads of nuclear material carrying genes, which transmit inherited characteristics.

Colporrhaphy. Repair of the vaginal wall.

Colpos. The vagina.

Credé's manoeuvre. A method of expressing from the uterus a partially adherent placenta. Painful, shock-producing and not nowadays employed.

Cyanosis. Blueness of the skin, caused by a deficiency of oxygen in the blood.

Cyesis. Pregnancy.

Decidua. The altered endometrium formed during pregnancy and shed after the birth of the fetus.

Diagonal conjugate. The distance between the promontory of the sacrum and the apex of the pubic arch (12 cm).

Dilatation. The stretching of a restricted passage, e.g. the neck of the uterus. *Full dilatation.* When the cervix has been completely drawn up into the lower uterine segment, and can no longer be felt on vaginal examination; or when the cervix is sufficiently dilated to allow the head to pass through.

Dys. Prefix meaning difficult or painful. Dystocia means difficult labour. Dysuria means painful micturition.

Eclampsia. A condition peculiar to pregnancy characterized by a fit or fits, and associated with hypertension and proteinuria.

Ectopic. Out of place. An ectopic pregnancy is a pregnancy not in the uterus; usually it is in the Fallopian tube.

Endometrium. The mucous membrane lining the uterus.

Engagement of the head. The head of the fetus is said to be *engaged* when the greatest presenting diameter has passed the plane of the brim.

Erb's paralysis. Paralysis of the arm from injury to the brachial plexus.

Fallopian tube. The oviduct or uterine tube. There are two of these connecting the ovaries to the uterus. Through them the ova are transmitted. Described by Gabriello Fallopius: Italian anatomist 1523–1563.

Falx. A sickle. The *falx cerebri* is sickle-shaped.

Fimbria. A fringe. The fringe-like processes at the ovarian end of the Fallopian tube.

Fistula. An abnormal opening between one cavity or passage and another.

Fetus. The unborn offspring of a mammal. The human embryo from the sixth week of pregnancy to the time of birth.

Fontanelle. A membranous space between the cranial bones of an infant. They are so named because of the pulsation of the anterior fontanelle. (From Fr. *Fontanelle.* A little fountain.)

Foramen. A hole or opening, e.g. *foramen ovale* and *foramen magnum.*

Forewaters. Fetal membranes containing liquor amnii situated below the presenting part.

Fornix. (Plural: *fornices*). An arch. The anterior, posterior and lateral parts of the vaginal vault.

Funis. The umbilical cord.

Genes. Minute structures carrying inherited characteristics. For each feature, e.g. colour of eyes, blood group, one gene is inherited from each parent.

Genotype. The classification of an individual according to the genes that are inherited. The hereditary or genetic make-up of an individual.

Gestation. Pregnancy.

Graafian follicle. A spherical vesicle embedded in the ovarian cortex and containing an ovum described by Regnier de Graaf. Dutch anatomist 1641–1673.

Gravid. Pregnant.

Heterozygous. Having inherited dissimilar members of a pair of genes.

Homozygous. Having inherited similar members of a pair of genes.
Hydrocephalus. An excess of cerebro-spinal fluid distending the ventricles of the brain.
Hydramnios. An excess of liquor amnii.
Hydro. Prefix meaning water.
Hyper. Prefix meaning 'over' or 'excess of', e.g. hypertension, a blood pressure in excess of normal.
Hypo. Prefix meaning 'under' or 'less than normal', e.g. hypotonic uterine action, uterine action less strong than normal; hypoxia, a less than normal oxygen supply.

Impaction. The wedging of one object inside another. In obstructed labour the fetus may become wedged in the pelvis.
Inter. Prefix meaning 'between', e.g. intercostal, between the ribs.
Intra. Prefix meaning 'within' or 'inside', e.g. intracranial, within the cranial cavity.
Intranatal. During birth.
Involution. A turning inwards, e.g. *involution of the uterus*, the gradual return of the uterus to the pre-pregnant state following labour or abortion.

Labium. A lip. *Labia majora* and *minora*, the greater and lesser lips of the vulva.
Labour. The expulsion of the fetus, placenta, membranes, and cord from the uterus via the birth canal after the twenty-eighth week of pregnancy.
Langhans's layer (*cytotrophoblast*). A cellular membrane covering the placental villi beneath the syncytium.
Lanugo. The downy hair seen on the face and body of a premature infant.
Leucorrhoea. An excessive white vaginal discharge.
Live birth. The birth of a baby, at any stage of maturity, which has breathed.
Lower uterine segment. The lower part of the uterus and cervix which stretches and thins during the first and second stage of labour.
Luteus. Yellow. Hence the *corpus luteum*, the yellow body which develops from the Graafian follicle after ovulation.
Lysis. Breaking down, e.g. haemolysis, breaking down of red blood cells.

Maceration. Softening by soaking. The tissues of the fetus retained in utero after death become softened.
Mal. Prefix meaning 'bad', 'wrong' or 'ill'. A malpresentation is any presentation other than the normal vertex.
Micro. Prefix meaning 'small', e.g. microcephaly, a small head.
Miscarriage. The same as abortion.

Monilia. A genus of fungi: otherwise known as *Candida.*
Multigravida. A woman who has been pregnant more than once.
Multipara. A woman who has had more than one child.

Natal. Pertaining to birth.
Neo. Prefix meaning 'new', e.g. *neonatal,* newborn.
Nullipara. A woman who has never borne a child.

Oblique. Slanting.
Oedema. Swelling due to collection of fluid in the cellular tissues.
Oligo. Prefix meaning less than normal, e.g. oligohydramnios, a deficiency in the amount of amniotic fluid, and oliguria, a diminished secretion of urine.
-orrhaphy. Suffix meaning repair, e.g. perineorrhaphy, repair of a perineal laceration.
Os. 1. A bone, e.g. *os pubis.* 2. Mouth or opening, e.g. *os uteri,* mouth of the uterus.

Pelvis. A basin. The cup-shaped ring of bone at the bottom of the trunk.
Peri. Prefix meaning 'around', e.g. perinatal mortality, death of the baby, around the time of birth.
Placenta praevia. A placenta lying wholly or partially in the lower uterine segment.
Poly. Prefix meaning 'much' or 'many'. *Polyuria,* the secretion of an excessive amount of urine.
Post. Prefix meaning 'after', e.g. postnatal, after birth.
Post-maturity. After maturity. A baby is said to be *post-mature* when it is born more than 14 days after the expected and corrected date of confinement.
Post-partum haemorrhage. Undue bleeding from the birth canal after the birth of the fetus and until the end of the puerperium.
Pre. Prefix meaning 'before'. *Prenatal,* before birth. *Premature,* before maturity.
Pregnancy. The state in which a living fertilized ovum is embedded in the maternal tissues, there to develop into a fetus.
Premature labour. Labour occurring before term. Labour leading to the birth of a premature baby.
Primigravida. A woman who is pregnant for the first time.
Primipara. A woman who has borne one child.
Prolonged labour. Labour lasting more than 36 hours.
Pseudocyesis. A false pregnancy. A condition in which symptoms and signs may simulate pregnancy.
Puerperal sepsis. Infection of the genital tract by micro-organisms causing morbidity during the puerperium.

Puerperium. An arbitrary period of 6 weeks after labour during which involution of the uterus and other structures takes place.

Retro. Prefix meaning 'backwards' or 'behind'.
Retroflexion. A bending backwards.
Retroplacental. Situated behind the placenta.
Retroversion. A turning backwards, e.g. *retroversion of the uterus.*
Rotation. The turning of a body on its long axis.

Sacrum. (*Os sacrum*, sacred bone.) A triangular bone between the coccyx and the lowest lumbar vertebra.
Sagittal. Shaped like an arrow.
'Show'. The discharge of blood and mucus which generally accompanies the onset of labour.
Souffle. A soft blowing sound sometimes heard on auscultation.
Spalding's sign. Overlapping of the cranial bones seen in an X-ray following death of the fetus in utero.
Stillbirth. A child born after the twenty-eighth week of pregnancy, which does not breathe or show any sign of life after being completely expelled from its mother.
Striae gravidarum. Stretch marks of pregnancy seen on the abdomen, breasts and thighs, during and after pregnancy.
Sub. Prefix meaning 'under' or 'below'.
Sub-involution. Incomplete involution of the uterus in the puerperium.
Supra. Prefix meaning 'above' or 'over'.
Suprapubic. Above the pubes.
Syncytium (*Syncytio-trophoblast*). Outer layer covering the placental villi, a layer with nuclei but no visible cell margins.

Tentorium. A roof or tent. Hence *tentorium cerebelli*, which covers the cerebellum like a tent.
Toxaemia of pregnancy. A disease occurring only during pregnancy. The name usually implies pre-eclampsia.
Transverse. Placed crosswise.
True conjugate. The shortest distance between the sacral promontory and the upper inner aspect of the symphysis pubis.

Unavoidable antepartum haemorrhage. Antepartum haemorrhage due to placenta praevia.

Vagina. A structure resembling a sheath.
Velamentous. In the form of a veil, e.g. *velamentous insertion of the cord* into the fetal membranes instead of the placenta. (From L. *velamentum.* A cover or veil.)

Vernix caseosa. A greasy substance which covers the fetus in utero.

Version. Turning of the fetus in the uterus to substitute one presentation for another.

Vertex. The area of the skull bounded in front by the anterior fontanelle, behind by the posterior fontanelle, and laterally by the parietal eminences.

Villus. A small, vascular projection of the chorion, which by invasion of the decidua, obtains nourishment from the maternal blood for the fetus.

Zygote. The cell formed by the fusion of the ovum and spermatozoön from the parents which develops to form the child.

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