Chapter 1

Surgical Anatomy of the Female Pelvis

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1.1 Development of the Female Pelvis and Its Contents

The female genitourinary system is mainly derived from the intermediate cell mass, which in turn is derived from the mesoderm following gastrulation. The pelvic girdle, however, is derived from the caudal mesoderm, which, as the name implies, is the mesoderm found caudal to the cloacal membrane. Upon folding, the caudal mesoderm folds ventrally at the point of the cloacal membrane, distal to the paraxial mesoderm and notochord, in such a way that the pelvic girdle wraps around the distal end of the trunk to fuse with the sacral somites and encase the developing female genitourinary system, and leads to the formation of the rump. Blastogenic defects involving the cloaca and caudal folding may also be associated with urogenital and possibly ano-rectal malformations, which can lead to reproductive problems [1].

Soon after gastrulation and folding at the end of the fourth week after fertilization, the gonadal ridge starts appearing as a thickened ridge at the border between the developing mesonephros within the substance of the intermediate cell mass and the intra-coelomic cavity within the lateral plate mesoderm. This gonadal ridge will start developing into an indifferent gonad. The proliferation of the coelomic epithelium over the genital ridge gives rise to primitive sex cords. At the same time, primordial germ cells start arising from the region of the allantois and start migrating towards the developing gonadal ridge. By the sixth week the primordial germ cells invade the primitive sex cords. If the sex chromosomes in the primordial germ cells are XX, this will lead to the formation of the ovary, in contrast to a testis if the sex chromosomes are XY. Failure of migration of these germ cells can occur in certain congenital conditions such as Turner syndrome, leading to ovarian dysgenesis.

By the seventh week, primordial follicles appear from the second generation of cords from the coelomic epithelium, and start proliferating rapidly by mitosis between the second and fourth month. By the end of the 16th week, there are around 4 million oogonia, which then enter the first phase of meiosis. These oogonia remain arrested until puberty, when, periodically, batches of primary oocytes resume the meiotic cycle, forming at least one dominant secondary oocyte which ovulates. There is a degree of oocyte degeneration throughout all of the duration of the meiotic arrest, with only around half of the original amount of oogonia making it until the time of birth. A healthy female

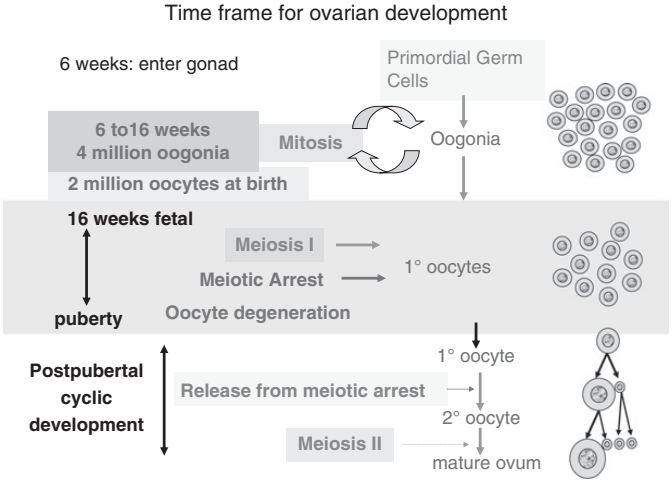

Figure 1.1 Time frame for ovarian development

neonate starts off with around 2 million oogonia, which by the time of puberty (average 11.5 years) continue degenerating, with only around 500 oogonia ever managing to be released from meiotic arrest and develop into secondary oocytes, start meiosis II and be ovulated as a mature ovum. Completion of meiosis II happens only physiologically upon fertilization by a sperm (Figure 1.1).

The paramesonephric (or Mullerian) ducts develop as invaginations from the epithelium lining the urogenital ridges, growing laterally to the mesonephric (Wolffian) ducts, but then crossing ventrally towards the caudal end of the mesonephric duct. These paramesonephric ducts fuse caudally in the midline, with the fused caudal tip projecting on the posterior wall of the urogenital sinus. The fallopian tubes and their fimbriae develop from the cranial part of the paramesonephric ducts, while the fused paramesonephric ducts lead to the formation of the uterus and cervix. The medial border of each of the two paramesonephric tubes will atrophy, in order to form one uterine cavity (Figure 1.2). Incomplete atrophy may lead to different degrees of uterine septation, causing bifid, unicornuate and other types of uterine anomalies. These may present with fertility problems and recurrent miscarriages [2]. Treatment of such septa is still debatable, with further trials under way [3]. Due to the close association with the development of the urinary system, such uterine congenital anomalies may have concomitant urinary anomalies.

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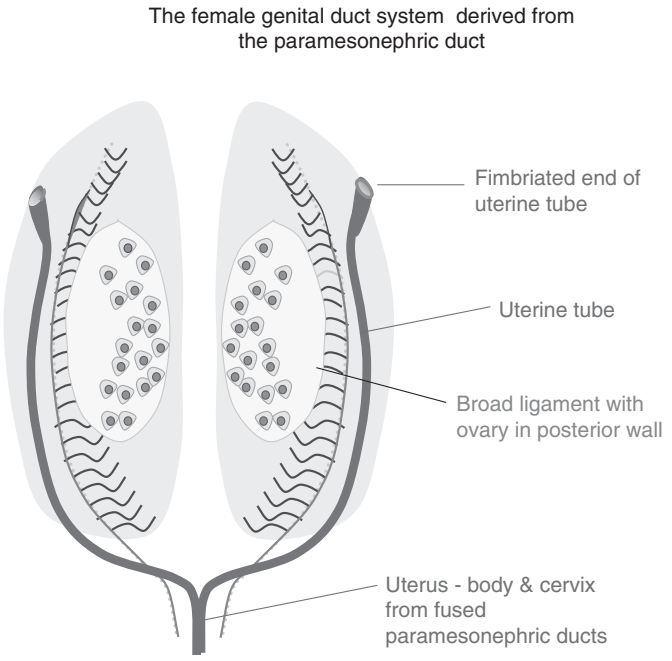

Figure 1.2 The female genital duct system derived from the paramesonephric duct

At the point of contact, a sino-vaginal bulb arises by cell proliferation from the paramesonephric ducts and the urogenital sinus. This leads to the vaginal plate, which canalizes in the fourth month, and the fornices develop. The hymen remains as a thin plate between the vagina and the urogenital sinus. Abnormal development at this point can lead to imperforate hymen or Robert's uterus, among others [4]. In the meantime, the mesonephric ducts will disappear during female urogenital development; however, some remnants may persist as epi-oophoron or para-oophoron in the broad ligament, which are vestigial structures which can lead to Gartner's cysts, which are usually benign.

In the meantime, mesodermal thickenings form around the cloacal membrane, with a genital tubercle forming cranially, leading to the formation of the clitoris and paired cloacal folds laterally. After separation of the urogenital sinus by the urorectal septum, the perineal body forms, and the cloacal folds are transformed into anterior urethral folds, leading to the labia and posterior anal folds.

1.2 The Pelvic Girdle: Bone and Ligaments – Implications in Obstetrics

The pelvis is an anatomically complex set of bones, which function as one, that contributes directly to human obstetrics, as well as locomotion. The unique shape of the human pelvis, superoinferiorly short and mediolaterally wide, is adapted for habitual bipedalism [5].

The pelvis consists of the right and left pelvic bones, the sacrum and the coccyx. Each pelvic bone consists of the ilium, ischium and pubis, which at birth are connected by cartilage at the acetabulum, which fully ossifies at the end of puberty. Superiorly, the sacrum articulates with the fifth lumbar vertebra at the lumbosacral joint. Anteriorly, the pelvic bones articulate at the pubic symphysis, and posteriorly, they articulate with the sacrum at the sacroiliac joints [6]. The pelvic inlet is circular in shape in women, as opposed to being heart shaped in males, due to the less prominent sacral promontory and broader iliac alae. Also, the subpubic arch is around 20 degrees wider in women, and the ischial spines project less into the pelvic cavity.

The measurements of the pelvis include: the sagittal inlet, between the promontory and the top of the symphysis pubis, 11 cm; the transverse diameter, 11.5 cm; the bispinous outlet, 9 cm; and the sagittal outlet, between the tip of the coccyx and the inferior margin of the pubic symphysis, 10 cm [6]. During labour, these diameters increase in a clinically significant manner with squatting [7]. The ligaments of the pelvic wall are the sacrospinous and the sacrotuberous. They convert the greater and the lesser sciatic notches into foramina, and also help stabilize the sacrum on the pelvic bones.

1.3 Overview of the Blood and Lymphatic Supply

The abdominal aorta bifurcates into two common iliac arteries, which in turn divide at the pelvic inlet in front of the sacroiliac joint into the internal and external iliac arteries. The external iliac becomes the femoral artery, while the internal iliac reaches the upper margin of the greater sciatic foramen, dividing into an anterior and a posterior division. The anterior division gives rise to the umbilical artery, the proximal part of which gives rise to the superior vesical artery; the inferior vesical artery the uterine artery, vaginal artery, internal pudendal artery, inferior gluteal artery, middle rectal artery and obturator artery. The posterior division of the internal iliac artery gives rise to the iliolumbar, lateral sacral and superior gluteal arteries. Apart from the internal iliac artery, the other arteries which enter the pelvic artery are the superior rectal artery, ovarian artery and the median sacral artery. The lymphatic supply is named after the blood vessels that are associated with it, namely, the external iliac nodes, internal iliac nodes and the common iliac nodes.

1.4 Overview of the Innervation in the Female Pelvis

The nerves of the pelvis are derived from the sacral plexus, lumbosacral trunk and autonomic nervous system. The sacral plexus is formed from the anterior rami of the fourth and fifth lumbar nerves and the anterior rami of the first, second, third and fourth sacral nerves. The sacral plexus lies in front of the piriformis muscles on the posterior pelvic wall. The lumbosacral trunk is made up of the fourth and fifth lumbar nerves. Branches to the lower limb leave the pelvis through the greater sciatic foramen, the largest of which is the sciatic nerve. The pudendal nerves, the nerves to the piriformis muscle and the pelvic splanchnic nerves are branches of the sacral plexus, which between them supply the pelvic muscles, pelvic viscera and perineum. The pudendal nerve (S2-4) leaves the pelvis through the greater sciatic foramen and enters the perineum through the lesser sciatic foramen.

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The obturator nerve (L2-4), which lies on the lateral wall of the pelvis and supplies the parietal peritoneum, is responsible for referred pain, for example, from an inflamed ovary or appendicitis to be felt on the inner side of the thigh. The autonomic nerves consist of the pelvic part of the sympathetic trunk, the pelvic splanchnic nerves form the parasympathetic part, and the superior and inferior hypogastric plexuses, which both contain sympathetic and parasympathetic nerve fibres and visceral afferent nerve fibres. The superior and inferior hypogastric nerves arise from the superior hypogastric plexus.

1.5 The Pelvic Floor

The pelvic diaphragm, and, in the anterior midline, the perineal membrane and the muscles of the deep perineal pouch, make up the pelvic floor. This separates the pelvic cavity above from the perineum below. The attachment of the pelvic diaphragm to the inside of the cylindrical pelvic walls separates the greater sciatic foramen from the lesser sciatic foramen, in such a way that the latter becomes a route of communication between the pelvic cavity and the gluteal region, while the former allows communication between the gluteal region and the perineum.

The levator ani and the coccygeus muscles from both sides of the pelvis form the pelvic diaphragm, which is shaped like a funnel and, particularly the levator ani, helps to support the pelvic viscera and maintain closure of the vagina and rectum. Each of levator ani muscles is subdivided into at least three parts, based on the site of origin and the relationship to the viscera found in the midline. These are the pubococcygeus, puborectalis and iliococcygeus. The levator ani consists of a medial part containing smooth muscle cells under autonomic nerve influence and a lateral part containing striated muscle cells under somatic nerve control [8]. In fact, the levator ani muscles are innervated directly by branches from the anterior ramus of S4, and by branches of the pudendal nerve (S2-4). The coccygeus muscles overlie the sacrospinous ligaments, spanning from the tips of the ischial spines to the lateral margins of the coccyx and adjacent sacral margins, thus completing the posterior part of the pelvic diaphragm. The coccygeus muscles are innervated by the anterior branches of S4 and S5 [9].

Within the deep perineal pouch, anteriorly there is a group of skeletal muscle fibres forming the external urethral sphincter, the sphincter urethrovaginalis and the compressor urethrae, which together facilitate the closure of the urethra. The deep transverse perineal muscles join in the midline along the posterior edge of the perineal membrane and stabilize the position of the perineal body. The perineal body is a connective tissue structure into which the muscles of the pelvic floor, the perineum, the posterior end of the urogenital hiatus, the deep and superficial transverse perineal muscles, the sphincter urethrovaginalis, the external anal sphincter and the bulbospongiosus muscles attach .The perineal body is the site which may be stretched or torn during childbirth. A posterolateral episiotomy is meant to bypass the perineal body and avoid complications like third- and fourth-degree tears. However, current evidence does not show that routine episiotomy reduces perineal/vaginal trauma. Further research in women undergoing instrumental delivery may help clarify if routine episiotomy is useful in this particular group [10].

Pelvic organ prolapse is a possible consequence of weakening of the pelvic floor muscles, which can start as early as in adolescence, and is aggravated particularly with childbearing and menopause. It may present with urinary incontinence symptoms, particularly urge urinary incontinence [11]. Women suffering from incontinence tend to have a greater anterior slope of the pelvis, which is directly proportional to the electrical activity of the pelvic floor muscles during rest and in orthostasis [12]. Early education regarding pelvic floor symptoms may lead to prevention using lifestyle modification and Kegel's exercises or empowerment to seek treatment.

A thorough knowledge of the pelvic anatomy is essential during pelvic floor surgery, especially in abdominal laparoscopic sacrocolpopexy, which is the gold standard of pelvic organ prolapse repair. This is because it presents a significant challenge to surgeons because the technique requires meticulous negotiation through abdominopelvic vascular structures and nerves supplying the pelvis and its contents, particularly the rectum, and ureters [13].

1.6 The Perineum

When viewed from below with the thighs abducted, the perineum is diamond shaped, bound anteriorly by the symphysis pubis, laterally by the ischial tuberosities and posteriorly by the tip of the coccyx. The perineum is anatomically divided into an anterior urogenital triangle and a posterior anal triangle, which contains the anal canal and the ischiorectal fossa. The latter is filled with dense fat and has the pudendal nerve and internal pudendal artery and vein passing on its lateral wall through the pudendal canal. The anal canal has an involuntary anal sphincter and a voluntary external sphincter, which in turn is made up of subcutaneous, superficial and deep parts, that then blend in with the puborectalis fibres of the two levatores muscles [14].

Anorectal vaginal fistulas may be obstetric, inflammatory (e.g. Crohn disease and diverticulitis), neoplastic, iatrogenic and/or radiation induced. Surgical management is heavily dependent on the cause and complexity of the fistulizing disease, which are related to the correct identification of location of the fistula in the vagina, the type and extent of fistula branching, the number of fistulas and any concomitant sphincter tears, inflammation and abscesses [15].

The female urogenital triangle contains the vulva, which is the collective term for the external genitalia (the clitoris, mons pubis, labia minora and majora, vestibule of the vagina, the vestibular bulb and the greater vestibular glands) and the urethral and vaginal openings [16].

Branches of the internal and external pudendal arteries supply both sides of the vulva, and the skin is drained into the medial group of the superficial inguinal nodes, with the Cloquet node being considered the sentinel node. The ilioinguinal nerves and the genital branch of the genitofemoral nerves supply the anterior part of the vulva, while the posterior

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part is supplied by branches of the perineal nerves and the posterior cutaneous nerves of the thigh.

The clitoris is situated at the apex of the vestibule anteriorly, and its root is made up of the bulb of the vestibule, which is attached to the undersurface of the urogenital diaphragm and is covered by the bulbospongiosus muscles and the right and left crura, which become the corpora cavernosa and are covered by an ischiocavernosus muscle. The glans, together with its prepuce, caps the body of the clitoris and has numerous sensory nerve endings, mainly through the dorsal nerves of the clitoris. Appropriate sexual stimulation of the clitoris and the region of the vaginal orifice and labia minora, reinforced by afferent nervous impulses from the breasts and other regions, results in sensory impulses reaching the central nervous system, which then pass down the spinal cord to the sympathetic outflow (T1 to L2), to synapse between the preganglionic and postganglionic first and second lumbar ganglia, which innervate the smooth muscle of the vagina, and via the pudendal nerve to reach the bulbospongiosus and ischiocavernosus muscles.

The greater vestibular glands, also known as Bartholin's glands, lie underneath the posterior parts of the bulb of the vestibule and the labia majora. Each drains its lubricating mucous secretion via a small duct into a groove between the posterior part of the labia minora and the hymen. Blockage of this gland can lead to a Bartholin's cyst or an abscess.

The urethra is just under 4 cm long, extending from the neck of the bladder to the external meatus. It opens into the vestibule at a point about 2.5 cm below the clitoris, immediately in front of the vagina. The relatively short distance between the urethra and the bladder makes it easier for catheterization; however, it does make women more prone to cystitis compared to men. The paraurethral glands open into the vestibule on either side of the urethral orifice.

1.7 The Vagina

The vagina is a muscular tube that is approximately 8 cm long and extends upwards and backwards between the vulva and the uterus. The upper half of the vagina lies above the pelvic floor within the pelvis, posterior to the bladder and in front of the rectum, and with its anterior wall pierced by the cervix. The upper third of the vagina is supported by the levator ani muscles and the transverse cervical, pubocervical and sacrocervical ligaments, while the urogenital diaphragm supports the middle third. The lower half of the vagina lies between the urethra anteriorly and the anal canal posteriorly, within the perineum, and the perineal body supports the lower third of the vagina. The main blood supply is via the vaginal artery, which is a branch of the internal iliac artery and by the vaginal branch of the uterine artery, and then drained by the vaginal veins into the internal iliac veins. The internal and external iliac nodes drain the upper third of the vagina, the internal iliac nodes drain the middle third while the superficial inguinal nodes drain the lower third of the vagina. This difference is due to the embryological development of the vagina, as described in Section 1.1, with the hymen demarcating the point of fusion between the sinovaginal bulb from the mesoderm and the developing vaginal dimple from the ectoderm. This clearly has implications in cases of the spread of malignancy, especially vaginal and metastatic cervical cancer, and its treatment [17,18].

The paracolpium (paravaginal tissue) is surrounded by the vaginal wall, the pubocervical fascia and the rectovaginal septum (Denonvilliers' fascia). The paracolpium contains the distal part of the pelvic autonomic nerve plexus and its branches: the nerves to the urethra, the cavernous nerve and the nerves to the internal anal sphincter (NIAS). There is evidence that with vaginal delivery and with aging, the pelvic plexus is likely to change from a sheet-like configuration to several bundles [19].

1.8 Overview of the Gross Structures in the Female Pelvis

In the anterior aspect of the female pelvis, there is the bladder and ureters, the uterus, fallopian tubes and broad ligament and the ovaries. The rectum, sigmoid colon and the terminal coils of the ileum occupy the posterior part of the pelvic cavity (Table 1.1).

1.8.1 The Urinary Bladder and Ureters

The apex of the urinary bladder lies immediately posterior to the symphysis pubis, with the neck resting on the upper surface of the urogenital diaphragm. The posterior aspect, or base, of the bladder lies immediately in front of the anterior vaginal wall, which in turn separates it from the rectum. The body of the uterus rests superiorly on the bladder, separated by the uterovesical pouch. The inferolateral surfaces lie in front of the retropubic pad of fat and pubic bones, and posteriorly, rest on the levator ani muscles.

Each of the two ureters crosses over the pelvic inlet in front of the bifurcation of the common iliac artery, running downwards and backwards in front of the internal iliac artery and behind the ovary down till the ischial spine. Here, it turns forward and medially beneath the base of the broad ligament, where it is crossed by the uterine artery. This point is known as 'water under the bridge', because the ureter lies immediately below the uterine artery at 1.5 cm lateral to the cervix. It then runs forward, lateral to the lateral vaginal fornix, to enter the base of the bladder, just above the trigone. There is indeed a risk of iatrogenic ureteric injury during pelvic surgery, both for benign and malignant gynaecological pathologies [20].

1.8.2 The Uterus and Tubes

The uterus is a muscular organ which has the shape of an upside-down pear, measuring about 8 cm in length, 5 cm in width and 2.5 cm in thickness in nulliparous adults of reproductive age. It is divided into a fundus (lying above the uterine tubes), body and a narrow lower part, the cervix.

In most women, the uterus is anteverted and anteflexed, by means of the round ligament; however, in some women, the fundus and the body of the uterus are bent backwards on the vagina, to lie in the rectouterine pouch, making the uterus retroverted and retroflexed. The body of the uterus is related

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Table 1.1 Overview of the gross structures in the female pelvis

Pelvic organ	Blood supply	Lymphatic drainage	Nerve supply
Sigmoid colon	Arterial: sigmoid branches of inferior mesenteric artery Venous: tributaries of inferior mesenteric vein, which joins portal system	Along sigmoid arteries to inferior mesenteric nodes	Sympathetic and parasympathetic nerves from inferior hypogastric plexus
Rectum	Arterial: superior rectal artery, middle rectal artery, inferior rectal artery Venous: veins correspond to the arteries	Pararectal nodes to inferior mesenteric nodes; vessels from the lower part of the rectum follow middle rectal artery to internal iliac nodes	Sympathetic and parasympathetic nerves from inferior hypogastric plexus
Urinary bladder	Arterial: superior and inferior vesical arteries, branches of internal iliac artery Venous: form vesical venous plexus, drained into internal iliac vein	Internal and external iliac lymph nodes	Inferior hypogastric plexuses
Uterus	Arterial: uterine artery from the internal iliac, ovarian artery from abdominal aorta Venous: correspond to the arteries	Lymph vessels from the fundus accompany ovarian artery to drain in para-aortic nodes; vessels from body and cervix drain into internal and external iliac lymph nodes; few lymph vessels drain into superficial inguinal lymph nodes	Sympathetic and parasympathetic nerves from inferior hypogastric plexuses
Uterine tubes	Arterial: uterine artery from the internal iliac, ovarian artery from abdominal aorta Venous: correspond to the arteries	Lymph vessels flow corresponding arteries and drain into internal iliac and para-aortic nodes	Sympathetic and parasympathetic nerves from inferior hypogastric plexuses
Ovary	Arterial: ovarian artery – branch of abdominal aorta at the level of first lumbar vertebra Venous: ovarian vein – drains into inferior vena cava on right side, into left renal vein on left side	Lymph vessels follow the ovarian artery and drain into para-aortic nodes at the level of first lumbar vertebra	Sympathetic fibres: from aortic plexus (accompanies ovarian artery); some parasympathetic fibres: from inferior hypogastric plexus (via uterine artery)
Vagina	Arterial: vaginal artery, branch of internal iliac artery and the vaginal branch of uterine artery Venous: form a plexus around vagina that drains into internal iliac vein	Lymph vessels from the upper third of vagina drain to external and internal iliac nodes, from middle third to internal iliac nodes and from lower third to superficial inguinal nodes	Inferior hypogastric plexus

anteriorly to the uterovesical pouch and the superior surface of the bladder, posteriorly is related to the pouch of Douglas, and laterally to the broad ligament and uterine vessels. The uterine artery, which is a branch of the internal iliac artery, supplies the uterus after running medially in the base of the broad ligament, reaching the cervix at the internal os and then ascending along the lateral margin of the uterus within the broad ligament, anastomosing with the ovarian artery, which also supplies the uterus. A small descending branch is given off by the uterine artery to supply the cervix and the vagina. Blood drains into the uterine vein and internal iliac vein.

The lymph from the fundus drains into the para-aortic nodes at the level of the first lumbar vertebra, while the body and the cervix drain into the internal and external iliac lymph nodes. Some lymph vessels pass through the inguinal canal, following the round ligament, and drain into the superficial inguinal nodes. Branches from the inferior hypogastric plexuses provide sympathetic and parasympathetic nerve supply. Knowledge of this lymphatic drainage is important in cases of endometrial cancer [21].

The thick myometrium is made up of smooth muscle supported by connective tissue. Leiomyomata, or fibroids, may occur in this layer, and when treatment is necessary, this can happen through myomectomy, total hysterectomy or uterine artery embolization [22].

The endometrium lines the body of the uterus and is continuous above with the mucous membrane lining the uterine tubes and below with the mucous membrane of the cervix. Deposits of ectopic endometrium can lead to endometriosis [23].

Peritoneum covers all of the uterus except anteriorly below the level of the internal os, where the peritoneum passes forward onto the bladder and laterally between the attachment of the layers of the broad ligament. Apart from the tone of the

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Figure 1.3 Dissection of the female pelvis (carried out on a Thiel embalmed cadaver at the Department of Anatomy, University of Malta). A black and white version of this figure will appear in some formats. For the colour version, please refer to the plate section.

Figure 1.4 Dissection of the uterus, tubes and ovaries (carried out on a Thiel embalmed cadaver at the Department of Anatomy, University of Malta). A black and white version of this figure will appear in some formats. For the colour version, please refer to the plate section.

levator ani muscles, the uterus is supported by three ligaments, namely, the transverse cervical (cardinal), pubocervical and sacrocervical ligaments, which result from the condensations of pelvic fascia (Figures 1.3 and 1.4).

The cervical canal communicates with the cavity of the uterine body through an internal os and with the vagina through the external os. There is a transformation zone, also known as the squamocolumnar junction or the transitional zone, where there is a high affinity for viruses like human papillomavirus due to the increased rate of cell replication at this point. The cervix is related anteriorly to the anterior fornix of the vagina, posteriorly to the rectouterine pouch with coils of ileum and sigmoid colon, and laterally related to the ureters as they pass forward to enter the bladder. Blood is supplied to the cervix by the descending branch of the uterine artery, which in turn drains into the uterine vein.

The anterior and lateral cervix drains to the lymph nodes along the uterine arteries, travelling along the cardinal ligaments at the base of the broad ligament to the external iliac lymph nodes and ultimately the para-aortic lymph nodes. The posterior and lateral cervix drains along the uterine arteries to the internal iliac lymph nodes and ultimately also the para-aortic lymph nodes. The posterior section of the cervix drains to the obturator and presacral lymph nodes. However, there are individual variations of lymphatic drainage from the cervix [24].

In cases of cervical malignancy, advances in magnetic resonance imaging (MRI) and positron emission tomography/computerized tomography (PET/CT) have made it possible to examine many of the prognostic factors noninvasively. In radiology. combining deep learning and anatomic prior information may improve segmentation accuracy for cervical tumours [25, 26].

1.8.3 The Ovary

The ovaries are responsible for the production of ova and the hormones oestrogen and progesterone. They are covered externally by the germinal epithelium, which is a modified area of peritoneum. Both ovaries are often found hanging down in the rectouterine pouch, lying against the lateral wall of the pelvis. They are each attached to the back of the broad ligament by the mesovarium, while the suspensory ligament (infundibulopelvic ligament) attaches the mesovarium to the lateral wall of the pelvis. The blood and nerve supply, together with the lymph drainage, pass over the pelvic inlet, through the lateral end of the broad ligament via the suspensory ligament and finally enter the hilum of the ovary via the mesovarium. The blood supply is via the ovarian artery, which is a direct branch of the aorta, arising at the level of the first lumbar vertebra. On the right side, blood drains into the inferior vena cava, and into the left renal vein on the left side. Because ovarian cancer might spread via the lymphatics via the suspensory ligament and mesovarium, as well as through the round ligament of the uterus, the sentinel node can be detected in the para-aortic and paracaval regions, obturator fossa and surrounding internal iliac arteries, and inguinal regions. These findings support the strategy of injecting tracers in both ovarian ligaments to identify sentinel nodes [27, 28].

1.9 The Peritoneum

From the anterior abdominal wall, the peritoneum passes down onto the upper surface of the urinary bladder, then onto the anterior surface of the uterus at the level of the internal os, upwards onto the anterior surface of the body and fundus of the uterus, and then downwards over the posterior surface of the uterus, covering the upper part of the posterior surface of the vagina, forming the rectouterine wall (pouch of Douglas). This is the lowest part of the abdominopelvic peritoneal cavity in the erect position. The broad ligaments are two layered folds of peritoneum extending from

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the lateral margins of the uterus to the lateral pelvic walls. Peritoneal spread of infection or malignancy is particular to the pelvic organs, particularly in the case of ovarian cancer spread [29, 30].

1.10 Conclusion

Accurate knowledge of the anatomy of the female pelvis and its contents is essential for safe management of patients presenting with obstetric and/or gynaecological conditions.

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