

Anatomy of female pelvic organs



External genitalia

Female external genitalia (Vulva)

1.

Mons pubis , compose of fibrofatty tissue which cover the body of the pubic bone, in adult the skin that cover the mons pubis bears pubic hair , the upper limit of which is usually horizontal.

2.Labia majora, this is two fold of skin with underlinig adipose tissue bounding either side of the vaginal opening ,they contain sebaceous glang & sweat gland & specialized apocrine glands.the fibers of the round ligament terminate her

3.Labia minora two thin folds of skin that lie between the labia minora , they have sabeceous glanf but no adipose tissue

3. The Vestibule, is the cleft between the labia minora & the urethra. the duct of the bartoline glands & the vagina open in the vestibule

4.

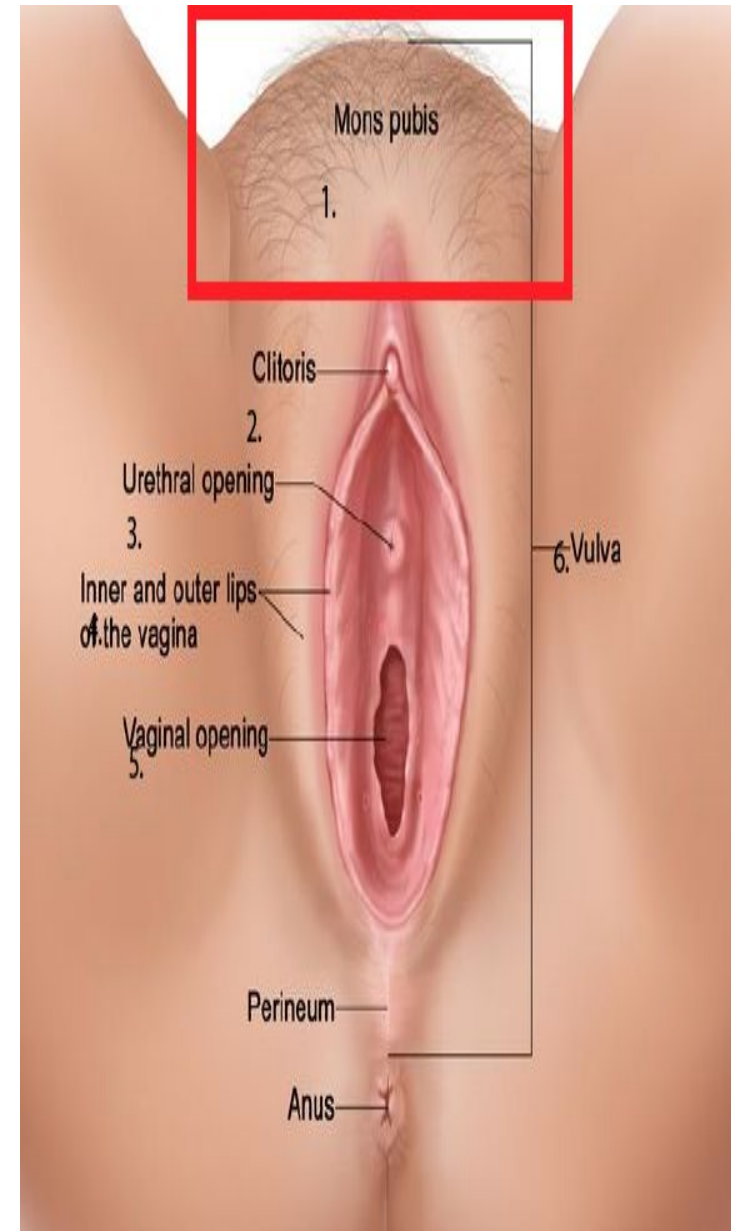
The Clitoris , this is small erectile structure

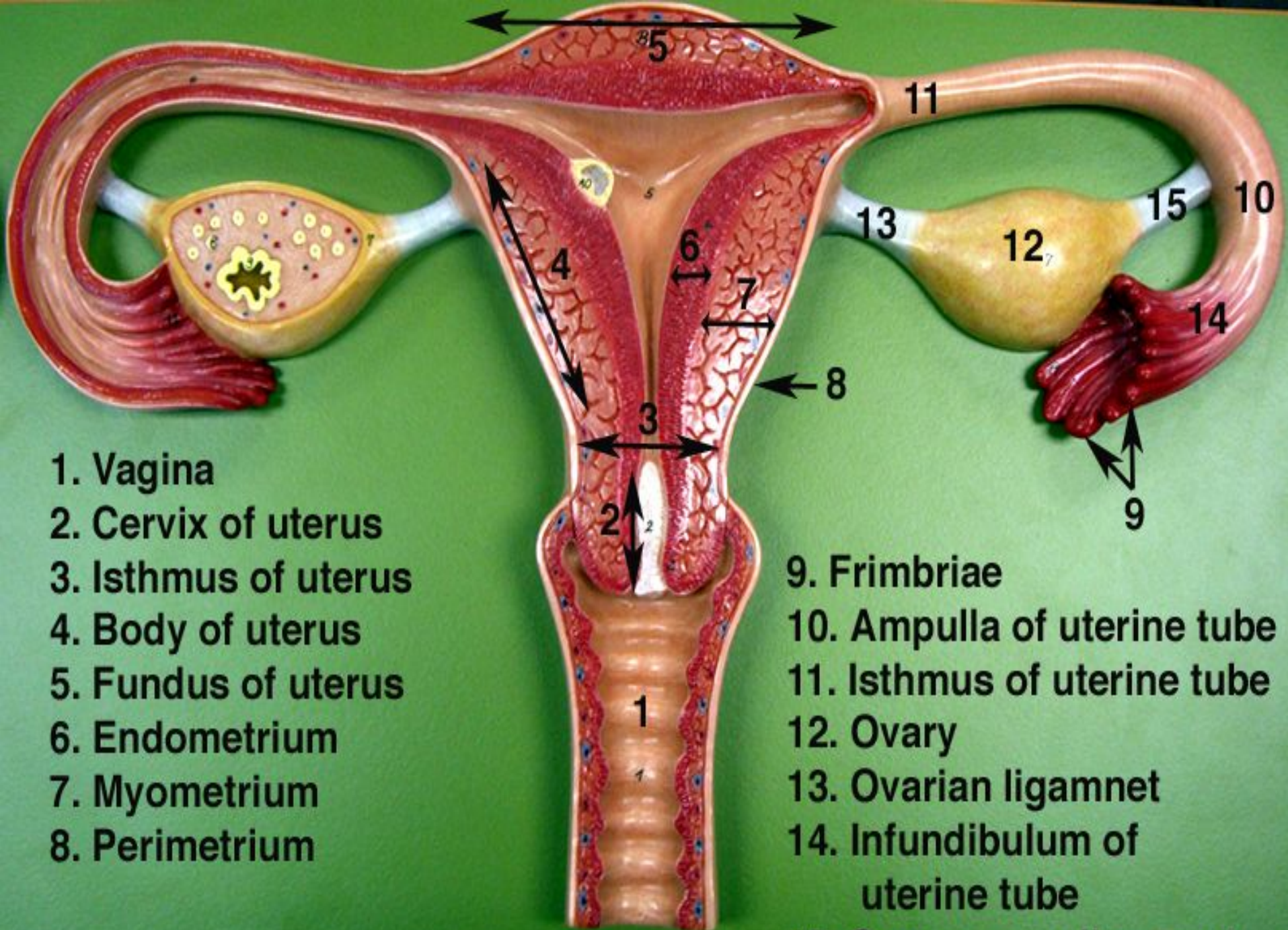
5.

The Greater vestibular gland

6.

The hymen is a thin fold of mucous memberane across the enterance to the vagina





1. Vagina
2. Cervix of uterus
3. Isthmus of uterus
4. Body of uterus
5. Fundus of uterus
6. Endometrium
7. Myometrium
8. Perimetrium

9. Frimbriae
10. Ampulla of uterine tube
11. Isthmus of uterine tube
12. Ovary
13. Ovarian ligament
14. Infundibulum of uterine tube
15. Suspensory ligament

The vagina

- The vagina is a **fibromuscular canal** lined with stratified squamous epithelium that leads **from** the **uterus to the vulva** It is longer in the posterior wall (approximately **9 cm**) than in the anterior wall (approximately **7 cm**).
- **The vaginal walls** are normally in apposition, except at the vault where they are separated by the cervix.
- **The vault of the vagina** is divided into four fornices: posterior, anterior and two lateral.

The vagina

- The vagina has no glands and is kept moist by secretions from the uterine and cervical glands and by transudation from its epithelial lining.
- The epithelium is thick and rich in glycogen which increases in the post-ovulatory phase of the cycle. However, before puberty and after the menopause, the vagina is devoid of glycogen due to the lack of **oestrogen**

Doderlein's bacillus is a normal commensal of the vaginal flora and breaks down glycogen to form lactic acid and producing a pH of around 4.5.

This has a protective role for the vagina in decreasing the growth of pathogenic bacteria.

The upper **posterior wall** forms the anterior peritoneal reflection of the pouch of Douglas. The middle third is separated from the rectum by pelvic fascia and the lower third abuts the perineal body.

Anteriorly, the vagina is in direct contact with the base of the bladder, while the urethra runs down the lower half in the midline to open into the vestibule. Its muscles fuse with the anterior vagina wall.

Laterally, at the fornices, the vagina is related to the cardinal ligaments. Below this are the levator ani muscles and the ischiorectal fossae. The cardinal ligaments and the uterosacral ligaments which form posteriorly from the parametrium support the upper part of the vagina

The uterus

The uterus is shaped like an inverted pear tapering inferiorly to the cervix and in its non-pregnant state is situated entirely within the pelvis. It is hollow and has thick, muscular walls.

Its maximum external dimensions are approximately 7.5 cm long, 5 cm wide and 3 cm thick.

An adult uterus weighs approximately 70 g.

In the upper part, the uterus is termed the body or 'corpus'. The area of insertion of each Fallopian tube is termed the 'cornu' and that part of the body above the cornu is called the 'fundus'.

The uterus tapers to a small constricted area, the isthmus, and below this is the cervix which projects obliquely into the vagina.

The longitudinal axis of the uterus is approximately at right angles to the vagina and normally tilts forward. This is called 'anteversion'.

In addition, **the long axis of the cervix** is rarely the same as the long axis of the uterus. The uterus is also usually flexed forward on itself at the isthmus – anteflexion.

However, in around 20 per cent of women, the uterus is tilted backwards – retroversion and retroflexion.

This has no pathological significance.

The cavity of the uterus is the shape of an inverted triangle and when sectioned coronally the Fallopian tubes open at lateral angles

The constriction at the isthmus where the corpus joins the cervix is the anatomical os.

Seen microscopically, the site of the histological internal os is where the mucous membrane of the isthmus becomes that of the cervix.

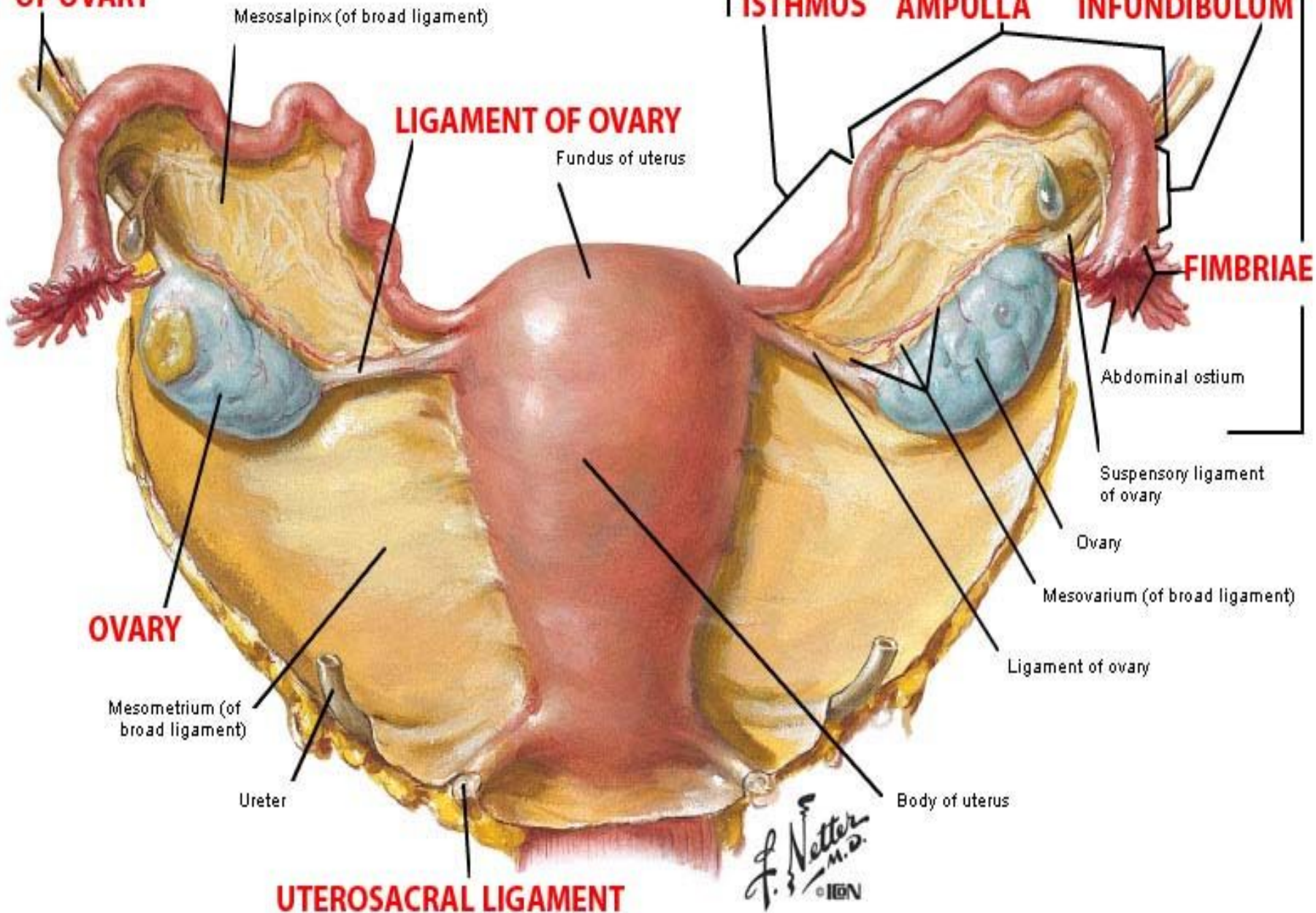
The uterus consists of three layers: the outer serous layer (peritoneum), the middle muscular layer (myometrium) and the inner mucous layer (endometrium).

The peritoneum covers the body of the uterus and posteriorly the supravaginal part of the cervix. The peritoneum is intimately attached to a subserous fibrous layer, except laterally where it spreads out to form **the leaves of the broad ligament.**

The muscular myometrium forms the main bulk of the uterus and is made up of **interlacing smooth muscle fibres** intermingling with areolar tissue, blood vessels, nerves and lymphatics. **Externally,** these are mostly longitudinal, but the **larger intermediate** layer has interlacing longitudinal, oblique and transverse fibres. **Internally,** they are mainly longitudinal and circular.

The inner endometrial layer has tubular glands that dip into the myometrium. The endometrial layer is covered by a single layer of **columnar epithelium**. this epithelium is mostly lost due to the effects of pregnancy and menstruation. The endometrium undergoes cyclical changes during menstruation and varies in thickness between 1 and 5 mm.

SUSPENSORY LIGAMENT OF OVARY



Mesosalpinx (of broad ligament)

LIGAMENT OF OVARY

Fundus of uterus

UTERINE TUBE

ISTHMUS AMPULLA INFUNDIBULUM

FIMBRIAE

Abdominal ostium

Suspensory ligament of ovary

Ovary

Mesovarium (of broad ligament)

Ligament of ovary

OVARY

Mesometrium (of broad ligament)

Ureter

Body of uterus

UTEROSACRAL LIGAMENT

F. Netter M.D. IBV

The cervix

The cervix is narrower than the body of the uterus and is approximately **2.5 cm** in length.

Lateral to the cervix lies cellular connective tissue called the parametrium. **The ureter** runs about **1 cm laterally** to the supravaginal cervix within the parametrium.

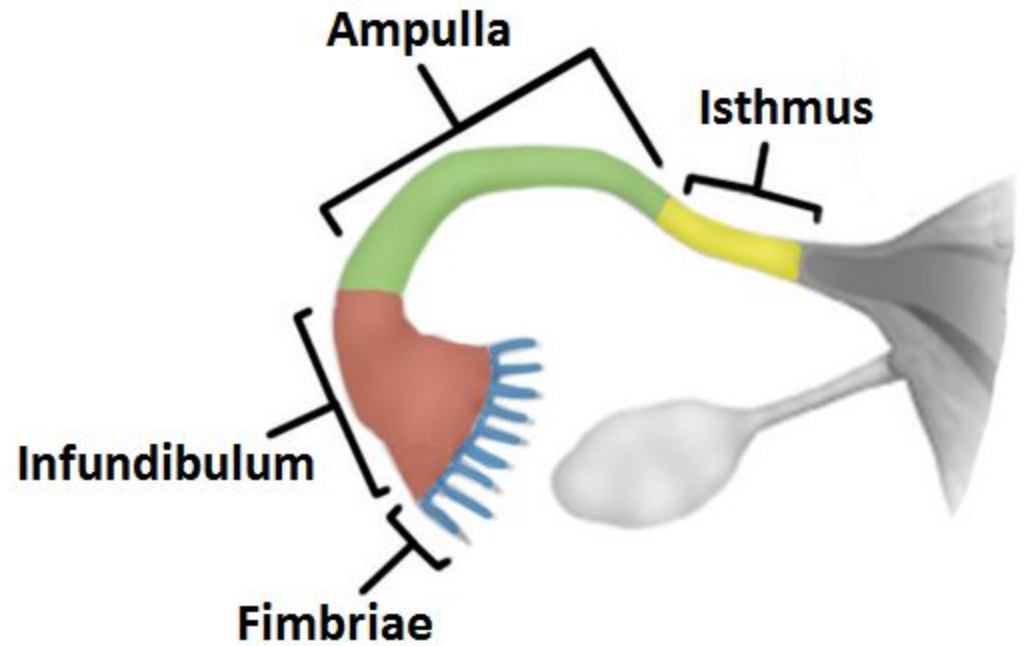
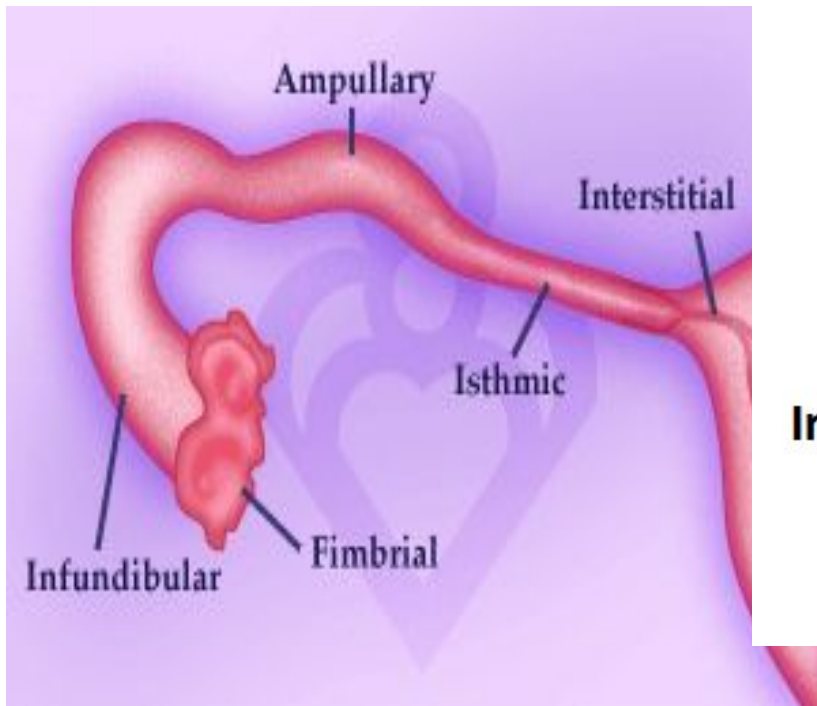
The posterior aspect of the cervix is covered by the peritoneum of the pouch of Douglas.

The upper part of the cervix mostly consists of involuntary muscle, whereas the lower part is mainly fibrous connective tissue.

The mucous membrane has **numerous deep glandular follicles** that **secrete clear alkaline mucus**, the main component of physiological vaginal discharge.

The epithelium of the endocervix is columnar and is also ciliated in its upper two thirds. This changes to stratified squamous epithelium around the region of the external os and the junction of these two types of epithelium is called the '**squamocolumnar junction**'

The Fallopian tubes



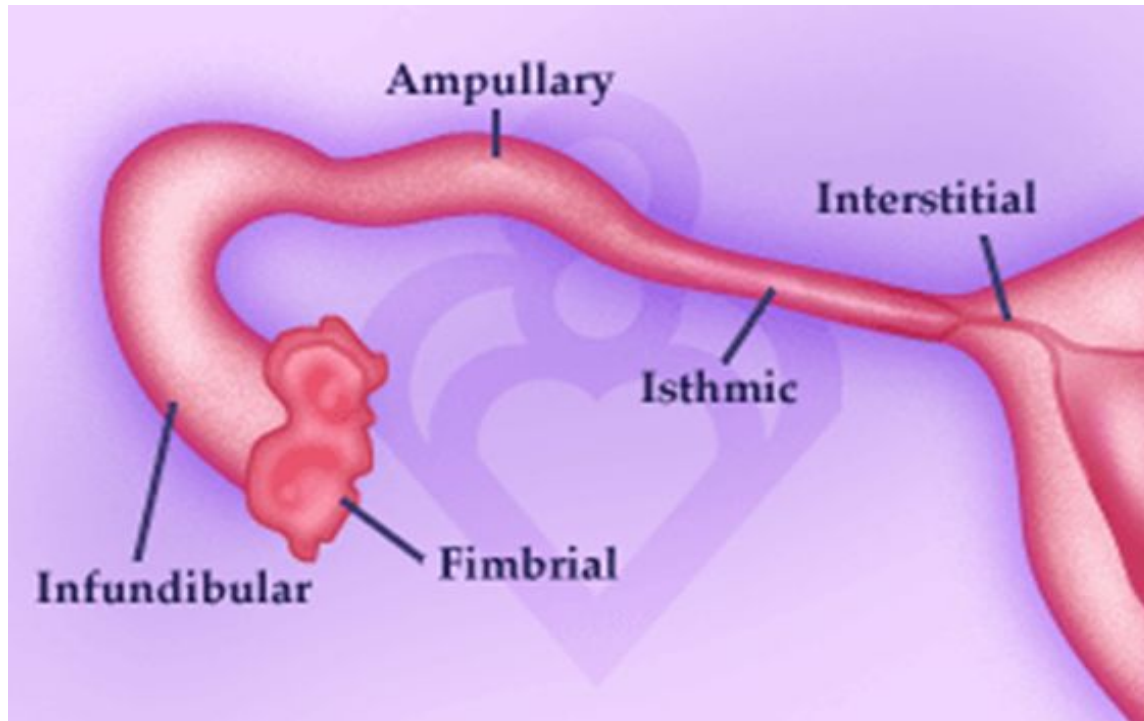
The Fallopian tubes

extends outwards from the uterine cornu to end near the ovary. At the abdominal ostium, the tube opens into the peritoneal cavity which is therefore in communication with the exterior of the body via the uterus and the vagina. This is essential to allow the sperm and egg to meet.

The Fallopian tube runs in the upper margin of the broad ligament part of which, known as the mesosalpinx, encloses it so the tube is completely covered with peritoneum, except for a narrow strip along this inferior aspect. Each tube is about **10 cm** long and is described in four parts:

- 1 The interstitial portion
- 2 The isthmus
- 3 The ampulla
- 4 The infundibulum or fimbrial portion

The muscular fibres of the wall of the tube are arranged in an inner circular and an outer longitudinal layer.



There is no submucosa and there are no glands.

The epithelium of the Fallopian tubes contains two functioning cell types; the ciliated cells and the secretory cells which contribute to the volume of tubal fluid. Changes occur under the influence of the menstrual cycle, but there is no cell shedding during menstruation.

The ovaries

The size and appearance of the ovaries depends on both **age and stage of the menstrual cycle**.

In a child, the ovaries are small structures approximately **1.5 cm** long; however, they increase to adult size in puberty due to proliferation of stromal cells and commencing maturation of the ovarian follicles. In the young adult, they are almond-shaped and measure approximately **3 cm long, 1.5 cm wide and 1 cm thick**.

After the menopause, no active follicles are present and the ovary becomes smaller with a wrinkled surface.

The ovary is the only intra-abdominal structure not to be covered by peritoneum.

Each **ovary is attached** to the cornu of the uterus by the **ovarian ligament** and at the hilum to the broad ligament by the **mesovarium** which contains its supply of nerves and blood vessels.

Laterally, each ovary is attached to **the suspensory ligament** of the ovary

Anterior to the ovaries lie the Fallopian tubes, the superior portion of the bladder and the uterovesical pouch.

It is bound behind by the ureter where it runs downwards and forwards in front of the internal iliac artery.

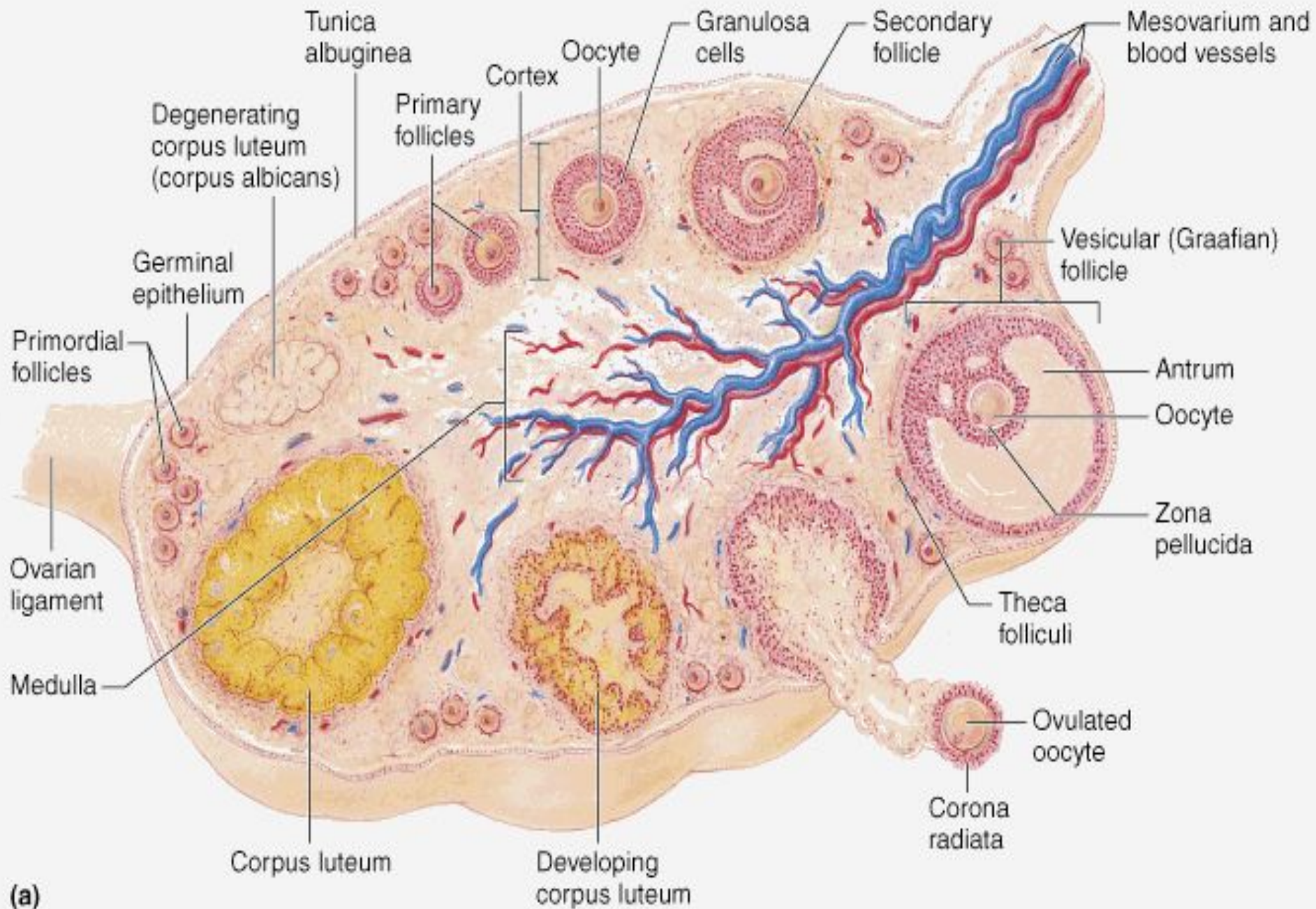
Structure

The ovary has a central vascular **medulla** consisting of loose connective tissue containing many elastin fibres and non-striated muscle cells.

It has an outer thicker **cortex**, denser than the medulla consisting of networks of reticular fibres and fusiform cells, although there is no clear-cut demarcation between the two.

The surface of the ovaries is covered by a single layer of cuboidal cells, the germinal epithelium. Beneath this is an ill-defined layer of condensed connective tissue called the 'tunica albuginea', which increases in density with age.

At birth, numerous primordial follicles are found mostly in the cortex, but some are found in the medulla. With puberty, some form each month into the graafian follicles which will at a later stage of development form corpus lutea and ultimately atretic follicles, the corpora albicans.



The bladder

The bladder wall is made of involuntary muscle arranged in an **inner** longitudinal layer, a **middle** circular layer and an **outer** longitudinal layer. It is **lined** with transitional epithelium and has an average capacity of **400 mL**.

The ureters open into the base of the bladder after running medially for about 1 cm through the vesical wall.

The urethra leaves the bladder in front of the ureteric orifices. The triangular area lying between the ureteric orifices and the internal meatus of the ureter is known as the '**trigone**'.

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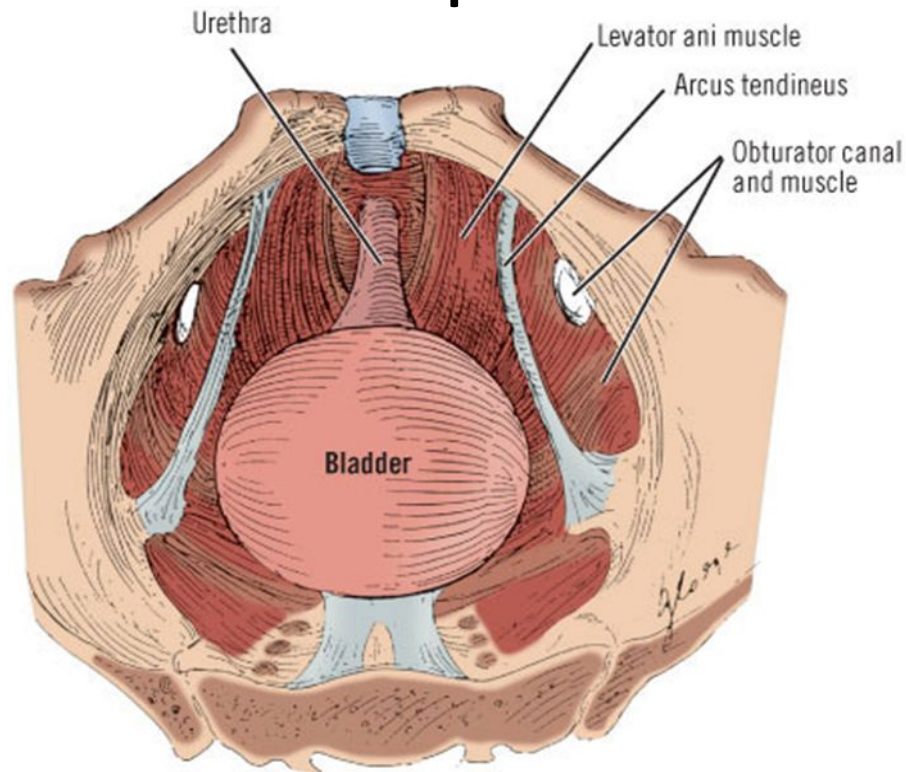
The urethra

The female urethra is about 3.5 cm long and is lined with **transitional epithelium**. It has a slight posterior angulation at the junction of its lower and middle thirds.

The smooth muscle of its wall is arranged in **outer** longitudinal and **inner** circular layers.

As the urethra passes through the two layers of the urogenital diaphragm (triangular ligament), it is embraced by the striated fibres of the deep transverse perineal muscle (compressor urethrae) and some of the striated fibres of this muscle form a loop on the urethra.

Posteriorly, it is firmly attached in its lower two thirds to the anterior vaginal wall. This means that the upper part of the urethra is mobile, but the lower part is relatively fixed.



The ureter

As the ureter crosses the pelvic brim, it lies **in front** of the bifurcation of the common iliac artery.

It runs downwards and forwards on **the lateral wall** of the pelvis to reach **the pelvic floor** and then passes **inwards and forwards** attached to the peritoneum of the back of the broad ligament to **pass beneath the uterine artery**. It next passes forward through a fibrous tunnel, the ureteric canal, **in the upper part of the cardinal ligament**. Finally, it runs close to the lateral vaginal fornix to enter the trigone of the bladder.

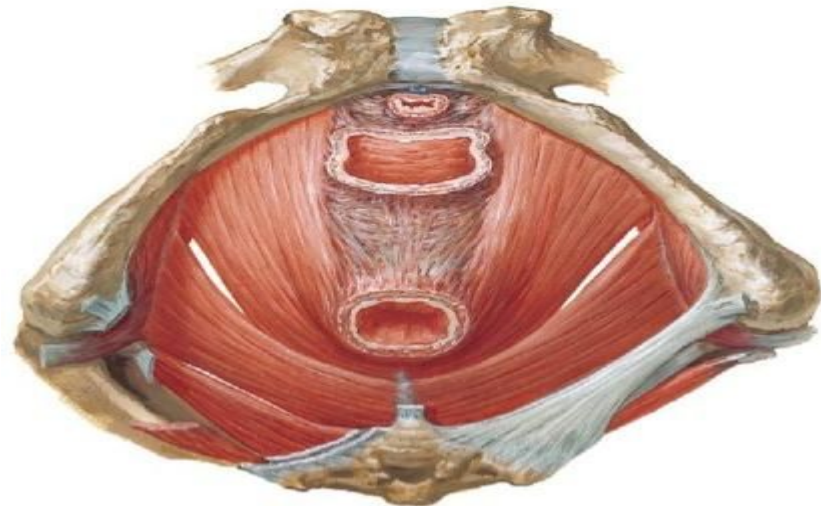
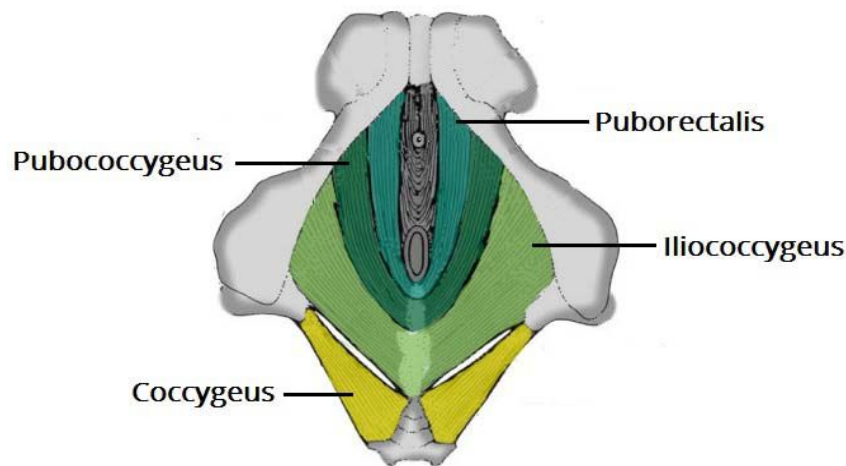
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Because of its close relationship to the cervix, the vault of the vagina and the uterine artery, the ureter may be damaged during hysterectomy. Apart from being cut or tied, in radical procedures, the ureter may undergo necrosis because of interference with its blood supply.

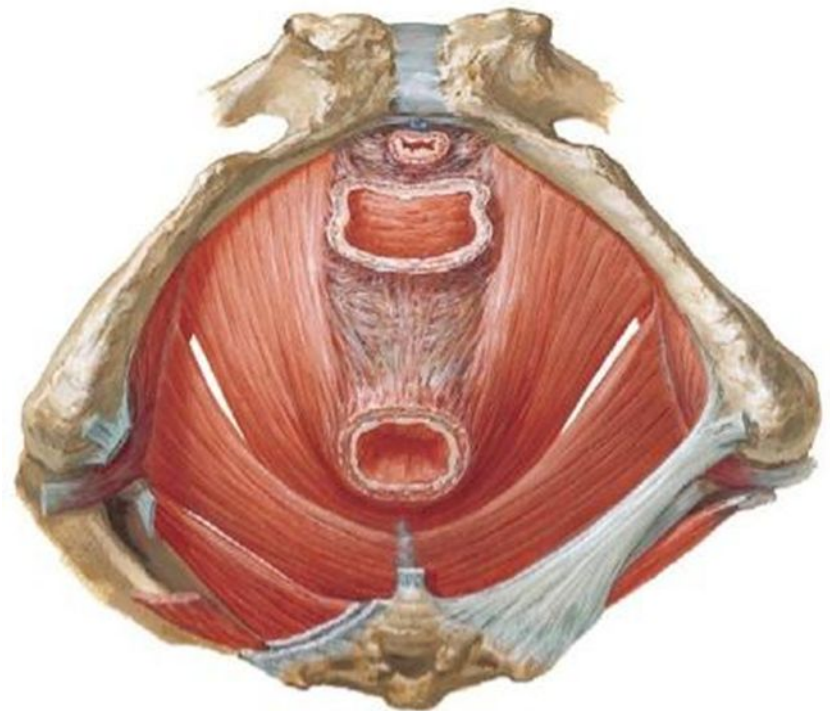
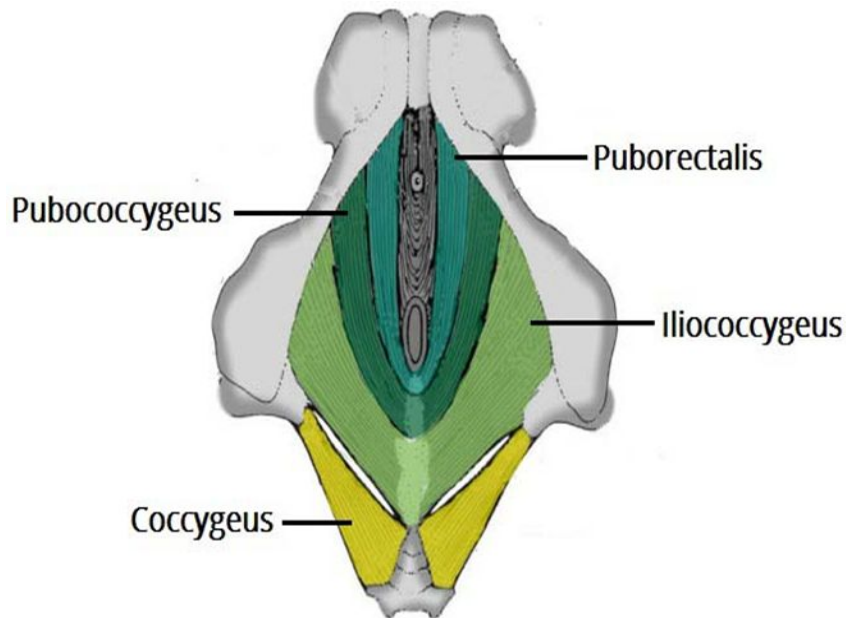
It may be displaced upwards by fibromyomata or cysts which are growing between the layers of the broad ligament and may suffer injury if its position is not noticed at operation

Structure and function of the pelvic floor

- The pelvic floor functions to support the pelvic and abdominal viscera and help maintain control of their contents. It has two major components, which are interdependent: the muscle and fascia.



The pelvic diaphragm is formed by the levator ani muscles which are broad, flat muscles the fibres of which pass downwards and inwards.



The muscle is described in two parts:

1 -The pubococcygeus which arises from the pubic bone and the anterior part of the tendinous arch of the pelvic fascia (white line)

2 -The iliococcygeus which arises from the posterior part of the tendinous arch and the ischial spine.

Fascia

Fascia envelopes levator ani, attaches it to bone at its origin and holds the two muscles together in the midline. The urethra, vagina and rectum perforate this midline fascia. Thus, the pelvic viscera are supported by both the levator ani muscle and the fascial

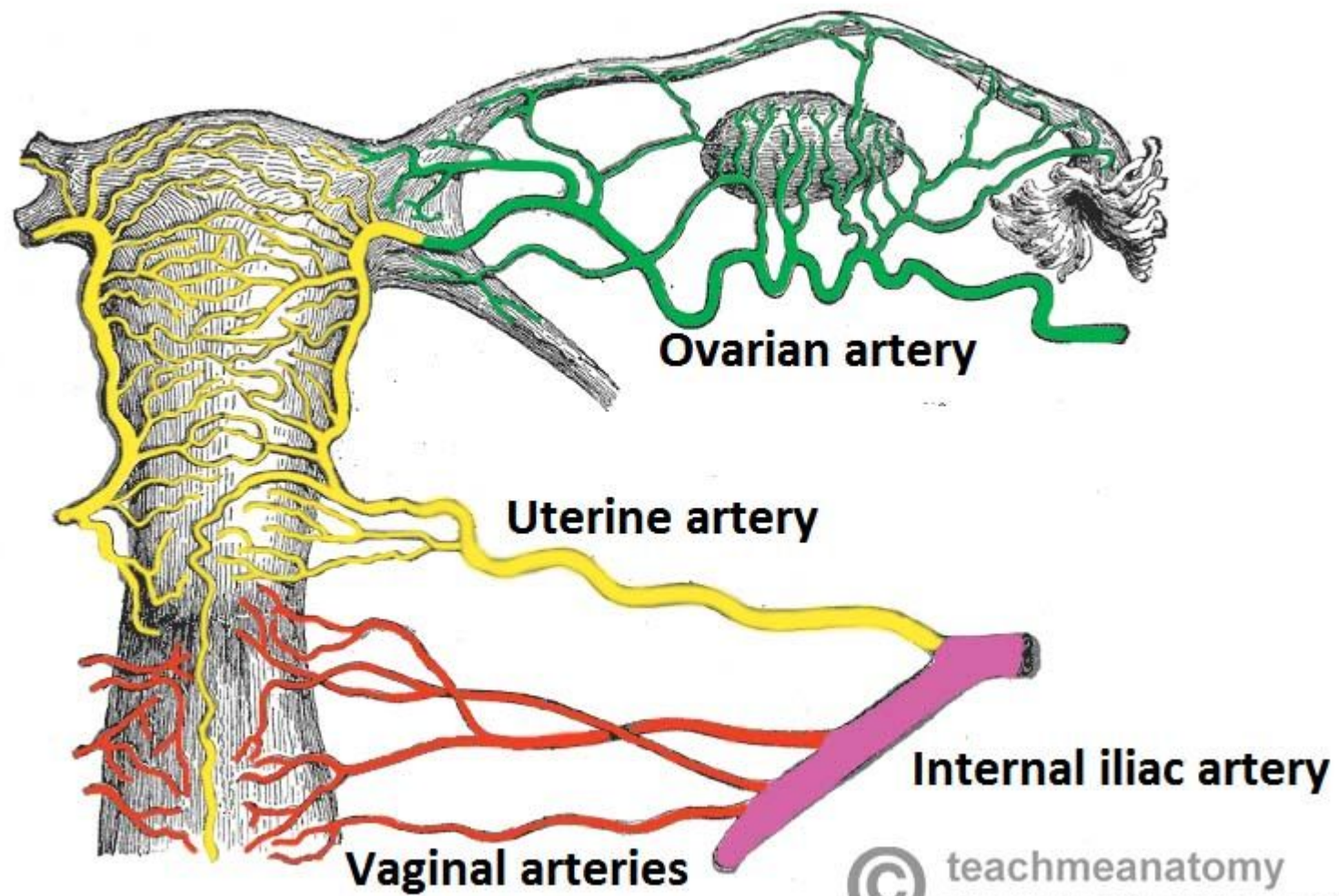
attachments that are **condensed** in some areas and are often referred to as ligaments – **the uterosacral, cardinal and round ligaments being examples**

any factor that influences the strength or integrity of pelvic **floor fascia** will influence the function of the pelvic floor. These factors may be **congenital** (such as hyperelasticity of the collagenous component of fascia) or **environmental**, such as stretching or tearing of fascia during childbirth or heavy lifting.

The blood supply

The ovarian artery arises from the aorta just below the renal artery and runs downwards on the surface of the psoas muscle to the pelvic brim, where it crosses in front of the ureter and then passes into the infundibulopelvic fold of the broad ligament

The artery divides into branches that supply the ovary and tube and then run on to reach the uterus where they anastomose with the terminal branches of the uterine artery.



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The internal iliac (hypogastric) artery

This vessel is about 4 cm in length and begins at the bifurcation of the common iliac artery in front of the sacroiliac joint.

It soon divides into anterior and posterior branches:

the branches that supply the pelvic organs are all from the anterior division.

The uterine artery provides the main blood supply to the uterus.

The artery first runs downwards on the lateral wall of the pelvis, in the same direction as the ureter. It then turns inward and **forwards lying in the**

base of the broad ligament. On reaching **the wall** of the uterus, the artery **turns upwards** to run tortuously to the upper part of the uterus, where it anastomoses with the ovarian artery. In this part of its course, it sends many branches into the substance of the uterus. **The uterine artery supplies a branch to the ureter as it crosses it and shortly afterwards another branch is given off to supply the cervix and upper vagina.**

The vaginal artery is another branch of the internal iliac artery that runs at a lower level to supply the vagina.

The vesical arteries are variable in numbers and supply the bladder and

The middle rectal artery often arises in common with the lowest vesical artery.

The pudendal artery is another branch of the internal iliac artery. It leaves the pelvic cavity through the sciatic foramen and, after winding round the ischial spine, enters the ischiorectal fossa where it gives off the inferior rectal artery. It terminates in branches that supply the perineal and vulval arteries, including the erectile tissue of the vestibular bulbs and clitoris.