

TEXTBOOK OF OBSTETRICS

BY

JOHN F. CUNNINGHAM

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"The amount of information given is sufficient for any qualifying examination and the practical procedures are exceedingly well illustrated and described."

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THIRD EDITION



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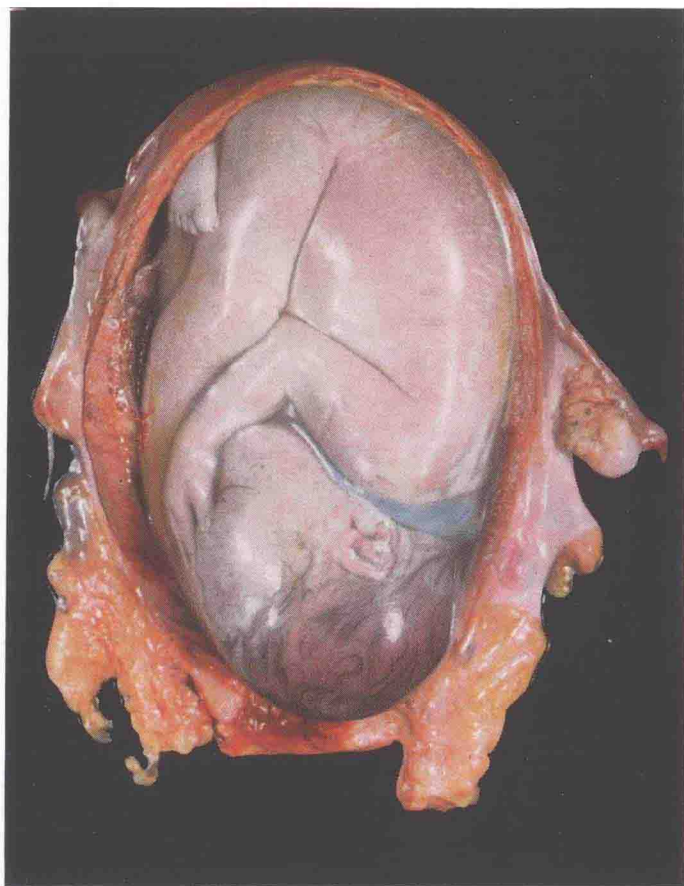
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TEXTBOOK OF OBSTETRICS



Uterus with foetus at 33rd week. The anterior wall of the uterus has been removed to show the intact amnion and the foetus *in situ*. The mother had died suddenly from cardiac disease.

(Courtesy of W. L. Brosius, M.D., Harper Hospital, Detroit; and Messrs. Eastman Kodak Ltd., Rochester, New York.)

[Frontispiece

TO

THE NATIONAL MATERNITY HOSPITAL, MY ASSISTANTS AND STAFF.

PREFACE TO THIRD EDITION

THIS edition has been completely revised and pruned and new work has been added. I am indebted again to Dr. C. J. Coyle for his valuable assistance and helpful suggestions in this revision.

There are many minor additions and rearrangements throughout the text, especially in the section on the Pathology of Pregnancy. The management of the cardiac patient in pregnancy has been rewritten and I am grateful to Dr. Philip Brennan for his co-operation and advice. Dr. F. Geoghegan has compiled and rearranged the text dealing with hæmolytic disease, and his extensive experience of this condition makes his contribution of great value.

In this era of analyses and statistics, I think it is important that the attention of the student be directed during his curriculum to this aspect of medicine. I have accordingly added an Appendix on statistical matters relating to marriage rates, birth rates, maternal and infantile mortality rates, etc., which should be both instructive and interesting. I am indebted to Professor Thomas Murphy and his staff from the Department of Social Medicine at University College, Dublin, for the compilation of these tables.

My secretary, Miss Maureen Cole, has been most helpful and co-operative. To Mr. J. Johnston Abraham and Mr. Owen R. Evans, of Messrs. William Heinemann Medical Books Limited, I am again grateful for their patience, kindness and help.

JOHN F. CUNNINGHAM.

FITZWILLIAM SQUARE,
DUBLIN.
November, 1957.

PREFACE TO FIRST EDITION

AT the end of my term of more than ten years as Master of the National Maternity Hospital, Dublin, some of my assistants requested me to publish my lecture notes. I explained that these were mainly headings and that to enlarge on them would be no easier than to write a book. I was thereupon urged to write a book and, in a rash moment, I uttered those fatal words : "I will." I have tried to keep my promise. Any temptations which I may have had to withdraw, were promptly dispelled when, a short time later, I was appointed to the Chair of Obstetrics and Gynæcology at University College, Dublin, which College embodies the largest Medical School in Ireland.

This work on Obstetrics is, therefore, intended primarily for students. Within its pages I have endeavoured to include all that a student should know of the subject, not only for his final examination but for his subsequent practice. The subject-matter is descriptive mainly of the methods employed during my Mastership, with certain modifications made necessary by recent advances in knowledge. The methods described and practised are in accordance with the Ethical Standards of the Roman Catholic Church, and it is hoped they may be helpful to doctors of any denomination who are unacquainted with these standards.

I am indebted to Mr. J. V. O'Sullivan for his help and advice with some of the earlier chapters. My former assistants at the National Maternity, Doctors A. P. Barry, J. G. Gallagher, E. de Valera, C. F. Coyle, and my late assistant at St. Vincent's, Doctor J. K. Feeney, were of very great help in reading the proofs and in offering many valuable suggestions.

Most of the illustrations have been drawn by my former student, Dr. T. MacDonald, and a few by my colleague, Dr. O. J. Murphy. Many are original and many have been reproduced from various well-known authors such as Eden and Holland, De Lee-Greenhill, Ten Teachers, Beck and others. I am grateful to Sir Eardley L. Holland, Dr. Ninian Falkiner and to J. & A. Churchill Ltd. for permission to reproduce two excellent plates. Professor John McGrath has supplied the photomicrographs and has been helpful in many ways. The X-ray negatives were kindly provided by Dr. S. J. Boland, who also contributed the description of his method of X-ray pelvimetry. Many other acknowledgments have been made throughout the text. I hope none has been omitted. Messrs. Fannin and Co. of Dublin kindly lent the blocks for the illustrations of instruments.

To my wife I am indebted for her help and encouragement in this as in so many other undertakings. Without her this work would not have been possible.

To my late secretary, Miss Edna Bray, and to my present secretary, Miss Valerie Wray, I am grateful for their patience and hard work.

It has been a very great pleasure to have the help and co-operation of Mr. J. Johnston Abraham and Mr. Owen R. Evans of William Heinemann Medical Books Ltd.

JOHN F. CUNNINGHAM.

FITZWILLIAM SQUARE,
DUBLIN.
August, 1950.

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Section I

CHAPTER I

THE FEMALE GENITAL ORGANS

THE female genital organs consist of the external genitalia generally termed the vulva, and the internal organs comprising the vagina, the uterus, the fallopian tubes and the ovaries.

The Vulva consists of the visible external genitalia, viz., Mons Veneris, Labia Majora, Labia Minora, Fourchette, Clitoris, Vestibule, External orifice of urethra, Hymen, and the orifices of Bartholin's glands.

The Mons Veneris is the prominence formed over the pubic bones by a fatty pad. It is covered by hair which has a characteristic distribution in the adult woman. The Labia Majora

are two rounded masses of tissue which arise anteriorly in the Mons Veneris, sweep backwards around the vaginal orifice external to the Labia Minora to fade away in the perinæum. They vary in size according to the amount of fat they contain, each Labium Majus has two surfaces—an outer and an inner surface. The outer is covered by skin, often pigmented, and by hairs. The inner surface has a mucous membrane-like appearance in the adult virgin. The Labia Minora are two thin crescentic folds roughly like a cockscomb. They vary greatly in size,

and lie between the Labia Majora. In front they bifurcate to embrace the Clitoris, the lower bifurcation forming the frenulum clitoridis, the upper the preputium. They sweep around the vaginal entrance and fuse posteriorly to form the Fourchette. The clitoris is analogous to the male penis but does not contain the urethra. It is formed of erectile tissue and measures about a $\frac{1}{2}$ inch in length. It is situated in the anterior portion of the vulva. The Vestibule is the triangular area which stretches from the clitoris in front to the vaginal orifice behind, the lateral boundaries are the Labia Minora. The external orifice of the urethra is visible about the middle of the vestibule. Bartholin's glands are two compound racemose glands about the size of a pea, situated one on either side of the vaginal opening at about the junction of the middle and posterior thirds of the labia majora. The ducts from the glands are $\frac{3}{4}$ inch in length and open upon the sides of the lateral margins of

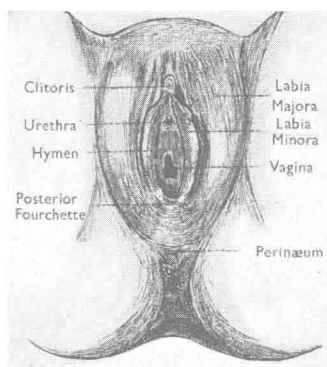


FIG. 1. The female external genitalia.

the vaginal orifice external to the hymen. The Hymen is a membrane of varying thickness which partially closes the vaginal opening in virgins. The hymneal opening is usually crescentic or annular in shape rarely cribriform or even imperforate. The remnants of the hymen left after childbirth are called the *carunculæ myrtiformes*.

The Obstetrical Perinæum is the part of the anatomical perinæum which lies between the fourchette anteriorly and the anus posteriorly. Its importance lies in its great susceptibility to damage during parturition. It contains the perineal body, a strong wedge of fibrous and muscular tissue situated between and separating the lower part of the vagina from the anal canal. Into it are inserted the perineal muscles and some fibres from the levatores ani.

The Vagina is the musculo-membranous passage which runs from the vulva to the uterus between the bladder and rectum. Its direction

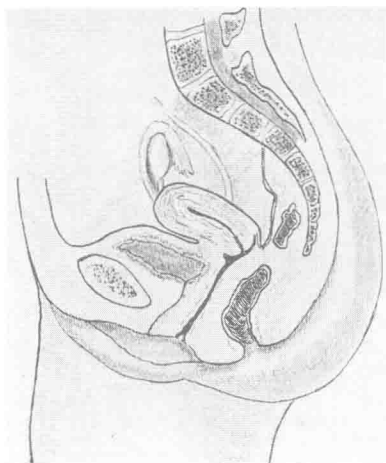


FIG. 2. Sagittal section showing contents of female pelvis.

is upwards and backwards almost parallel to the plane of the brim of the pelvis. The anterior wall is about 3 inches in length. The posterior wall is nearly an inch longer, due to the insertion of the cervix, at nearly a right angle to its long axis, into the upper end of the anterior wall. The posterior wall extends above the cervix and is in close relationship from below upwards to the perineal body and the anal canal, the rectum and the pouch of Douglas. The walls of the vagina are normally in contact, the anterior lying against the posterior. The lateral walls also tend to approach the mid-line, so that on cross-section the appearance is

H-shaped. When distended, the vagina is pyriform in shape, the wide end above being made up of the fornices around the cervix, and the narrow end at the vulva. Posteriorly it is related, from above downwards, to Douglas' pouch, the rectum and the perineal body; anteriorly to the bladder and urethra. The walls are made up of a muscular coat supported by the surrounding projections of the pelvic fascia, and laterally by the levatores ani. The vagina is lined by a squamous epithelium and contains no glands. The secretion is mainly transuded fluid and desquamated epithelium. The reaction is acid, due mainly to the action of Döderlein's bacillus.

The Uterus is the hollow muscular organ in which the fœtus develops. It is about 3 inches in length, $1\frac{3}{4}$ inches at its maximum width and 1 inch in thickness. It is somewhat pear-shaped, with the wider end

uppermost. The wall is $\frac{1}{2}$ inch in thickness, in some parts being slightly less. The top of the uterus is dome-shaped and is called the fundus. The uterus is divided into two main parts, the body and the cervix. The whole organ is anteverted and the body is slightly anteflexed on the cervix, so that when a woman is standing in the erect position the uterus is lying forwards on the bladder, making an angle of about 20 degrees with the horizontal. The uterus is freely movable, and changes its position frequently with the filling and emptying of the bladder.

The cervix protrudes into the vaginal fornix, the anterior lip for about $\frac{1}{2}$ inch, the posterior $\frac{3}{4}$ inch or more. The external opening of the cervix is known as the external os. The cervical canal, which is fusiform in shape, is about 1 inch in length and at the upper end is a tight

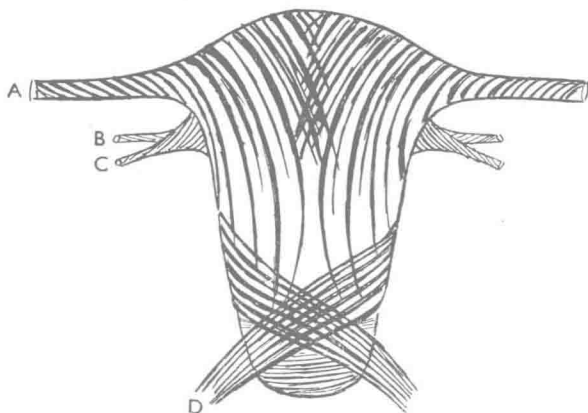


FIG. 3. Outer layer of uterine muscle fibres (diagrammatic). (a) Fallopian tube, (b) Round ligament, (c) Ovarian ligament, (d) Utero-sacral ligament.

sphincter surrounding the internal os, which joins the cervical canal to the uterine cavity. The uterine cavity (potential) is triangular in shape, the base of the triangle being at the fundus; measured from the internal os to the fundus it is $1\frac{1}{2}$ inches long and is capable of holding only a few drops of fluid. The Fallopian tubes enter the cavity at the upper lateral angles or cornua.

The wall of the uterus is composed of unstriped muscle, fibro-elastic tissue, connective tissue, blood vessels, lymphatics, nerves, peritoneum, etc. The muscle itself is generally described as consisting of three layers, an outer thin layer, a middle thick and vascular layer and an inner layer, also thin. These layers can often be observed at a classical Cæsarean section. The outer layer of fibres is mainly longitudinal and is continued into the tubes and ligaments. The fibres of the inner layer have a somewhat similar distribution, but there is greater crossing and interlocking. In the thick middle layer the fibres run in all direc-

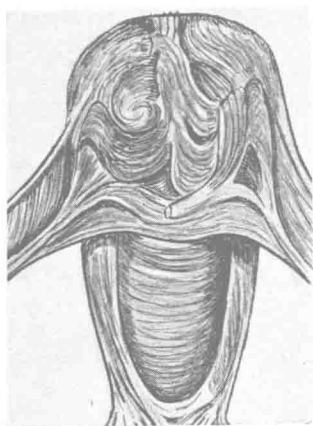


FIG. 4. Middle layer of muscular wall of uterus. (Diagrammatic after Dr. Lee.)

tions, also sending projections into the tubes and ligaments. This meshwork of fibres is completed by bundles running obliquely, binding the three layers together. The result is a very powerful muscular container, capable of withstanding tremendous strain.

In the cervix the fibres are less complicated, running mainly longitudinally and circularly. There are strong circular bundles at both the external and internal os, especially the latter. The musculature at the sides of the cervix is thinner, thus tending to form an anterior and posterior lip. During delivery, lacerations at these weaker sites are common.

The Endometrium is the term applied to the mucous membrane lining the

uterine cavity. It is this membrane alone which undergoes the changes of menstruation. The surface is covered by a single layer of columnar ciliated cells with oval nuclei. Beneath this layer is a stroma of oval cells, less closely packed in the deeper layers and lying directly on the inner wall of the uterus, there being no submucous layer. The glands are simple tubules, sometimes bifurcating in the deeper layers and penetrating down to, and frequently into, the surface muscle layer. They are lined by the same columnar cells and secrete a thin mucus.

The cervix is lined by a high columnar epithelium with deep branching racemose glands, no submucosa is present. There is a longitudinal ridge on both the anterior and posterior walls from which other ridges of membrane run laterally, not unlike the branches of a tree. This is described as the "*arbor vitæ*." The glands of the cervix secrete a thick mucus which acts as a plug in the cervical canal and which, during pregnancy, is known as the *operculum*.

The Fallopian Tubes, or oviducts, run one on each side, from the cornua of the uterus, along the top of the broad ligaments towards the side of the pelvis, to terminate in open fimbriated ends, just above and lateral to the ovaries. Each tube is about 4 inches long and is covered by peritoneum, except on its lower surface which is in contact with the connective tissue of the mesosalpinx. It has two muscle coats, an outer longitudinal and an inner circular layer. It is lined by columnar ciliated epithelium. The epithelium is thrown into folds in the wider parts of the tube, but there are no glands present. The tube consists of three main parts: (1) the interstitial portion; (2) the isthmus; (3) the ampulla. The interstitial is the portion which runs through the uterine wall. It is the narrowest part of the tube. The isthmus runs

outwards from the uterus and also has a narrow lumen, but soon broadens out to form the wider ampulla. The latter terminates in an expansion called the infundibulum, from which opens the abdominal ostium surrounded by the fimbriæ. One of these fimbriæ projects

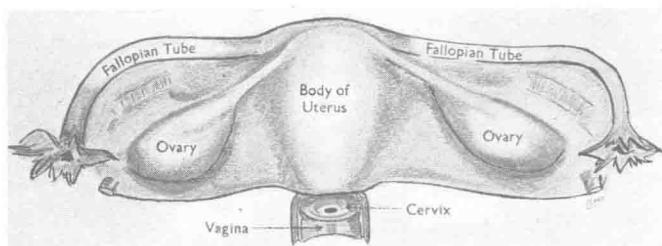


FIG. 5. Posterior aspect of uterus with fallopian tubes and ovaries.

along the mesentery towards the ovary, and is known as the "fimbria ovarica." The fimbriæ contain erectile tissue and are possibly attracted to the ovary at the time of ovulation. Experimentally, small glass beads placed in the pelvic peritoneal cavity, have been passed down through the tubes and uterus and recovered later in the vagina.

The Ovaries. Each ovary is shaped like a large almond, is densely fibrous and is attached to the back of the broad ligament by a mesentery consisting of two layers of peritonæum. It is attached to the uterus by the strong ovarian ligament which arises from the lateral wall of the uterus, a little below and behind the origin of the fallopian tube, and runs to the lower pole of the ovary. The blood supply, lymphatics and nerves are to be found in the mesentery. The portion of the ovary attached to the mesentery is called the *hilum*. The medulla or stroma is composed of fibrous tissue and some unstriated muscle fibres, and carries the blood vessels and lymphatics to the surface. The cortex, or outer layer of the ovary, contains many primordial and Graafian follicles. It is covered by the *tunica albuginea*, which has a dull white appearance, and its surface epithelium called the *Germinal Epithelium*. Throughout the stroma may be seen numbers of small *Graafian Follicles*, some on the surface and some lying deeper. They vary in size and are in varying stages of maturity. Each follicle contains an ovum which will be extruded if, and when, the follicle ripens and ruptures. As a rule only one follicle matures and ruptures at a time.

The blood supply of the uterus must of necessity be very generous to make provision for the enormous changes the organ is obliged to undergo during pregnancy. The arterial supply comes from the uterine, a branch of the hypogastric; the ovarian, which arises from the aorta, and the funicular, a small branch of the vesical which runs in the round ligament. The uterine artery joins the lateral aspect of the uterus about the level of the internal os. It gives off branches

which go downwards to the vagina and cervix. The main artery runs upwards in the broad ligament giving off branches which enter the uterine wall and anastomose with corresponding branches from the opposite side. There is free anastomosis between the terminal branches

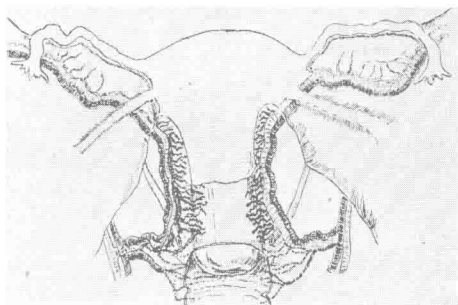


FIG. 6. Blood supply of uterus. Showing origin of uterine vessels from hypogastric; and anastomosis of uterine and ovarian vessels.

of the uterine and ovarian vessels. The branches running through the uterine wall are spiralled and very convoluted. The veins follow the course of the arteries and also anastomose freely. The right ovarian vein empties into the inferior vena cava, the left into the left renal vein, while the uterines enter the hypogastric veins. The uterine veins have no valves.

The Lymphatics of the uterine body drain into the iliac and lumbar glands, those which accompany the round ligament into the upper set of deep inguinal glands. The lymphatics of the cervix and upper vagina drain into the deep pelvic and iliac glands. The lymphatics of the lower third of the vagina and vulva go to the inguinal glands and thence to the glands around the external iliac vessels.

The Nerve Supply to the uterus and parametrium is derived mainly from the autonomic system. There are also branches from the cerebrospinal system. Fibres come from the hypogastric plexus near the bifurcation of the aorta and are made up of branches from the aortic, renal, and mesenteric ganglia. These fibres pass downwards through the hypogastric plexuses to the great cervical ganglion and some to the sides of the uterus. Small branches from the second, third and fourth sacrals are also present.

Sensory nerves also pass to the spinal cord through the great cervical ganglion. Smaller local ganglia and nerve centres are found in the uterine muscle and around the blood vessels.

The Ligaments of the uterus help to keep the organ in position. The main support of the uterus is through the attachment of the pelvic fascia to the cervix and vaginal vault. Certain portions of this fascia are specially thickened and contain muscle fibres derived from the uterus, thus forming a muscle-fascia or ligament.

The *pubocervical* ligaments run from the back of the pubes to the anterior surface of the cervix. They assist in supporting the bladder and act as a stay in steadying the cervix.

The *cardinal* ligaments (lateral pelvic ligaments, Mackenrodt's ligaments) are strong bands of reinforced pelvic fascia stretching from the sides of the cervix and vaginal vault to the side walls of the pelvis. They help in maintaining the uterus in its central position and prevent prolapse. In them run the uterine vessels and lymphatics.

The *uterosacral* ligaments extend from the postero-lateral aspect of the cervix to between the second and third sacral vertebræ. They may be seen, covered by peritonæum, as two ridges stretching on either side of Douglas' pouch.

The *broad* ligaments are made up of the lateral extensions of the folds of peritonæum covering the pelvic organs. They contain within them the blood vessels of the uterus below and the Fallopian tubes above, together with some vestigial structures and connective tissue. They have little effect in supporting the uterus.

The *round* ligaments, one on either side, are thin fibromuscular bands which arise from the anterior wall of the uterus, just below the Fallopian tubes, and pass under the anterior peritoneal layer of the broad ligament, through the inguinal canal, to merge into the tissue of the labia majora. They have no supporting action but may function in limiting the backward movement of the uterus which accompanies distension of the bladder. They also act as guy-ropes to stabilise the uterus during a contraction.