CLINICAL
GYNAECOLOGY

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Preface

Since the plan and scope of this book represent something of a departure from those followed in other textbooks of gynaecology, I feel impelled to state the ideas which furnished the incentive for its preparation, and which dictated its character and scope.

The biological aspects of gynaecology have assumed very great importance, chiefly because of some amazing developments in the fields of reproductive physiology and endocrinology. Many of these advances find daily application in the interpretation and management of functional disorders in women. In other words, female endocrinology is now an integral and important part of gynaecology, and this is reflected in the book.

Diagnosis and treatment have been accentuated throughout. The traditional chapters on anatomy, history-taking and examination have been boiled down to the essentials. On the other hand, most of the other chapters provide comprehensive treatments, in keeping with the plan of covering the combined fields of gynaecology and female endocrinology. The lists of references appended to each chapter are not intended to be exhaustive, preference having been given to recent publications and those thought most worthwhile. Since this book is intended to be useful for postgraduates, a detailed chapter on relevant operative procedures and the epidemiology of gynaecological disorders is included.

The book thus updates the clinical aspects of gynaecology while bringing in relevant points of basic science and maintaining a strong emphasis on pathology. With great difficulty, adjustments have been made to produce a book that covers adequately the ever-expanding field of gynaecology, and yet is of a size that allows it to be a ready reference. All relevant topics are included, so that supplementary volumes will not be required; both undergraduates and postgraduates will, I hope, benefit from its study.

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Acknowledgements

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The female genital organs can be divided into two groups, the external and the internal. The *internal organs* are situated within the lesser pelvis, and are the ovaries, the fallopian tubes, the uterus and the vagina. The *external organs* are below and in front of the pubic arch. They comprise the mons pubis, the labia majora, labia minora, clitoris, vestibule, urethra and the greater vestibular glands.

The external genitalia

'Vulva' is a composite name for the external genitalia. It includes the surface structures and deeper structures.

Surface structures (Fig. 1.1)

Mons pubis. This is a fibro-fatty cushion lying anterior and superior to the junction of the two pubic bones (symphysis pubis). It becomes covered with coarse hair at the time of puberty over an area which has a horizontal upper limit without extension on to the abdominal wall.

Labia majora. These are fibro-fatty folds that extend from the mons above to the perineum below. They are homologous to the scrotum. Posteriorly they merge into each other and into the perineal skin. Their outer aspects are covered with hair, while their inner aspects are smooth and moistened by the secretion of sebaceous and other glands. They are responsive to stimulation from ovarian steriod hormones, and thus before puberty and after the menopause they tend to be smaller than during the child-bearing years. Except where the labia minora intervene, the inner surfaces ordinarily lie in contact with each other and thus close the entrance to the vagina.

The mons and labia majora are covered with coarse skin which contains hair follicles, sebaceous glands and sweat glands. Some of the latter are large, coiled and specialized and are known as *apocrine* glands; these are only found in certain areas of the body such as the axilla and the vulva and their secretion (when modified by bacteria) gives rise to a characteristic odour which is of sexual significance. The mons and the labia majora are likely to develop the ordinary diseases of the skin, including conditions such as psoriasis, sebaceous cyst, boils, and carbuncles and new growths.

Labia minora. These are delicate flaps of soft skin lying within the labia majora, one on each side of the vaginal orifice, and are homologous to the floor of the penile urethra in the male. They contain fewer sebaceous and sweat glands and are devoid of hair.
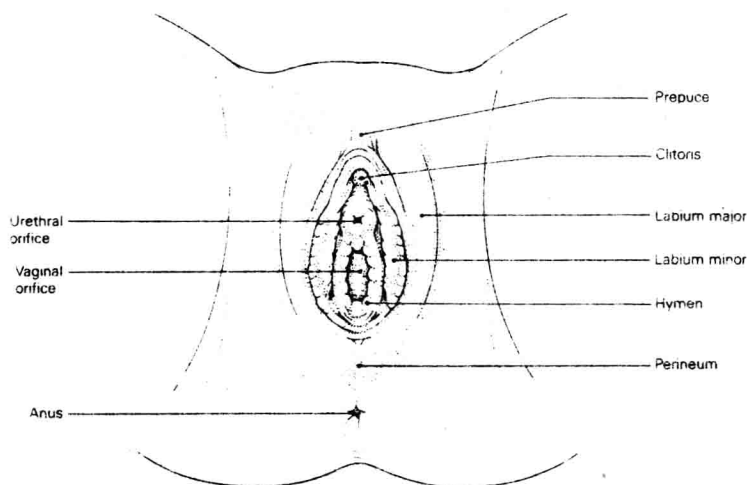
Fig. 1.1 External genitalia of the normal female.

They are richly vascular and plentifully supplied with nerve endings. Anteriorly the labia minora join together and in so doing divide to provide the clitoris with a prepuce and frenulum. They join posteriorly to form a thin but well-defined fold of skin, the fourchette, and they also merge into the labia majora. The depression between the fourchette and hymen, which is found in virgins, is the fossa navicularis.

Clitoris. This is the homologue of the male penis. It is composed of a vascular plexus (erectile tissue) arranged in the central corpus with two crura which are attached to the inferior ischiopubic rami. It has a glans, prepuce, body and two crura.

The clitoris usually measures 1.5–2 cm in length, the terminal 0.5 cm being called the glans. The latter is richly supplied with nerve endings and is thus extremely sensitive.

Vestibule. This is the area enclosed by the labia minora. The urethra, the vagina and the paired Bartholin ducts open into it along with some of Skene's ducts. It represents the lower portion of the embryological urogenital sinus.

Urethral meatus. The external urinary orifice is situated 1–1.5 cm below the clitoris. It is a small slit-like or triangular orifice of the urethra. At each side of the meatus one usually sees a small pit-like depression in which there are a number of mucous glands, called the lesser glands of the vestibule. The meatus is often covered by the folds of the labia minora. In some patients the lower paraurethral tissues are tethered to the hymeneal ring and this can be a source of lower urinary tract infection when coital activity is commenced.

Paraurethral ducts (Skene ducts). These ducts serve the paraurethral glands, which have a lubricating function. Their small openings can be seen inside the lower urethra and just below and beside the external urethral meatus.

Vaginal introitus. The vagina opens on to the lower part of the vestibule, just below the urethral meatus. Before puberty the orifice is closed by the hymeneal membrane which usually has one or two openings in it. During reproductive life, the hymen is broken down and the lower vagina is visualized when the labia are parted. Remnants of the hymen are then represented by the carunculae myrtiformes which consists of nodules of fibroepithelial tissue.

The hymen is originally a membrane composed of connective tissue and covered by stratified squamous epithelium on both aspects.

Perineum. This is the area outlined by the vaginal fourchette anteriorly and the anus posteriorly.

Deeper structures (Fig. 1.2)

Vestibule. Lying beside the entrance to the vagina is the bulb of the vestibule and its surrounding bulbocavernosus muscle. This muscle extends anteriorly to the clitoris and is joined by the ischiocavernosus muscle which arises from the medial and inferior portion of the ischiopubic ramus. Posteriorly the two bulbocavernosus muscles join the superficial and deep transverse perineal muscles, as well as the muscle forming the external anal sphincter, to form the strong perineal body.

Bartholin's glands or vulvovaginal glands. These lie on each side posterolateral to the vaginal orifice in relation to the posterior end of the labia majora. They are often overlapped by the bulb of the vestibule and lie within the superficial perineal compartment. They are lobulated racemose glands, approximately 8–10 mm in diameter, and not normally palpable. The duct of each gland is about 2 cm long and runs downwards and inwards to open immediately lateral to the hymen in the groove between its attached border and the labia minora. The main duct of the gland is lined by a stratified transitional type of epithelium, except for a very short distance within the orifice. The acini are lined by a layer of cuboidal cells with basal nuclei. The function of the gland is secretion of mucus for lubrication of the vaginal orifice and canal. Bartholin's glands are homologous to Cowper's (bulbourethral) glands in the male.

Muscles of the vulva. The muscles of the vulva are contained within the superficial perineal space, superficial to the fascia of the urogenital diaphragm, and consist of the superficial transverse perineal, the ischiocavernosus and the bulbocavernosus muscles. The superficial transverse perineal muscle arises from the descending ramus of the ischium near the tuberosity, passes medially, and is inserted in the central tendon of the perineum. The bulbocavernosus is a paired muscle that arises from the clitoris and its corpora and from the superficial fascia; it envelops the inferior surface of the vestibular bulbs and the Bartholin's gland and inserts into the central tendon of the perineum. The ischiocavernosus muscle arises from the ischial tuberosity and the pubic ramus, covers the crura of the clitoris, and inserts into the corpora cavernosa near the suspensory ligament.

Urogenital diaphragm. This is situated in the triangular area bounded by the transverse perinei muscles posteriorly and the inferior ischiopubic rami on each side. It is a triangular diaphragm which lies below the levator ani muscles and through which
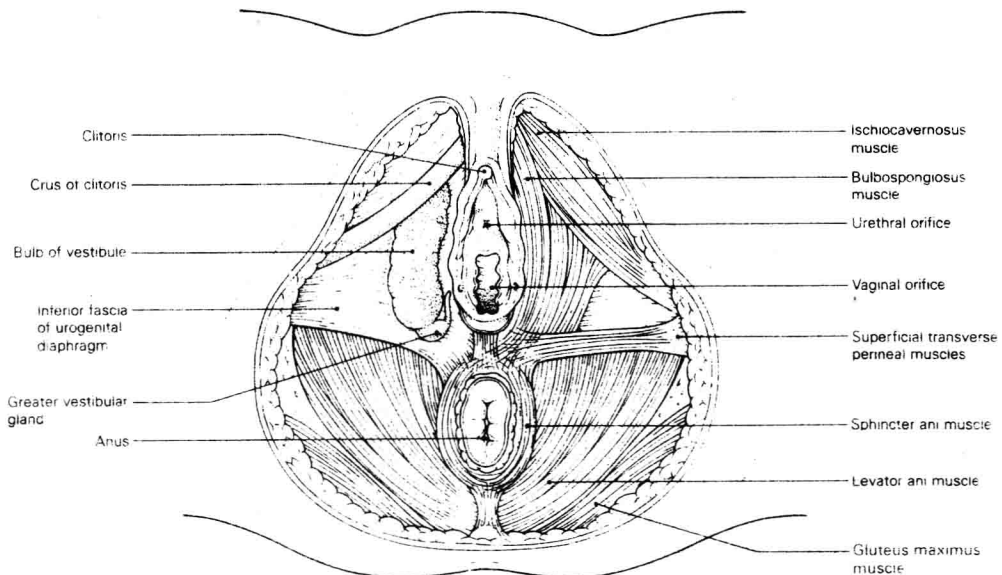
Fig. 1.2 Deeper structures in the vulva.

pass the urethra and vagina. It is composed of a superficial and a deep layer. The superficial perineal muscles are superficial to the urogenital diaphragm. The deeper perineal muscles with other important structures are situated in the space between the two layers. Above the triangular ligament are the muscles of the deep compartment which comprise the compressor urethrae anteriorly and the deep transverse perineal muscles posteriorly. Below the triangular ligament or diaphragm are the structures already mentioned. Posteriorly, in the space behind the transverse perineal muscles, is the ischiorectal fossa, composed of fibro-fatty tissue.

The internal genitalia
(Fig. 1.3)

The vagina

This is an elastic musculomembranous canal which connects the vulva with the uterus. Its anterior wall measures 8–10 cm in length and the posterior wall is 12–14 cm long. In the erect position its direction is in general upwards and backwards from the vestibule to the uterine end. In the resting state the walls are opposed. Its upper end expands into the cup-shaped fornix into which the cervix uteri is fitted. The portions of the fornix in front of, behind, and at the sides of the cervix are designated as the anterior, posterior and lateral fornices respectively.

Anteriorly the vagina is closely related to the base of the bladder and the urethra. Posteriorly it is related to the Pouch of Douglas, rectum and anal canal. Fascial supports separate the vagina from the surrounding structures. The vagina passes through the pelvic diaphragm and below this it passes through the perineal diaphragm to which the vagina is attached by strong connecting fibres.

In the virgin the lining of the vagina is thrown into folds (rugae). It is reddish pink and is lined by stratified squamous epithelium and has no glands. The vagina is kept moist by cervical mucus and vaginal transudation. The vaginal squamous epithelium responds to ovarian hormones and the cells become rich in glycogen which provides a medium for the resident lactobacilli (of Doderlein). These convert glycogen to lactic acid which maintains the pH of the vagina between 4 and 4.5.

Beneath the vaginal epithelium is the muscular coat, made up of an inner circular and an other longitudinal layer. The outermost layer is fibrous, derived from the pelvic connective tissue. Passing downwards in the anterolateral aspect of the vaginal wall are the vestigial Wolffian or mesonephric ducts (Gartner ducts). They may enlarge and become cystic.

The uterus (Fig. 1.4)

This is the centrepiece of the reproductive apparatus whose function is to provide a nidus for the develop-

Fallopian tube

Ovary

Ligament of ovary

Uterus

Bladder

Cervix

Urethra

Clitoris

Vesicouterine recess

Rectouterine recess

Posterior fornix

Rectum

Vagina

Anal canal

Fig. 1.3 Section through female pelvis.

Fig. 1.4 Coronal section of uterus.

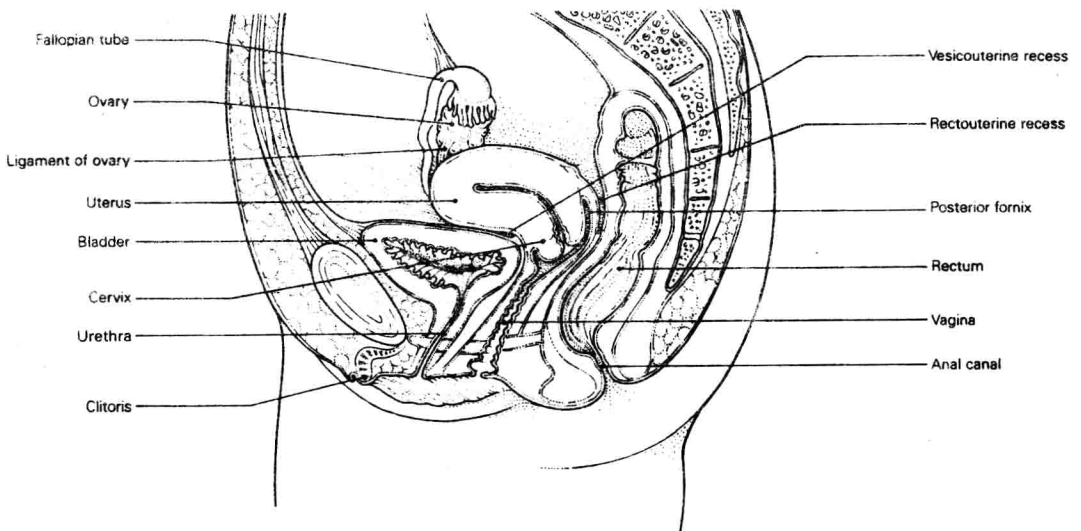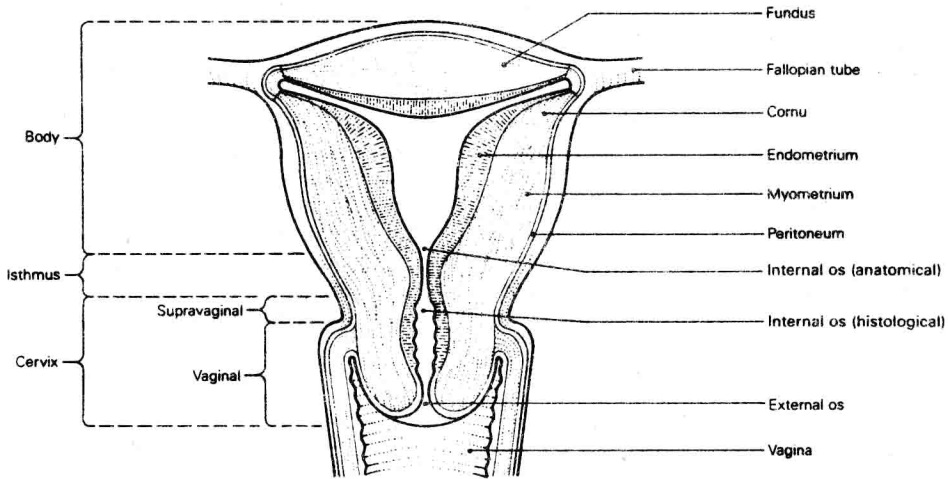ing embryo and fetus until the time of parturition. It possesses a fundus, body and cervix.

Fundus. The fundus is the part above the entrance of the tubes. It is convex and measures about 5 cm from side to side and is about 3 cm thick. It possesses a serous coat of pelvic peritoneum which continues downwards over the front and back of the body.

Uterine body. This is a hollow thick-walled muscular organ, the cavity being roughly triangular. It tapers downwards from the fundus and is flattened anteroposteriorly. The upper angles, at the junction of fundus and body, receive the fallopian tubes. They are called the cornua. The uterine body is covered externally by peritoneum, except for the lower part anteriorly, where the peritoneum is reflected on to the bladder.

The normal position of the uterus is one of anteversion and slight anteflexion: that is to say, the fundus and the upper part of the body are bent slightly forwards, while the organ thus flexed leans forwards as a whole from the vagina. It is maintained in this position by the support of the pelvic floor muscles and ligaments, especially the uterosacral ligaments. In 20 per cent of patients the uterus is retroverted. It measures in the nulliparous woman about 8–9 cm in length, 6 cm in width and about 4 cm in thickness.

The mucous membrane of the uterine body is the endometrium. It varies in thickness not only in individual women, but even more at different phases

of the menstrual cycle, ranging from 0.05 to 0.5 cm. The endometrium is composed of columnar epithelium which dips into the submucosa in the form of branched tubular glands. Both the epithelium and the glands are responsive to the two ovarian hormones. An additional feature of the endometrium is the typical coiled arteries which are also under hormonal influence. The stroma is a characteristic immature type of connective tissue, made up of a homogenous mass of small cells with round or slightly oval nuclei. The vascular supply of the endometrium is through the two sets of vessels, the spiral or coiled arterioles and the basal arterioles. The latter are the chief nutritional vessels, supplying especially the basal layers. The spiral arterioles, on the other hand, play an important part in the mechanism of the menstrual cycle and especially in menstrual bleeding.

The myometrium is the middle muscular layer and is composed of several interlacing layers of involuntary smooth muscle. The content of the muscle in the cervix is about 10 per cent, although there is a recognizable sphincter in its upper part. The other serous coat consists of the peritoneum which covers the entire corpus uteri and continues laterally on each side to be attached to the side wall of the pelvis; this reflexion is the broad ligament. The front of the uterus possesses a serous coat as far down as the attachment of the base of the bladder, at the level of the isthmus, while the back of the organ is completely clad with the very adherent peritoneum. At the sides of the uterus the anterior and

posterior serous coats pass laterally as the anterior and posterior leaves of the broad ligament.

Cervix. The cervix in the infant is usually twice as large as the uterine body, and in the adult this ratio is reversed. There is a vaginal and supravaginal component to the cervix. It is a strong pivotal point for uterine stability, being attached to the pelvic walls by radiating fascial condensations called ligaments —pubocervical anteriorly, uterosacral posteriorly, and transverse cervical (Mackenrodt) laterally. The cervix or neck of the uterus tapers below the body and is clasped by the vault of the vagina, into which it protrudes. The deep sulcus which surrounds the protruding cervix is known as the fornix of the vagina; it is deepest posteriorly. The cervix is 2–3 cm in length and is delineated inferiorly by the external os and superiorly by the internal cervical os, now called the isthmus uteri. The isthmus dilates and is taken up into the uterus as the organ enlarges during pregnancy. This expansion of the upper cervix or isthmus constitutes the lower uterine segment of the obstetrician.

The mucous membrane covering the external or vaginal surface is of the stratified squamous variety. The cervical canal is lined by columnar epithelium, the cytoplasm of these cells being rich in mucin. The columnar epithelium often extends to cover the central part of the ectocervix, resulting in a bright-red colour (eversion or 'erosion'). The openings of cervical glandular clefts may become blocked by overgrowth of squamous epithelium (metaplasia) or by inflammation; small retention cysts form and these are obvious on the surface as Nabothian follicles.

The muscular coat of the cervix is well-developed in the region of the internal os, but becomes increasingly sparse at a lower level, with corresponding increase in the proportion of connective tissue.

Anteriorly the supravaginal part of the cervix is firmly attached by fibrous tissue to the base of the bladder, but posteriorly it is covered by the peritoneum of the Pouch of Douglas.

Gland-like vestiges of mesonephric duct are occasionally observed deep in the cervical musculature.

The fascia and ligaments of the uterus (Fig. 1.5)

The lower part of the front of the uterus is adherent to the bladder, as already mentioned, by condensed fibrous tissue. The extraperitioneal areolar tissue (pelvic fascia) is condensed in other places to form named ligaments. These ligaments are composed histologically of a high proportion of smooth muscle fibres. The most important ligaments are the round ligament of the body of the uterus and the lateral and the uterosacral ligaments of the cervix.

Round ligament. This extends from the junction of uterus and tube to the deep inguinal ring. It lies in the anterior leaf of the broad ligament, below the uterine tube. It is continuous with the ligament of
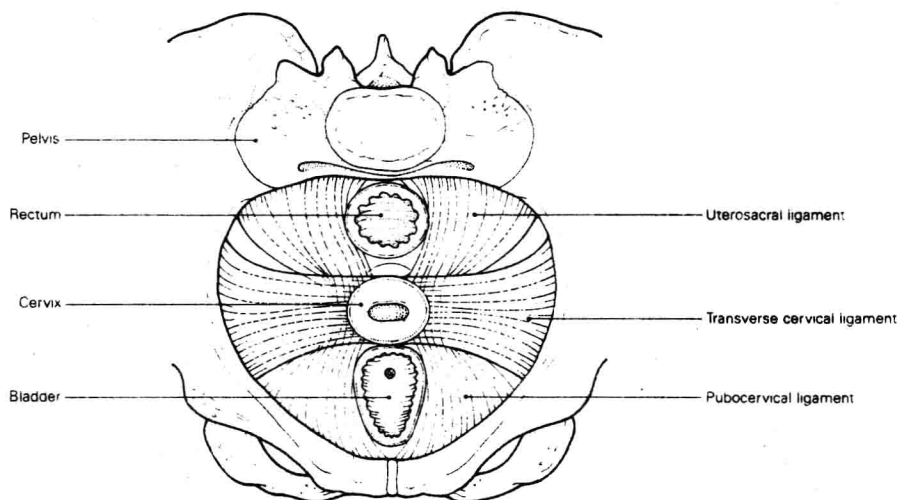

Pelvis

Rectum

Cervix

Bladder

Uterosacral ligament

Transverse cervical ligament

Pubocervical ligament

Fig. 1.5   Ligaments of the uterus.

the ovary and the two represent in continuity, the gubernaculum, the counter-part of the gubernaculum testis of the male. The round ligament passes through the inguinal canal and is attached at its distal extremity to the fibro-fatty tissue of the labium majus of the vulva. It consists largely of smooth muscle. Its function is to hold the fundus forward in anteversion, especially when forces tend to push the uterus back (such as during distension of the bladder, or gravity during recumbence).

Uterosacral ligaments. These extend backwards from the cervix. They lie below the pelvic peritoneum which covers the Pouch of Douglas and the rectum and are attached to the front and side of the second and third sacral vertebrae where it blends with the fibres of the endopelvic fascia. They consist of bundles of smooth muscle connected and surrounded by the fibrous tissue of the pelvic fascia. They serve to keep the cervix braced backwards against the forward pull of the round ligaments on the fundus, and so maintain the body of the uterus in anteversion.

Lateral ligaments of Mackenrodt (transverse cervical ligament). They consist of thickening or condensations of connective tissue around the uterine arteries and the uterine venous plexuses in the base of the broad ligaments. They extend from the cervix, laterally to the side wall of the pelvis. They impart lateral stability to the cervix uteri.

The cervix is supported centrally in the pelvis by ligaments which radiate out to the pelvic wall. These lie below the level of the peritoneal reflections and are arranged in three main ligaments: laterally they are called the cardinal or Mackenrodt ligaments, posteriorly the uterosacral ligaments, and anteriorly the pubocervical ligaments.

It has already been mentioned that the base of the bladder is firmly attached to the front of the uterus and cervix. The connective tissue binding them together extends inferiorly to bind the urethra to the anterior wall of the vagina. Posteriorly the vagina and anal canal are separated, but bound together, by the fibromuscular mass of the perineal body. This mass helps to support the uterus; when torn or damaged, the posterior vaginal wall prolapses, and
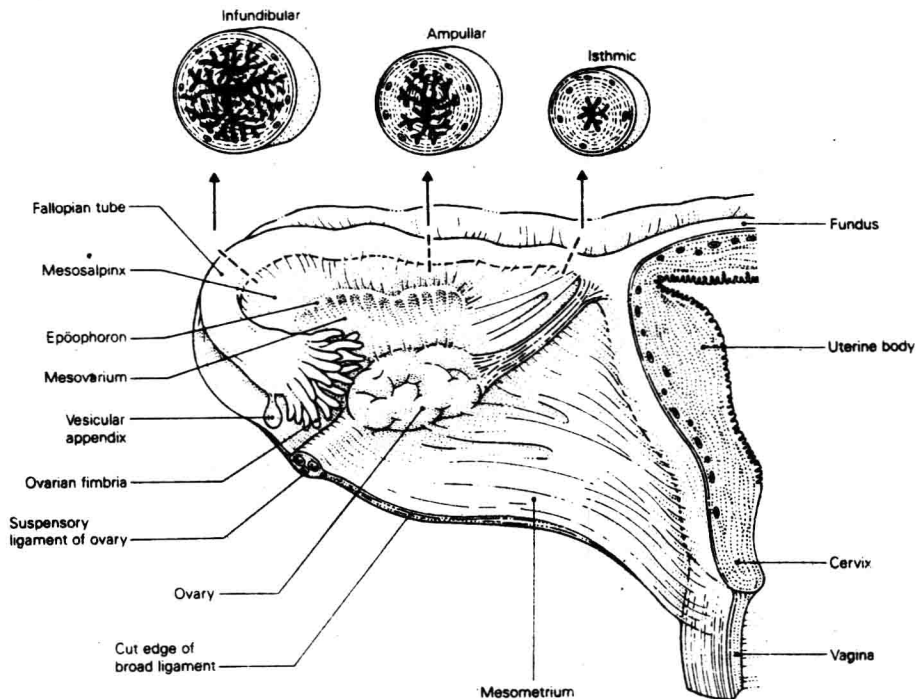

Fig. 1.6 Uterus, broad ligament and fallopian tube (in cross-section).

this condition is often followed by prolapse or retroversion of the uterus.

The fallopian tubes (Fig. 1.6)

Each tube measures 10–14 cm in length and lies in the upper part of the broad ligament behind the round ligament. They are musculomembranous canals which transport the ova from the ovaries to the uterus.

Each tube can be divided into four parts. Each has a lateral free extremity, expanded and open, surrounded by a number of small finger-like processes called fimbrae, of which one is longer than the others, and is attached by its tip to the ovary called the ovarian fimbria. The fimbriated end of the tube, or infundibulum, lies coiled behind the broad ligament. The remainder of the tube lies between the two layers of the upper margin of the broad ligament. Laterally this part is somewhat tortuous and dilated in a spindle shape, the ampulla. The portion of tube adjoining the uterine wall is straight and narrow; it is known as the isthmus. The intramural part of the tube is surrounded by its own muscular wall up to its opening into the cavity of the uterus.

Histologically, the tube consists of three coats: a serous coat, and two muscular coats, arranged in an inner circular and an outer longitudinal layer. It is lined by a mucous membrane that is thrown into complicated folds. The surface epithelium is composed of a ciliated columnar type which undergoes definite cyclical changes. In the isthmus the folds flatten and the cilia tend to disappear.

The ovaries (Figs. 1.6 and 1.10)

These are two ovoid bodies placed one on each side of the pelvis just below the tubes, the outer ends of which curve over them in an arc-like fashion. They measure about 3.5 × 2 × 1.5 cm. The external surface of the ovary is of dull whitish opaque appearance.

The ovary projects into the pelvic cavity, attached to the posterior leaf of the broad ligament by a double fold of peritoneum called the mesovarium; but this does not cover the surface of the ovary, which is covered with low columnar epithelium. The mesovarium extends to the hilum of the ovary through which blood vessels, nerves and lymphatics enter and leave the ovary. It is attached to the uterus by a well-developed ovarian ligament, while the outer upper pole is suspended to the side of the

pelvis by the infundibulo-pelvic ligament. The ovary lies on the peritoneum of the side wall of the pelvis in the angle between the internal and external iliac vessels, on the obturator nerve. Pain in the ovary is often referred along the cutaneous distribution of this nerve, the inner side of the thigh down to the knee. The obturator internus muscle and its fascia separate the ovary from the thinnest part of the hip bone, the concavity of the acetabulum.

On section, the ovary is divisible into an outer cortex and a central part or medulla. A single layer of cuboidal epithelium covers the cortex and is called the germinal epithelium. Beneath this layer of epithelium is the cortical stroma, which shows a slightly condensed layer called the tunica albuginea. The stroma is made up of compactly placed spindle cell connective tissue cells, in which are seen the follicular elements and their derivatives. In the ovary of the young child the follicles are exceedingly numerous, being estimated at about three million in the ovary of the newborn child, but becoming progressively less numerous after puberty. The cortex of the ovary contains primordial and developing follicles and specialized connective tissue called theca. The inner medulla is mainly composed of loose connective tissue and blood vessels.

The pelvic musculature

The pelvic floor or diaphragm (Fig. 1.7)

The pelvic floor consists of a gutter-shaped sheet of muscle, the pelvic diaphragm. The muscles of the pelvic floor are the coccygeus and levator ani, but it is better to regard them as one morphological entity: ischiococcygeus, iliococcygeus and pubococcygeus from behind forwards. They arise in continuity from the spine of the ischium, from the white line over the obturator fascia and from the body of the pubis and are inserted into the coccyx and the anococcygeal raphe. From their origin the muscle fibres slope downwards and backwards to the mid-line; the pelvic floor so produced in a gutter that slopes downwards and forwards.

The ischiococcygeus muscle arises from the tip of the ischial spine, alongside the posterior margin of the obturator internus muscle. Its fibres run out to be inserted into the side of the coccyx and the lowest piece of the sacrum. The iliococcygeus muscle arises from the posterior half of the white line on the obturator fascia and, crossing the pelvic surface of
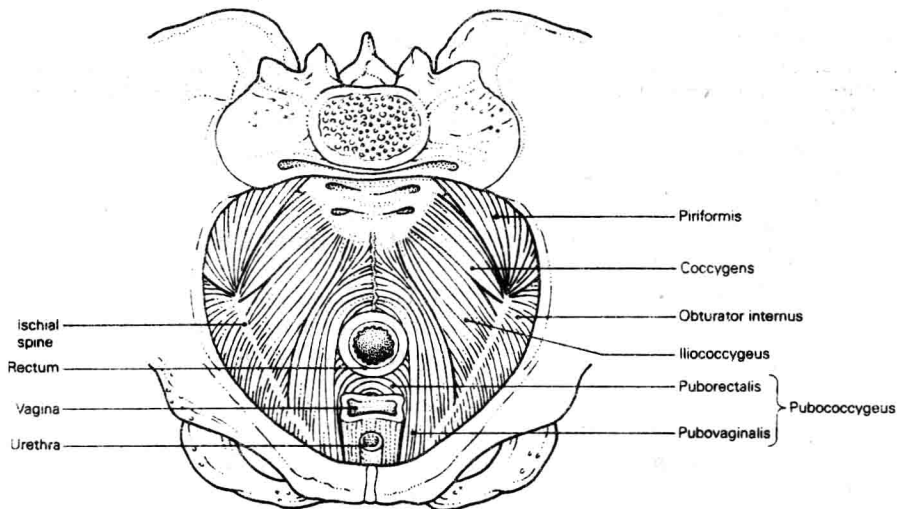
Fig. 1.7 Muscles of the pelvic floor.

the coccygeus, its fibres are inserted into the side of the coccyx and anococcygeal raphe. The latter extends from the tip of the coccyx to the junction of rectum and anal canal. It consists of an interdigitation of the fibres of the levator ani muscles of right and left sides, and is easily elongated.

The pubococcygeus muscle is that part of the levator ani which arises from the anterior half of the white line and from the posterior surface of the body of the pubis on a level with the lower border of the symphysis pubis. There is often a triangular gap between the adjacent borders of this muscle and iliococcygeus. The pubococcygeus forms a flat muscle whose fibres are in different functional sets. The bulk of its posterior fibres, those arising from the white line, sweep backwards in a flat sheet on the pelvic surface of the iliococcygeus and are inserted into the tip of the coccyx and the anococcygeal raphe. Fibres arising more anteriorly, from the periosteum of the body of the pubis, swing more medially and more inferiorly around the anorectal junction and join with the fibres of the opposite side and with the posterior fibres of the profundus part of the external anal sphincter. Here the muscles form a U-shaped sling which holds the anorectal junction angled forwards; this part of the muscle is called the puborectalis. More medially still, a U-shaped sling of fibres passes behind the vagina into the perineal body; it is named the pubovaginalis or sphincter vaginae. The gap anteriorly between the medial

edges of pubovaginal muscles is filled by the pubovesical ligaments. The muscle fibres decussate around the vagina and rectum and anchor these structures by further fibres attached to their outer coats.

The puborectalis portion of the levator complex is important in helping to maintain closure of the outlet, by drawing the different structures passing through it anteriorly towards the shelf formed by the anterior portion of the muscle and symphysis pubis.

The perineum

The perineum consists of that part of the pelvic outlet caudal to the pelvic diaphragm. A line joining the anterior parts of the ischial tuberosities divides the perineum into a large posterior anal triangle and a smaller anterior urogenital triangle.

The urogenital triangle

This triangle is contained between the ischiopubic rami and a line passing between the anterior parts of the ischial tuberosities. The triangular ligament of the male is represented in the female by only a narrow shelf of membrane attached along the pubic rami. It gives attachment to the crura of the clitoris, each of which is covered by an ischiocavernous muscle, as in the male. Medial to each crus, attached to the margin of the shelf of perineal membrane, is a

mass of erectile tissue. This is the bulb of the vestibule separated into two halves by the orifices of vagina and urethra. They join together in front of the urethral orifice and pass forwards to the glans of the clitoris. The glans is closed by fusion together of the anterior ends of the labia minora, each of which splits to form a dorsal prepuce and ventral frenulum to the glans.

The erectile tissue of the bulb is covered by the bulbospongiosus muscle, whose fibres extend from the perineal body around vagina and urethra to the clitoris.

The perineal body

This lies below the pelvic floor between the vagina and anal canal; it is a mass of fibrous tissue into which mingle many muscle fibres from the bulbospongiosus and transversus perinei muscles, as well as from the pubovaginalis and external anal sphincter. It helps to support the levator ani above it; its integrity is indispensable to the stability of the pelvic organs.

The bony pelvis

This is made up of four bones joined together by ligaments. At the sides are the hip or innominate bones. These are joined in front at the symphysis pubis and, behind, they join with the ala of the sacrum forming the sacroiliac joints. The fourth bone, the coccyx, is loosely articulated with the lower border of the sacrum. Both the sacrum and the iliac bones are strong and heavy, since it is through them that the weight of the head, arms and trunk is transferred to the legs. The innominate bone is composed of three separate elements: pubis, ischium and ilium. These unite in early adulthood.

The sacrum is composed of five fused vertebrae and a large intervertebral disc separates it from the fifth lumbar vertebra. The sacroiliac joints are partly cartilagenous, partly fibrous and are very strong. The lumbosacral joint lies between the fifth lumbar vertebra and the sacrum. Strain may occur in the ligaments of these joints and the pain may be referred to the back or lower abdomen.

The symphysis pubis is the joint between the two pubic bones. It consists of fibrous tissue with a layer of cartilage in the middle. The sacrococcygeal joint is much looser than the others. Undue displacement

may overstretch the ligament, giving rise to the condition called coccydynia or pain.

The union between the sacrum and ilium is strengthened by the sacrospinous and sacrotuberous ligaments which join the sacrum to the ischial spine and to the ischial tuberosity respectively.

The urinary tract

The anatomy of that part of the urinary tract which is located in the pelvis is of considerable significance in gynaecology in view of its close relationship to the structures of the genital tract.

The bladder

This is made of smooth muscle arranged in whorls and spirals—the detrusor muscle. The involuntary muscle of its wall is arranged in an inner longitudinal layer, a middle circular layer and an outer longitudinal layer. At the internal urethral orifice circular fibres provide an internal sphincter of smooth muscle which, though of obvious capability, is rather unconvincing anatomically. It is adapted for mass contraction, not for peristalsis. The muscle is lined by a loose and readily distensible mucous membrane, surfaced by transitional epithelium. It has no glands or muscularis mucosae. The distended bladder is globular, while the empty bladder is flattened from above downwards by the pressure of the overlying intestines.

The fundus of the bladder lies behind the bodies of the pubic bone; during distension it rises over the upper border of the pubis. The fundus is held in position by the tone of its muscular walls on the fixed base of the trigone (see below). The bladder is separated from the pubic bones by a space lying between the pelvic floor and the pelvic peritoneum. This is the retropubic space (or Cave of Retzius). It is occupied by very tenuous areolar tissue. The upper surface of the fundus has a serous coat, for here the pelvic peritoneum is firmly adherent behind the attachment of the median umbilical ligament. Elsewhere the bladder is surrounded by loose and tenuous areolar tissue. The rising bladder strips peritoneum behind the rectus abdominis, for the fascia transversalis here is loose and tenuous.

The trigone or base of the bladder is, unlike the fundus, relatively indistensible and immobile. It is held in position by the lateral ligaments of the