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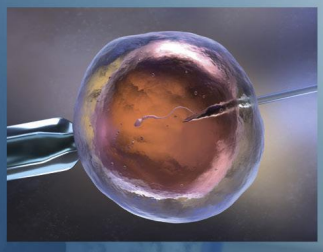

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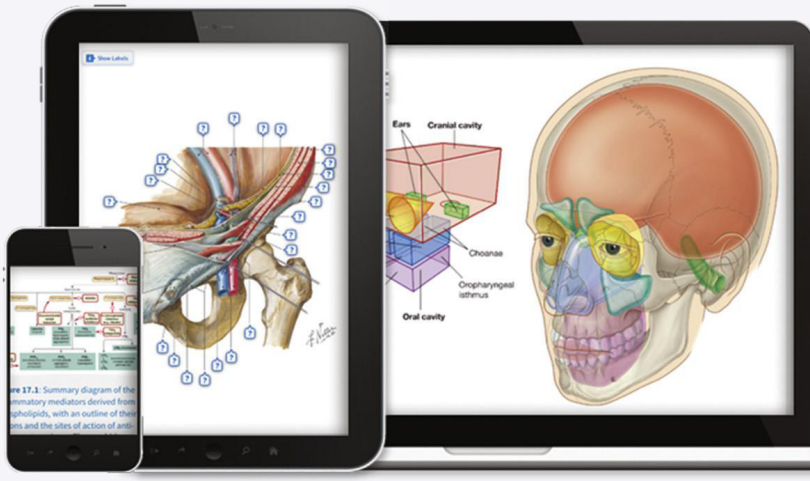

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Clinical Obstetrics and Gynaecology

Fifth Edition

Clinical Obstetrics and Gynaecology

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This book is dedicated to the millions of women worldwide who will suffer disability, lose their babies, or lose their lives through the want of adequate reproductive healthcare.

Preface

Obstetrics and gynaecology is an evolving specialty, which is reflected in our fifth edition. We have fully updated and streamlined the textbook to reflect clinical advances such as non-invasive prenatal screening, added new chapters discussing some of the ethical and medicolegal challenges specific to obstetrics and gynaecology, and extended the section on practical guidance to make the most of your clinical time spent in this specialty. A new chapter of OSCE cases has also been added to allow you to practice this style of assessment, as well as 'single best answer' questions with which to test your learning.

The global COVID-19 pandemic has impacted all healthcare systems, and has had enormous direct and indirect effects on women's health. This fifth edition covers the impact of COVID-19 upon maternal, fetal and global healthcare, and includes updates on other epidemic diseases such as Zika virus.

There are many challenges that remain constant in obstetrics and gynaecology – a specialty which encompasses hugely varied topics, from assisted reproductive technology to gynaecological cancer care, fetal medicine to advanced laparoscopic gynaecological surgery and contraception to obstetric haemorrhage – with the associated complex clinical and ethical issues with which you will become familiar.

Although there have been many global advances, sadly, hundreds of thousands of women and babies are still dying each year from treatable complications of pregnancy, nearly all in low-resource settings. There are many remaining obstacles to improving their care. These are still ours – and, hopefully, now also yours – to overcome.

Wherever you study or practise obstetrics and gynaecology, a sound knowledge of the clinical aspects will underpin your understanding of this specialty and maximize your ability to learn about and contribute to the care of women. This book aims to provide you with that knowledge.

Elizabeth A. Layden

Andrew Thomson

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The editors would like to acknowledge and offer grateful thanks for the input of all previous editions' contributors, without whom this new edition would not have been possible.

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Language Statement

For simplicity of language, this textbook uses the term women throughout; this should be taken to include people who do not identify as women but who are pregnant or have gynaecological conditions.

Contents

FUNDAMENTALS

Section Outline

Chapter 1

Clinical Pelvic Anatomy

Brian A. Magowan

Chapter Outline

Introduction

A thorough understanding of pelvic anatomy is essential for clinical practice. Not only does it facilitate an understanding of the process of labour, it also allows an appreciation of the mechanisms of sexual function and reproduction, and establishes a background to the understanding of gynaecological pathology. Congenital abnormalities are discussed in Chapters 3, 25, and 40.

Obstetric Anatomy

THE BONY PELVIS

The girdle of bones formed by the sacrum and the two innominate bones has several important functions (Fig. 1.1). It supports the weight of the upper body and transmits the stresses of weight bearing to the lower limbs via the acetabulae. It provides firm attachments for the supporting tissues of the pelvic floor, including the sphincters of the lower bowel and

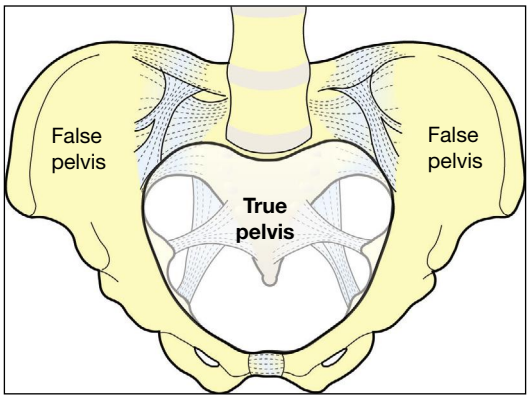


Fig. 1.1 The 'true' and 'false' pelvis.

bladder, and forms the bony margins of the birth canal, accommodating the passage of the fetus during labour.

The birth canal is bounded by the true pelvis, that is, the part of the bony girdle which lies below the pelvic brim – the lower parts of the two innominate bones and the sacrum. These bones are bound together at the sacroiliac joints and at the symphysis pubis anteriorly. The brim is outlined by the promontory of the sacrum, the sacral alae, the iliopectineal lines, and the symphysis. The pelvic outlet is bounded by bone and ligament, including the tip of the sacrum, the sacrotuberous ligaments, the ischial tuberosities, and the subpubic arch (of rounded 'Norman' shape) formed by the fused rami of the ischial and pubic bones. In the erect posture, the pelvic brim is inclined at an angle of 65 to 70 degrees to the horizontal. Because of the curvature of the sacrum, the axis of the pelvis (the pathway of descent of the fetal head in labour) is a J-shaped curve (Fig. 1.2).

The change in the cross-sectional shape of the birth canal at different levels is fundamentally important in understanding the mechanics of labour. The canal can be envisaged initially as a sector of a curved cylinder of about 12 cm in diameter (see Fig. 1.2). The stresses of weight bearing at the brim level in the average woman tend to flatten the inlet a little, reducing the anteroposterior diameter but increasing the transverse diameter. In the lower pelvis, the counterpressure through the necks of the femora tends to compress the pelvis from the sides, reducing the transverse diameters of this part of the pelvis (see Fig. 1.1). At an intermediate level, opposite the third segment of the sacrum, the canal retains a circular cross-section. With this picture in mind, the 'average' diameters of the pelvis at brim, cavity, and outlet levels can be readily understood (Table 1.1).

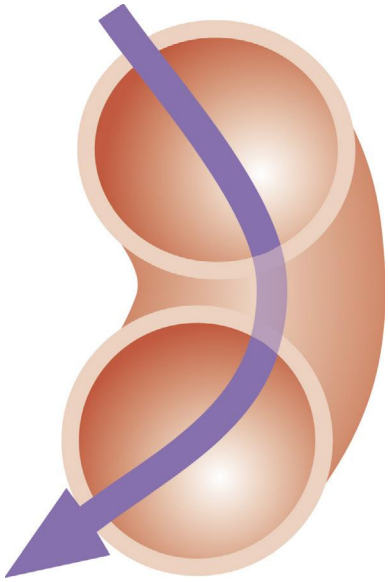


Fig. 1.2 The birth canal resembles a curved cylinder.

The distortions from a circular cross-section, however, are very modest. If, in circumstances of malnutrition or metabolic bone disease, the consolidation of bone is impaired, more gross distortion of the pelvic shape is liable to occur and labour is likely to involve mechanical difficulty. This is termed 'cephalopelvic disproportion'. The changing cross-sectional shape of the true pelvis at different levels – transverse oval at the brim and anteroposterior oval at the outlet – usually determines a fundamental feature of labour, that is, that the ovoid fetal head enters the brim with its longer (anteroposterior) diameter in a transverse or oblique position but rotates during descent to bring the longer head diameter into the longer anteroposterior

TABLE 1.1 Average Pelvic Diameters

Level	Diameter: Direction	Size (cm)
Inlet	Anteroposterior	11.5
	Transverse	13
Cavity	All diameters	12
Outlet	Anteroposterior	12.5
	Transverse intertuberous	11
	Interspinous	10.5

diameter of the outlet before the time of birth. This rotation is necessary because of the relatively large size of the human fetal head at term, which reflects the unique size and development of the fetal brain.

In most high-resource countries, marked pelvic deformation is rare. Pelvimetry using X-rays, computed tomography, or magnetic resonance imaging scans can be used to measure the pelvic diameters but is of limited clinical value in predicting the likelihood of a successful vaginal delivery. Mechanical difficulty in labour is assessed by close observation of the progress of dilatation of the cervix and of descent, assessed by both abdominal and vaginal examination.

The Pelvic Organs During Pregnancy

THE UTERUS

The uterus is a remarkable organ, composed largely of smooth muscle (the myometrium), which increases in weight during pregnancy from about 40 g to around 1000 g as the myometrial muscle fibres undergo both hyperplasia and hypertrophy (Fig. 1.3). It provides a 'protected' implantation site for the genetically 'foreign' fertilized ovum, accommodates the developing fetus as it grows and, finally, expels it into the outside world during labour.

Whereas the body of the uterus is formed from a thick layer of plain muscle, the cervix, which communicates with the upper vagina, is largely composed of denser collagenous tissue. This forms a rigid collar,

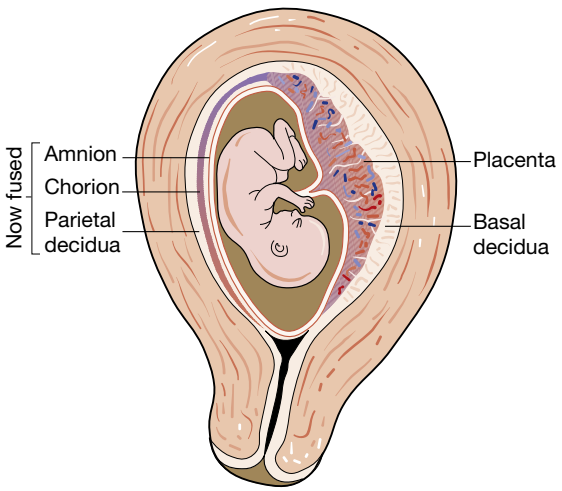


Fig. 1.3 The uterus and developing fetus at 12 weeks' gestation.

retaining the fetus in utero as the myometrium hypertrophies and stretches. The junctional area between the body and cervix is known as the isthmus, which, in late pregnancy and labour, undergoes dilatation and thinning, forming the lower segment of the uterus. It is through this thinned area that the uterine wall is incised during caesarean section.

The uterine arteries, branches of the anterior division of the internal iliac arteries, become tortuous and coiled within the uterine wall (Fig. 1.4). Innervation of the uterus is derived from both sympathetic and parasympathetic systems, and the functional significance of the motor pathways is incompletely understood. Drugs that stimulate alpha-adrenergic receptors activate the myometrium, whereas beta-adrenergic drugs have an inhibitory effect, and both beta-agonists and alpha-antagonists have been used in attempts to inhibit premature labour. Afferent fibres from the cervix enter the spinal cord via the pelvic splanchnic (parasympathetic) nerves (S2,3,4). Pain stimuli during labour from the fundus and body of the uterus travel via the hypogastric (sympathetic) plexus and enter the spinal cord at the level of the lower thoracic segments.

THE CERVIX

The cervix becomes more vascular and softens in early pregnancy. The mucous secretion from the endocervical glands becomes thick and tenacious, forming a mechanical barrier to ascending infection. In late pregnancy, the cervix 'ripens' – the dense mesh of collagen fibres loosens, as fluid is taken up by the hydrophilic mucopolysaccharides that occupy the interstices between the collagen bundles. This allows the cervix to become shorter as its upper part expands.

ADDITIONAL CHANGES

The ligaments of the sacroiliac and symphyseal joints become more extensible under the influence of pregnancy hormones. As a result, the pelvic girdle has more 'give' during labour. The increased mobility of the joints may result in backache or symphyseal pain.

THE URINARY TRACT IN PREGNANCY

Frequency of micturition is often noticed in early pregnancy. As pregnancy advances, the ureters become dilated, probably due to the relaxing effect of progesterone on the smooth muscle wall but also in part due to

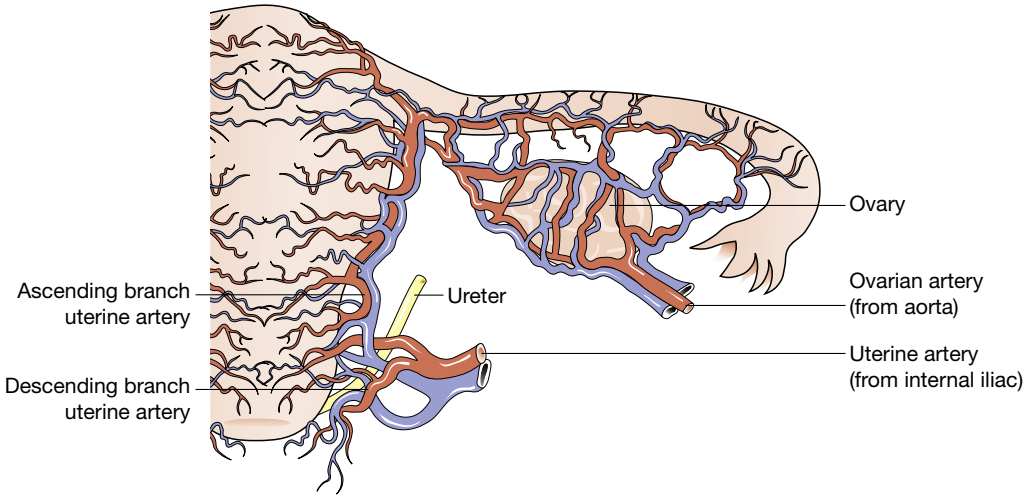


Fig. 1.4 The blood supply of the uterus, fallopian tube, and ovary (posterior view).

the mechanical effects of the gravid uterus. The urinary tract is therefore more vulnerable to ascending infection (acute pyelonephritis) in comparison to non-pregnancy.

THE PERINEUM

This term usually refers to the area of skin between the vaginal orifice and the anus. The underlying musculature at the outlet of the pelvis, surrounding the lower vagina and the anal canal, is important in the maintenance of bowel and urinary continence, and in sexual response. The muscles intermesh to form a firm pyramidal support, the perineal body, between the lower third of the posterior vaginal wall and the anal canal (Fig. 1.5). The tissues of the perineal body are often markedly stretched during the expulsive second stage of labour and may be torn as the head is delivered. Injury to the anal sphincters may lead to impaired anal continence of faeces and/or flatus. Poor healing of an episiotomy or tear is liable to result in scarring, which may cause dyspareunia (pain during intercourse).

Anatomical Points for Obstetric Analgesia

PUDENDAL NERVE BLOCK

Knowledge of the pudendal nerves is important in obstetrics because they may be blocked to minimize pain during instrumental delivery and because their integrity is vital for visceral muscular support and sphincter function. These nerves, which innervate the vulva and perineum, are derived from the second, third, and fourth sacral roots (see Fig. 31.13). On each side the nerve passes behind the sacrospinous ligament close to the tip of the ischial spine and re-enters the pelvis, along with the pudendal blood vessels, in the pudendal canal. After giving off an inferior rectal branch, they divide into the perineal nerves and dorsal nerves of the clitoris. Motor fibres of the pudendal nerve supply the levator ani, the superficial and deep perineal muscles, and the voluntary urethral sphincter. Sensory fibres innervate the central areas of the vulva and perineum. The peripheral skin areas are supplied by branches of the ilioinguinal nerve, the genitofemoral nerve, and the posterior femoral cutaneous nerve (Fig. 1.6). The pudendal nerve can be blocked by an injection of local anaesthetic just below the tip of the ischial spine, as described in Fig. 31.13.

SPINAL BLOCK

The spinal cord ends at the level of L1–2. A spinal injection at the level of the L3–4 space will produce excellent analgesia up to around the level of the T10 nerve root or above, depending on the position of the patient and the volume of local anaesthetic used.

EPIDURAL BLOCK

The epidural space, between the dura and the periosteum and ligaments of the spinal canal, is about

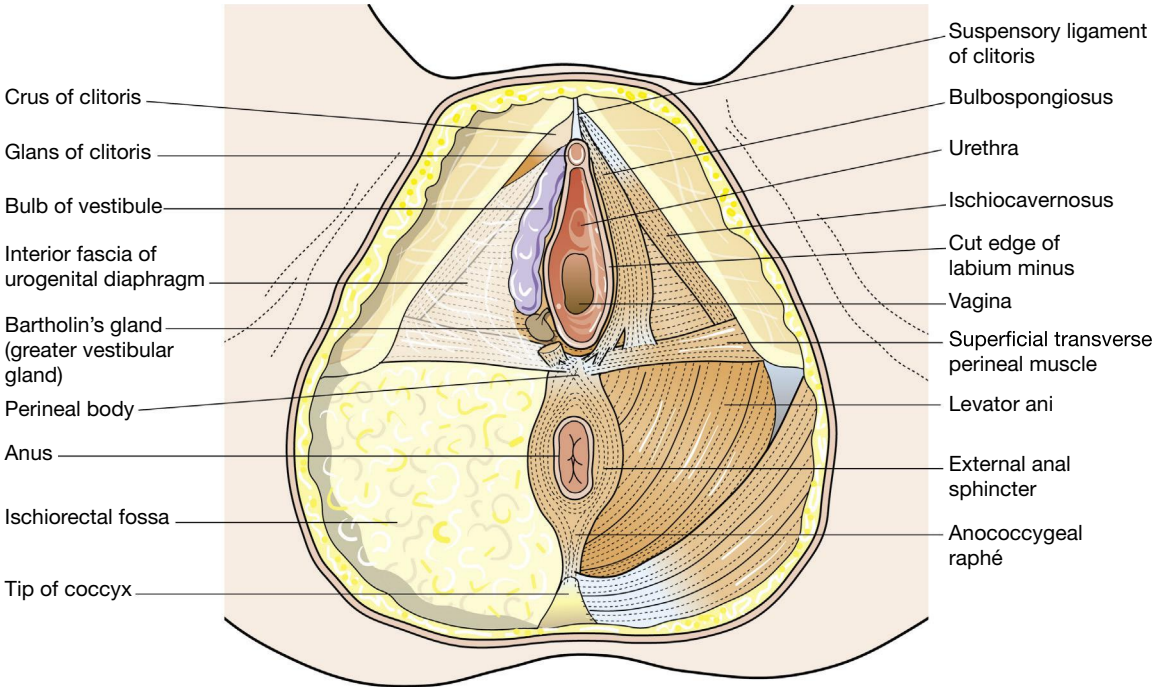


Fig. 1.5 The perineum: a view from below the pelvic outlet, showing the intermeshing muscles.

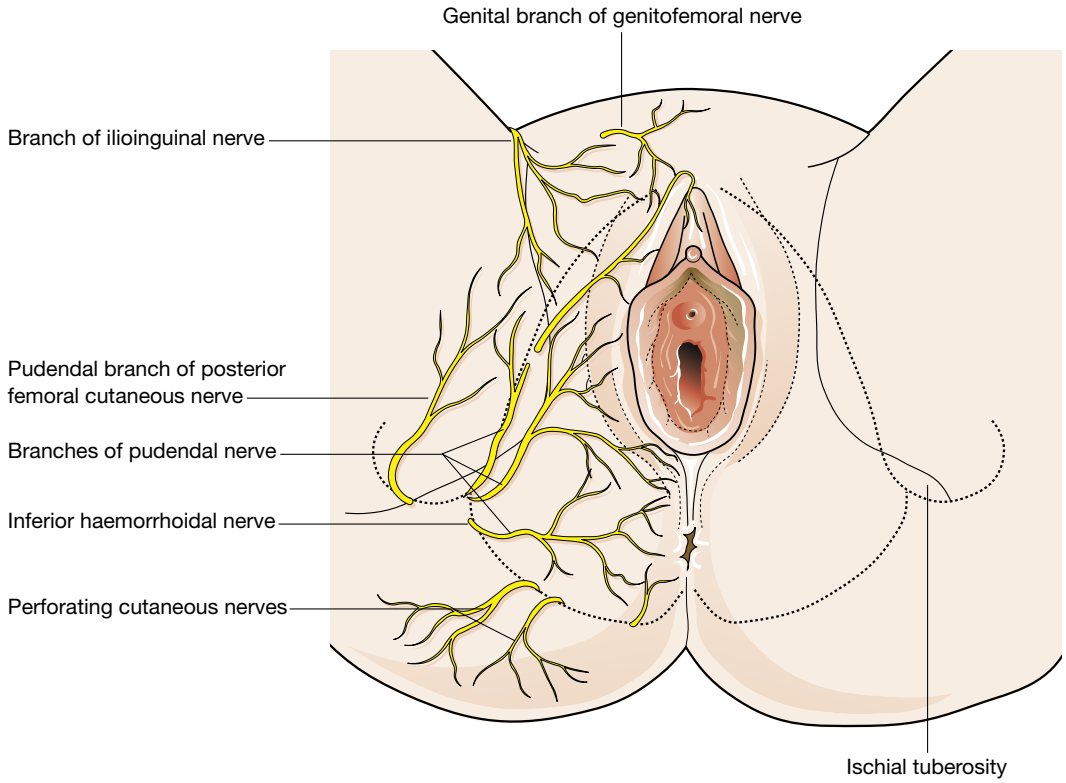


Fig. 1.6 Innervation of the vulva.

4 mm deep. Epidural injection of local anaesthetic blocks the spinal nerve roots as they traverse the space.

Gynaecological Anatomy

THE UTERUS

The uterus has the shape of a slightly flattened pear and measures, on average, 7.5 × 5.0 × 2.5 cm. Its principal named parts are the fundus, the cornua, the body, and the cervix (Fig. 1.7).

It forms part of the genital tract, lying in close proximity to the urinary tract anteriorly and the lower bowel behind. All three tracts traverse the pelvic floor in the hiatus between the two bellies of the levator ani muscle. Clinically, this means that a problem in one tract can readily affect another (Fig. 1.8).

The uterine cavity is around 6 or 7 cm in length and forms a flattened slit, with the anterior and posterior walls in virtual contact. The wall has three layers: the endometrium (innermost), myometrium, and peritoneum (outermost).

Endometrium

The endometrium is the epithelial lining of the cavity. The surface consists of a single layer of columnar ciliated cells, with invaginations forming uterine mucus-secreting glands within a cellular stroma. It undergoes cyclical changes in both the glands and stroma, leading to shedding and renewal about every 28 days.

There are two layers: a superficial functional layer which is shed monthly and a basal layer which is not shed, from which the new functional layer is regenerated. The epithelium of the functional layer shows active proliferative changes after a menstrual period until ovulation occurs, when the endometrial glands undergo secretory changes. Permanent destruction of the basal layer will result in amenorrhoea. This fact forms the basis for ablative techniques for the treatment of heavy menstrual bleeding.

The normal changes in endometrial histology during the menstrual cycle are determined by changing secretion of ovarian steroid hormones. If the endometrium is exposed to sustained estrogenic stimulation,

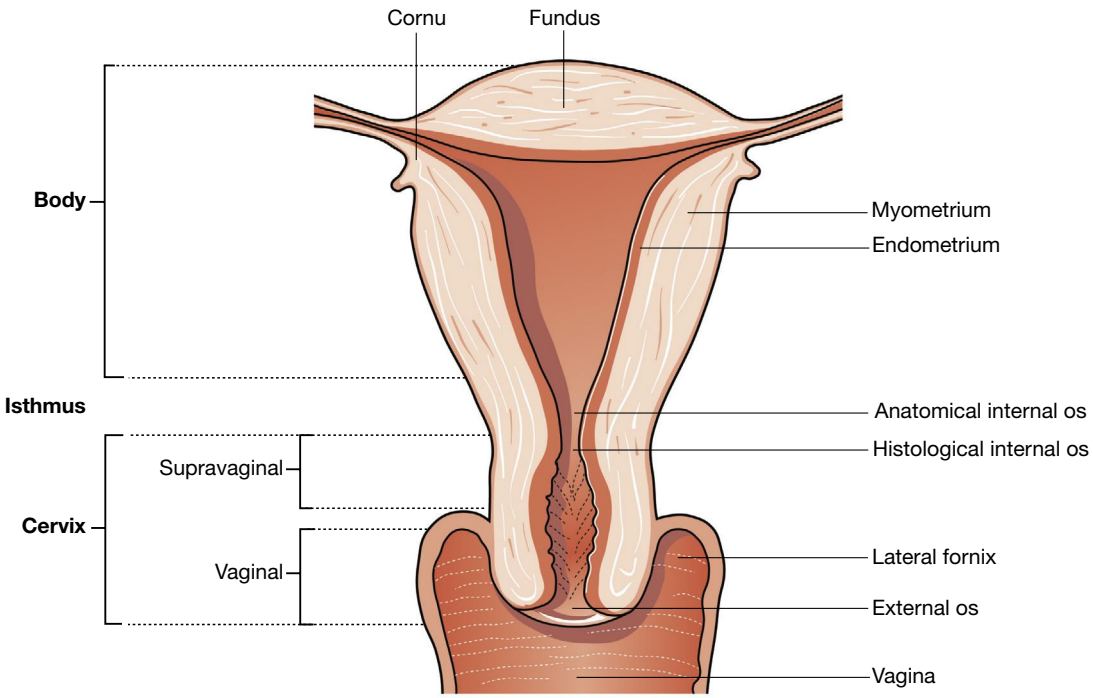


Fig. 1.7 Coronal section of the uterus.

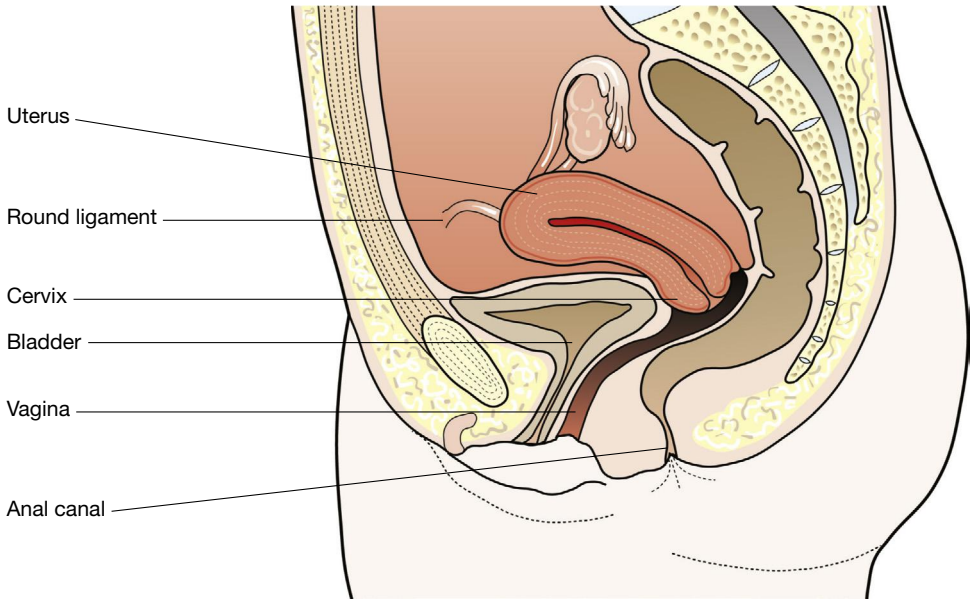


Fig. 1.8 Female pelvic organs: sagittal view.

whether endogenous or exogenous, it may become hyperplastic. Benign hyperplasia may precede malignant change.

Myometrium

The smooth muscle fibres of the uterine wall do not form distinct layers. While the outermost fibres are predominantly longitudinal, continuous with the musculature of the uterine tubes above and the vaginal wall below, the main thickness of the uterine wall is formed from a mesh of criss-crossing spiral strands. The individual muscle cells contain filaments of actin and myosin, which interact to generate contractions. During labour, the propagation of contractile excitation throughout the uterine wall is facilitated by the formation of 'gap junctions' between adjacent muscle cells. As a result, the spread of excitation resembles that in a syncytium.

Peritoneum

The posterior surface of the uterus is completely covered by peritoneum, which passes down over the posterior fornix of the vagina into the pouch of Douglas. Anteriorly, the peritoneum is reflected off the uterus at a much higher level onto the superior surface of the bladder.

THE CERVIX

The cervix connects the uterus and vagina, and projects into the upper vagina. The 'gutter' surrounding this projection comprises the vaginal fornices – lateral, anterior, and posterior. The cervix is about 2.5 cm long. The shorter part of it, which lies above the fornices, is termed the 'supravaginal part'. The endocervical canal is fusiform in shape between the external and internal os. After childbirth, the external os loses its circular shape and resembles a transverse slit. The epithelial lining of the canal is a columnar mucous membrane with an anterior and posterior longitudinal ridge from which shallow palmate folds extend – hence, the name 'arbor vitae'.

There are numerous glands secreting mucus that becomes more abundant and less viscous at the time of ovulation in mid-cycle. The vaginal surface of the cervix is covered with stratified squamous epithelium, similar to that lining the vagina. The squamocolumnar junction (histological external os) commonly does not correspond to the anatomical os but may lie either above or external to the anatomical os. This 'tidal zone', within which the epithelial junction migrates at different stages of life, is termed the 'transformation zone'. The ebb and flow of the squamocolumnar junction is influenced by estrogenic stimulation. In the newborn female, and in

pregnancy particularly, outgrowth of the columnar epithelium is very common, forming a bright pink 'rosette' around the external os. This appearance has been misnamed an 'erosion'. In fact, the epithelial covering, though delicate, is intact and is more correctly termed 'ectropion'. In cases in which the cervix has undergone deep bilateral laceration during childbirth, the resulting anterior and posterior lips tend to evert, exposing the glandular epithelium of the canal widely.

Clinical Aspects

The transformation zone is typically the area where precancerous change occurs. This can be detected by microscopic assessment of a cervical cytological smear. If the duct of a cervical gland becomes occluded, the gland distends with mucus to form a retention cyst (or Nabothian follicle). Multiple follicles are not uncommon, giving the cervix an irregular nodular feel and appearance. The body of the uterus is usually angled forward in relation to the cervix (anteflexion), while the uterus and cervix as a whole lean forward from the upper vagina (anteversion). In about 15% of women, the uterus leans backwards towards the sacrum, and is described as retroverted. The cervical os then faces down the long axis of the vagina rather than at right angles to it. In most instances, retroversion is an asymptomatic variant of normality.

It is especially important to distinguish retroversion from anteversion before introducing a sound or similar instrument into the uterine cavity, to avoid perforation of the uterine wall. After menopause, the uterus and cervix gradually become atrophic, and cervical mucus is scanty. The amount of cervix projecting into the vagina also diminishes.

Because the uterus lies immediately behind the bladder and between the lower parts of the ureters, particular care must be taken not to damage these structures during hysterectomy (Fig. 1.9). The endometrium and uterine cavity can be examined by hysteroscopy. The tubal ostia can be seen (Fig. 1.10). Because the anterior and posterior walls are normally in contact, the cavity must be inflated with gas or fluid to obtain an adequate view of the surfaces.

THE UTERINE ATTACHMENTS AND SUPPORTS

Structures attached to the uterus include (Fig. 1.11):

- Round ligament
- Ovarian ligament

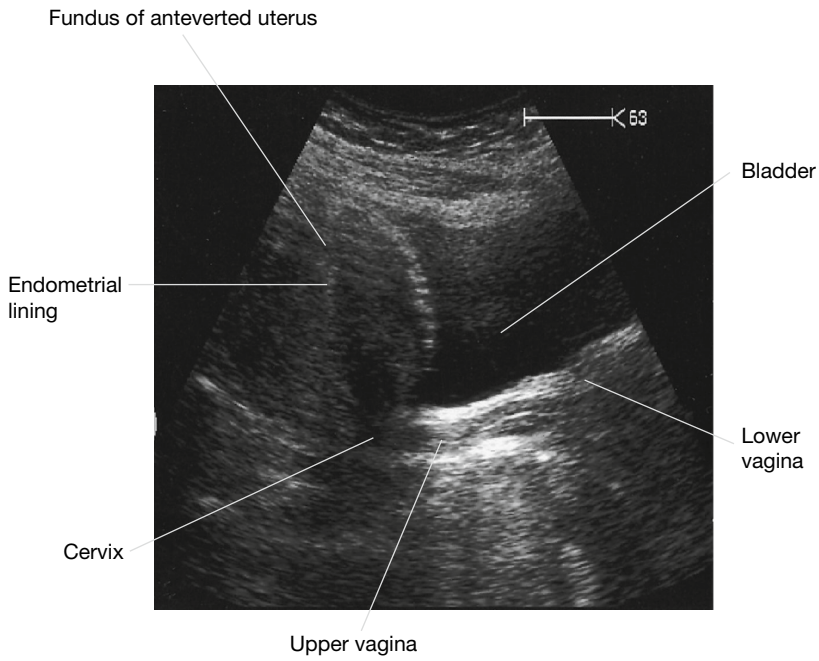


Fig. 1.9 Transabdominal scan of the bladder, uterus, and vagina.

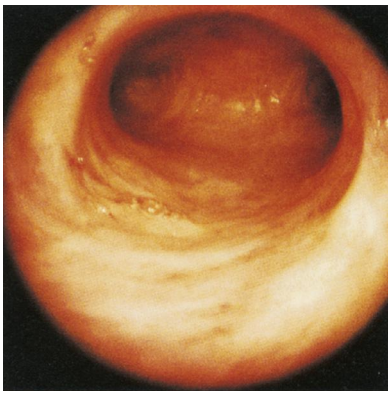


Fig. 1.10 Normal hysteroscopic view of the endometrial cavity, showing both tubal ostia.

- Uterosacral ligament or fold
- Cardinal ligament/transverse cervical ligament (of Mackenrodt).

The broad ligament is merely a double fold of peritoneum extending laterally from the uterus towards the pelvic sidewall. The hilum of the ovary arises from its posterior surface. The portion of the fold lateral to the ovary and tube is termed the infundibulopelvic ligament. Between the leaves of this fold, the uterine and ovarian blood vessels form an anastomotic loop. The ovarian ligament forms a ridge on the posterior leaf of the broad ligament, from the cornu of the uterus to the medial pole of the ovary. Developmentally, it is part of the gubernaculum of the ovary, in continuity with the round ligament, which curves round anteriorly from the cornu towards the inguinal canal, through which it passes. The uterosacral ligaments pass upwards and backwards from the posterior aspect of the cervix towards the lateral part of the second piece of the sacrum. In their lower part, they contain plain muscle along with fibrous tissue and autonomic nerve fibres. In their upper part, they dwindle to shallow peritoneal folds. The ligaments divide the pouch of Douglas from the pararectal fossa on each side.

The main ligaments providing support to the internal genital organs are the cardinal ligaments. The traditional name 'transverse cervical ligaments' is a misnomer. The cardinal ligaments are essentially dense condensations of connective tissue around the venous and nerve plexuses and arterial vessels, which extend from the pelvic sidewall towards the genital tract. Medially, they are firmly fused with the fascia surrounding the cervix and upper part of the vagina. They pass upwards and backwards towards the root of the internal iliac vessels. These condensations of fibrous and elastic tissue, together with plain muscle fibres, are sometimes referred to as the 'parametrium'. They support the upper vagina and cervix, helping to maintain the angle between the axis of the vagina and that of the anteverted uterus. Inferiorly, they are continuous with the fascia on the upper surface of the levator muscles.

THE PELVIC DIAPHRAGM

Below the level of the cardinal ligaments, the pelvic organs are supported by a sloping shelf of muscle on each side, formed by the levator ani muscle (Fig. 1.12). The disposition of the muscle bundles is comparable with that of the abdominal musculature. Near to the midline, there is a longitudinal muscle bundle, the puborectalis (cf. the rectus abdominis). Laterally, the muscle sheets (iliococcygeus and ischiococcygeus) are oblique/transverse. The most medial fibres of puborectalis are inserted into the upper part of the perineal body. The succeeding fibres turn medially behind the anorectal flexure and are inserted into the anococcygeal raphe and the tip of the coccyx along with the fibres of ilio- and ischiococcygeus. Thus, all three visceral tubes reach the body surface via a hiatus between the medial margins of puborectalis, and all are supported from behind by the sling action of the muscle when it contracts. Innervation is from the pudendal nerve (S2,3,4). The fascia on the upper surface of the pelvic diaphragm blends with the lower part of the cardinal ligaments. The fascia on the inferior surface of levator ani forms the roof of the ischiorectal fossa.

The main blood supply of the uterus is from the uterine arteries, which are branches of the internal iliac vessels (Fig. 1.13). Each passes medially in the base of the broad ligament above the ureter and ascends along the lateral aspect of the uterus, forming an anastomotic loop in the broad ligament with the ovarian artery (see Fig. 1.4). The uterine veins form a plexus in the parametrium below the uterine arteries, draining into the internal iliac veins. The principal lymph drainage is to the iliac and obturator glands on the pelvic sidewall. From the fundus and cornua, lymph drains via the ovarian pathway to aortic nodes, while a few lymphatics in the round ligaments drain

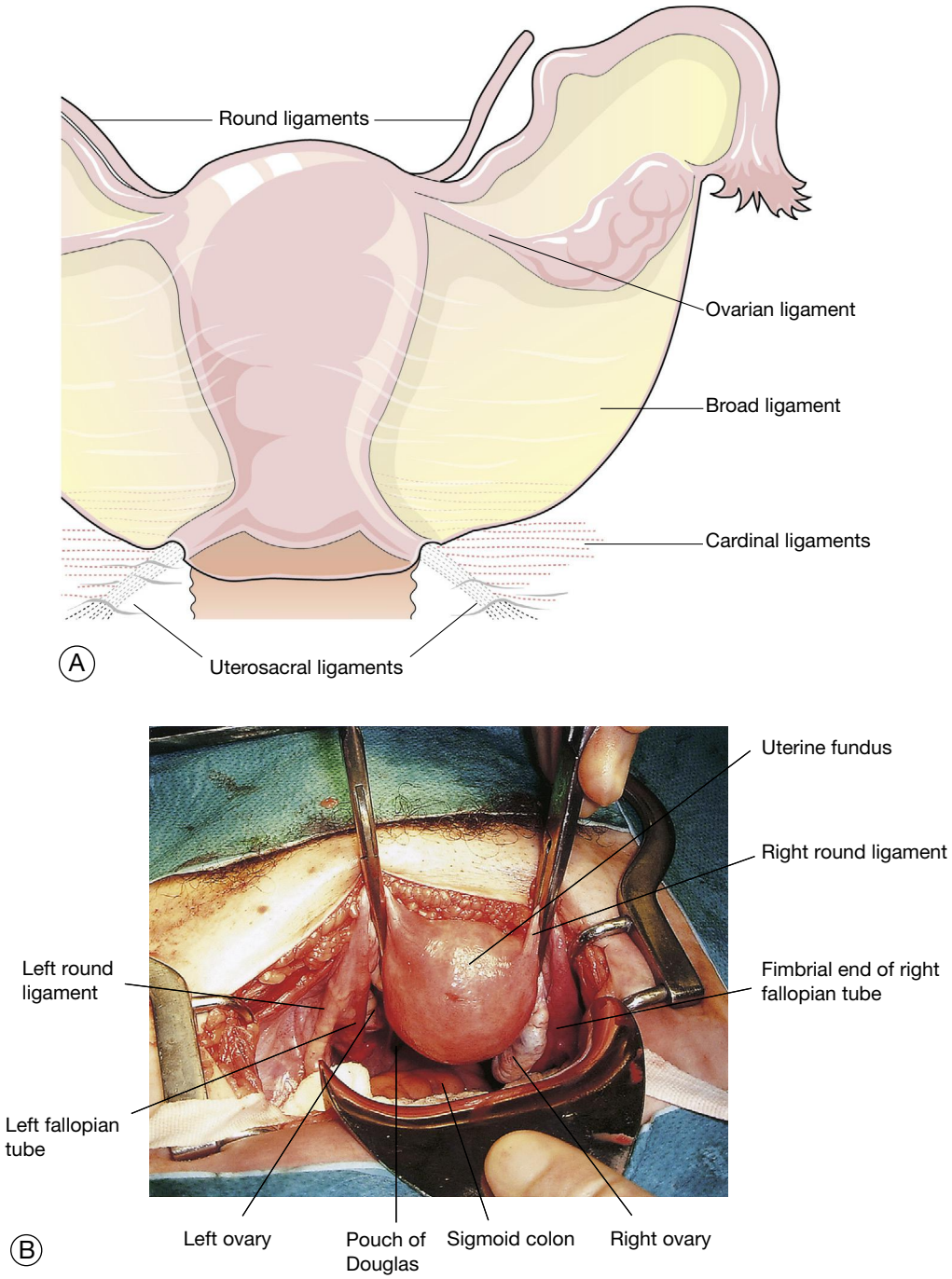


Fig. 1.11 The uterus and appendages. (A) Schematic view of the uterine ligaments seen from behind. **(B)** View of the uterus, fallopian tubes, and ovaries at abdominal hysterectomy.

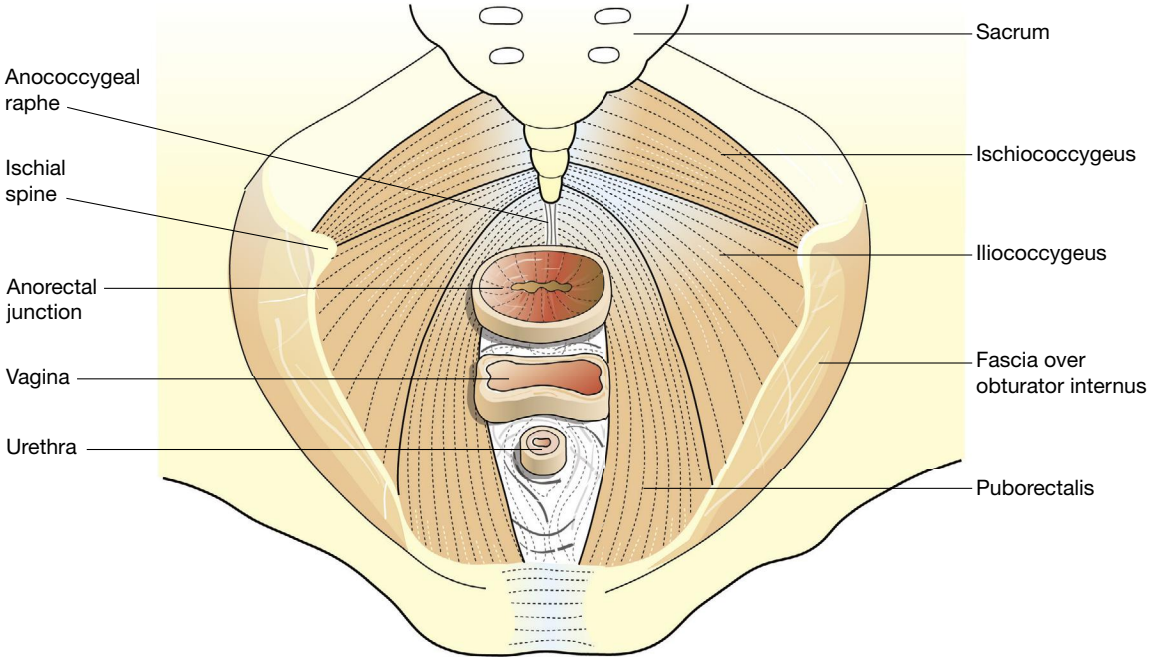


Fig. 1.12 The urogenital diaphragm from above.

into the inguinal nodes (Fig. 1.14). The uterus is supplied by sympathetic and parasympathetic nerves, the exact functional significance of which is uncertain.

CONGENITAL ABNORMALITIES OF THE UTERUS

Most of the female genital tract develops from the two paramesonephric (Müllerian) ducts, the caudal portions of which approximate in the midline and fuse to form the uterus, cervix, and upper part of the vagina. The upper divergent portions of the ducts form the uterine tubes.

Congenital abnormality can result from:

- Failure of or incomplete fusion
- Failure of canalization
- Asymmetrical maldevelopment.

The diagrams in Fig. 3.9 illustrate some of abnormalities that may be encountered. Failures of canalization are likely to present at puberty, as menstrual blood has no way to escape. Incomplete fusion is associated with late miscarriage, pre-term labour and malpresentation. Because of the intimate association during development, congenital abnormality of the female genital tract is commonly associated with abnormality of the urinary tract.

THE VULVA

The term 'vulva' generally encompasses all of the external female genitalia, that is, the mons pubis, labia majora and minora, clitoris, and structures within the vestibule – the external urinary meatus and hymen. The mons pubis is a thickened pad of fat, cushioning the pubic bones anteriorly. The labia majora contain fatty tissue overlying the vascular bulbs of the vestibule and the bulbospongiosus muscles. The skin of the labia majora bears secondary sexual hair on the lateral surfaces only. There are abundant sebaceous, sweat, and apocrine glands. The folds of the labia minora vary considerably in size and may be concealed by the labia majora or may project between them. They contain no fat but are vascular and erectile during sexual arousal; the skin contains many sebaceous glands. Anteriorly, the folds bifurcate before uniting to form a hood above the clitoris and a frenulum along its dorsal surface. Posteriorly, the labia minora are linked by a fine ridge of skin, the 'fourchette'.

The labia minora and the fourchette form the boundaries of the vestibule. Between the fourchette and the posterior part of the hymen, there is a crescentic furrow termed the 'navicular fossa'. The urethral meatus lies

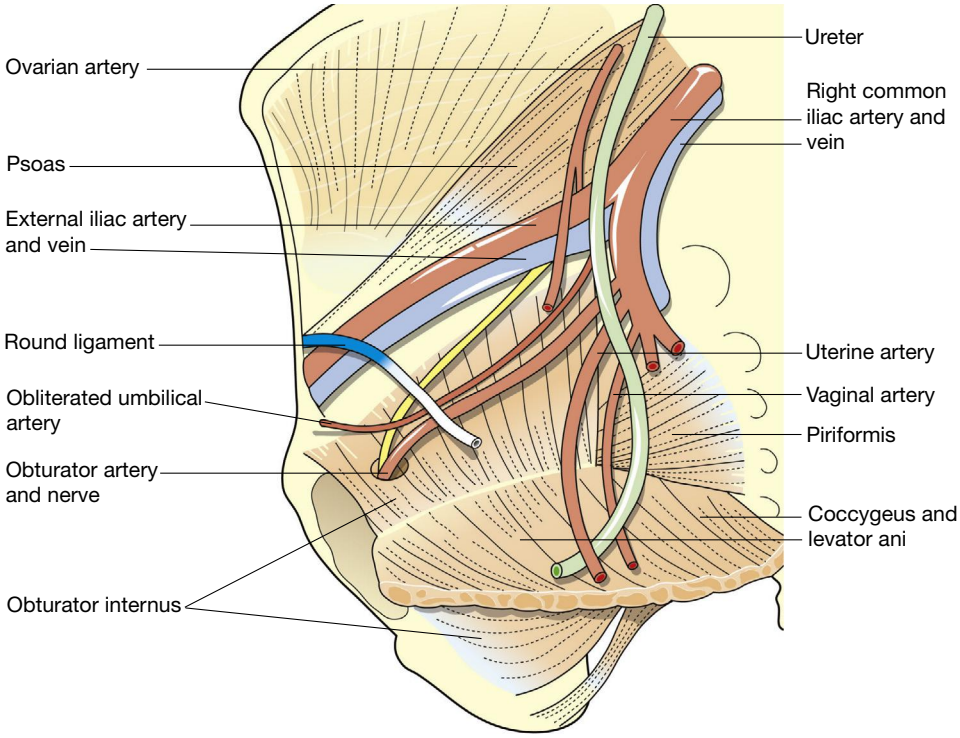


Fig. 1.13 The lateral pelvic sidewall.

within the vestibule, close to the anterior margin of the vaginal orifice. There are pairs of small mucus-secreting paraurethral glands in the lower part of the posterior wall of the urethra. These rudimentary tubules are homologous with the glands in the male prostate. If they become infected and blocked, they may form a paraurethral abscess, cyst, or urethral diverticulum. Two mucus-secreting glands, known as 'Bartholin's glands' (or 'greater vestibular glands'), lie posterolateral to the vaginal orifice on each side, embedded in the posterior pole of the vascular vestibular bulb (see Fig. 1.5). Their ducts open near the lateral limits of the navicular fossa. The glands become palpable and the duct orifices become visible only if the ducts are occluded, resulting in a cyst, or if infection is present.

Blood Supply

The main sources of the vascularity of the vulva are branches of the internal pudendal arteries. There are also branches from the superficial and deep external pudendal arteries.

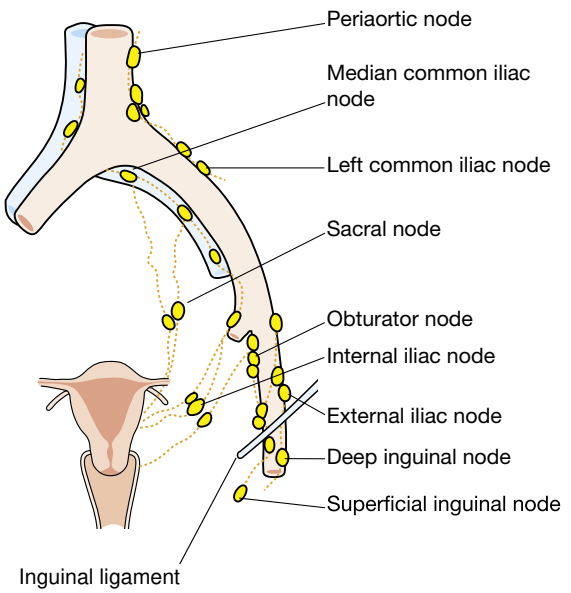


Fig. 1.14 Lymphatic drainage of the uterus. The lymph channels follow the blood supply.

Nerve Supply

The main sensory supply to the vulva is via the pudendal nerves. Peripheral parts of the vulvar skin are supplied by filaments from the iliohypogastric and ilioinguinal nerves, and from the perineal branches of the posterior cutaneous nerves of the thigh (see Fig. 1.6). The pudendal nerve provides motor fibres to all of the muscles of the perineum, including the voluntary urinary and bowel sphincters, as well as the levator ani.

Lymph Drainage

The main pathway of drainage is to the superficial inguinal glands and on through the deep inguinal to the external iliac glands. Some lymphatics from the deeper structures of the vulva pass with vaginal lymphatics to the internal iliac nodes.

THE FALLOPIAN TUBES

The tubes extend on each side from the cornu of the uterus, within the upper border of the broad ligament, for about 10 cm. The tubes and ovaries together are commonly described as the uterine appendages, or adnexa (Fig. 1.15).

The tube can be divided into four parts (Fig. 1.16). The interstitial (intramural) part forms a narrow passage through the thickness of the myometrium. The isthmus, extending out from the cornu for about 3 cm, is also narrow. The ampulla is thin walled, 'baggy', and tortuous. Its lateral portion is free from the broad ligament and droops down behind it towards the ovary. Near its lateral limit, the abdominal ostium is constricted, but opens out again to form the infundibulum. This trumpet-shaped expansion is fringed by a ring of delicate fronds (or fimbriae), one of which is attached to the surface of the ovary.

The walls of the tubes include outer longitudinal and inner circular layers of smooth muscle. The delicate lining (endosalpinx), containing columnar ciliated and secretory cells, has longitudinal folds in the isthmic segment, which change into a highly intricate branching pattern in the ampulla.

Tubal Function

At the time of ovulation, the fimbriae clasp the ovary in the area where the stigma (or point of follicular rupture) is forming. Usually, therefore, the ovum is discharged into the infundibulum (funnel) and is carried by tubal peristalsis into the ampulla of the tube, which is where fertilization occurs. Transit of the zygote to the site of implantation in the uterus takes several days.

Sterilization is effected by occluding both tubes, preferably in the narrow isthmic portion, using clips, sutures, rings, or diathermy.

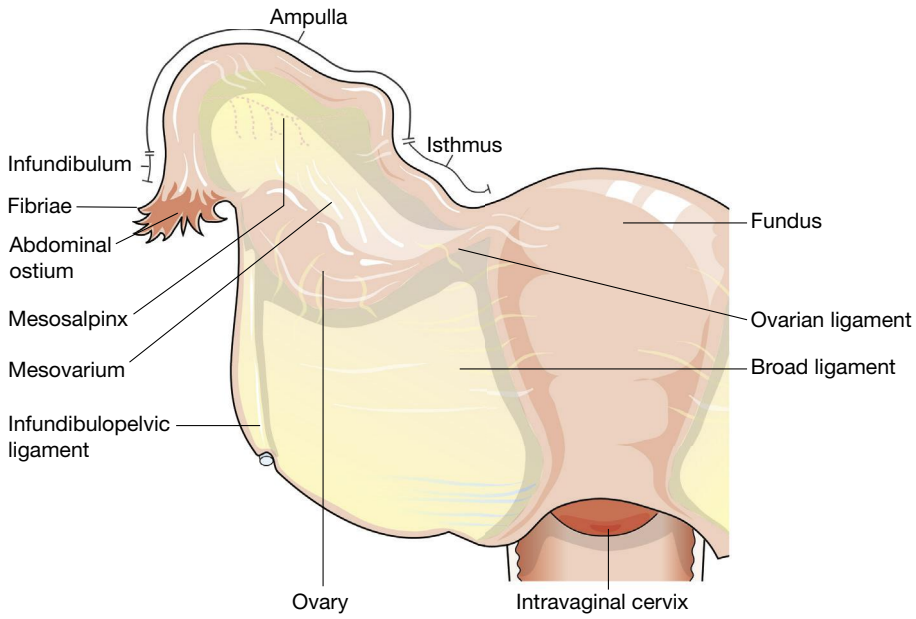


Fig. 1.15 Posterior view of the uterus and broad ligament.

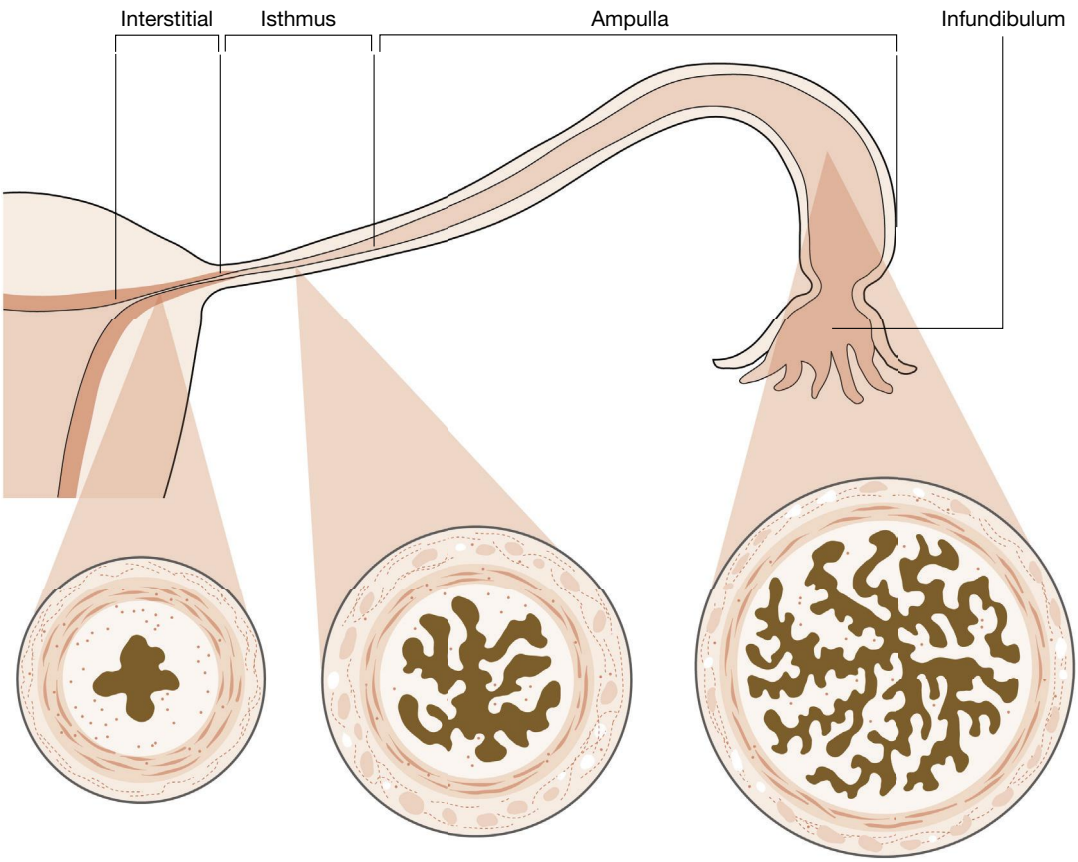


Fig. 1.16 The oviduct, showing the structure of the mucosal layer.

Patency of the tubes can be tested by injecting a watery dye (methylthioninium chloride – methylene blue) through the cervix and observing spill from the abdominal ostia by laparoscopy. The contours of the uterine cavity and tubal lumen may also be demonstrated with radio-opaque fluid during a hysterosalpingogram.

THE VAGINA

The vagina, which links the external and internal parts of the female genital tract, has a dual function. It forms the coital canal, affording access for spermatozoa to reach the cervix and, with the cervix, it forms the soft-tissue birth canal. It lies in close proximity to the urethra and bladder anteriorly, and to the anal canal and rectum posteriorly. All three canals traverse the pelvic floor, passing between the medial (puborectalis) portions of the levator ani muscles. The insertion of these muscle fibres into the anococcygeal raphe creates a sling behind the bowel so that a sharp angle is created at the junction of the lower rectum and the anal canal, which is opened when the muscle relaxes. Other muscle fibres are inserted into the perineal body near its apex, creating a similar sling which angulates the axis of the vagina at that level. In turn, the anterior vaginal wall in the area of the bladder neck receives support.

There are differences in the anatomy of the vagina above and below this level. The lower third of the vagina is closely invested by the superficial and deep muscles of the perineum. It:

- Incorporates the urethra in its anterior wall
- Is separated from the bowel by the perineal body
- Has a rich arterial blood supply from branches of the vaginal arteries and from both external and internal pudendal vessels.

The upper two-thirds of the vagina, above the levator shelf:

- Is not invested by muscles – rather, it is wide and capacious
- Is in apposition with the bladder base anteriorly and with the rectum (and, above that, the pouch of Douglas) posteriorly
- Is supported laterally and at the vault by the parametrium (cardinal and uterosacral ligaments). During sexual arousal, the smooth muscle fibres within the parametrium elevate the vaginal vault and cervix, thereby elongating the vagina and straightening its long axis.

Vaginal Structure

The vaginal walls form an elastic fibromuscular tube with a multilayered structure. The lining of stratified squamous epithelium is corrugated into transverse folds (or rugae), which facilitates stretching during childbirth. The epithelium contains no glands, but during the reproductive years the more superficial cells contain abundant glycogen. This polysaccharide is broken down by lactobacilli, which form the normal flora of the vagina, producing lactic acid. This accounts for the low pH in the vaginal lumen (average pH, 4.5).

Between the epithelium and the muscle, there is a layer of areolar tissue containing an extensive venous plexus. Vascular engorgement during sexual arousal, analogous to erection in the male, is most marked in the lower part of the vagina, encroaching on the vaginal lumen as the rugae distend. The vasocongestive response also results in increased transudation into the vaginal lumen.

The smooth muscle layers (outer longitudinal, inner circular) are not distinct, and an interlacing pattern is usual. Deep to the muscle, there is another extensive plexus of veins within the outer vaginal fascia.

THE OVARY

The ovaries are attached on each side to the posterior surface of the broad ligaments through a narrowed base, termed the 'hilum'. The ovaries are also attached to the cornua of the uterus by the ovarian ligaments. Developmentally, these are the upper portions of the gubernacula ovarii. They are responsible for drawing the ovaries down into the pelvis from the posterior wall of the abdominal cavity. Typically, each ovary lies in an ovarian fossa, a shallow peritoneal depression lateral to the ureter, near the pelvic sidewall. However, the position may vary; when the uterus is retroverted, one or both ovaries may lie in the pouch of Douglas.

The ovaries are ovoid in shape, with an irregular surface and a firm, largely solid, stroma, which can be divided indistinctly into an outer cortex and an inner medulla. The surface epithelium of cuboidal coelomic cells forms an incomplete layer, beneath which is a fibrous investment – the 'tunica albuginea'. The germ cells from which the ova are derived are embedded in the substance of the ovaries.

The ovarian blood vessels and nerves enter through the hilum from the broad ligament. The ovarian arteries are direct branches of the aorta. Within the broad ligaments, they form an anastomotic loop with branches of the uterine arteries.

Anatomy of the Lower Urinary Tract

The descending ureters are narrow, thick-walled muscular tubes that cross into the pelvis close to the bifurcation of the common iliac arteries. They lie immediately under the peritoneum of the pelvic sidewall, behind the lateral attachment of the broad ligaments. Curving medially and forwards, they pass through the base of the broad ligaments below the uterine arteries, about 2 cm lateral to the supravaginal part of the cervix, a short distance above the lateral fornices of the vagina.

Approaching the bladder, the ureters pass medially in front of the upper vagina and enter the bladder base obliquely at the upper angles of the trigone.

The wall of the ureter is composed of three elements: an external fibrous sheath, layers of smooth muscle, and a lining of transitional epithelium. There may be partial or complete duplication of one or both ureters. An ectopic ureter is one that opens anywhere but the trigone of the bladder; this may even be into the vagina or the vestibule. Urinary incontinence inevitably results.

THE BLADDER

The urinary reservoir, lined with transitional epithelium, has the shape of a tetrahedron when empty. However, the mesh of smooth muscle in the bladder

wall can readily distend to contain a volume of half a litre or more. This muscle coat (the detrusor muscle) is thus normally relaxed and capable of considerable stretching without a contractile response. If urinary outflow during micturition is chronically impeded, however, the detrusor muscle becomes irritable and ultimately hypertrophic, producing prominent trabecular bands visible at cystoscopy.

The bladder is covered with peritoneum on its superior surface only. The peritoneum is reflected onto the anterior abdominal wall at varying levels dependent on the degree of bladder filling. The oblique passage of the terminal part of each ureter through the bladder wall creates a one-way valve, which normally prevents urinary backflow from the bladder. This protects the kidneys from ascending infection. The triangular area within the bladder base defined by the two ureteric orifices and the internal urethral orifice is termed the 'trigone'. Over this area, the epithelium remains smooth even when the bladder is empty.

THE URETHRA

The female urethra is about 4 cm long. Below the bladder neck, it is embedded in the anterior vaginal wall, and the smooth muscle layers of the two structures intermingle. The urethral tissues also reflect the vascularity and turgidity of the vagina itself. Many of the urethral muscle fibres near the bladder neck are longitudinal and continuous with those of the bladder above, forming a funnel that opens out when these fibres contract, flattening the angle between the bladder base and the upper urethra. There are also abundant elastic fibres at this level, whose action helps to restore urethral closure after micturition. Around the lower part of the urethra, there is a fusiform collar of voluntary muscle – 'the external urethral sphincter'. This segment of the urethra passes through the perineal membrane, which keeps it in a stable position. The upper urethra, on the other hand, shares the mobility of the bladder neck. The urethra is lined by transitional epithelium in its upper part, and by squamous epithelium below.

NERVE SUPPLY

Apart from the external sphincter, the efferent nerve supply controlling bladder function is from the pelvic parasympathetic system (S2,3,4), which provides the main motor fibres to the detrusor muscle. Afferent fibres conveying the normal sensations of bladder filling also return through the parasympathetic pathway, though some sympathetic sensory fibres convey the feelings of bladder overdistension via the hypogastric plexus. At the level of the second, third, and fourth sacral segments of the spinal cord, the sensory and motor parasympathetic nerves form spinal reflex arcs, which are moderated by interaction with higher centres in the brain. Urinary continence depends upon a variety of factors. These include the elastic fibres surrounding the bladder neck, which normally maintain urethral closure, and the tone or reflex contraction of the levator ani muscles, which, through their insertion into the perineal body, elevate the urethrovesical junction, creating an angulation at the junction of the mobile (upper) and fixed (lower) portions of the urethra. The turgidity of spongy tissue underlying the urethral epithelium also assists in occluding the urethra, as does the action of the voluntary sphincter.

Key Points

- **Without understanding the anatomy of the pelvis, it is impossible to understand the mechanisms of labour.**
- **The cross-sectional shape of the birth canal is different at different levels. At the pelvic brim, it is oval in shape; the widest part of this oval is in the lateral plane from one side to the other. The outlet is also oval, with the widest part in the anteroposterior plane. The head enters the pelvic brim in the transverse position, as the inlet is widest in this plane, but rotates 90 degrees at the pelvic floor to the anteroposterior plane before delivery. The shoulders also follow the same rotation.**

Chapter 2

History and Examination

Kate Darlow

Chapter Outline

Introduction

In general, history and examination cannot be divided neatly into different specialties, and questions relating to obstetrics and gynaecology should form part of the assessment of any woman presenting to any specialty. There may be embarrassment and recrimination, for example, when a suspected appendicitis turns out to be a pelvic infection secondary to an unsuspected intrauterine contraceptive device (IUCD). Similarly, not all problems presenting to obstetricians and gynaecologists are obstetrical or gynaecological in nature. It is therefore important to take

a full history and perform an appropriate examination in all cases. The key points of gynaecological and obstetrical history and examination are emphasised in the next sections.

Gynaecological History

A gynaecological history should follow the usual model for history taking, with questions about the presenting complaint, its history and associated problems. It should include a past medical history and information about prescription and non-prescription drugs used, and any known allergies. After questions about social circumstances and activities, plus family history, the history is completed with a general systemic enquiry. However, during a gynaecological history, there are specific key areas to be expanded upon. These include menstrual, fertility, pelvic pain, urogynaecological and obstetrical histories.

MENSTRUAL HISTORY

The Pattern of Bleeding

The simple phrase 'tell me about your periods' often elicits all the information required. The bleeding pattern of the menstrual cycle is expressed as a fraction, such that a cycle of 4/28 means the woman bleeds for 4 days every 28 days. A cycle of 4 to 10/21 to 42 means the woman bleeds between 4 and 10 days every 21 to 42 days. Asking the shortest time between the start of successive periods, the longest time between periods, and the average time between periods helps determine the cycle characteristics.

Bleeding Too Little

Amenorrhoea is the absence of periods. Primary amenorrhoea is when someone has not started menstruating by the age of 16 years. Secondary amenorrhoea means that periods have been absent for longer than 6 months. Oligomenorrhoea means that the periods are infrequent, with a cycle of 42 days or more.

Climacteric is the perimenopausal time when periods become less regular and are accompanied by increasing menopausal symptoms. Menopause is the time after the last ever period; therefore, it can only be assessed retrospectively.

Irregular periods, oligomenorrhoea or amenorrhoea, suggest anovulation or irregular ovulation. Specific questions about weight, weight change, acne, greasy skin, hirsutism, flushes or galactorrhoea may help identify the nature of the patient's ovarian dysfunction.

Bleeding Too Much

It is very difficult to find out how heavy someone's periods are. If menstrual blood loss is accurately measured, an average of 35 mL of blood is lost each month. Heavy menstrual bleeding (previously known as 'menorrhagia') is defined as loss of more than 80 mL during regular menstruation. Some women will complain of very heavy periods with a normal blood loss, while others will not complain in the presence of heavy menstrual bleeding. Asking how often pads or tampons have to be changed and using pictorial charts can provide more objective information. Whether menstrual loss is excessive, however, is a largely subjective assessment.

Specific symptoms can indicate abnormally heavy menstruation. Although small pieces of tissue are normal, blood clots are not. 'Flooding' is when menstrual blood soaks through all protection. It is both abnormal and distressing. Symptoms of anaemia may also be present. A history of the menstrual cycle since menarche (the first period) can reveal changes in the bleeding pattern. However, an emphasis on the effect on lifestyle and treatments tried previously is particularly important.

Bleeding at the Wrong Time

It is important to ask specifically about bleeding, brown or bloody discharge between periods (intermenstrual bleeding), or after intercourse (post-coital bleeding). These symptoms can point to abnormalities of the cervix or uterine cavity. Postmenopausal bleeding is defined as bleeding more than 1 year after the last period. Undiagnosed abnormal bleeding requires further investigation. If a woman is postmenopausal, enquiry should be made about past or current use of hormone replacement therapy.

FERTILITY HISTORY

Last Menstrual Period (LMP)

This question is vital and should be followed with whether that period came at the expected time and was of normal character. As well as alerting to the possibility of pregnancy, the information is important

because some investigations need to be performed at specific times of the menstrual cycle.

CONTRACEPTION

It is useful to establish whether the woman is sexually active, perhaps with something like, 'Are you currently in a physical sexual relationship?' and then, 'Are you using any contraception at present?' A further discussion about fertility issues, unprotected intercourse, and risk factors for certain diseases may be appropriate. A contraceptive history should include any problems with chosen contraceptives and why they were stopped. Questions may be followed-up with 'Are you hoping for a pregnancy?' if the situation is not clear.

If there are any infertility issues, their duration and the results of any investigation or treatment may be of relevance.

CERVICAL SMEARS

Cervical screening programmes vary in different countries but, generally, women between the ages of 20 to 25 and 60 to 64 years are invited to participate every 3 to 5 years. The date of the woman's last smear should be noted and when it was recommended that she have her next smear. Any previous abnormalities or vaccination should also be noted and whether she has had any colposcopic investigation or treatment. If she is over 50 years of age, it may be relevant to discuss breast screening.

PELVIC PAIN HISTORY

Painful Periods

Dysmenorrhoea is a common problem and its effects on lifestyle are important. The cramping pain of primary dysmenorrhoea is at its most intense just before and during the early stages of a period. Young women are particularly affected, and the pain has usually been present from the time of the first period. It is not usually associated with structural abnormalities and may improve with age or after a pregnancy. Secondary dysmenorrhoea is when menstruation has not tended to be painful in the past; it is more likely to indicate pelvic pathology. In particular, progressive dysmenorrhoea, in which the intensity of the pain increases throughout menstruation, may suggest endometriosis.

Pelvic Pain

The relationship of pelvic pain to the menstrual cycle is important. Pain immediately prior to or during periods is more likely to be of gynaecological origin. 'Mittelschmerz' is a cramping pelvic pain that can be midline or unilateral. It occurs 2 weeks before a period and is caused by ovulation. Intermittent discomfort may suggest some scarring or ovarian pathology, but it is more commonly non-gynaecological. It is vital to take a urinary and lower gastrointestinal history, as urinary tract infection or irritable bowel syndrome may present with pelvic pain. Any pain is likely to be worse if the person is anxious, stressed or depressed. Chronic pelvic pain is particularly affected by psychosomatic factors – recognising this during history taking is important.

Pain With Intercourse

There are two main types of dyspareunia: superficial and deep. They can be differentiated by asking, 'Is it painful just as he begins to enter or when he is deep inside?' Deep dyspareunia is associated with pelvic pathology, such as scarring, adhesions, endometriosis or masses that restrict uterine mobility. Superficial dyspareunia can arise from local abnormalities at the introitus or from inadequate lubrication. It can also be due to a voluntary or involuntary contraction of the muscles of the pelvic floor referred to as 'vaginismus' (see Chapter 19).

VAGINAL DISCHARGE

Discharge can be normal or associated with cervical ectopy and, particularly if offensive or irritant, can indicate infection. It can also suggest neoplasia of the cervix or endometrium. Enquire about the duration, amount, colour, smell and relationship to cycle.

UROGYNAECOLOGICAL HISTORY

Urinary Symptoms

A good initial question to ask is, 'Do you ever leak urine when you don't intend to?' If so, find out what provokes it, how it affects her quality of life and how troublesome her symptoms are. Symptoms suggestive of an overactive bladder include frequency, urgency and nocturia. Incontinence after exercise, coughing, laughing or straining can suggest stress incontinence. It can be difficult to differentiate stress incontinence

and urge incontinence, however, as there is often a mixed picture. It is important to ask about fluid intake, in particular about caffeine and alcohol, which can exacerbate urinary symptoms.

A history of dysuria or haematuria may suggest bladder infection or pathology. 'Strangury' is the constant desire to pass urine and suggests urinary tract inflammation.

Prolapse

Prolapse may be associated with vaginal discomfort, a dragging sensation, the feeling of something 'coming down', and possibly backache. Although the uterus, anterior vaginal wall and posterior vaginal wall can prolapse, it is difficult to separate these by history. Bladder and bowel function should be explored, including a question about the need to digitally manipulate the vagina in order to be able to void.

Gynaecological Examination

Signs of gynaecological disease are not limited to the pelvis. A full examination may reveal anaemia, pleural effusions, visual field defects or lymphadenopathy in gynaecological conditions. However, passing a speculum, taking a cervical smear and performing a bimanual pelvic examination are the key skills to acquire. A great deal of sensitivity is required in their use.

PASSING A SPECULUM

Preparation

The woman should empty her bladder and remove sanitary protection. The examination room should be quiet and have a private area for the woman to undress. It should contain an examination couch with a modesty sheet and good adjustable lighting. A chaperone should always be present. The examination requires full explanation and verbal consent.

Stand on the right side of the woman with gloves, speculum and lubricating gel immediately to hand. The woman should be asked to lie back, bend her knees, put her heels together and let her knees fall apart. The light should be adjusted to give a good view of the vulva and perineum; the modesty sheet should cover the woman's abdomen and thighs.

Inspection

Inspect the hair distribution and vulval skin. Hair extending towards the umbilicus and onto the inner thighs can be associated with disorders of androgen excess, as can clitoromegaly. The vulva can be a site of chronic skin conditions such as eczema and psoriasis, specific conditions such as lichen sclerosis and warts, cysts of the Bartholin glands and cancers. Ulceration may imply herpes, syphilis, trauma or malignancy.

Look at the perineum (Fig. 2.1) and gently part the labia to inspect the introitus. Perineal scars are usually secondary to tears or episiotomy during childbirth. A red papule around the urethral opening is usually a prolapsed area of urethral mucosa. A white, plaque-like discharge may suggest thrush, and pale skin with punctate red areas implies atrophic vaginitis. Asking the woman to cough may reveal demonstrable stress incontinence or the bulge of a prolapse.

Speculum Examination

Disposable speculums come in different sizes. Ensure that the speculum is working normally and lubricated with gel. Hold the speculum so that its blades are oriented in the same direction as the vaginal opening. Part the labia and slowly insert the speculum, rotating it gently until the blades are horizontal (Fig. 2.2).

If the woman is in the lithotomy position at the edge of the couch, the speculum can be turned downwards to avoid pressure on the clitoris. If the woman is lying on the couch itself, it is usually easier to rotate the speculum upwards. It should be inserted fully in a slightly posterior direction, before firmly, but gently, opening to visualize the cervix (Fig. 2.3). The speculum can be closed a little when the cervix pops into view.

If the cervix is not visible, it is often because the speculum has not been inserted far enough before opening. If this is not the case, the cervix is either above or below the blades. As most uteri are anteverted, it is usually below the blades, and the speculum should be angled more posteriorly before reopening. Otherwise, gently insert a finger to determine its position. For removal, the speculum should be opened further and withdrawn beyond the cervix before rotation back again, closure and removal.

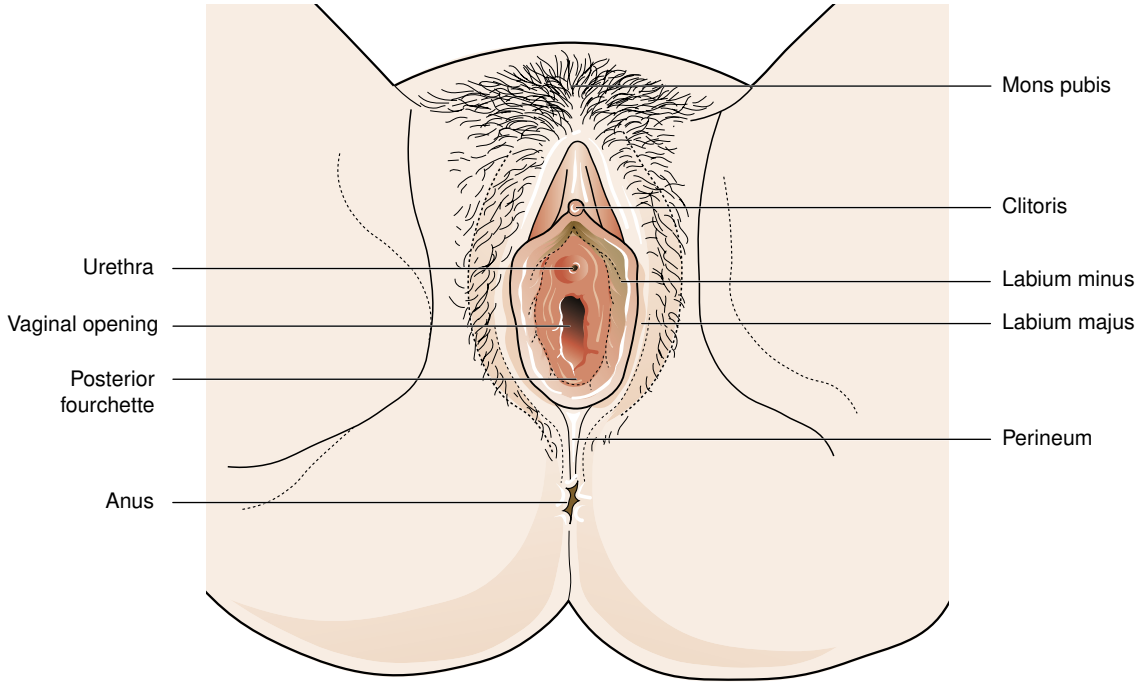


Fig. 2.1 Inspection of the perineum.

Inspect the vagina for atrophic vaginitis and discharge. A creamy or mucousy discharge is normal. A yellow-greenish frothy discharge is seen with *Trichomonas vaginalis* and a grey-green fishy discharge suggests bacterial vaginosis. There may be a purulent cervical discharge with gonorrhoea, and an increased mucousy discharge may occur with chlamydial cervicitis. Swabs, if required, should be taken from the vaginal fornices (high vaginal) or the cervical canal (endocervical).

The cervical os is small and round in the nulliparous and bigger and more slit-like in parous women. Threads from an IUCD may be present. Translucent lumps or cysts around the os are Nabothian follicles, but warts and tumours can sometimes be seen. An ectopy is red, as the epithelium of the cervical canal extends onto the surface of the paler outer cervical epithelium. It varies across the cycle and should be considered as normal, although it may be associated with contact bleeding or increased discharge.

A bivalve speculum holds open the vaginal walls and obscures any cystocele or rectocele, but a univalve speculum can demonstrate these well. For this, a woman lies in the left-lateral position with her knees drawn up and the lubricated blade of the speculum is used to hold back the anterior vaginal wall. Coughing will show a bulge of the posterior wall if a rectocele is present. When the posterior wall is held back, coughing will demonstrate the bulge of a cystocele and/or uterine descent (Figs 2.4 and 2.5).

TAKING A CERVICAL SMEAR

Smears should ideally be performed in the mid- to late follicular phase, not during menstruation, and only as part of the screening programme. Confirm the woman's details and ensure that you have ascertained all of the information required for the request form. Run the speculum under warm water to provide appropriate lubrication and then visualize the cervix.

The most commonly used technique involves liquid-based cytology and a broom-type sampling device. Insert the central bristles of the broom-like device into the endocervical canal deep enough to allow the shorter bristles to fully contact the ectocervix. Push

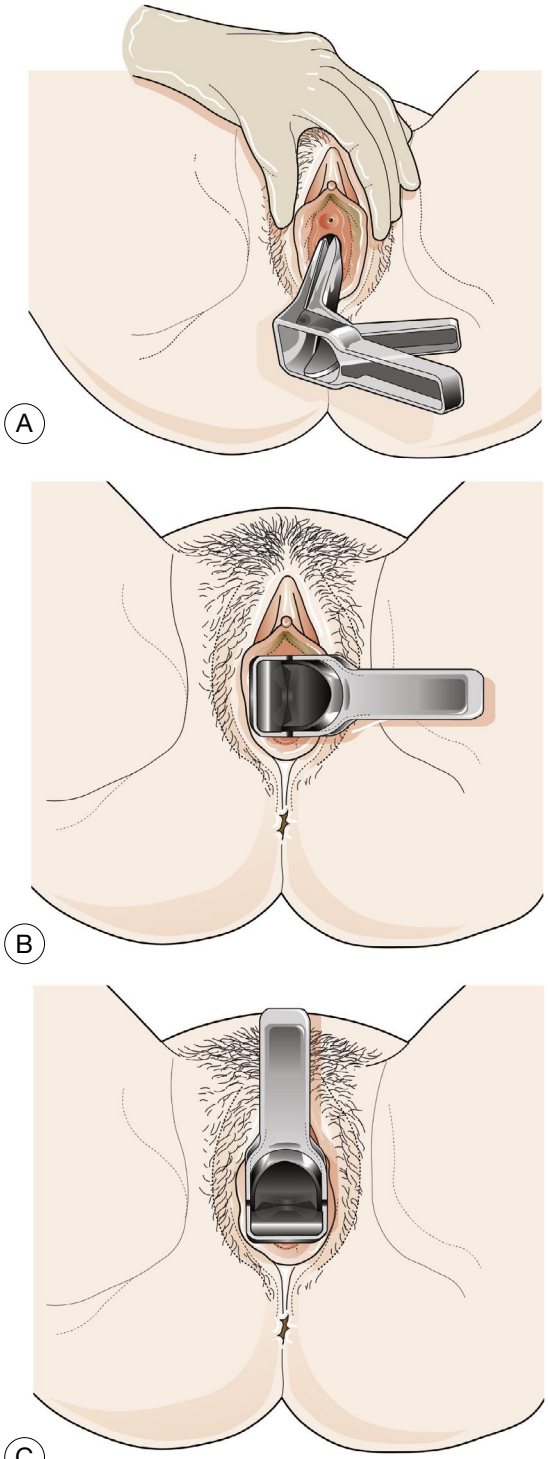


Fig. 2.2 (A–C) Insertion of a bivalve (Cusco) speculum.

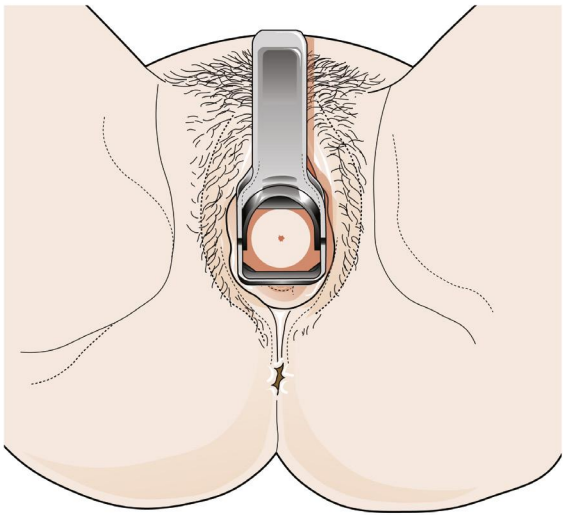


Fig. 2.3 Visualization of the cervix.

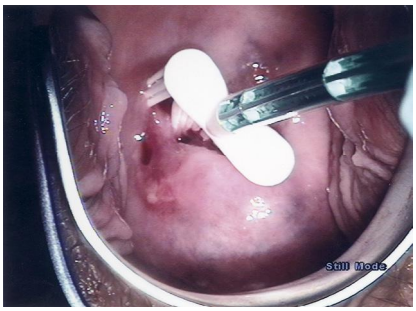


Fig. 2.4 Taking a cervical smear.

gently and rotate the broom in a clockwise direction five times (Fig. 2.6).

Immediately put the broom into the container of preserving solution and rotate 10 times while pushing against the side of the container. Discard the broom, tighten the lid and label the container with the woman's details. Complete and check the cytology request form, ensuring that all of the information required is provided, and match this, or the computer-generated barcode if the form is completed electronically, to the container for transport to the laboratory. Inform the woman of how long the result will take and how it will be delivered.

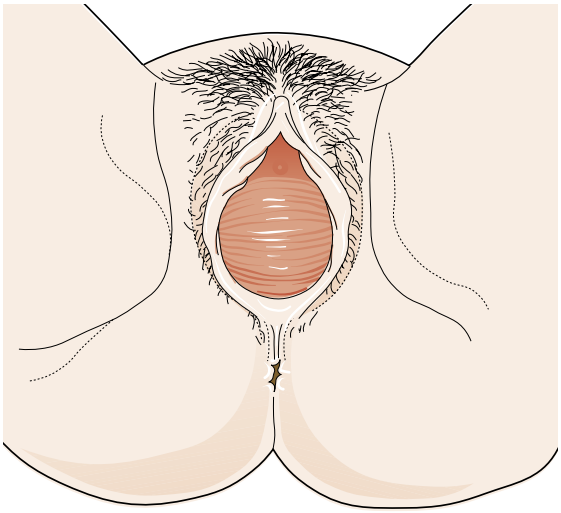


Fig. 2.5 The bulge of a prolapse.

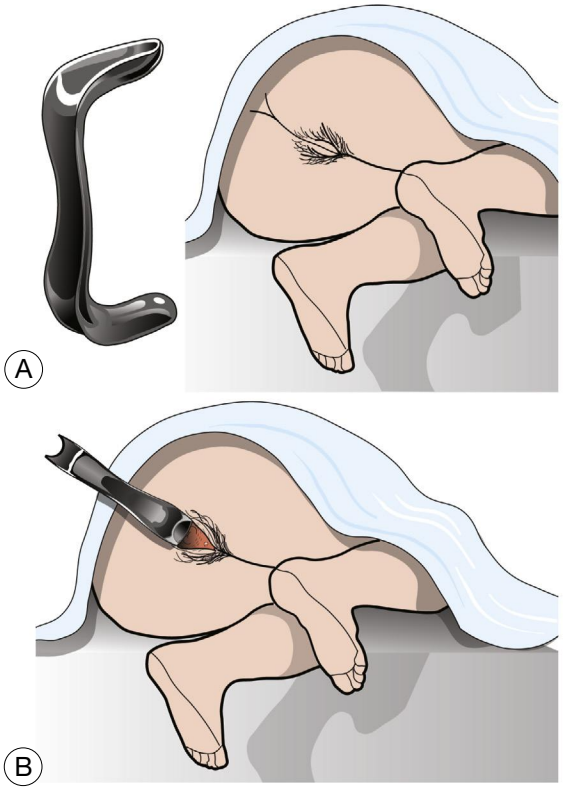


Fig. 2.6 (A,B) Examination with a univalve speculum.

PELVIC EXAMINATION

Apply lubricating gel to the gloved fingers of the right hand. Part the labia with the index and middle fingers of the left hand. Gently insert the right index finger into the vagina. If comfortable for the woman, insert the middle finger in below the index finger, making room posteriorly to avoid the sensitive urethra. The cervix feels like the tip of a nose and protrudes into the top of the vagina (Fig. 2.7).

Feel the cervix and record irregularities or discomfort. 'Cervical excitation' is when touching the cervix causes intense pain, which implies active pelvic inflammation. The dimple of the os can be felt and the firmness of the uterine body lies above or below the cervix. A vaginal cyst may be an embryological duct remnant, and vaginal nodules may represent endometriosis.

Assess the position of the uterus. It is usually anteverted, with the cervix posterior and the uterine body anterior. If the uterus is retroverted, the cervix is anterior and the uterine body lies posteriorly. The fingers should be manipulated behind the cervix to lift the uterus. With the left hand above the umbilicus, feel through the abdomen for the moving uterus (Fig. 2.8). If the uterus cannot be palpated, the hand should be moved gradually down until the uterus is between the fingers (Fig. 2.9A).

Assess the mobility, regularity and size of the uterus. The adhesions of endometriosis, infection, surgery or malignancy fix the uterus and make bimanual examination more uncomfortable. Asymmetry of the uterus may imply fibroids. Uterine size is often related

Fig. 2.7 Digital pelvic examination.

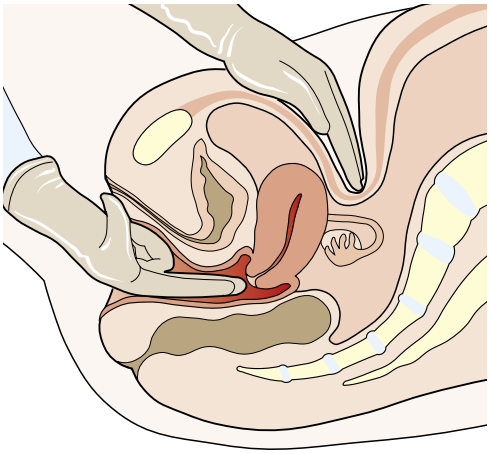
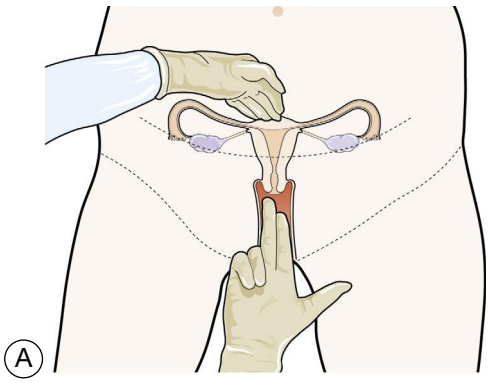


Fig. 2.8 Bimanual examination.



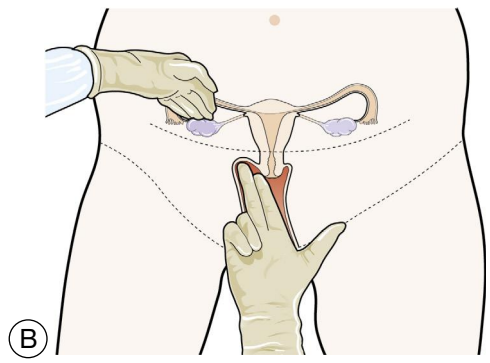


Fig. 2.9 (A,B) Examination of the uterus and adnexa.

to stage of pregnancy. A normally sized uterus feels like a plum. At 6 weeks, a pregnant uterus feels like a tangerine, at 8 weeks an apple, at 10 weeks an orange, and at 12 weeks a grapefruit. At 14 weeks, the uterus can be felt on abdominal palpation alone.

Feel for adnexal masses in the vaginal fornices lateral to the cervix on each side. Push up the tissues in the adnexa and, starting with the left hand above the umbilicus, bring it down to the appropriate iliac fossa, trying to feel a mass bimanually (Fig. 2.9B). In thin women, the ovaries can just be felt, but a definite adnexal mass is abnormal and should be investigated further. As large adnexal masses tend to move to the midline, it can be difficult to differentiate a large ovarian cyst from a large uterus.

Obstetrical History

An obstetrical history follows the usual model for history taking. However, as with gynaecological histories, there are several unique things to be covered. A history from a pregnant woman starts with calculating the gestation and putting this pregnancy in the context of previous pregnancies. The presenting complaint is next, which encompasses a record of what is happening now, risk factors and symptom progression. It is followed by a complete history of this pregnancy and previous pregnancies. After this, medical, gynaecological, drug, social and family histories are expanded. However, these are often straightforward, as pregnant women are usually young and healthy.

ESTABLISHMENT OF THE ESTIMATED DAY OF DELIVERY (EDD)

Term is between 37 and 42 weeks' gestation, but the actual EDD is 40 weeks after day 1 of the LMP. This can cause confusion, as gestation is calculated from the LMP, not conception. When someone is 12 weeks' pregnant, she conceived 10 weeks ago. Phone-based apps or gestational wheel calculators allow the easy calculation of EDD and current gestation from the LMP (Fig. 2.10). In their absence, Naegele's rule can be used. To calculate the EDD, subtract 3 months from the LMP and add 10 days.

These methods assume a regular 4-week cycle. If this is not the case, the EDD may require adjustment. With a regular 5-week cycle, the true EDD will be 1 week later than calculated. An ultrasound scan (USS) is used to confirm the final EDD. However,

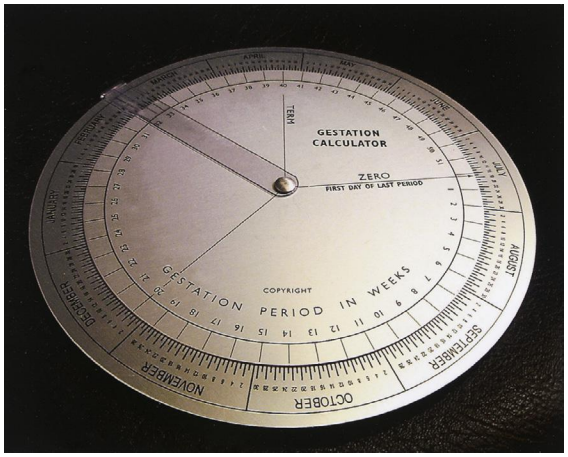


Fig. 2.10 Gestational wheel.

scans have an associated error that increases with gestation. In the early second trimester, this is approximately plus or minus 1 week. In general, the EDD from the LMP is used unless the USS date differs by more than a week.

OBSTETRICAL SUMMARY

Parity is a summary of a woman's obstetrical history; two numbers are used to document this. Added together, the numbers give the number of previous pregnancies. Someone who is para 0 + 0 has not been pregnant before. The first number is the total number of live births, plus the number of stillbirths after 24 weeks' gestation. The second number is the number of pregnancies before 24 weeks, in which the baby was not born alive.

A woman who is para 3 + 3 has been pregnant six times. The first '3' might represent a normal-term delivery, a live birth at 23 weeks after which the baby died and a stillbirth at 25 weeks' gestation. The other three pregnancies may have been a spontaneous miscarriage at 23 weeks, an early ectopic pregnancy and a first-trimester termination. The numbers relate to pregnancies rather than babies, so that the mother of twins would be para 1 + 0. A woman who is primiparous is 'pregnant and para 0'. A parous woman is 'pregnant and para 1' (or more).

Gravidity is the number of times a woman has been pregnant, including the current pregnancy. A woman who is currently pregnant and has had two previous pregnancies resulting in one live birth and one miscarriage is 'gravida 3, para 1' (or 'G3 P1').

WHAT IS HAPPENING NOW?

The next stage is the presenting complaint and its history. Assuming that there is a specific problem, the history should include when it was first noticed, its progress, treatment and associated symptoms. It may also be useful to ask about important risk factors, for example, a past history of placental abruption, chronic hypertension, smoking or pre-eclampsia.

Remember that there are two patients. The fetus should be assessed by asking about movements and any recent tests of fetal well-being. Fetal movements are first felt around 20 weeks, a time referred to as the 'quickening', but can be as early as 16 weeks. Concerns about fetal well-being may be established by a reduction in the frequency or change in pattern of fetal movements.

HISTORY OF THIS PREGNANCY

This pregnancy should now be covered in detail. The first thing to ask about is pre-conceptual folic acid, followed by the diagnosis of pregnancy and problems such as bleeding and vomiting or pain in the first trimester. The next thing to ask about is the booking appointment, results of investigations, including dating and anomaly USS and additional prenatal screening tests. Then, cover subsequent antenatal care, including clinics, parentcraft, and any day unit assessment. The reason for and outcome of any additional USS should be reported. Any concerns, problems identified or emergency attendance at hospital should be documented, along with plans for the rest of the pregnancy and delivery.

PAST OBSTETRIC HISTORY

Each of the woman's previous pregnancies should be discussed chronologically. Information required includes the date, gestation and outcome. If the pregnancy ended in the first or second trimester, the diagnosis and management, including any operative procedures, should be recorded. For other pregnancies, information about the method of delivery, the reason for an operative delivery, the sex, weight, health and method of feeding of the baby should be obtained. In

particular, any pregnancy and postnatal complication should be highlighted.

MEDICAL HISTORY

The medical history should include previous operations, hospitalizations and medical problems. Continuing medical problems are of great importance because they may have an effect on the pregnancy and make complications more likely or complex. In addition, pregnancy may have an effect on medical problems, resulting in their deterioration, improvement or an alteration in recommended care.

GYNAECOLOGICAL HISTORY

All or some of the gynaecological topics may be important in the history. Infertility treatment, particularly the use of assisted reproductive technologies (such as egg donation, pre-gestational diagnosis or screening), may suggest the need to modify counselling and tests. The date of the last cervical smear is relevant.

DRUG HISTORY

It is important to record drugs taken, both over-the-counter and prescribed, and the reasons for their use. The need to continue the drug or change its dose, as well as any possible teratogenic effects, should be considered.

FAMILY HISTORY

In a pregnant woman, a family history of fetal abnormalities, genetic conditions or consanguinity is particularly important. Some obstetrical conditions – such as twins, pre-eclampsia, gestational diabetes and obstetric cholestasis – may also have a familial element.

SOCIAL HISTORY

It is important to assess the facilities for the forthcoming baby and determine whether further support is required. The risk of intimate partner violence (IPV) increases during pregnancy and is associated with poorer maternal and perinatal outcomes. Therefore, all pregnant women should be routinely asked if they have experienced IPV. A woman's occupation and her plans for working during the pregnancy should be noted. It is also important to ask about smoking, drinking alcoholic beverages and other drugs of misuse.

SYSTEMIC ENQUIRY

Often, the systemic enquiry will be covered in the history of the presenting complaint. However, remember that many symptoms are more common in pregnancy, including urinary frequency, shortness of breath, tiredness, headache, nausea and breast tenderness.

LOW-RISK VERSUS HIGH-RISK PREGNANCY

The key to good antenatal care is to recognise which women are more likely to develop problems in pregnancy before they happen. Clearly, all women can develop problems, but women at extremes of age and weight; those with pre-existing medical conditions such as diabetes, hypertension and epilepsy; those with significant past or family histories of obstetric problems; and those who smoke heavily, misuse drugs or have poor social circumstances are all more likely to develop problems. In these 'high-risk' pregnancies, antenatal care should be tailored to meet the increased needs of the woman and her baby.

Obstetrical Examination

In an obstetrical examination, the areas to focus on should be guided by the clinical history. It is only by becoming familiar with examination findings in normal pregnancy that deviations from normal can be fully appreciated. In the hyperdynamic circulation of pregnancy, for example, cardiac murmurs are common. The vast majority of these are flow murmurs, but previously unrecognised pathological murmurs occasionally become apparent. Likewise, in normal pregnancy, skin changes and increasing oedema are common.

A systematic approach is preferable. Starting with the hands and working up to the head and down to the abdomen and legs will avoid missing important signs. Examination of the skin, sclera, conjunctiva, retina, thyroid, liver and tendon reflexes may reveal important abnormalities that may otherwise be missed. There are three elements of obstetrical examination that are particularly important: blood pressure assessment, abdominal palpation and vaginal examination if indicated.

BLOOD PRESSURE ASSESSMENT

The pregnant woman should lie in a semi-recumbent position at an approximately 30-degree angle and

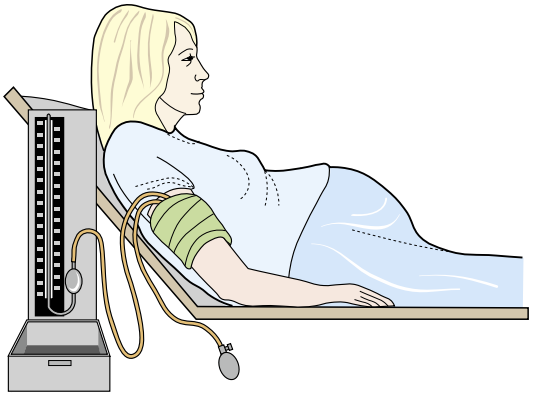


Fig. 2.11 Blood pressure measurement.

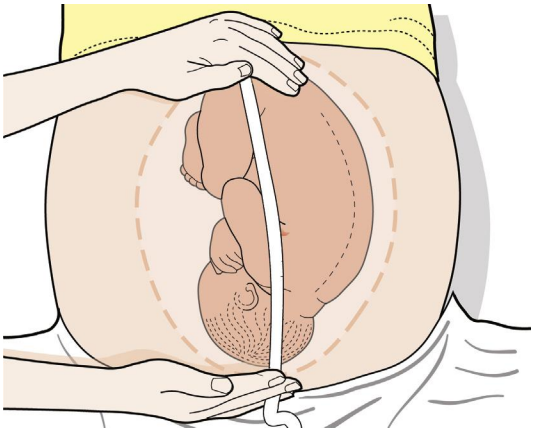


Fig. 2.12 Measurement of symphysis fundal height.

time should be taken to ensure that she is relaxed. The room should be quiet and any tight clothing on her arm removed. The blood pressure should be taken from her right arm, supported at the level of the heart (Fig. 2.11).

An appropriately sized cuff should be used, as too small a cuff will overestimate the blood pressure. The best cuffs have an indication of acceptable arm circumference on them. Ideally, the cuff bladder should cover 80% of the arm circumference and the width of the bladder should be 40% of the arm circumference. Problems occur if the bladder length is <67% (this usually means the arm circumference is >34 cm). In such cases, a large or thigh cuff should be used.

ABDOMINAL PALPATION

Ensure that the woman has privacy and is comfortable and relaxed. Although pregnant women should avoid lying flat on their back for any period of time as this can compress major vessels, the woman should be examined in the recumbent position.

Initially, the abdomen is inspected. During inspection, look for the distended abdomen of pregnancy and note asymmetry, fetal movements and tense stretching. The skin may reveal old or fresh striae gravidarum, a midline pigmented linea nigra and any scars from previous surgery. The most common scars to note are the Pfannenstiel scars of previous pelvic surgery, the small subumbilical and suprapubic scars of laparoscopy, and the gridiron incision of a previous appendicectomy.

The next stage is palpation. This begins with the symphysis fundal height (SFH; Fig. 2.12). The uterus is palpated with the palm of the left hand, moving it upwards and pressing with the lateral border. There is a 'give' at the fundus. Hold the end of a tape measure, measuring side (i.e., centimetre side) down, at the fundus and mark the tape at the upper border of the pubic symphysis.

At 20 weeks' gestation, the uterus comes up to around the umbilicus and the SFH is ~20 cm. Each week, the uterus grows 1 cm so that at 28 weeks it is ~28 ± 2 cm and at 32 weeks it is ~32 ± 2 cm. Metric measurement is therefore a reasonable guide to size for gestation and is useful in identifying those that are large- or small-for-dates.

The next stage is to feel the uterus using gentle pressure with both hands, noting any irregularities, any tender areas, and the two fetal 'poles', head and bottom. The 'lie' of the fetus refers to the axis of the poles in relation to the mother. It is usually longitudinal but can be transverse or oblique. The presentation refers to the part of the baby that is entering the pelvis. Generally, it is the head (cephalic) or the bottom (breech), but it can be the back or limbs (Figs 2.13–2.16). In twins, it should be possible to feel at least three fetal poles.

The 'engagement' of the head refers to how far into the pelvis it has moved (Figs 2.17–2.21). This may be palpated by turning to face the woman's feet and pushing suprapubically, trying to ballot the head between the fingers. The descent can be likened to a setting sun and is recorded as 'fifths palpable'. It is 'engaged'

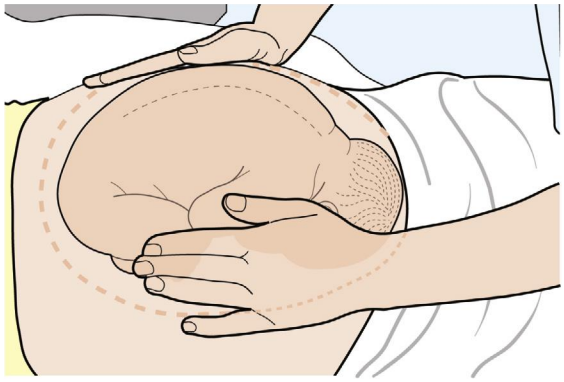


Fig. 2.13 Palpation of the lie and liquor volume.

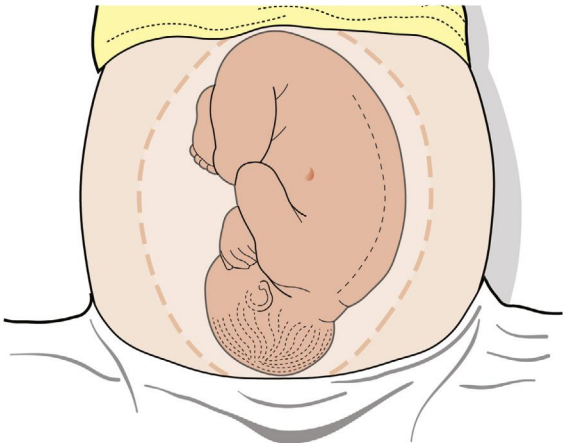


Fig. 2.14 Longitudinal cephalic.

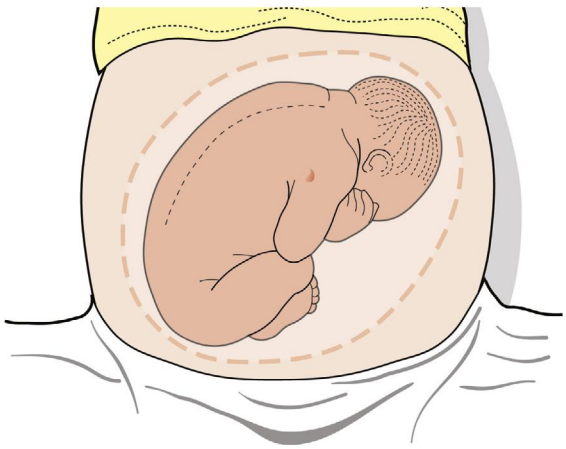


Fig. 2.15 Oblique breech.

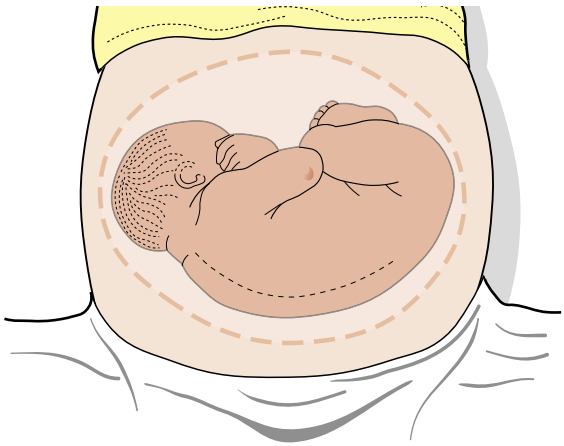


Fig. 2.16 Transverse (back presenting).

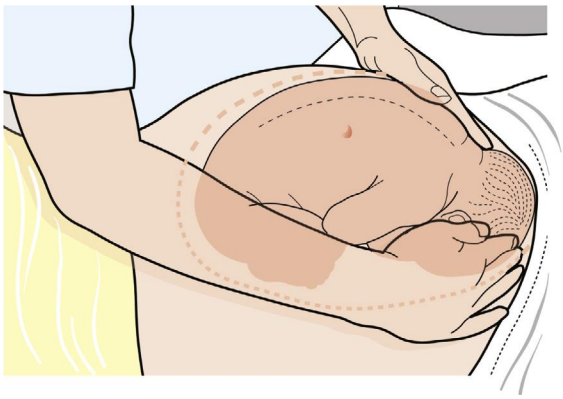


Fig. 2.17 Palpation of the descent of the fetal head.

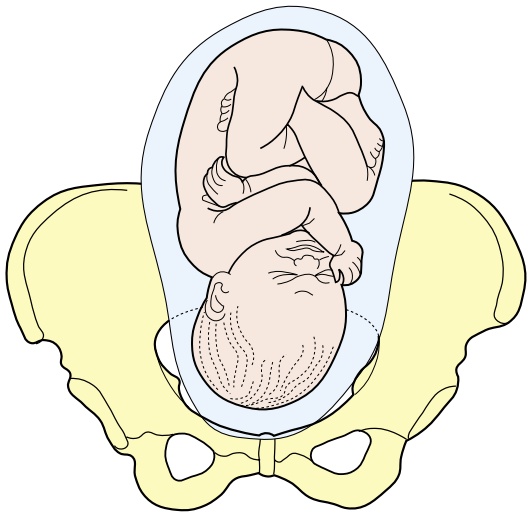


Fig. 2.18 Head 5/5 palpable (free).

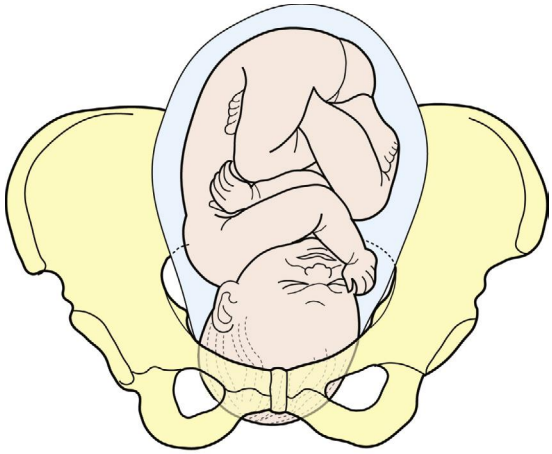


Fig. 2.19 Head 4/5 palpable.

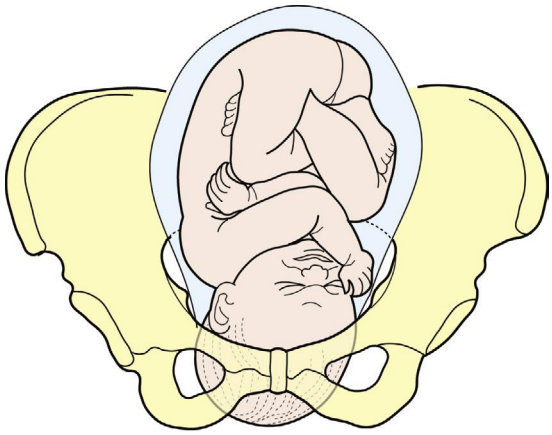


Fig. 2.20 Head 2/5 palpable (engaged).

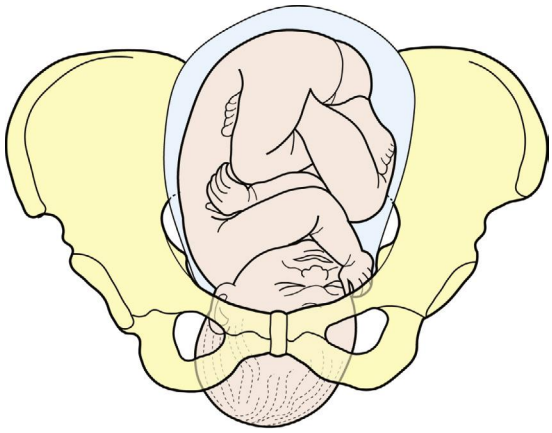


Fig. 2.21 Head 0/5 palpable (fully engaged).

Fig. 2.22 Auscultation with a Doppler probe.

when the maximum diameter of the fetal head has passed through the pelvic brim. Therefore, at three-fifths (3/5) palpable, it is not engaged but at two-fifths (2/5) palpable, it is.

An attempt should be made to get an impression of the liquor volume, particularly if the SFH is abnormal. In oligohydramnios, fetal parts can often be felt easily; in polyhydramnios, the uterus is usually tense and fetal parts are difficult to feel. Also, feel for the back of the fetus. It is firmer than the limbs (the side of most movements) and lies to one side. This helps work out the position of the fetus and where to pick up the fetal heart. To hear the fetal heart, place a USS transducer over the anterior shoulder of the fetus (Fig. 2.22). The rate should be between 100 and 160 bpm and differentiated clearly from the mother's pulse. At the end of the examination, ensure that the woman is comfortable, cover her abdomen and help her to sit up.

OBSTETRICAL VAGINAL AND SPECULUM EXAMINATION

Speculum and vaginal examination in a pregnant woman should only be performed with a clear clinical indication. Vaginal examination is the cornerstone of intrapartum care. A speculum is used in the diagnosis of antepartum haemorrhage, pre-labour rupture of membranes and to assess pre-labour cervical change.

If the diagnosis of pre-term labour or membrane rupture is suspected from the clinical history, a speculum examination is important for three reasons. The first is to look for evidence of liquor in the vagina. The technique is similar to gynaecological speculum examination, with careful aseptic technique. A pool of fluid, sometimes containing white flecks of vernix, can usually be seen in the posterior vagina or coming from the cervix on coughing. The second is to allow swabs to be taken – either looking for pathogenic bacteria – in particular, group B beta-haemolytic streptococci – or to test for fetal fibronectin as part of pre-term labour assessment. The third is to allow a visual inspection of the cervix. Digital examination is used to assess the cervical length/effacement (shortening of the cervix), cervical dilatation and descent and position of the presenting part. Feel for the cervix and note its position. Is it anterior or posterior and difficult to reach? Note its length. The cervix shortens from 3 to 4 cm until it is flush with the fetal head and does not protrude into the vagina. This is called 'effacement'. What is its consistency? Is it soft like a cheek or hard like a nose? Feel for the os and how much it is dilated, as determined by how far the fingers can stretch inside it. This may be only 1 to 2 cm or up to 10 cm at full dilatation. The station of the presenting part is determined relative to the mother's ischial spines. When the biparietal diameter of the fetal head is level with the ischial spines, this is described as station 0. Above this point is –1, –2, etc. When the head is below the ischial spines, it is +1 or +2.

In the early stages of labour and during the induction process, the findings of the cervix can be described using the modified Bishop score (see Table 33.1). As the cervix ripens, it becomes softer, shorter, more anterior and more dilated, and the fetal head descends. As the onset of spontaneous labour approaches, the Bishop score increases.

Key Points

- **Taking a history is never the same for any two women, and many questions will follow from previous answers.**
- **Always ensure that the woman is comfortable and an appropriate chaperone is present during the examination.**

Section 2

GYNAECOLOGY

Section Outline

Paediatric Gynaecology and Differences in Sex Development

Cara Williams

Chapter Outline

Introduction

Puberty should transform a girl into a fertile woman. Its social importance is so great that any deviation from normality may be the cause of considerable embarrassment and anxiety. This chapter describes normal puberty and outlines the management of both precocious and delayed puberty. It will also cover some of the gynaecological conditions which may affect pre- and post-pubertal girls.

Normal Puberty

PATHOPHYSIOLOGY OF NORMAL PUBERTY

The onset of pubertal development is heralded by an increase in pulsatile release of gonadotrophin-releasing hormone (GnRH) from the hypothalamus. Following brief activation of the GnRH neurons in the neonatal period, they remain in a dormant state until the onset of puberty. Initially, the pulsatile release of GnRH occurs only at night. However, as puberty progresses, it occurs throughout the day and night. Pulsatile GnRH release causes gonadotropic cells of the anterior pituitary to release luteinizing hormone (LH) and follicle-stimulating hormone (FSH). These gonadotrophins lead to the production of ovarian estrogen, which initiates the physical changes of puberty.

PUBERTAL DEVELOPMENT

The external signs of puberty usually (but not always) occur in a specific order (Fig. 3.1) and are described in five Tanner stages (Figs. 3.2 and 3.3). Breast development (thelarche) is usually the first sign of puberty. Pubic and axillary hair (pubarche) normally develops about 6 months later, although in one-third of girls' pubic hair may appear before breast development. Breast development occurs as a result of rising estradiol levels, and pubic and axillary hair by adrenal androgen secretion. Menarche occurs late in puberty, normally corresponding to the end of the growth spurt. Maximal growth velocity usually occurs after the start of breast and pubic and axillary hair development. However, in some girls, the growth spurt may be the first sign of puberty. The complete process of puberty is usually a slow progression, taking a minimum of 18 months.

During puberty, the ovaries enlarge and develop multifollicular cysts under the influence of pulsatile gonadotrophin secretion. The uterus also grows steadily through puberty. Due to the relative immaturity of the hypothalamic–pituitary–ovarian axis in the first 2 years following menarche, more than half of menstrual cycles are anovulatory, resulting in irregular cycles. After the first 1 to 2 years, the capacity for estrogen-positive feedback on the anterior pituitary develops with the subsequent mid-cycle LH surge and ovulation, resulting in regulation of the menstrual cycle. Anovulatory cycles are often heavy and prolonged, with some girls bleeding for several weeks at a time. This can lead to iron-deficiency anaemia and, in very rare cases, cardiovascular collapse requiring admission and blood transfusion. Initial anovulatory cycles tend to be pain free, although heavy menstrual loss can result in an element of dysmenorrhoea. When regular ovulatory cycles commence, the periods often become more painful due to the increased levels of circulating prostaglandins.

AGE OF MENARCHE

Since the late 19th century, there has been a gradual decline in the age of menarche. In the United Kingdom, the average age of menarche has fallen from 15 years in 1860 to the current average age of 12.3 years. The onset of puberty will range between individuals, with 95% of girls showing signs of secondary sexual characteristics between the ages of 8.5 and 13 years.

Energy reserves and metabolic conditions play an important role in the timing of pubertal development. Leptin, a hormone released by adipose cells, is known to play a critical role in body weight homeostasis and the metabolic control of puberty. Childhood obesity is consistently associated with an early onset of puberty. Factors which delay the attainment of a critical body weight may delay puberty. These include malnutrition, eating disorders, and excessive exercise.

Variations of Normal Puberty

Premature adrenarche is the secretion of adrenal androgens resulting in the appearance of pubic hair before the age of 8 years. Axillary hair, body odour and acne may occur, but other secondary sexual characteristics do not. It can be slowly progressive or stay stable, and puberty usually begins at the normal time. Serum androgen concentrations may be slightly raised or normal. Gonadotrophin levels are pre-pubertal and bone age is normal.

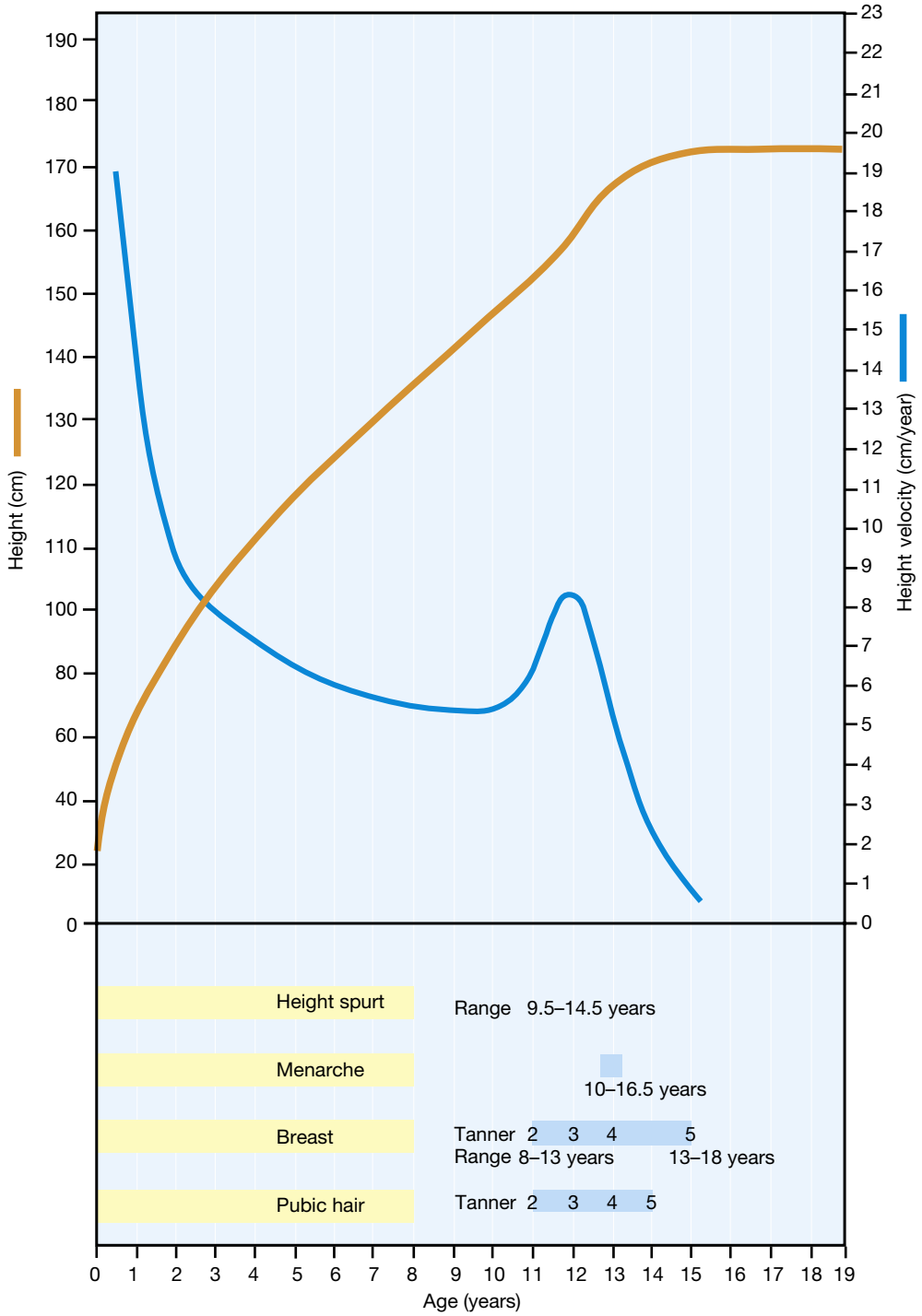


Fig. 3.1 Schematic representation of puberty.

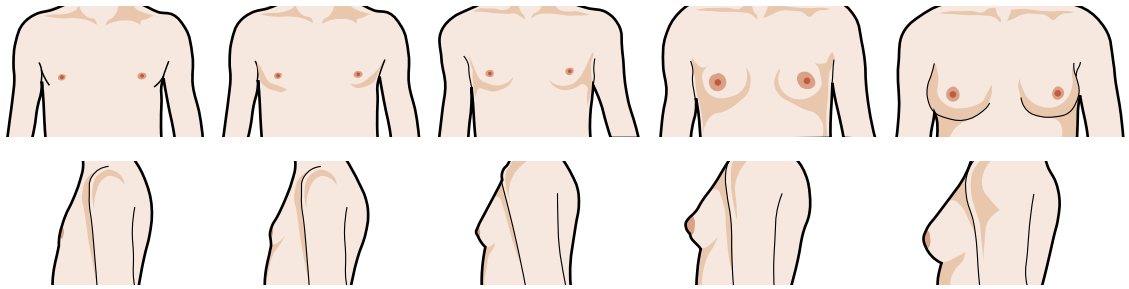


Fig. 3.2 Tanner stages of breast development.

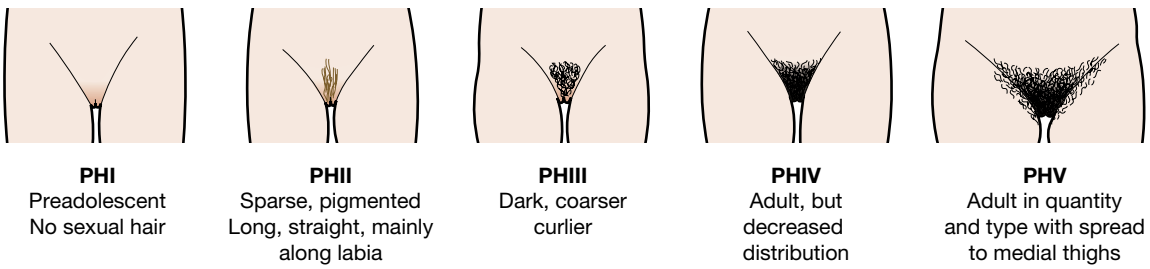


Fig. 3.3 Tanner stages of pubic hair development.

Premature thelarche is defined as the premature development of breast tissue in the absence of other secondary sexual characteristics before the age of 8 years. The most common age of onset is within the first 2 years of life but can occur at any age. Progression to precocious puberty can occur in up to a third of girls.

Isolated premature menarche is the occurrence of vaginal bleeding in the absence of other secondary sexual characteristics. It is a diagnosis of exclusion after vaginal and uterine pathology, foreign body, and precocious puberty have been ruled out. It can be an isolated event or it can recur. Puberty will be expected to start at the normal time and final adult height will not be affected.

Precocious Puberty

The development of secondary sexual characteristics prior to the age of 8 years in girls constitutes precocious puberty and must be investigated. Central (gonadotrophin-dependent) precocious puberty occurs when there is a pituitary or hypothalamic cause. Peripheral (gonadotrophin-independent) precocious puberty occurs when puberty is induced by sex steroids from other causes, such as a hormone-secreting tumour. The growth spurt is a striking feature, but frequently it is the occurrence of menstruation which brings the girl to medical attention. In the event of vaginal bleeding, a local cause—such as a foreign body or malignancy—should always be ruled out. Children with precocious puberty should be under the care of a paediatric endocrinologist.

CAUSES OF PRECOCIOUS PUBERTY

Gonadotrophic-Dependent Precocious Puberty (GDPP)

In 90% of girls with GDPP, no cause is found. In the remaining 10%, causes are intracranial and include encephalitis, meningitis, cranial radiation, hydrocephaly, and space-occupying neoplasms, such as optic nerve gliomas. Sexual abuse has been reported as a precipitating cause.

Gonadotrophic-Independent Precocious Puberty (GIPP)

Causes of GIPP include feminising tumours of the ovary or adrenal, which may give rise to vaginal bleeding without signs of pubertal development. Other causes include hypothyroidism, and the very rare McCune–Albright syndrome, in which cystic cavities develop in the long bones (polyostotic fibrous dysplasia) and café-au-lait skin pigmentation is evident. Estrogen-secreting cysts are found in the ovaries on ultrasound. Other rare causes include ingestion of exogenous estrogens.

INVESTIGATION OF PRECOCIOUS PUBERTY

1. Plasma FSH, LH, estradiol, and thyroid function tests
2. X-ray of the hand to determine bone age, which may be advanced
3. Ultrasound scan of the abdomen and pelvis
4. Radiological skeletal survey of the long bones if McCune–Albright syndrome is suspected
5. Cranial magnetic resonance imaging (MRI) scan.

In the constitutional and cerebral forms, the ovaries may show a multicystic appearance on ultrasound as seen in normal puberty. Ultrasound will also distinguish between a follicular cyst, which will be expected to subside spontaneously, and a predominantly solid estrogen-secreting granulosa/theca cell tumour of the ovary, which will require surgical removal.

CARE OF CHILDREN WITH PRECOCIOUS PUBERTY

With precocious puberty the aims of treatment are to:

1. Suppress menstruation and prevent progression of puberty
2. Maximise growth potential and
3. Achieve psychological well-being.

Not all children need treatment, as symptoms may only be slowly progressive. Treatment prevents progression but does not usually reverse changes that have already happened. If an underlying aetiology is found, this should be treated.

GnRH agonists suppress gonadotrophin secretion. Depot injections are given every 3 months and treatment can be continued for 2 to 3 years without significant side effects. Treatment is stopped when an acceptable age for puberty is reached.

Delayed Puberty

Delayed puberty in girls is defined as the absence of physical manifestations of puberty by the age of 13 years. Primary amenorrhoea is the absence of menarche and needs to be evaluated in the context of secondary sexual characteristics. The diagnosis may be made by age 15 years if a patient has normal secondary sexual characteristics or if menarche has failed to occur by 2 years post breast budding. In some instances, a girl may enter puberty but the normal progression is not maintained. This is described as 'arrested puberty'.

CAUSES OF DELAYED PUBERTY

These features of delayed puberty fall into three main categories (Table 3.1).

Constitutional Delay

Constitutional delay is the most common cause of delayed puberty. These girls are normal but just inherently late at entering puberty. They are usually of short stature, but their height is generally appropriate for their bone age. All stages of development are delayed. They may be considered to be physiologically immature, with a functional deficiency of GnRH for their chronological age but not for their stage of physiological development. There is frequently a history of delayed menarche in their mothers.

In these patients, bone age shows a better correlation with the onset and progression of puberty than does chronological age. On attaining a bone age of 11 to 13 years, they can be expected to enter puberty.

TABLE 3.1 Differential Features of Delayed Puberty

	Stature	Gonadotrophins	Gonadal steroids	Karyotype
Constitutional delay	Short	Pre-pubertal	Low	Normal
Hypogonadotrophic hypogonadism	Normal	Low	Low	Normal
Primary gonadal failure:				
Turner syndrome and variants	Short	High	Low	XO and variants
Gonadal dysgenesis	Normal/tall	High	Low	XX or XY

Hypogonadotrophic Hypogonadism

This is caused by the deficient production, secretion, or action of GnRH. It may be associated with:

- Conditions affecting body weight, such as chronic systemic disease, malnutrition or anorexia nervosa.
- Central nervous system tumours—the most common of these rare conditions is craniopharyngioma. Girls may also have associated growth hormone deficiency and, therefore, short stature.
- Isolated gonadotrophin deficiency. Such patients are generally of appropriate height for chronological age. The association of hypogonadotrophic hypogonadism with anosmia or hyposmia is called Kallmann syndrome, which results from incomplete embryonic migration of GnRH-synthesising neurons. This occurs in 50% of cases.

Premature Ovarian Insufficiency (POI)

POI is defined by the loss of ovarian activity before the age of 40 years. If this happens at a young age, puberty will not occur. There are various different causes of POI, including:

- Autoimmune disease (this may also be associated with autoimmune thyroid and adrenal disease)
- Chromosomal disorders (Turner syndrome and Fragile X carrier status)
- Chemotherapy or radiotherapy for a childhood malignancy, as a result of germ cell damage
- Metabolic disorders, such as galactossaemia
- Surgical—bilateral oophorectomy.

Other Causes

These include hyperprolactinaemia and hypothyroidism. Differences in sex development may also present with delayed puberty. This is discussed in more detail later.

INVESTIGATION OF DELAYED OR ARRESTED PUBERTY

The scheme of investigation follows logically from the differential diagnosis discussed previously:

1. Plasma FSH, LH, estradiol, prolactin, and thyroid function tests
2. Karyotype
3. X-ray for bone age
4. Pelvic ultrasound scan
5. Cranial MRI scan.

Care of Children with Delayed Puberty

Constitutional Delay

Often, reassurance and continued observation are sufficient. It is important to reassure the parents as well as the girl herself. Where psychological problems arise as a result of comparison with her peers, induction of puberty may be indicated.

Hypogonadotrophic Hypogonadism

In those with low weight, restoration of weight may result in spontaneous onset of puberty. Those with central nervous system tumours require appropriate neurosurgical treatment. Induction of puberty is required, and treatment with hormone replacement is continued until approximately age 50 years, although 10% to 20% will have spontaneous return of reproductive function.

Premature Ovarian Insufficiency (POI)

Induction of puberty is required, and hormone replacement is continued until approximately age 50 years. Pregnancy can be achieved through in vitro fertilization (IVF) with ovum donation.

Spontaneous ovulation can occur in this group, with a pregnancy risk of approximately 5%.

Induction of Puberty

The aim is to ensure normal progress through puberty. This is achieved by incremental doses of estrogen, preferably transdermal 17β-estradiol. A low dose of estrogen is commenced and increased gradually over approximately 2 to 3 years in order to maximise breast development. After 2 to 3 years of estrogen therapy, or after the first menstrual bleed, a progestogen is added to avoid unopposed estrogenic stimulation of the endometrium. Commonly, hormone replacement therapy is used, but the combined contraceptive pill is an alternative, preferably on a continuous basis to maximise estrogen replacement. Bone mineral density should be assessed every 3 to 5 years. Vitamin D and calcium levels should also be optimised.

Pre-Pubertal Conditions

VAGINAL DISCHARGE

Vaginal discharge is one of the most common reasons for referral to a paediatric gynaecology clinic. The most frequent age of referral is 3 to 10 years. Non-specific

vulvovaginitis is the most common cause. Positive low vaginal swabs are only found in approximately 20%. Vaginal cultures are often non-specific, but organisms commonly found in the rectum or upper respiratory tract are often found, such as group A *Streptococcus* or *Haemophilus influenzae*. Symptoms include discharge, soreness, and itching, all of which can be chronic and distressing.

Contributory aetiological factors include the hypo-estrogenic state and neutral pH of the pre-pubertal vagina, proximity of the vagina and anus, under-developed flat labia, and hygiene. Rarer causes, such as a foreign body or tumour, must be excluded if symptoms are persistent. Sexual abuse should always be considered but is not the cause in the majority of cases. Vulval hygiene, with the avoidance of soaps in the genital area and the use of emollients, is the cornerstone of successful management. Threadworms can lead to genital irritation, particularly at night; thus, empirical treatment could also be tried.

VAGINAL BLEEDING

Vaginal bleeding in the pre-pubertal girl always needs specialist referral and may require examination under anaesthesia (vaginoscopy and cystoscopy) to rule out local causes such as a foreign body or malignancy. Hormone profile, bone age, and pelvic ultrasound should also be performed to look for precocious puberty.

LABIAL ADHESIONS

Labial adhesions occur due to the hypo-estrogenic state of the pre-pubertal genitalia. The labia minora fuse together in the midline. There may be a small opening or there may be no visible opening (Fig. 3.4). Typically, the labia are apart at birth due to the effect of maternal estrogens. They then fuse after a few months. Usually, they are asymptomatic, but occasionally urine can get trapped behind them, causing post-void dribbling or even urinary tract infections. In most cases, no treatment other than emollients is required and the parents can be reassured that the adhesions will open up as the girl progresses through puberty. In cases in which there are significant urinary symptoms or for maternal reassurance, a low-dose estrogen ointment can be applied to the adhesions twice daily for 6 weeks. This can cause some breast budding, which will usually disappear after treatment finishes, and the labial adhesions often reoccur. Good hygiene and use of emollients can help to prevent recurrence. In very rare cases, the labia may need to be separated under general anaesthetic.

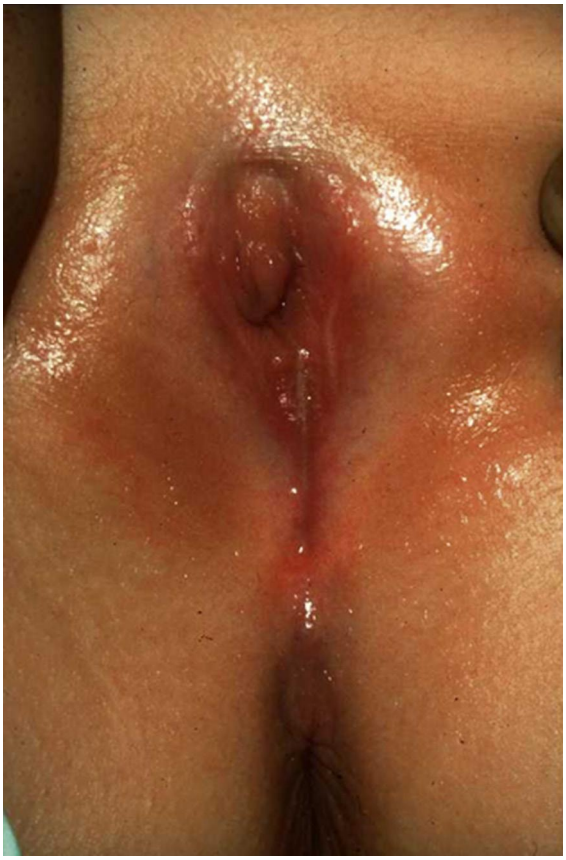


Fig. 3.4 Labial adhesions.

LICHEN SCLEROSUS

Lichen sclerosus is an inflammatory skin condition that occurs in postmenopausal women and pre-pubertal girls. It can affect any part of the body, but it most frequently occurs on the genitalia. It can cause itching and discomfort, which can be quite severe. White plaques occur typically in a figure-of-eight pattern around the vulva and anus. There may also be areas of superficial haemorrhage, thickening of the skin, and fissures (Fig. 3.5). Diagnosis is usually made by the typical appearance, and biopsies are rarely required. Treatment is with a potent steroid ointment in a reducing regime over 3 months. Once it clears