



# MIDWIFERY AND OBSTETRIC NURSING

BY

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SECOND EDITION

FABER & FABER LIMITED

24 RUSSELL SQUARE, LONDON, W.C.1

1945

FIRST PUBLISHED IN 1941  
BY FABER AND FABER LIMITED  
24 RUSSELL SQUARE, LONDON, W.C.1  
SECOND EDITION, 1945  
PRINTED IN GREAT BRITAIN BY  
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## PREFACE TO SECOND EDITION

THE text has been revised and amplified for this edition. Several suggestions made by reviewers of the first edition have been incorporated and a description of erythroblastosis has been added. Additional illustrations have been provided, particularly for the section dealing with the early development of the ovum.

My special thanks are due to Miss E. M. Leveridge, S.R.N., S.C.M., Sister in Charge of the Obstetric Department, Norfolk and Norwich Hospital, for her assistance with the revision.

NORWICH, 1945.

M. W. B.

## PREFACE TO FIRST EDITION

THIS book is intended for the use of midwives in training and in practice. Special care has been taken to follow a logical and easily remembered sequence in presenting the various parts of the subject, and in dealing with disorders, such as those of pregnancy, to stress symptoms as these are of more importance to midwives than diagnosis. Treatment is given in detail of all conditions which the midwife normally, or under exceptional circumstances, may be called upon to undertake, but is indicated in broader outline for those conditions in which medical aid is required.

I am very grateful for the assistance I have had from Mr. J. W. Burns, of Liverpool, in the account given of his method of delivering the after-coming head and for permission to use illustrations from which figure 84 has been drawn.

I am much indebted also to Miss L. Beulah, District Sister at University College Hospital and Tutor to Midwives' Teachers' Students at the Royal College of Nursing, and to Miss A. V. Fineron, of Norwich, for reading the manuscript and making many valuable suggestions which have been incorporated in the text.

The large majority of the illustrations has been drawn by Miss Hodge, whose care and attention to detail I acknowledge with gratitude. Acknowledgments are also due to the authors of the following works and their publishers for permission to reproduce illustrations: Bailey and Love, *Surgery for Nurses* (H. K. Lewis); Hutchison, *Diseases of Children* (Edward Arnold); Rose and Carless, *Manual of Surgery* (Baillière, Tindall and Cox). And to Messrs. Allen and Hanbury for supplying illustrations of instruments.

The manuscript of the book was started before the war and I express my thanks to the publishers for continuing its production in spite of the difficulties and delays caused by the present situation.

NORWICH, 1941.

M. W. B.

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## CHAPTER 1

### ANATOMY OF THE PELVIS

A SOUND knowledge of anatomy and physiology is as necessary in obstetrics as in other branches of medicine and surgery. In obstetric anatomy the attention of the student has to be directed chiefly to the pelvis, but obstetric physiology, concerned largely with the activity of pelvic structures, must also take into consideration the activity of a large number of associated organs throughout the body. In this chapter is described the anatomy of the bony pelvis and the pelvic soft tissues. The organs contained within the pelvis require separate description later.

#### THE BONY PELVIS

The bony pelvis contains and protects the internal generative organs, the bladder and the terminal portion of the bowel, and also forms the bony ring through which the foetus passes during parturition. It is composed of four bones, the *innominate* (or hip) bones on each side and the *sacrum* and *coccyx* behind.

Each *innominate bone* is built up from three bones, the *ilium*, *ischium* and *pubis*, which, joined by cartilage in childhood, become fused to form a single bone in adult life. The crest of the *ilium*, which constitutes the upper boundary of the pelvis; the *tuberosity of the ischium* (*tuber ischii*) upon which the weight of the body is taken when sitting; and the *symphysis pubis*, the joint anteriorly between the pubic portion of two innominate bones, are of obstetric importance and will also serve to keep in mind the names of the bones which together form the innominate bone.

The *Sacrum* is composed of five vertebrae fused to form a single bone. Together with the *coccyx* it forms the base of the spine and the posterior boundary of the pelvis. The upper border of the sacrum, at the joint with the fifth lumbar vertebra, is known as the *promontory*.

The *Coccyx* is composed of four fused vertebrae. It is situated below the sacrum.

**The Pelvic Joints** unite the pelvic bones and are also four in number.

The right and left *sacro-iliac joints* join the sacrum to the iliac portion of the innominate bone on either side.

The *symphysis pubis* is the joint between the pelvic portion of each innominate bone and forms the anterior boundary of the pelvis.

The *sacro-coccygeal joint* lies between the sacrum and the *coccyx*.



A small range of movement is possible at each of these joints. During pregnancy this range is slightly increased by softening and relaxation of the very strong ligaments by which the joints are held together.

The pelvis may be divided into two portions, the false pelvis and the true pelvis.

**The False Pelvis** lies *above* a line (the *arcuate line*) which passes from the upper border of the symphysis pubis across the pubic and iliac bones to the promontory of the sacrum.

**The True Pelvis** lies *below* the arcuate line and is the part of the pelvis concerned in parturition. For convenience in description it is divided into three parts—namely, the brim, inlet or superior strait; the cavity; and the outlet, or inferior strait.

The *brim*, or *inlet*, is heart-shaped in outline. It is bounded on each side by the arcuate line and behind by the upper border of the sacrum.

The *cavity* is roughly cylindrical in shape. It is limited above by the pelvic brim and below by the outlet. The lateral walls are formed by the ischial portions of the innominate bones and by pelvic ligaments, the posterior wall is formed by the sacrum and coccyx while in front it is bounded by the pubic bones and symphysis pubis. Because of the curvature of the sacrum the direction of the pelvic cavity alters as it passes down from brim to outlet. In its upper portion it passes downwards and backwards from the brim to the level of the joint between the second and third sacral vertebrae, and then curves forward to gain a downward and forward direction at the outlet.

The *outlet* is lozenge shaped. It is bounded in front by the lower border of the symphysis pubis, at the back by the coccyx, and at each side by the tuberosity of the ischium.

**Pelvic Measurements.** Two measurements of the false pelvis are of obstetric importance. They are:

1. The *interspinous diameter*, which is the distance from the anterior superior spine of one iliac bone to its fellow of the opposite side, and which normally measures  $9\frac{1}{2}$ –10 inches.

2. The *intercristal diameter*, which is the distance between the outer lips of the iliac crests at their widest point and which normally measures  $10\frac{1}{2}$ –11 inches.

The inch of difference between these measurements is of great importance as it indicates a normal curvature of the iliac crests. Alteration of this curvature, accompanied by alteration of the measurements, commonly occurs in cases of contracted pelvis.

A third measurement which is sometimes taken is the *inter-trochanteric diameter*. This is the distance from the great trochanter of one femur to that of the opposite side. It normally measures 12 inches.

Certain diameters of the true pelvis are of obstetric importance, but not all of them can be obtained in the living subject. Those to be obtained clinically will be discussed more fully in a later chapter.

*Diameters of the brim.* (1) The *antero-posterior diameter* extends from the centre of the promontory of the sacrum to the top of the symphysis pubis. As the brim is elliptical in shape and as the shorter diameter of an ellipse is called the conjugate, this measurement is usually referred to as the conjugate. Actually two conjugate diameters may be obtained—the *anatomical* or *true conjugate* which is the distance ( $4\frac{1}{2}$  inches) from the promontory to the summit of the symphysis; and the obstetric, or *available*

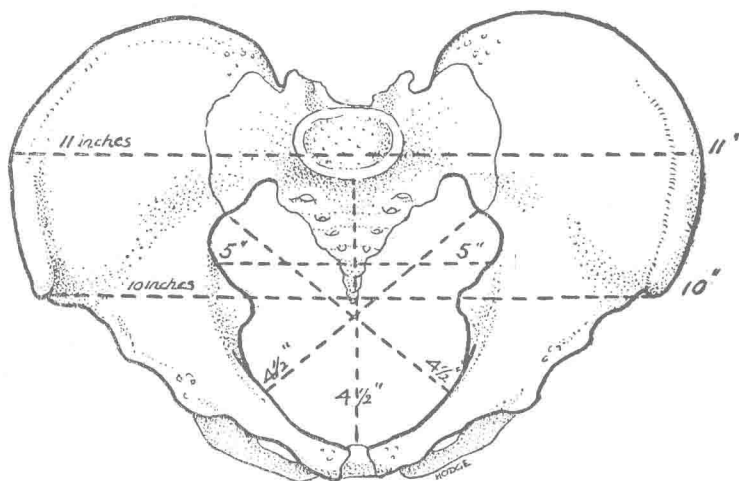


FIG. 1.—FEMALE PELVIS SHOWING DIAMETERS OF FALSE PELVIS AND OF PELVIC BRIM.

*conjugate*, which is the distance (4 inches) from the promontory to the upper border of the posterior superior surface of the symphysis. The latter distance, which is about  $\frac{1}{4}$  inch less than the former, represents the actual space available for the passage of the foetal head. As it is very difficult to obtain these measurements in the living woman, a third measurement known as the *diagonal conjugate*, is obtained clinically. This is the distance from the promontory to the centre of the lower border of the symphysis. It usually measures about  $4\frac{3}{4}$  inches and from it the true conjugate is estimated by subtraction of  $\frac{1}{2}-\frac{3}{4}$  inch.

(2) The *transverse diameter*, which measures 5 inches, is the greatest distance between the two arcuate lines.

(3) The *right and left oblique diameters* are measured from the right and left sacro-iliac joints respectively to the point on the

arcuate line of the opposite side at which the iliac and pubic bones join (*ilio-pubic eminence*). Each diameter measures  $4\frac{1}{2}$  inches, though the right oblique is often a little longer than the left.

*Diameters of the cavity.* These are measured at the level of a line drawn between the upper border of the third sacral vertebra and the symphysis pubis. The anterior and transverse diameters at this point are both about  $4\frac{1}{2}$  inches.

*Diameters of the outlet.* The *antero-posterior diameter* is measured from the centre of the lower border of the symphysis pubis to the tip of the coccyx. When the coccyx is in its normal position this diameter measures 4 inches, but when the coccyx is pressed backwards, as in the later part of labour, it measures 5 inches.

The *transverse diameter* is measured between the inner surfaces of the ischial tuberosities and is 4 inches long.

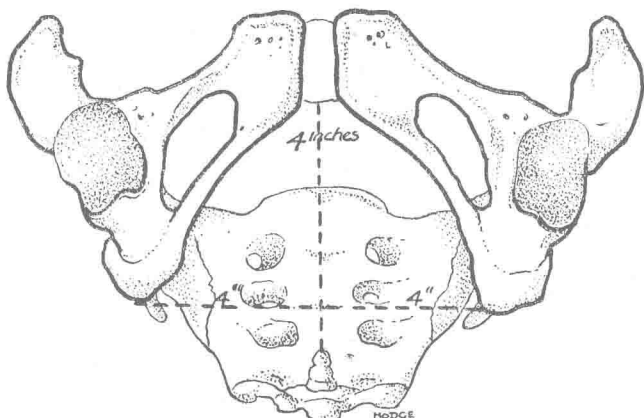


FIG. 2.—OUTLET OF FEMALE PELVIS SHOWING DIAMETERS.

**Planes of the Pelvis.** The pelvis is so irregular in shape that it would be difficult, without making use of the planes of the pelvis to aid description, to indicate exactly the position of a body within the pelvis. The planes of the pelvis are imaginary planes, or surfaces, passing through the pelvis at different levels. The most important of these are:

(1) The *plane of the brim*, already described as marking the boundary between the true and the false pelvis.

(2) The *plane of greatest pelvic dimensions*, the most roomy part of the pelvic cavity, which passes through the upper border of the third sacral vertebra and the middle of the symphysis pubis.

(3) The *plane of least pelvic dimensions*, which passes through the tip of the sacrum and the lower border of the symphysis pubis. This is usually taken as being also the plane of the outlet. The coccyx is, of course, the true posterior boundary of the outlet,

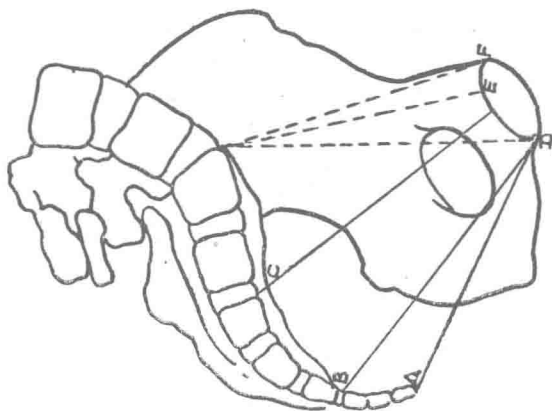


FIG. 3.—DIAGRAM SHOWING PELVIC PLANES.

Promontory to F = True conjugate.  
 Promontory to E = Obstetric conjugate.  
 Promontory to D = Diagonal conjugate.  
 C to E = Plane of greatest pelvic dimensions.  
 B to D = Plane of least pelvic dimensions.  
 A to D = Plane of pelvic outlet.

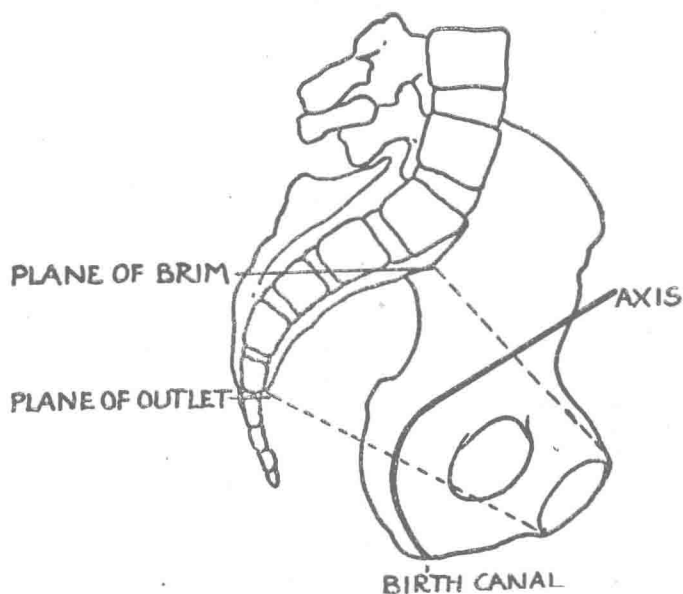


FIG. 4.—DIAGRAM SHOWING PELVIC AXIS.

but the movement of this bone during labour would cause any plane passing through it to vary in position.

**Axis of the Pelvis.** The axis of the pelvis is an imaginary line which would show the position of the centre of the foetal head during its passage through the pelvis. To find this line first draw a number of antero-posterior diameters of the true pelvis between the plane of the brim and that of the outlet. The axis of the pelvis is then indicated by a line joining the centre of all these diameters.

**Inclination of the Pelvis.** The plane of the pelvic brim is not horizontal. It is inclined downwards so that if extended to meet the floor while the woman is standing it would make an angle of about  $60^{\circ}$  with the floor.

### SEX DIFFERENCES IN THE ADULT PELVIS

In the male the pelvis is heavier, higher and more conical than in the female. The muscular attachments in the former are more strongly marked and the iliac bones are placed more vertically than in the latter. The pubic arch in the male forms a more acute angle than in the female, while the male pelvic brim is smaller and more triangular in outline and the pelvic cavity deeper and more conical in shape. The external measurements are similar in both sexes, but in the male all the diameters of the pelvic cavity are shorter. Occasionally the female pelvis resembles the male type, a condition known as *funnel pelvis*, and in such cases serious difficulty in labour may occur as the outlet of the pelvis of the male type is so narrow that the birth of a child of average size is difficult, if not impossible.

### THE PELVIC SOFT TISSUES

The bony pelvis forms a framework upon which numerous muscles and ligaments gain attachment and within which important organs are supported. The walls of the true pelvis are covered by muscles which together with the rectum and the thickness of the uterine and to a less extent of the vaginal walls diminish the space available for passage of the foetus during labour. The outlet of the pelvis is closed by a series of layers of tissue which together constitute the pelvic floor. Externally the pelvic floor is covered by skin, while internally it is lined by the peritoneum. The most important structures in the pelvic floor are the *levator ani muscles*, which lie on each side of the mid-line. They have together the shape of a horse-shoe open in front. Attached in front to the back of the pubic bone, they pass backwards enclosing the vagina and rectum, acting as a sling to hold them in position. On each side they are attached to the wall of

the pelvis and posteriorly to the coccyx. In the mid-line they end in a fibrous band (*median raphe*) which joins each levator to its fellow of the opposite side. The pelvic contents are thus supported by the two levator ani muscles in a way which may be roughly compared with the cupped hands. The muscular pelvic floor is weakened by the passage through it of the vagina and anal canal, and if the muscular power is impaired by tearing or overstretching during labour prolapse is liable to occur at a later date

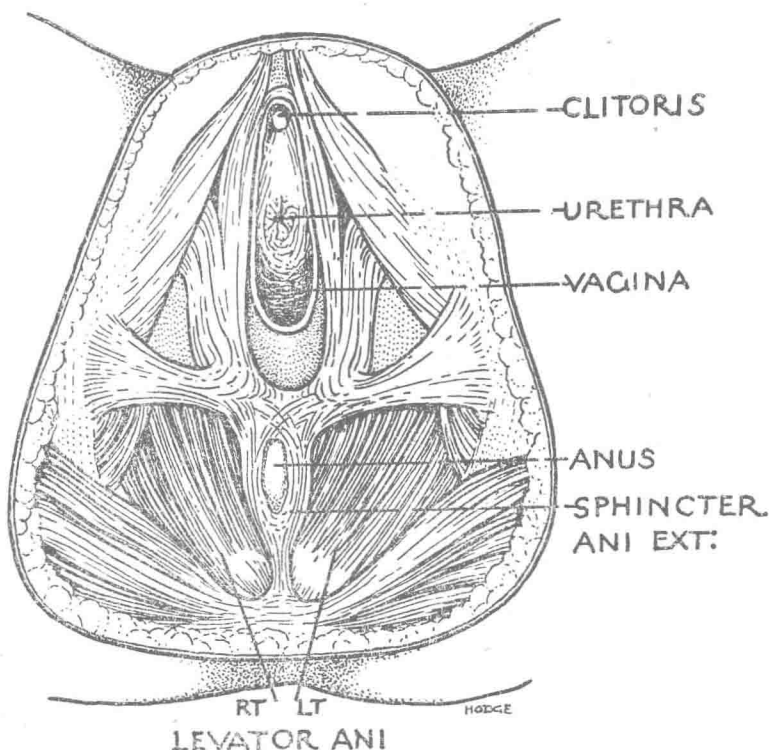


FIG. 5.—MUSCLES OF THE FEMALE PERINEUM.

since the pelvic floor is no longer able to support the weight of the pelvic and abdominal contents.

The *perineal body* is a mass of tissue which separates the vulva and lower part of the vagina in front from the rectum and anus posteriorly. It is triangular in shape, the base being formed by the skin surface and the apex being situated at the point about  $1\frac{1}{2}$  inches above the anus at which the rectum and vagina come into contact. It is composed of muscular, fibrous and fatty tissue.

During labour certain important anatomical changes take place

in the structures of the pelvic floor. In the first stage of labour the bag of waters commences to stretch the upper part of the vagina, while after rupture of the membranes the presenting part comes into immediate contact with and brings about further changes in the pelvic floor. As the presenting part descends the anterior part of the pelvic floor is forced against the posterior and lower part of the symphysis pubis. At the same time the posterior part of the pelvic floor is pushed downwards and forwards, becoming, in the process, greatly stretched and finally converted into a thin-walled tubular structure known as the *perineal gutter*. The most important change consists of the stretching of the fibres of the levator ani muscle and the thinning of the central part of the perineum. The latter is converted from its normal triangular shape into a thin, almost transparent sheet of tissue and in the process of stretching is pushed downwards about an inch from its original position.

When the head distends the vulva the opening of the latter is directed upwards and forwards. When the vulva and perineum are fully distended during birth of the head the anus also becomes widely dilated, forming an aperture nearly an inch in diameter through which the anterior wall of the rectum can be seen.

This extreme distension of the pelvic floor is made possible by hypertrophy (increased growth) of all the structures concerned, together with a marked increase of the blood supply, during pregnancy.

## CHAPTER 2

### ANATOMY OF THE REPRODUCTIVE ORGANS

#### THE EXTERNAL GENERATIVE ORGANS

THE external generative organs in the female are together termed the vulva. They include the labia majora and the structures lying between them.

**Labia Majora.** The two labia majora represent the scrotum of the male. Each labium is a rounded fold of skin, narrow and flattened behind but increasing in size as it passes forward to end, with the opposite labium, in an elevation lying over the symphysis pubis. This elevation, which is composed chiefly of fat, is known as the *mons pubis*. The labia majora are usually in contact with each other, thus covering and protecting the deeper structures.

**Labia Minora.** The labia minora are two much smaller folds lying one on each side in the cleft between the labia majora. In front each labium divides and joins, above and below the clitoris, the labium of the opposite side. As they pass backwards the labia become smaller in size and end by merging with the labia majora.

**The Clitoris** represents the penis of the male. It is composed of a body and glans and is attached to the pubic bones by two crura (legs) which arise from the posterior extremity of the body. It is about an inch in length.

**The Vestibule** is the name given to the cleft lying between the labia minora and behind the clitoris. Within the vestibule are the external openings of the urethra and vagina.

**The Urethra** opens externally about an inch behind the glans of the clitoris and immediately in front of the vagina.

**The Vagina** opens externally behind and below the urethra. The opening of the vagina is in the virgin woman partly closed by a thin membranous fold known as the *hymen*. After rupture of the hymen the opening is larger and the torn remains of the hymen may be seen in the form of small projections known as *carunculae myrtiformes*.

**Bartholin's Glands** lie one on each side of the vaginal opening. They secrete a yellowish lubricant fluid.

**The Vestibular Bulbs** are elongated masses of erectile tissue composed of veins which lie one on each side of the opening of the vagina.

**The Perineal Body** is a pyramid shaped mass of strong connective tissue and fat lying between the posterior margin of the vulva and the anus.



### THE INTERNAL GENERATIVE ORGANS

The internal generative organs include the vagina, the uterus, the Fallopian tubes and the ovaries.

**The Vagina** is a passage about 3 inches in length which opens externally at the vulva and communicates internally with the uterus. It is directed downwards and forwards and has throughout its length a slight backward convexity. The lower portion (cervix) of the uterus enters the vagina through the upper part of the anterior wall. The projection of the cervix into the vagina produces a recess between the cervix and the vaginal wall, this recess being deepest behind the cervix. The terms *anterior fornix*, *posterior fornix* and *lateral fornix* are applied to those portions of the recess respectively in front of, behind, and on each side of the cervix.

The anterior wall of the vagina lies in its upper part against the base of the bladder and in its lower part in close contact with the urethra. The posterior wall of the vagina in its upper part is covered for a short distance by the peritoneum. Lower down it is in contact with the rectum, but as the vaginal opening is approached the rectum turns backwards and becomes separated from the vagina by the perineal body. On each side the vagina is supported by the levator ani muscles. The ureters lie a short distance from the upper part of each lateral wall of the vagina. The vaginal wall is composed of unstriped muscle fibres and its lining, which is covered by epithelium, is thrown into numerous transverse folds known as *rugae*.

The blood supply of the vagina is derived from the vaginal artery and from branches of the uterine and middle haemorrhoidal artery, all of which vessels are themselves branches of the internal iliac artery on each side. Blood is drained from the vagina by a plexus of veins, through which it returns to the internal iliac veins.

**The Uterus** is a hollow muscular organ covered by the peritoneum and lined by a mucous membrane known as the *endometrium*. It is pear-shaped, the larger upper end projecting upwards and forwards into the pelvic cavity and the narrow lower end opening into the vagina. It is usually 3 inches long and 1 inch thick, while the greatest breadth is 2 inches. For purposes of description the uterus is divided into three parts: the fundus, body and cervix.

*The fundus* is that part of the uterus which lies above a line joining the entrance of each Fallopian tube into the uterus.

*The body or corpus of the uterus* when seen from in front or behind has a roughly triangular shape, the base of the triangle being upwards. The anterior surface rests against the upper