



# A SHORT TEXTBOOK OF MIDWIFERY

BY

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## PREFACE TO THE FOURTH EDITION

IN the practice of medicine it is but seldom that a revolutionary discovery forces a sudden radical change of view upon those who practise it, and in the daily routine of midwifery we are apt to think that we have been doing the same thing or adopting the same attitude for many years without change. In fact, our outlook on most subjects is changing slowly and imperceptibly all the time. It is only when an opportunity arises of comparing our present-day habits with our recorded habits of a few years ago, that the results of the gradual change are noticeable. Sometimes, what was a tentative suggestion becomes a firm assertion: sometimes, a former dogmatic belief has to be discarded as completely untenable. Altogether these minor changes add up to quite considerable differences, and in the new edition of this text-book they form the bulk of the work of revision.

There have, however, been some outstanding new discoveries which found no place at all in previous editions. The use of penicillin in puerperal infections, and the recognition of rhesus incompatibility as a cause of foetal and neo-natal disease are two examples. The new light that has been thrown upon the ætiology of hydrops foetalis and icterus gravis neonatorum is an example of a complete change in outlook in one small corner of midwifery. This enlightenment has ushered in a new phase in organised maternity work, in which obstetricians have generally realised that the special care and study of the new-born baby is the proper field of the pediatrician. It is necessary for the understanding of one another's problems (and for the joint problems that are presented by the foetus while still *in utero*) that the obstetrician should have a working acquaintance with the specialised studies of the pediatrician, just as the pediatrician must know broadly the principles of midwifery: but the causes which underlie infant mortality and morbidity cover a field too large and too specialised any longer to be left to the spare time of the obstetrician. No obstetrician likes to give into other hands the baby he has delivered, but now that

he knows those other hands are better equipped than his own to receive it, he welcomes the change knowing that it must surely lead to new knowledge and to better medicine.

In the work of revision of this edition I have again to thank Mr. J. Rivers of Messrs. J. and A. Churchill for the help to which I have grown so accustomed. It has been none the less welcome and refreshing because it has become habitual.

G. F. GIBBERD.

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## PREFACE TO THE FIRST EDITION

MIDWIFERY is remarkable for the variety of the interests which it offers to different types of mind. The functions of the uterine muscle, to the physiologist; the conformation of the pelvis, to the anatomist; the "toxæmias of pregnancy," to the pathologist; the opportunities for nice judgment, to the clinician; the contemplation of that most nearly perfect of all surgical instruments—the long curved forceps of Smellie, to the craftsman: these are but a few examples of the interests that midwifery affords to those who study and practise it, and even in a short textbook I have not felt bound to confine the pages entirely to matters of essentially practical importance. It is better that a book should from time to time stimulate the natural interests of the reader, than that it should provide him with a complete set of facts. I have assumed that the reader of this book has a working knowledge of general anatomy and physiology, and an acquaintance with the principles of pathology and clinical methods, and I have tried to show how this general knowledge has to be expanded and applied in the special branch of medicine, called midwifery. In a book of this size it is impossible to review conflicting opinions on many controversial matters, and I regret the omission of many references to the work and opinions of other obstetricians; but this is a matter that the reader can easily remedy for himself. If I have shown him the parts of midwifery

in which his interests naturally lie, he will have no difficulty in following these interests further from other more ambitious books or special works.

Unlike most other branches of medicine, midwifery is largely concerned with normal healthy patients, and in the majority of such women pregnancy and parturition run an entirely normal course. It is necessary to state this obvious fact because four-fifths of this book is concerned with the unlikely (*i.e.*, abnormal) results that sometimes complicate the child-bearing process. The incidence of abnormalities has been calculated wherever practicable from the figures relating to "Class A" patients at Guy's Hospital. This group of women includes all the patients domiciled in a small compact district and delivered by the hospital service, whether in their own homes or in the hospital wards and whether or not they attended an ante-natal clinic; it forms therefore a very near approach to an average sample of the general population.

I am very grateful to those of my friends who have allowed me to make use of their illustrations which I have acknowledged in the text. To Dr. R. M. Fry of Queen Charlotte's Research Laboratories, I am particularly indebted for his kindness in allowing me to select from his collection of photographs all the illustrations of the morbid anatomy of puerperal infections. Mr. W. Thornton Shiells and Miss B. E. Nicholson have been responsible for all the drawings and diagrams in the book, and I take this opportunity of thanking them for the care they have taken to illustrate the points I have wished to emphasise. Their special experience and skill have been the greatest help. For permission to reproduce photographs illustrating the specimens in the Gordon Museum, Guy's Hospital, I have to thank the Curator, Mr. R. Davies-Colley. The illustrations of instruments are reproduced by kind permission of Messrs. Down Bros. Ltd., and those of the anæsthetic apparatus by the kindness of Messrs. A. Charles King Ltd.

Mr. J. Rivers, of Messrs. J. and A. Churchill Ltd., has compiled the index, but in addition to this work, I have had reason to appreciate the help and advice that he has so willingly given me at every stage in the production of this book. For this help, and for the generous freedom from restrictions that the publishers have allowed me, I am most grateful.

G. F. GIBBERD.

# CONTENTS

CHAPTER	PAGE
I. The Anatomy of the Pelvis and its Contents . . . . .	1
II. The Development of the Ovum . . . . .	18
III. The Anatomy and Physiology of Pregnancy . . . . .	44
IV. The Diagnosis of Pregnancy . . . . .	52
V. The Management of Normal Pregnancy . . . . .	62
VI. The Anatomy and Physiology of Normal Labour . . . . .	73
VII. Clinical Course and Management of Normal Labour . . . . .	98
VIII. Occipito-posterior Positions of the Vertex . . . . .	128
IX. Multiple Pregnancy . . . . .	141
X. Ectopic Pregnancy . . . . .	144
XI. Pregnancy complicated by Pelvic Abnormalities . . . . .	154
XII. Diseases of the Ovum in the Early Months of Pregnancy . . . . .	168
XIII. Diseases of the Ovum in the Later Months of Pregnancy . . . . .	191
XIV. The Toxæmias of Pregnancy . . . . .	205
XV. Diseases associated with Pregnancy . . . . .	246
XVI. Malpresentations . . . . .	265
XVII. Presentation and Prolapse of the Cord . . . . .	296
XVIII. Contracted Pelvis . . . . .	301
XIX. Abnormalities in Uterine Action during Labour . . . . .	326
XX. Abnormalities in the Birth-Canal during Labour . . . . .	349
XXI. Ante-Partum Hæmorrhage . . . . .	366
XXII. Abnormalities in the Third Stage of Labour . . . . .	387
XXIII. The Normal Puerperium . . . . .	399
XXIV. Puerperal Infections . . . . .	411
XXV. The Abnormal Puerperium . . . . .	458
XXVI. Obstetric Operations . . . . .	464
XXVII. The Normal Infant . . . . .	497
XXVIII. The Premature Infant . . . . .	505
XXIX. The Abnormal Infant . . . . .	509
Index . . . . .	546

# A SHORT TEXTBOOK OF MIDWIFERY

## CHAPTER I

### THE ANATOMY OF THE PELVIS AND ITS CONTENTS

#### THE BONY PELVIS

FROM the obstetrical standpoint it is useful to consider the bony pelvis as a whole rather than to describe separately the sacrum and the two innominate bones which take part in its formation. Together these massive bones form the pelvic girdle, which transmits the weight of the whole trunk through the spine to the lower limbs; but in the female the pelvic cavity which they bound has to be large enough to allow of the passage of the foetus during labour, and it is this cavity which is of the greatest interest to the obstetrician. It is convenient to divide the pelvis into a *false* pelvis above, which is formed by the splayed-out iliac portions of the innominate bones, and a *true* pelvis below, which is bounded behind by the sacrum, laterally by the ischium, and in front by the body of the pubis and its horizontal and descending rami. The junction of the true with the false pelvis is marked by an edge of bone running from the spine of the pubis in front, *viâ* the ilio-pectineal line, to the upper anterior border of the sacral ala and promontory behind; and this edge of bone forms the entrance, or brim, of the true pelvis (Fig. 1).

#### The True Pelvis

**The Brim.** In the erect position the brim of the pelvis is inclined so that it makes an angle of about  $60^{\circ}$  with the horizontal (Fig. 2).

It is customary to describe the brim of the normal pelvis as conforming more or less to a definite shape, *i.e.*, slightly oval with its shortest diameter in an antero-posterior direction.

## 2 ANATOMY OF PELVIS AND ITS CONTENTS

Although this may represent the average normal, it must be realised that there are very wide variations both in size and shape of the brim of the pelvis in different healthy women, quite apart from gross differences in shape which may result from disease. These variations are considered in more detail in Chapter XVIII.

In the brim of the average pelvis the antero-posterior diameter is the smallest, and measures  $4\frac{1}{4}$  inches (11 cms.), and it is usually spoken of as the true conjugate. The transverse diameter of the brim measures  $5\frac{1}{4}$  inches (13 cms.), and the



FIG. 1. The normal pelvis seen from above.

oblique diameters  $4\frac{3}{4}$  inches (12 cms.). The oblique diameters are measured from the sacro-iliac joint to the opposite ilio-pectineal eminence, and are named right and left according to the sacro-iliac joint from which they are measured. Thus, the right oblique diameter runs from the right sacro-iliac joint to the left ilio-pectineal eminence.

**The Cavity.** A line passing from the middle of the body of the pubis to the third piece of the sacrum lies in the plane of the mid-cavity of the pelvis (Fig. 2), and in this situation the pelvis is more or less circular in plan so that its antero-posterior, oblique, and transverse diameters tend to

approximate to one another. They measure about  $4\frac{3}{4}$  inches (12 cms.).

**The Outlet.** Although the extremity of the posterior wall of the bony pelvis is formed by the coccyx, the existence of this bone is usually ignored when measurements are considered, because it is sufficiently mobile not to encroach upon the antero-posterior diameter of the outlet during labour. For this reason the outlet is taken as extending from the lower border of the symphysis pubis to the last piece of the sacrum (Fig. 2), and this antero-posterior diameter measures  $5\frac{1}{4}$  inches (13 cms.). The transverse diameter of the outlet—the distance between the inner borders of the ischial tuberosities—is  $4\frac{1}{4}$  inches (11 cms.). When viewed from below the outlet of the pelvis therefore appears to be oval in shape with its long diameter lying antero-posteriorly (Fig. 3), in contrast to the brim of the pelvis where the long diameter lies transversely.

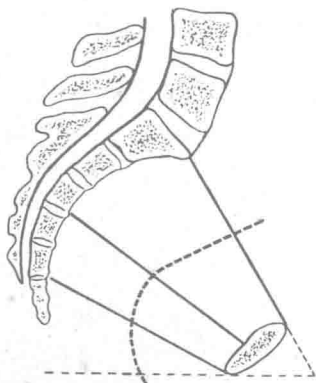


FIG. 2. Diagram of the pelvis, showing the inclination of the brim, the cavity, and the outlet, to the horizontal.

The pelvic axis is indicated by the curved dotted line.

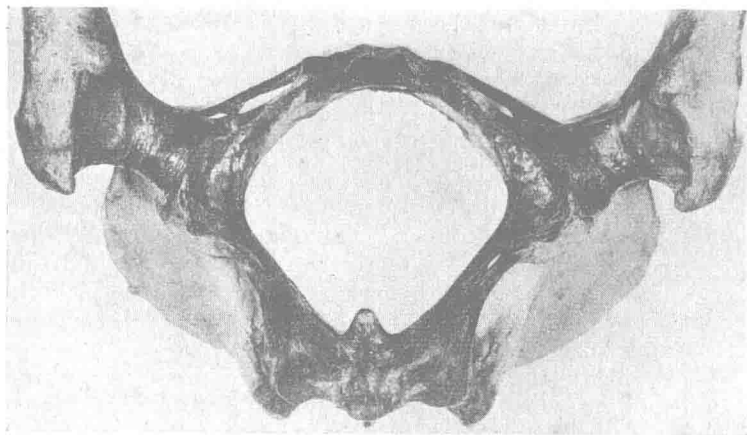


FIG. 3. The pelvic outlet, seen from below. The postero-lateral boundaries are formed by the sacro-sciatic ligaments.

#### 4 ANATOMY OF PELVIS AND ITS CONTENTS

Although the outlet of the bony pelvis is often measured, and spoken of, as if it were a plane, it is really a canal whose greatest depth at the sides may be  $1\frac{1}{2}$  inches, and for this reason the antero-posterior and transverse measurements of the outlet may give an entirely wrong impression of the available room in this part of the pelvis.

Fig. 4 shows how the ischium extends below the "plane of the outlet" for a variable distance on either side, so that while the outlet has no depth in front or behind, it consists laterally of a rigid canal an inch or more deep. The exact



FIG. 4. Diagram of pelvis, showing that a considerable part of the ischium extends below the so-called "plane of the outlet."

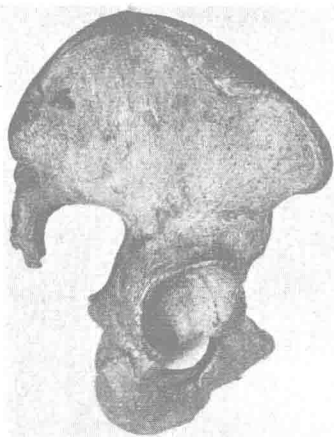
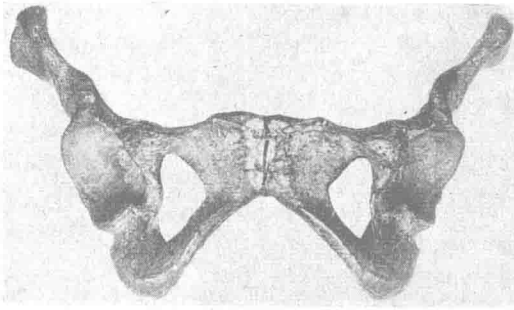


FIG. 5. Side view of the pelvis, showing an average-shaped sacro-sciatic notch. (Gordon Museum, Guy's Hospital.)

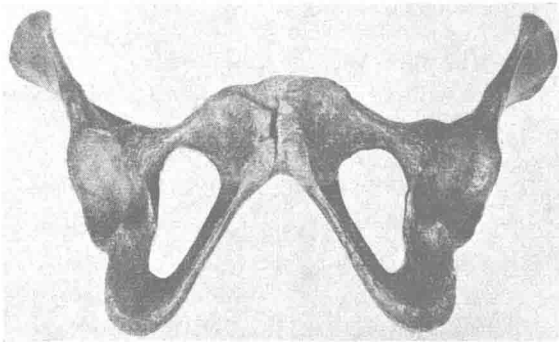
depth depends upon the vertical distance between the tuber ischii and the ilio-pectineal line. The antero-posterior diameter of the outlet depends, amongst other things, upon the size and shape of the sacro-sciatic notch. A high and narrow notch will give rise to a relatively short antero-posterior diameter, while a low-arched wide notch will be associated with a long antero-posterior diameter (Fig. 5).

The shape of the pubic arch is also of great importance in determining whether or not the outlet is adequate for the passage of the foetus. In the most roomy type of female pelvis the sub-pubic angle is not less than  $90^\circ$ , and the descending rami are short (Fig. 6, *a*). In this way a wide pubic arch

is formed allowing the foetal head to approach close to the symphysis, so that almost the whole of the antero-posterior diameter of the outlet is available for the accommodation of the head. In less favourable types of pelvis (approaching the male type), the sub-pubic angle is less than  $90^\circ$ , and the descending pubic rami are long (Fig. 6, *b*). This results in a



(*a*)



(*b*)

FIG. 6. Variations in the shape of the pubic arch. (*a*) A wide pubic arch. (*b*) A narrow pubic arch. (Gordon Museum, Guy's Hospital.)

narrow pubic arch so that a considerable amount of the antero-posterior diameter of the pelvic outlet is not available for the accommodation of the foetal head.

Just as there are wide variations amongst normal women in the shape of the brim of the pelvis, so also are there differences in the shape and size of the outlet. It has been shown that the shape and size of the outlet depend largely upon (*a*) the

depth of the true pelvis, (b) the configuration of the sacro-sciatic notch, and (c) the type of the pubic arch ; and as all of these three factors are variables, it will be clear that many varieties of outlet may be encountered in normal women. Simple antero-posterior and transverse measurements of the outlet give but a very incomplete picture of the anatomical conditions. In the majority of women, however, the outlet is slightly more roomy than the brim, so that if the brim of the pelvis will allow the passage of the foetal head, there will not, as a rule, be any difficulty in its passage through the cavity and outlet. Although this is generally the case, we do sometimes find a pelvis in which the outlet is smaller than the brim, a variation which will be considered in Chapter XVIII.

### **The False Pelvis**

The false pelvis is formed by the iliac portions of the innominate bones, and is limited above by the iliac crests. These crests are easily palpable in life, and in their widest part they measure 11 inches (27·5 cms.) (inter-cristal diameter). The distance between the two anterior superior iliac spines (interspinous) measures about 10 inches (25 cms.). The distance between the spine of the fifth lumbar vertebra (which is situated in the mid-line of the back about  $1\frac{1}{2}$  inches above the level of the dimples which lie over the posterior superior iliac spines) and the top of the anterior aspect of the symphysis pubis, averages about  $7\frac{3}{4}$  inches (20 cms.), and is known as the external conjugate diameter.

### **Pelvic Axis**

The brim of the bony pelvis is inclined forwards so that it makes an angle of about  $60^\circ$  with the horizontal when the patient is erect, and a line drawn perpendicular to the middle of this plane marks the direction of the axis of the brim. In the same way a mid-perpendicular to the plane of the cavity or outlet indicates the axes of these planes. If these perpendiculars are joined into a curve, the axis of the pelvis is obtained and it will mark the course taken by the foetal head in its passage through the pelvis (Fig. 2). There is considerable variation from the average ( $60^\circ$ ) inclination which the brim of the pelvis makes with the horizontal. In some women it is much more steeply inclined ( $75^\circ$ ) ; in others, less ( $50^\circ$ ) : but it is the relation of the inclination of the brim to the axis of the uterus (rather than to the horizontal plane) which is important from the point of view of the mechanics of labour.

Under ideal mechanical conditions the axis of the uterus at term will coincide with the axis of the brim of the pelvis, so that the force of the uterine contractions will be expended in the right direction for forcing the foetus through the brim of the pelvis. The coincidence of the axis of the uterus with that of the pelvic brim will depend on two factors—firstly the inclination of the brim to the horizontal, and secondly the inclination of the uterine axis to the horizontal. In a multi-gravida with a lax abdominal wall and an average ( $60^{\circ}$ ) inclination of the pelvis, the foetal head may fail to engage in the pelvis at the end of pregnancy because the uterine axis falls in front of the axis of the pelvic brim. On the other hand, in a primigravida with a strong abdominal wall, and an unusually steeply inclined pelvis ( $75^{\circ}$ ), the head may fail to engage because the uterine axis lies behind that of the brim. It is important to realise the part played by the inclination of the pelvic brim in relation to the uterine axis in determining the engagement of the foetal head towards the end of pregnancy, not because variations in inclination are likely to be a serious obstacle to engagement once labour begins, but because, by hindering the engagement of the head, they may give rise to a false impression that the foetus is disproportionately big for the pelvis when a prognosis of the labour is being made during the last weeks of pregnancy.

### The Pelvic Joints

The innominate bones are joined together in front by the symphysis pubis, which allows a slight amount of movement to take place between the opposed surfaces, although there is no synovial cavity. Posteriorly the sacro-iliac joints are provided with synovial cavities, and here a considerable amount of movement is possible. During pregnancy the ligaments around the pelvic joints become softened so that there is increased mobility. In the sacro-iliac joints a movement of  $15^{\circ}$  of rotation is possible, and this tends to increase the antero-posterior diameter of the pelvic brim during labour. At the symphysis, separation between the bodies of the pubic bones may occur, and may amount to as much as one inch: at the same time there is a tendency to absorption of bone in the region of the symphysis. These changes, which occur to a variable degree in every pregnancy, may be associated with so much mobility at the symphysis pubis that the movement can be demonstrated clinically. In certain pathological cases (described by James Young as pelvic osteo-arthritis) the

joint changes may be associated with severe pain on movement so that the patient can walk, or even turn in bed, only with the greatest difficulty. It is remarkable, however, that the symptoms bear no constant relationship to the degree of demonstrable joint changes, and a very wide separation of the symphysis with greatly increased mobility is not necessarily associated with any pain or other disability.

### THE PELVIC MUSCLES AND FASCIA

In life, the pelvic cavity is encroached upon slightly at the sides by the obturator internus muscles which cover the obturator foramina, and the muscles are covered by the

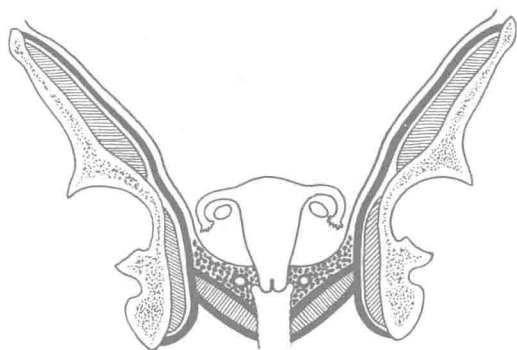


FIG. 7. Diagram illustrating the arrangement of the pelvic and anal fascia, and of the pelvic cellular tissue.

obturator fascia which becomes continuous with the fascia covering the psoas and iliacus muscles, as it passes upwards over the ilio-pectineal line. Running backwards from the body of the pubis towards the spine of the ischium is a thickened band in the obturator fascia known as the white line, and this gives origin to part of the large sheet of muscle (levator ani) which forms the pelvic floor. The levator ani is covered above and below by well-defined layers of fascia springing from the white line, and known as the pelvic fascia and anal fascia respectively.

The peritoneal cavity does not extend as low as the upper surface of the levator ani, so that between the floor of the peritoneal sac and the levator ani, the pelvic cellular tissue fills in all the available space between the rectum, the vagina, and the bladder, before these canals pass through the cleft