



# A HANDBOOK OF MIDWIFERY

For Pupil-Midwives, Midwives, and  
Obstetric Dressers

BY

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THIRTEENTH EDITION

WITH 3 COLOUR PLATES AND 85 ILLUSTRATIONS IN  
THE TEXT

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## PREFACE TO THE THIRTEENTH EDITION

IN a former edition I pointed out that in an Appendix to this Handbook additional information would be found which might be of interest to some of my readers. Although not necessary for pupil midwives engaged in training for the examinations of the Central Midwives Board, this additional information may be of some use to those sitting for the examination of the Sister Tutors' Teaching Certificate.

In this edition the chapter on Hormones has been transferred to the Appendix, since the Central Midwives Board has notified to its examiners that it is not necessary to examine pupil midwives on this subject.

The section on the Treatment of Unavoidable Hæmorrhage and that on Blood Transfusion have been re-written and a short account of the Rhesus Factor has been added. For the rest, a certain amount of new matter has been included; a large number of the paragraphs have been recast with a view to simplification and the avoidance of repetition where avoidance seemed desirable. When I was a young man one of the wisest teachers of medicine I knew remarked to me that he always taught his students 100 per cent. on the assumption that they might assimilate at least 50 per cent. I think there may be something to be said for judicious repetition!

COMYNS BERKELEY.

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# A HANDBOOK OF MIDWIFERY

## PART I.—FEMALE AND FŒTAL ANATOMY

### CHAPTER 1

#### The Female Pelvis

THE pelvis consists of 4 bones: the 2 innominate bones, the sacrum, and the coccyx, separated by 4 joints: the 2 sacro-iliac

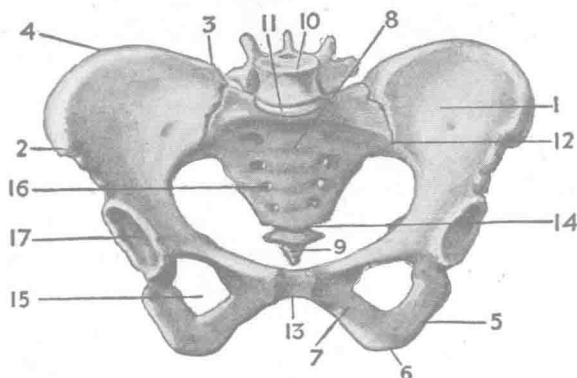


FIG. 1.—The Pelvis.

1, Ilium; 2, Anterior superior spine; 3, Posterior superior spine; 4, Crest of the ilium; 5, Ischium; 6, Tuberosity of the ischium; 7, Pubes; 8, Sacrum; 9, Coccyx; 10, Fifth lumbar vertebra; 11, Promontory of the sacrum; 12, Sacro-iliac joint; 13, Symphysis pubis; 14, Sacro-coccygeal joint; 15, Obturator foramen; 16, Foramina for nerves and blood-vessels; 17, Acetabulum.

joints, the sacro-coccygeal joint and the symphysis pubis. (Fig. 1.)

#### THE INNOMINATE BONE

The innominate bone of each side is formed of 3 separate pieces: the ilium, ischium, and os pubis, which, between the ages of 20 and 25, become firmly united (Fig. 2). The innominate bones are attached in front by the symphysis pubis, and separated behind by the sacrum.

The **ilium** is the expanded portion of the pelvis which forms the hips. The upper border of the ilium is termed the *crest*. The point at the end of each crest is termed the *anterior superior spine*, and that at the back of each crest the *posterior superior spine*. The ilia form part of the lateral walls of the false pelvis. The inner surface of each ilium is scooped out (*iliac fossa*);

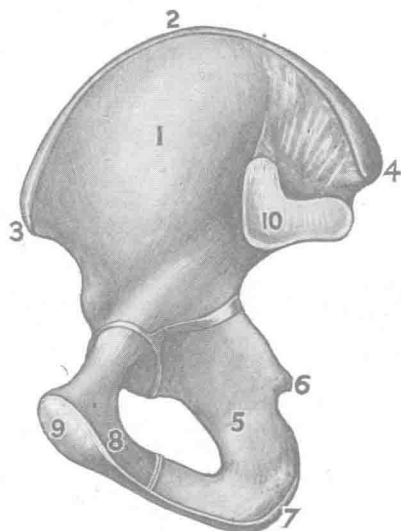


FIG. 2.—Inner surface of the innominate bone, showing how it is composed of three separate bones. The inferior surfaces of the pubes and ischium unite at the 8th year. The three bones unite at the 12th year.

1, Ilium; 2, Crest of Ilium; 3, Anterior superior spine; 4, Posterior superior spine; 5, Ischium; 6, Spine of ischium; 7, Tuberosity of ischium; 8, Os pubis; 9, Symphysis; 10, Surface articulating with the sacrum.

its outer surface is rough, for the attachment of muscles and the sacro-tuberos and sacro-spinous ligaments. Below the posterior superior spine is a notch, and this, closed in by the ligaments, forms the great and small sacro-sciatic foramina through which pass muscles, vessels and nerves to the lower limb.

The **ischium** forms part of the lateral walls of the true pelvis,

is the lowest portion of the pelvis, and terminates in an expanded piece of bone termed the *tuberosity*, upon which the body rests when sitting.

The **pubic bone**, with its fellow on the opposite side, forms the front and part of the lateral walls of the true pelvis. It extends forwards on each side, by its horizontal ramus, to meet at the *symphysis pubis*, and then turns downwards as the descending ramus to form, with its fellow on the opposite side, the arch below the symphysis termed the *pubic arch*. The two rami surround a space termed the *obturator foramen*, through which the obturator nerve sends branches to the thigh, hip and knee joint, and which is referred to when describing the position of the occiput in a 1st and 2nd vertex presentation, of the forehead in a 3rd and 4th face presentation, and of the sacrum in a 1st and 2nd breech presentation.

On the outer surface of each half of the innominate bone, where the ischium, ilium and os pubis join, is a hollow termed the *acetabulum*, which forms a socket for the hip-joint and in which the head of the femur rests.

### THE SACRUM

The sacrum consists of the 5 sacral vertebrae fused together. It forms the back of the true pelvis and is triangular. On its anterior surface are foramina, and nerves pass out through these from the spinal cord to form the *sacral plexus* (from which the nerves to the lower limbs originate) together with arteries, and veins pass in. Cramp in the legs, of which patients at times complain during the 2nd stage of labour, may be due to the head of the child pressing against these nerves as it passes through the pelvis. The curve on its anterior surface is termed the hollow of the sacrum. Between the 5th lumbar vertebra and the 1st sacral vertebra, where the upper surface of the sacrum is in contact with the lower surface of the intervertebral disc, an angle is formed, the projecting portion of bone being termed the *promontory of the sacrum*. If this angle is more marked than usual the entrance to the true pelvis is narrowed. The promontory of the sacrum is, therefore, the most important landmark of the pelvis. This narrowing is generally due to a softening of the bones of the pelvis during childhood, causing a *flattened pelvis*, which is the commonest variety of contracted pelvis.

## THE COCCYX

The coccyx consists of the 4 coccygeal vertebræ fused together.

## THE PELVIS FROM AN OBSTETRICAL POINT OF VIEW

The obstetric pelvis consists of two parts, the false pelvis and the true pelvis, divided by the brim of the pelvis.

The *false* pelvis is that portion above the brim; it helps to support the intestines in a woman who is not pregnant, and the enlarged uterus in a woman who is. Although the false pelvis does not take any part in the mechanism of labour, it is yet of some importance in diagnosis, since the size and shape of the true pelvis can, up to a point, be estimated by measuring the length between the spine of the 5th lumbar vertebra and the front of the symphysis pubis, and also that between the 2 anterior superior spines and between the 2 posterior superior spines.

The *true* pelvis, which includes the brim and the portion below it, consists of the brim or inlet, the cavity, and the outlet. The **brim**, which is heart-shaped, is its most important part since, in a normal-shaped pelvis, if the head of the child can pass through the brim it can usually pass through the outlet. In a *male-shaped* pelvis, however, although the head can pass through the brim it may be unable to pass through the outlet. The brim is formed in front by the upper margin of the pubic bones, at the sides by the *ileo-pectineal line* (the rounded ridge on the inner surface of the innominate bones at the junction of the ilium and ischium) and behind by the anterior and upper margin of the sacral promontory.

The smallest antero-posterior diameter of the pelvis is at the brim and is termed the *true conjugate*, which is the distance between the centre of the promontory of the sacrum and the nearest point on the posterior surface of the symphysis pubis; it measures roughly 4 inches. The head of the child should, in normal circumstances, have sunk into the brim of a primigravida by the 36th week, and it is important to ascertain at the antenatal examination whether this is so or, if not, whether the head can be pushed in from above. This sinking is termed the *engagement* of the head. Failure to engage may be due to:

1. Too large a diameter of the head presenting at the brim, as in a 3rd or 4th vertex with deficient flexion, or a brow.

2. Multiparity, with pendulous abdomen, so that the uterus falls forwards. The uterine force is not, therefore, acting in the axis of the brim of the pelvis.
3. Too great an amount of liquor amnii, as in hydramnios and some twin pregnancies.
4. Too small a pelvis.
5. Too large a head, as in post-maturity or hydrocephalus.

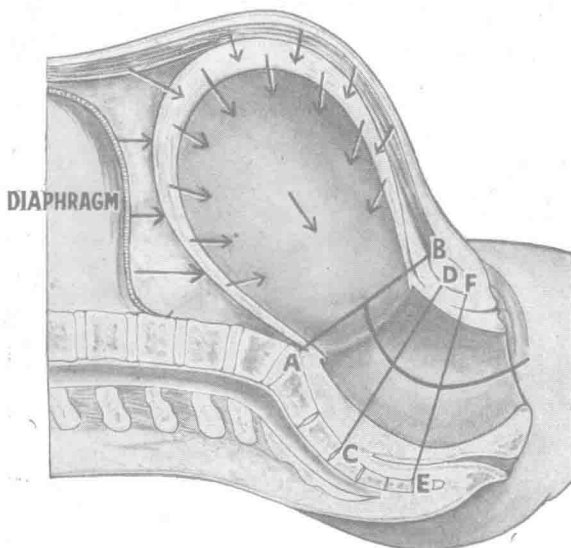


FIG. 3.—Diagram showing the axis of the genital canal, and the direction of the direct uterine force.

AB, Plane of the brim of the pelvis.

CD, Plane of the cavity of the pelvis.

EF, Plane of the outlet of the pelvis.

The curved black line joining the mid-points of the planes is termed the axis of the pelvis.

Note the auxiliary forces exerted by the abdominal wall and diaphragm.

6. Exclusion of the head from the pelvic cavity by the head or breech of a twin, by placenta prævia, or by an ovarian or fibroid tumour.

It is obvious, therefore, that if a midwife finds that the head of the child has not engaged in the pelvis by the 36th week or cannot be made to engage—in other words, when it is floating above the Brim of the pelvis—she must refer her patient to an antenatal

clinic or private doctor. In a multipara, although the head of the child does not often engage till the 2nd stage of labour, it is important to ascertain whether or not it can be pushed into the brim. Since children tend to be larger in successive pregnancies until the mother has reached the age of 36, a patient who has given birth normally to a baby weighing, say, under 7 pounds, may have considerable difficulty in expelling one weighing a pound or two more.

The **cavity** is that portion of the pelvis between the inlet and outlet. It is more or less round, and is formed in front by the pubic bones, behind by the anterior surface of the sacrum, and at the sides by the inner surfaces of the ischial bones and the great sacro-sciatic ligaments.

The **outlet** is lozenge-shaped and is formed in front by the lower margins of the ischia and pubes converging to the lower surface of the symphysis pubis; at the sides by the tuberosities of the ischia; and behind by the tip of the sacrum, coccyx and sacro-sciatic ligaments.

#### INCLINED PLANES OF THE PELVIS

There are 5 inclined planes in the pelvis, 1 soft and 4 hard.

*Soft Inclined Plane.*—This is formed by the floor of the pelvis. It is this inclined plane which, in a pelvis of normal proportions, causes that part of the child which first touches it during the progress of labour to rotate forwards (page 176).

*Hard Inclined Planes.*—These planes are formed by the inner surfaces of the ischia. There is an anterior and a posterior plane on each side, divided by a ridge on the inner surface which stretches between the ilio-pectineal eminence and the spine of the ischium. They are not of any importance in normal midwifery, but take some part in the rotation of the head if it fits the pelvis tightly.

#### AXIS OF THE GENITAL CANAL

The genital canal, from the brim of the pelvis to its outlet, can be divided into any number of imaginary planes (flat surfaces). So far as the pelvis is concerned, 3 planes are always chosen, and can be represented by sheets of paper: one sheet fitted into the brim of the pelvis; a second sheet into the cavity of the pelvis

at the junction of the 2nd and 3rd sacral vertebræ, and a third sheet at the outlet of the pelvis. A line drawn through the centre of and perpendicular to these 3 planes, indicates the *axis* of the pelvis, which is that part traversed by the centre of the head of the child as it passes through the pelvis. Since the planes face in different directions, it is obvious that a line passing through the centre of each will be curved, from above downwards and backwards and then forwards.

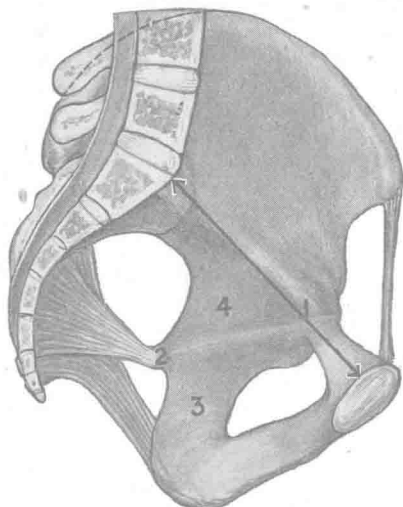


FIG. 4.—Section of pelvis, showing inclined bony planes.

1, Ilio-pectineal eminence; 2, Spine of the ischium. The ridge of bone joining 1 and 2 divides the side of the true pelvis into: 3, the anterior inclined plane, and 4, the posterior inclined plane. The dark line shows the antero-posterior diameter at the brim.

When a woman is standing erect, the plane at the brim of the pelvis is directed forwards so that it makes with the horizon an angle of  $60^{\circ}$ . When, during labour, the uterus contracts, its long axis corresponds with the axis of the brim; thus the head of the child is pressed into the best position to enter the pelvis. When the uterus is directed abnormally forwards (pendulous abdomen), the two axes do not correspond and so the head of the child floats above the brim.

## JOINTS

The 4 bones of the pelvis are attached to each other by the following joints :

The **sacro-iliac** joint is situated on each side between the sacrum and the ilium (Fig. 1). This joint is mentioned in describing the position of the occiput in a 3rd and 4th vertex presentation, a 1st and 2nd face presentation, and a 3rd and 4th breech presentation.

The **pubic** joint, or the **symphysis pubis**, lies between the upper and anterior portions of the pubic bones (Fig. 1).

The **sacro-coccygeal** joint lies between the sacrum and coccyx (Fig. 1).

During pregnancy these joints become somewhat softened and thus allow slight movement. Thus, the movement of the sacro-iliac joints tilts back the promontory of the sacrum when the woman is standing up, so increasing the size of the inlet, and likewise tilts the lower end of the sacrum when the woman is lying down with her thighs flexed, thus enlarging the outlet. In the Walcher position the rotation of the upper part of the sacrum backwards is obtained to its extreme limit. In this position the woman lies on her back across the bed or table, with her buttocks projecting over the edge and her feet hanging free just off the floor ; it is used when delivering, with or without the forceps, a patient whose pelvis is slightly contracted. The movement of the sacro-iliac joint produced by the pressure of the head of the child as it is being born allows an increase of half an inch in the antero-posterior diameter of the outlet. Very rarely, towards the end of pregnancy, the movement in these joints is more marked, causing pain and difficulty in walking, and making necessary a tight bandage round the hips. This disability may remain for some time after the birth of the child. There is but little movement in the symphysis pubis.

## LIGAMENTS OF THE PELVIS

The bones involved in the joints are bound together by ligaments which become softened during pregnancy ; this allows the head of the child a little more room at the inlet and outlet of the pelvis during birth.

The **sacro-tuberous ligaments** stretch from the sacrum and coccyx to the ischial tuberosities.

The **sacro-spinous ligaments** stretch across the pelvic surface of the sacro-tuberous ligaments from the sacrum and coccyx to the ischial spines.

The **interpubic ligaments**, one in front and one behind, unite the 2 pubic bones at the symphysis pubis.

### SIZE OF THE PELVIS

#### External Measurements of the False Pelvis

These measurements are taken with a pelvimeter.

*The Anterior Interspinous.*—Between the outer edges of the two anterior-superior spines of the ilium, which should measure 10 inches.

*The Intercristal.*—Between the points farthest apart of the outer edge on the two iliac crests, the points of the pelvimeter being moved backwards and forwards until the greatest separation is obtained. This should measure 11 inches.

*The External Conjugate.*—From the top of the symphysis pubis to a depression immediately below the spine of the 5th lumbar vertebra; the average measurement is  $7\frac{3}{4}$  inches. This measurement is of clinical use only if it is obviously smaller than normal.

In fat women it is often impossible to determine the position of the tip of the spine of the 5th lumbar vertebra. It can be identified as follows: Mark with an indelible pencil, or ink, the 2 posterior-superior spines of the ilium. Draw a line between these marks;  $1\frac{1}{2}$  inches above the middle of that line will be the position of the tip of the spine of the 5th lumbar vertebra.

In many women a dimple will indicate the posterior-superior spine.

These measurements of the false pelvis are only useful as an indication of the shape of the true pelvis. They do not give any indication of the length of the diameters of the true pelvis.

If the first three diameters mentioned are smaller than normal but the differences between them remain the same, the pelvis is probably *generally contracted*. If the diameters are normal in size or a little larger, and yet the difference between the interspinous and intercrystal diameters is less than normal, the pelvis is probably *flattened*. If the diameters are smaller and the difference between them less than normal, the pelvis is probably *generally contracted and flattened*.

The midwife must record these measurements on the form