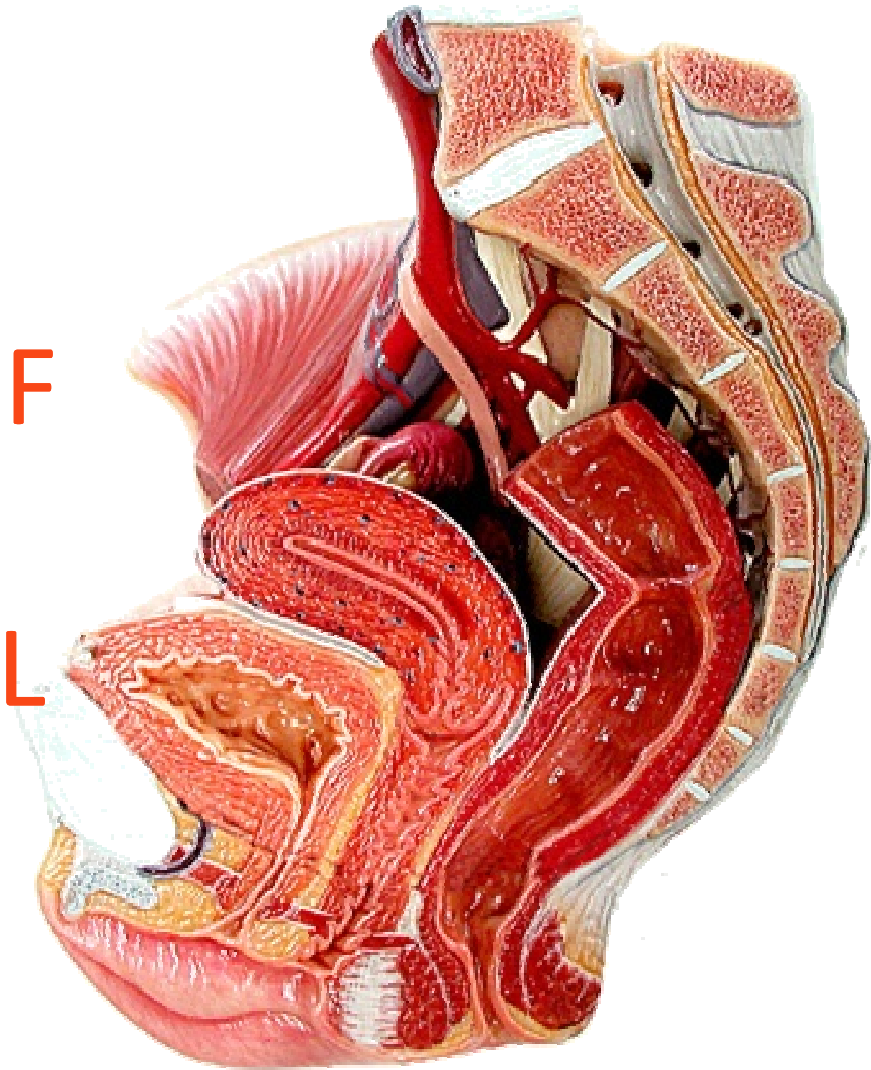


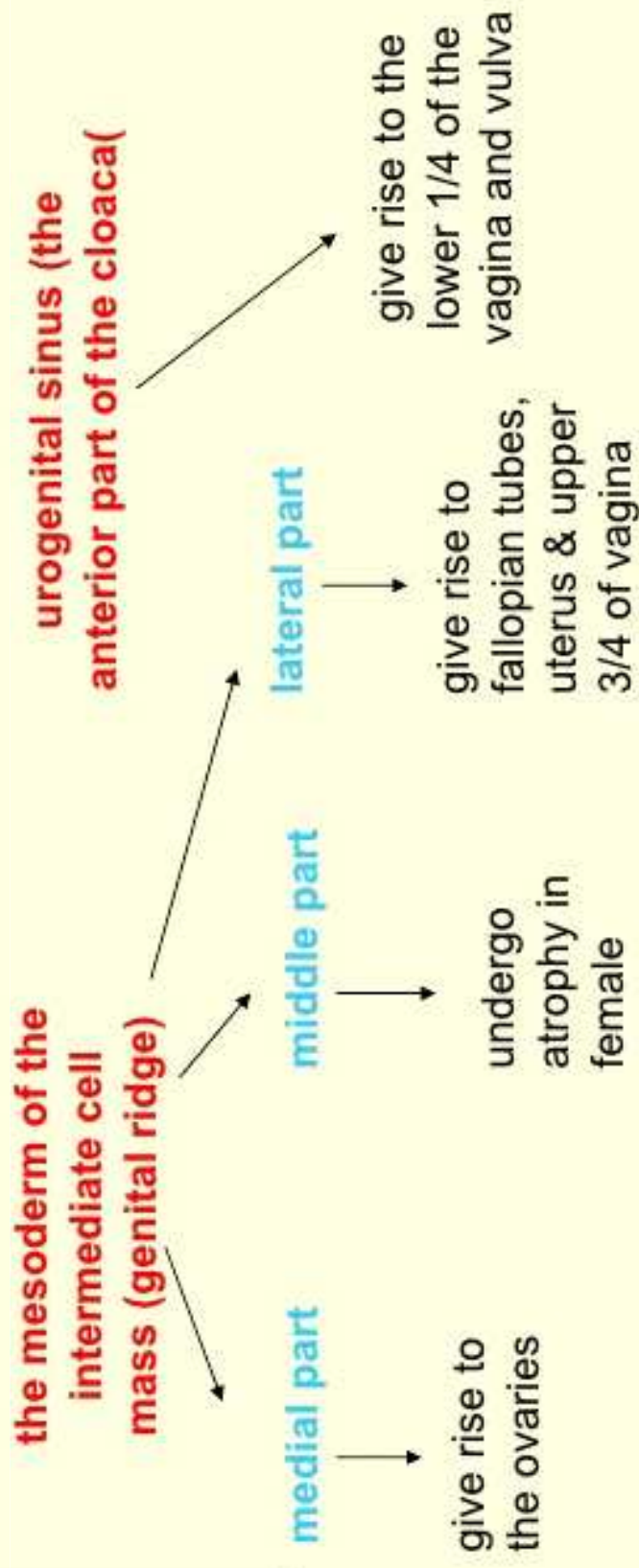
ANATOMY AND
EMBRYOLOGY OF
THE
FEMALE GENITAL
SYSTEM



Embryology of the female genital tract

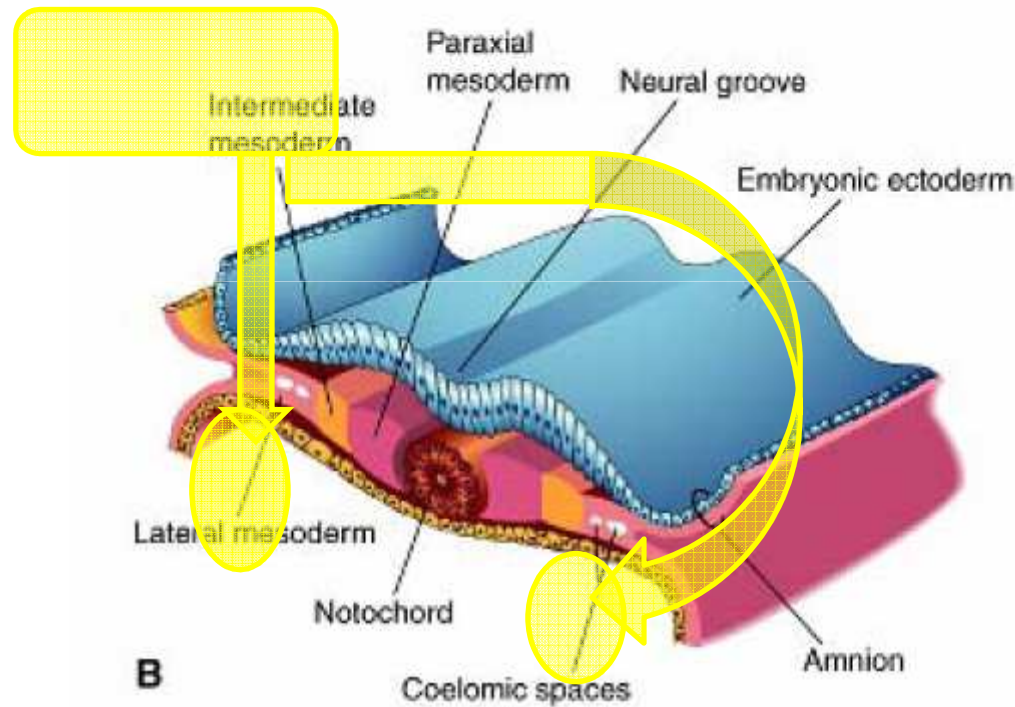
The urogenital system (U.G.S)

develops from

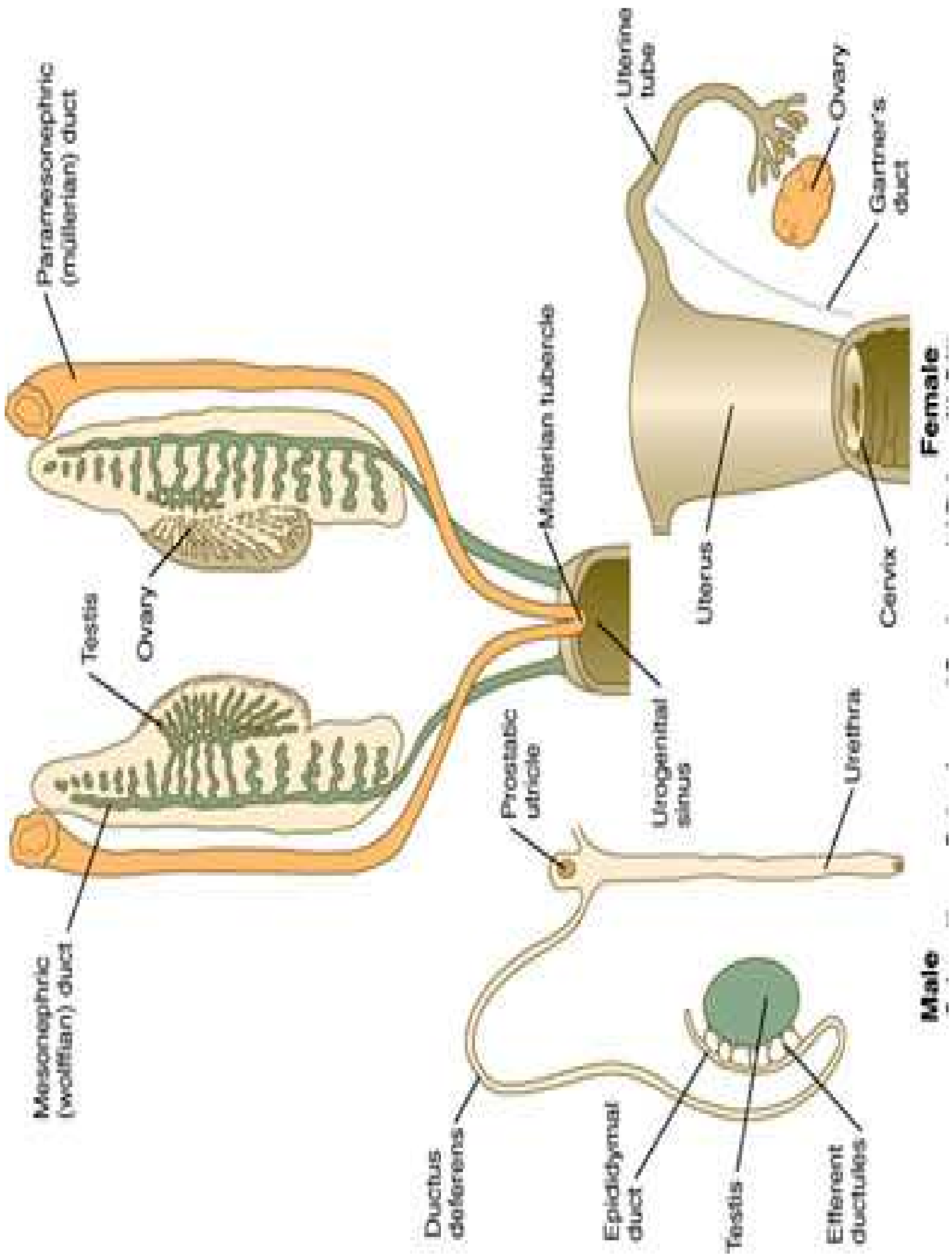


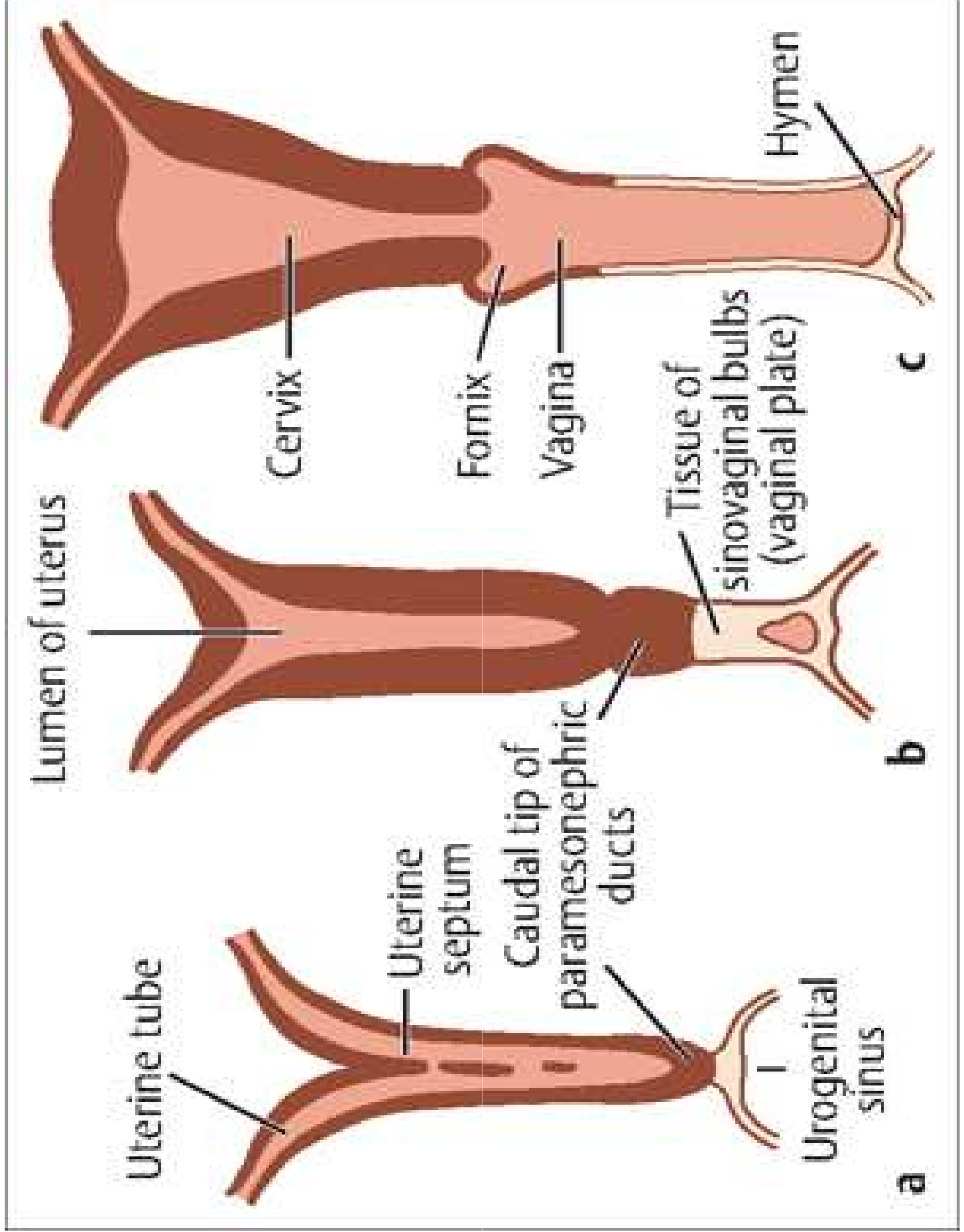
EMBRIOLOGY

Intermediate Mesoderm

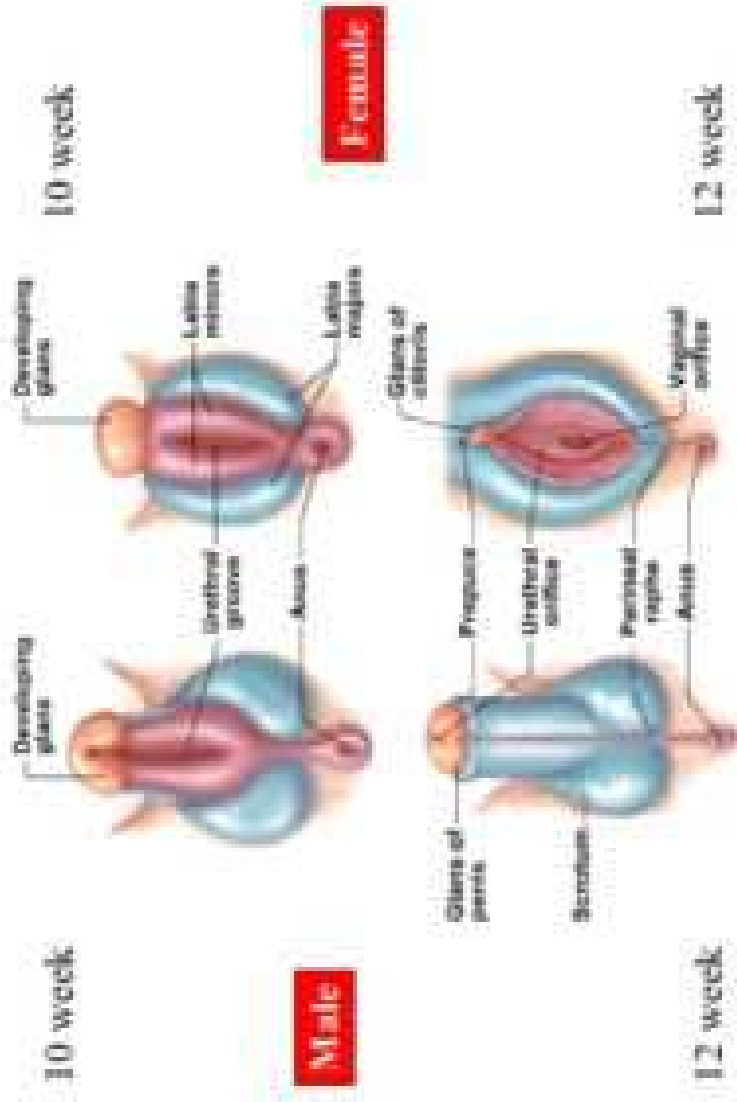


Becomes the
suprarenal
glands, gonads,
kidneys and
associated
tubes and
vasculature





Development of External Genitalia



THE VULVA

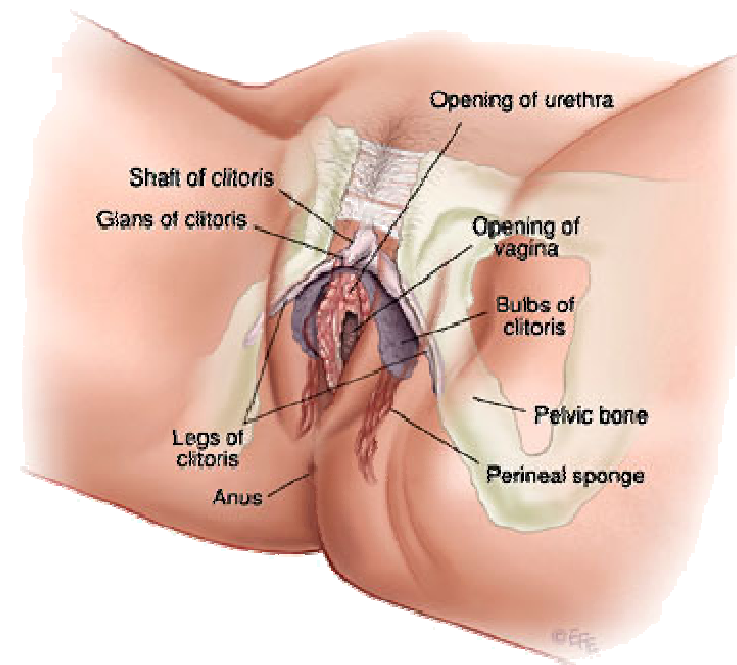
1. Mons : •

a pad of fat overlying the —
symphysis pubis and
covered by skin & hairs.

2. Clitoris: •

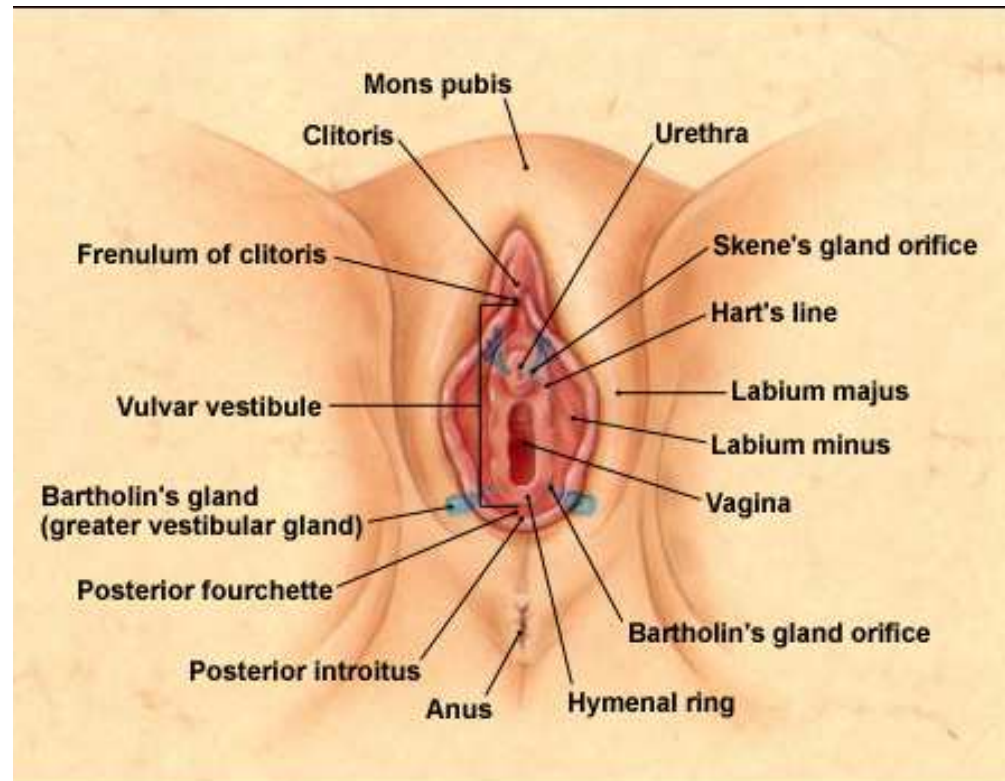
an erectile cavernous —
structure below the
symphysis pubis.

formed of a small glans —
and two corpora
cavernosa.



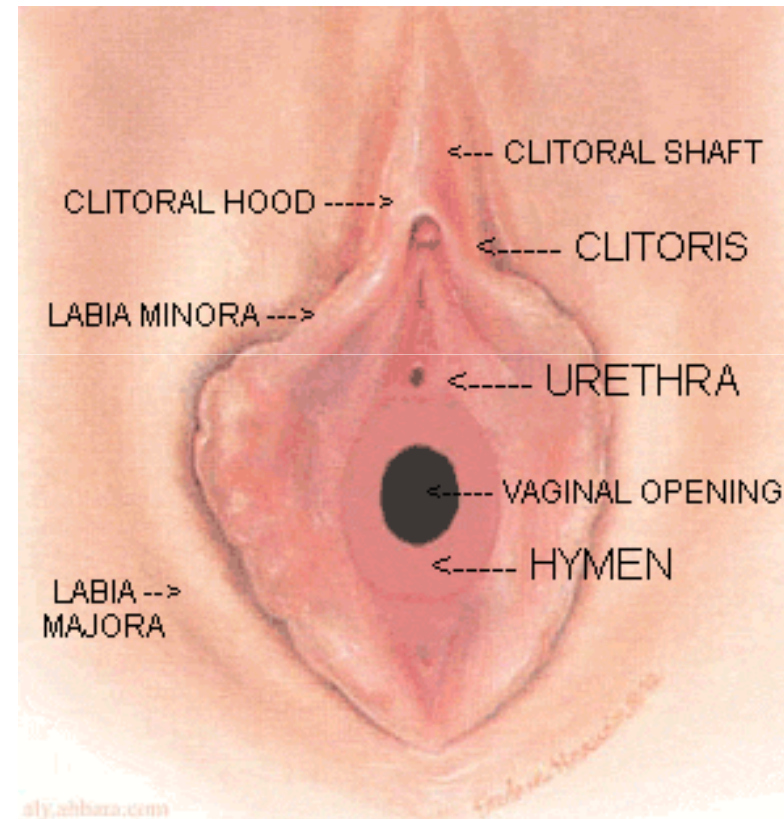
THE VULVA

- ◆ **3. Labia Majora:**
 - The outer 2 skin folds, raised by underlying fat, and passing back from the mons veneris to the perineum. The outer skin is covered by hairs while the inner medial surface is smooth, hairless and contains sebaceous and sweat glands.
- ◆ **4. Labia Minora:**
 - 2 thin folds of modified skin situated medial to the labia majora.



THE VULVA

5. The Hymen: •
a membrane, situated –
about 2 cm from the
vestibule that
demarcates the
external from the
internal genital
organs, and partially
closes the vaginal
orifice.



Blood Supply

Arterial Supply: •

Internal pudendal artery: The terminal branch of the – anterior division of the internal iliac artery that ends as the dorsal artery of the clitoris.

Branches from the femoral artery, supply the anterior – part.

Superficial and deep external pudendal arteries. –

Venous Drainage: •

The veins draining the vulva form a venous plexus – from which veins accompany their corresponding arteries. The veins draining the clitoris join vaginal and vesical venous plexuses.

Lymphatic drainage and Nerve Supply

Lymphatic Drainage of the vulva •

From the skin and appendages, to the superficial inguinal lymph nodes, to the deep inguinal and femoral lymph nodes of which the lymph node of Cloquet drains the clitoris directly. –

From the former superficial group, lymphatic channels pass to the deep pelvic nodes including; the external iliac, common iliac, then para-aortic lymph nodes. –

Nerve Supply of the vulva •

The vulva is supplied mainly from the pudendal nerve (S 2, 3 & 4). –

Additional sensory nerves are supplied from; the Ilio-inguinal nerve (L1), the genital branch of genito-femoral nerve (L 1,2), and the posterior cutaneous nerve of the thigh. –

THE VAGINA

A fibromuscular tube from the vulva to the uterus forming an angle of 60° with the horizontal plane. •

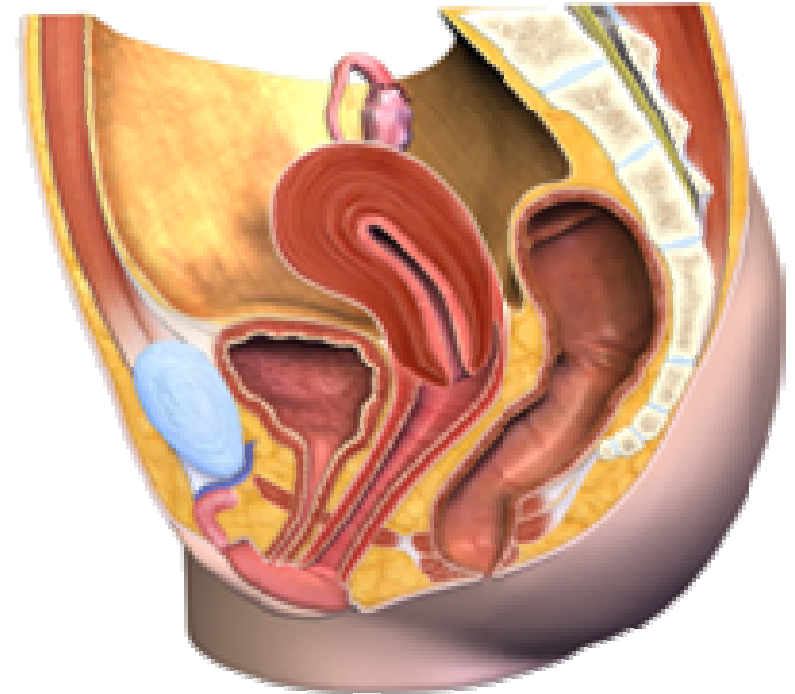
Length: •

anterior wall is 8-9 cm –

posterior wall is 10 -11 cm –

Vaginal Fornices: •

The cervix projects in the upper blind –
end of the vagina that forms a pouch
(vaginal pouch) around the cervix and is
divided into four fornices : two lateral,
anterior and posterior (deeper) fornices.



Anatomical Relations of the Vagina

Anteriorly: •

Upper 1/3: trigone of urinary bladder —

Lower 2/3: urethra. —

Posteriorly: •

Upper 1/3: peritoneum of Douglas pouch. —

Middle 1/3: ampulla of rectum. —

Lower 1/3: the perineal body. —

Laterally: •

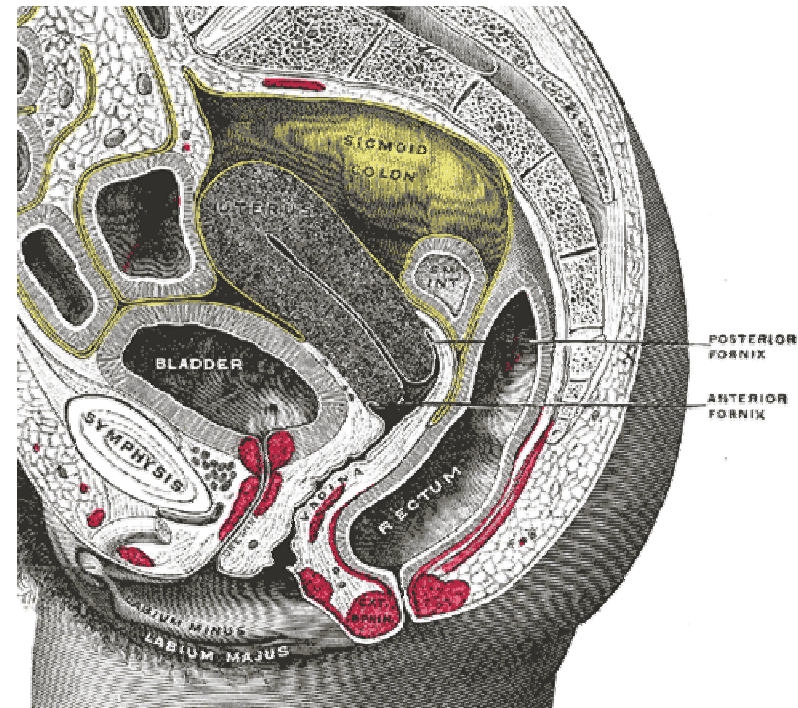
Lower end: Bulbocavernosus muscle, —
vestibular bulb, and Bartholin gland.

1 cm above orifice: urogenital diaphragm —

2½ cm above the orifice: levator ani —
muscle with the pelvic fascia above it.

The lateral fornix gives attachment, to the —
lower part of the cardinal ligaments.

The ureters pass through the cardinal —
ligaments 1 cm lateral to the vagina.



Vaginal Supports

Ligaments attached to the upper vagina: •

Pubocervical ligament anteriorly, –

Mackenrodt's ligament laterally, –

Uterosacral ligament posteriorly. –

Levator ani muscles : pubo-vaginalis part •

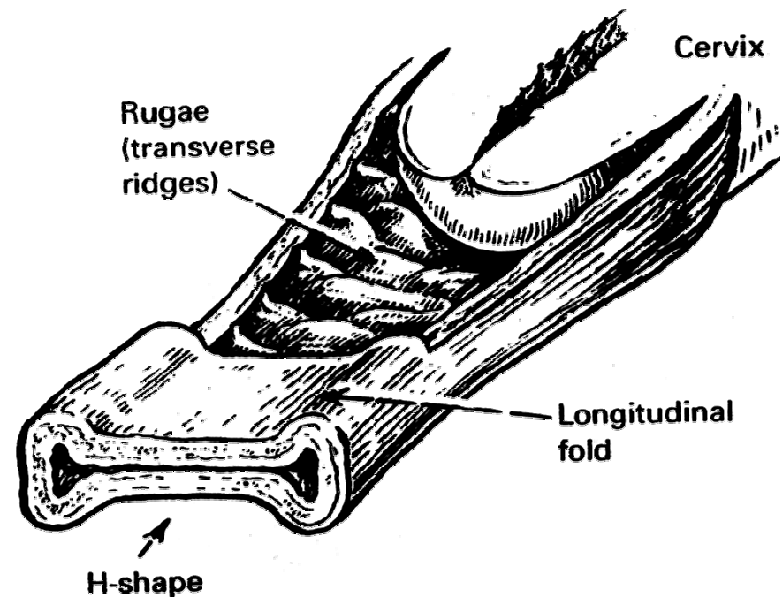
Triangular ligament, and the **Perineal membrane**. •

Vaginal fascia: Connective tissue fascia that condenses •
anteriorly forming the vesico-vaginal fascia and posteriorly
forming the recto-vaginal fascia.

Histology of the Vagina

The cut section of the vagina is “H” shaped with approximation of the anterior to the posterior vaginal walls. It is formed of Three layers; •

- **mucosa**, formed of squamous epithelium without glands, the
- **musculosa**, which is fibromuscular with some fibres from the levator ani inserted into it, and the
- **adventitia**, which is connective tissue continuous with the paracolpos.



Blood Supply

Arterial supply: •

The vaginal artery (from internal iliac artery) –

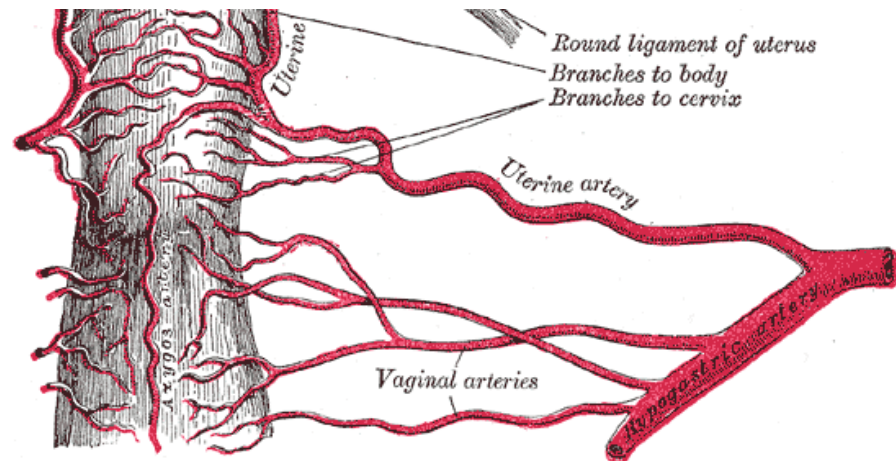
Additional branches from: –

Middle rectal artery (from internal iliac artery) •

Inferior rectal artery (from the internal pudendal artery, •
of the internal iliac artery)

◆ Venous drainage:

- A plexus around the vagina (the vaginal plexus), drain into the internal iliac vein by veins that accompany their corresponding arteries.



Lymphatic drainage and Nerve Supply

Lymphatic drainage of the vagina •

lower 1/3 drains to the inguinal lymph nodes, –

upper 1/3 follows lymphatic drainage of the –
cervix,

middle 1/3, drains in both upper and lower –
directions.

Nerve supply of the vagina: •

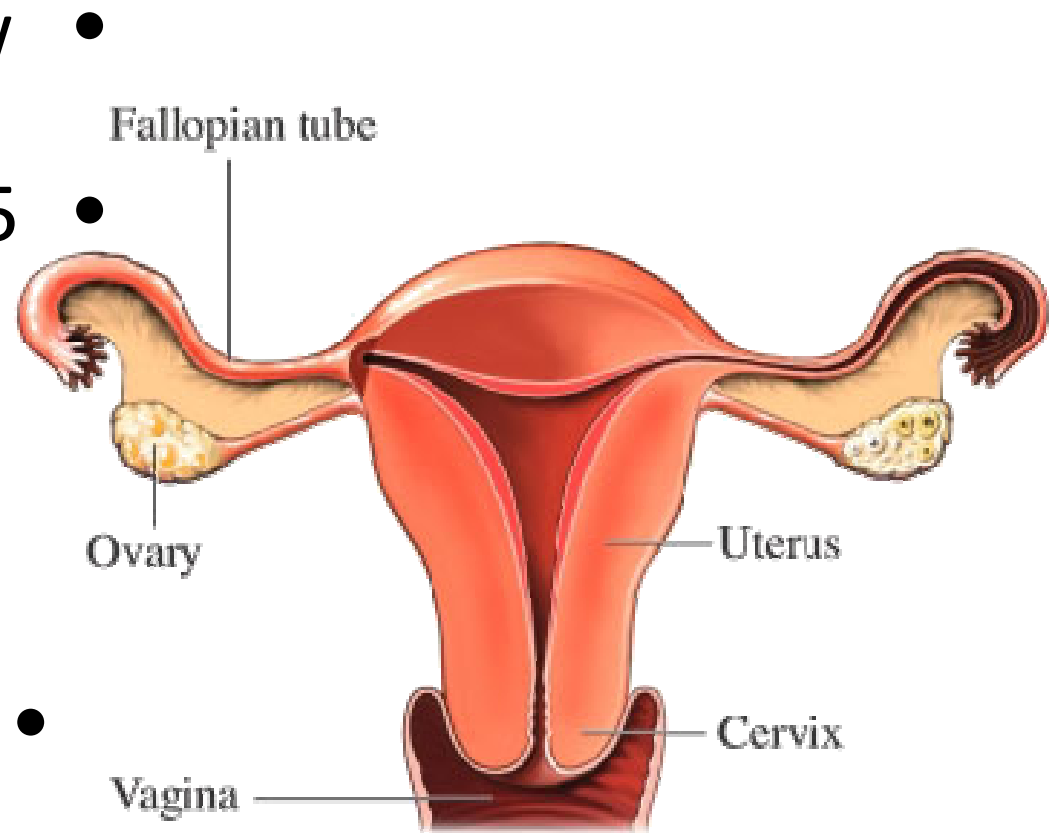
The pudendal nerve gives sensory fibres to the –
lower vagina.

THE UTERUS

A pear shaped hollow muscular organ

Measuring around 7.5 x 4.0 x 2.5 cm in the longitudinal, transverse, and anteroposterior diameters.

It is slightly larger in the multipara than in the nullipara.



Divisions

1. The corpus uteri:

Body that lies above the internal os

Cornu = the area of insertion of the fallopian tubes

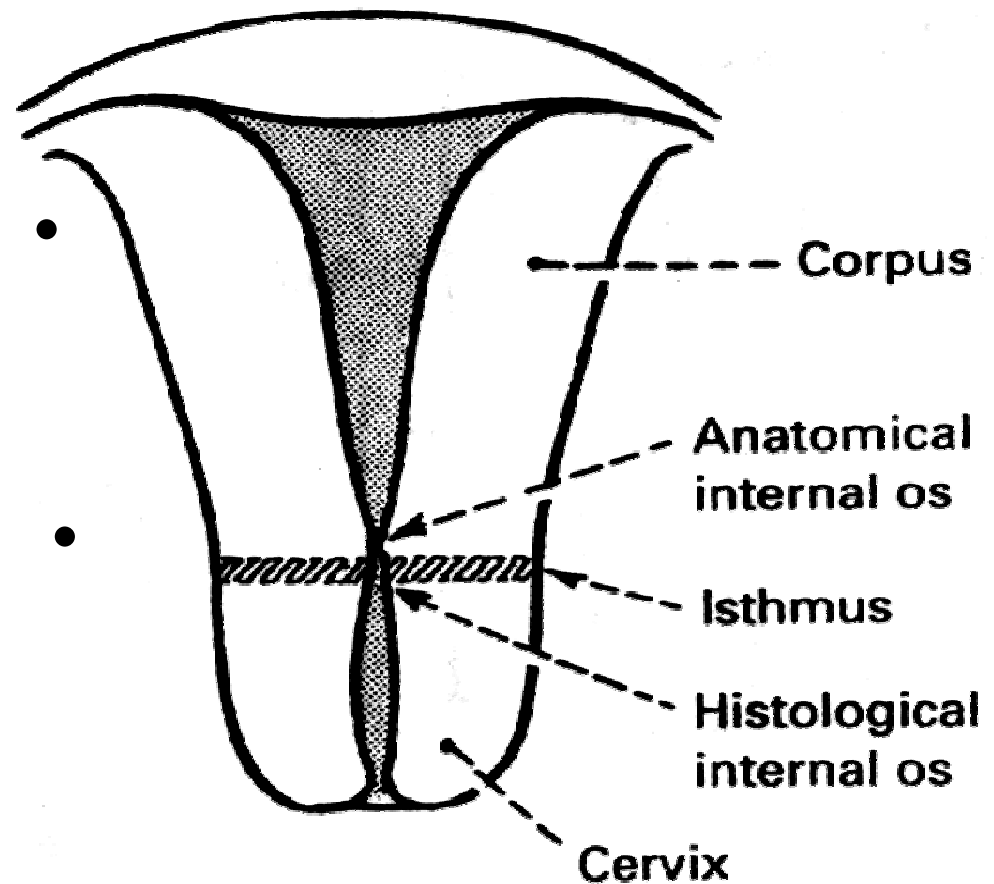
Fundus lies above the insertion of the tubes.

Three structures are attached to the cornu

round ligament anteriorly, —

Fallopian tube centrally, —

ovarian ligament posteriorly. —

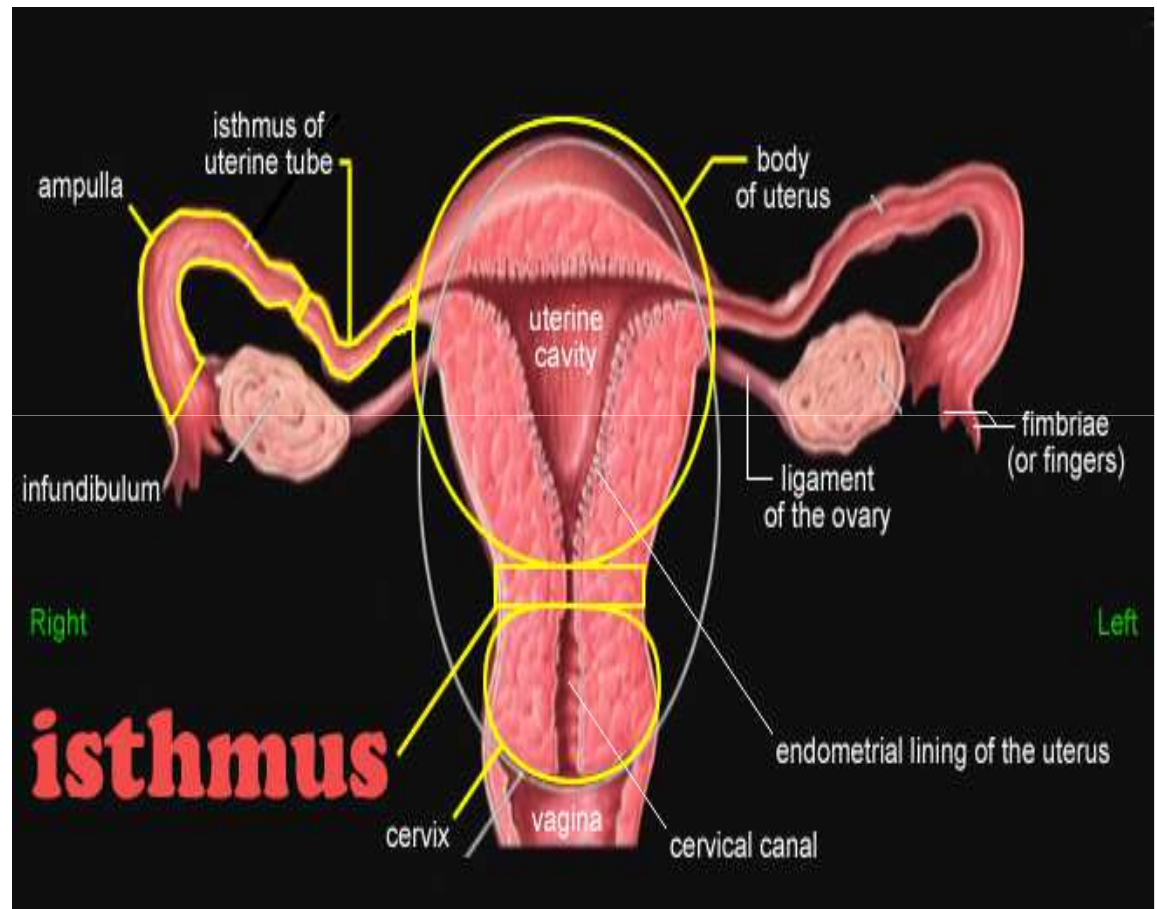


Divisions

2. The isthmus:

an area 4-5 mm in length that lies between the anatomical internal os above, and the histological internal os below. It is lined by low columnar epithelium and few glands.

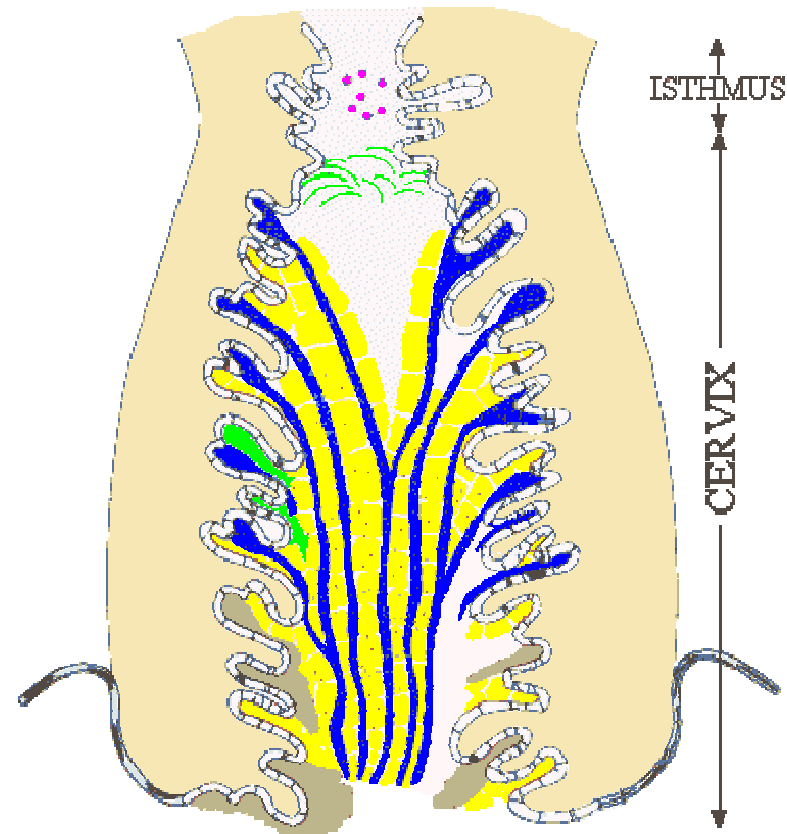
The isthmus expands during pregnancy forming the lower uterine segment (10 cm) during the last trimester.



Divisions

3. The cervix:

- The elongated lower part of the uterus
- Measuring 2.5-3.0 cm.
- Divided by the vaginal attachment into
 - supravaginal portion above
 - vaginal portion (portio-vaginalis) – below.
- The external os is round in nulliparas and slit shaped in multiparas.

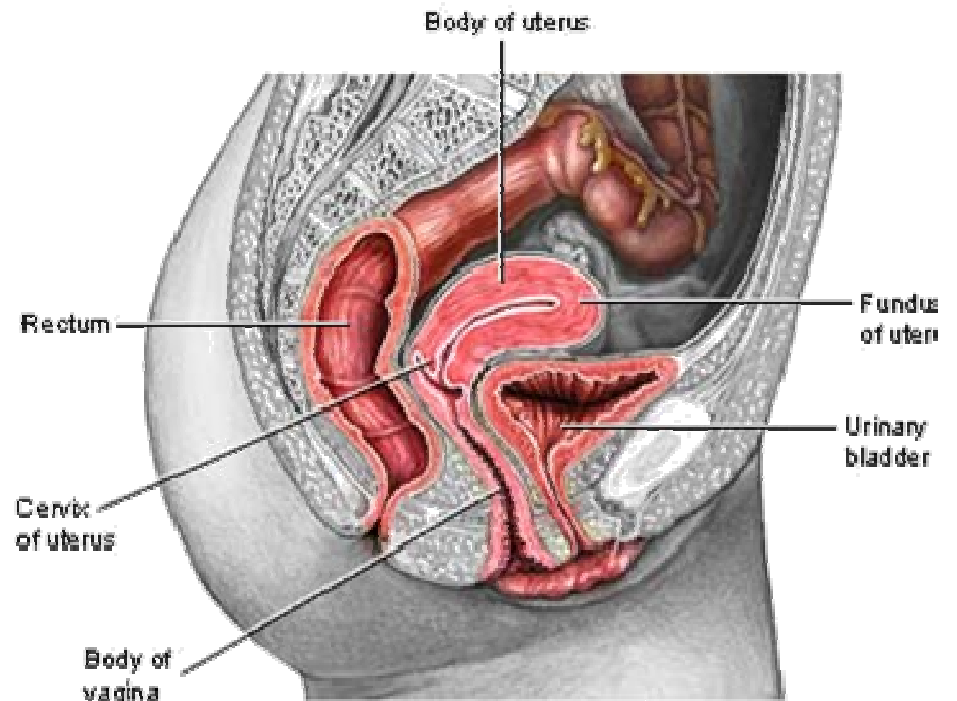


Position

The uterus is kept in an •
anteverted anteflexed position (AVF), with the external os lying at the level of the ischial spines, by the support of the cervical ligaments, endopelvic fascia and pelvic floor muscles (levator ani).

Anteversion: The uterus is •
inclined anteriorly to axis of the vagina.

Anteflexion: The body of the •
uterus is bent forwards upon the cervix.



Relations of the Body of the Uterus

Anteriorly: •

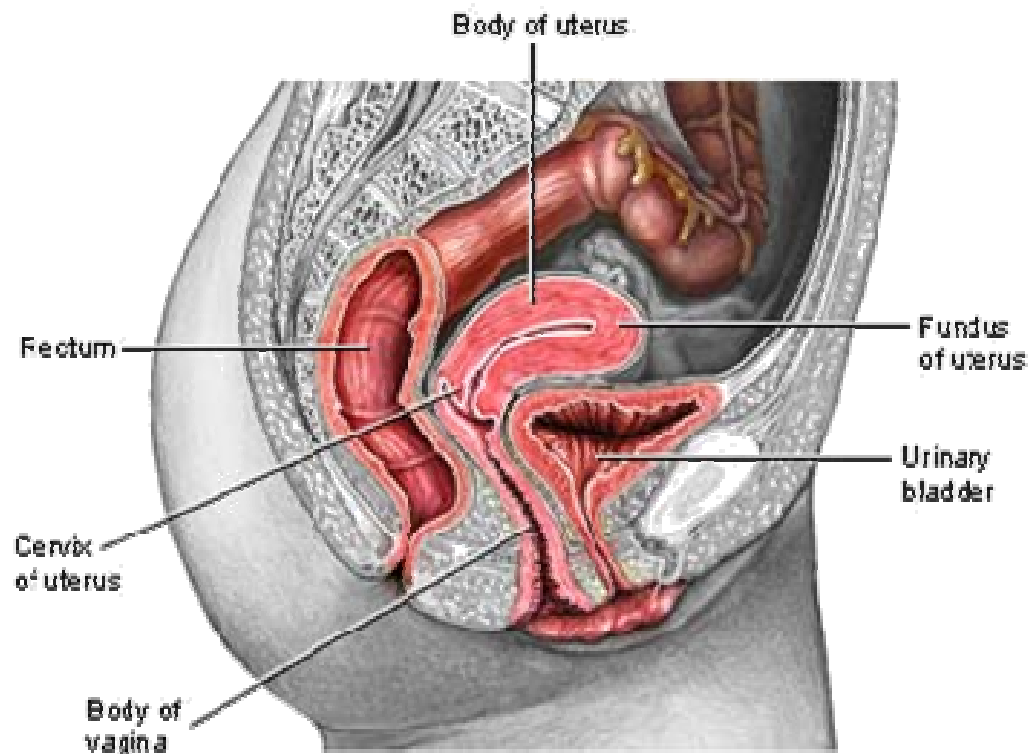
The bladder and –
vesicouterine pouch.

Posteriorly: •

The pouch of –
Douglas.

Laterally: •

The broad ligament –
on each side.



Relations of cervix

Anteriorly: •

Urinary bladder. –

Posteriorly: •

Forms the anterior wall of Douglas pouch. –

Laterally: •

1/2 an inch lateral to the internal os the ureter is –
crossed by the uterine artery (i.e. ureter below the
uterine artery).

The uterosacral, cardinal, and pubocervical •
ligaments are attached to its posterior, lateral,
and anterior surfaces respectively.

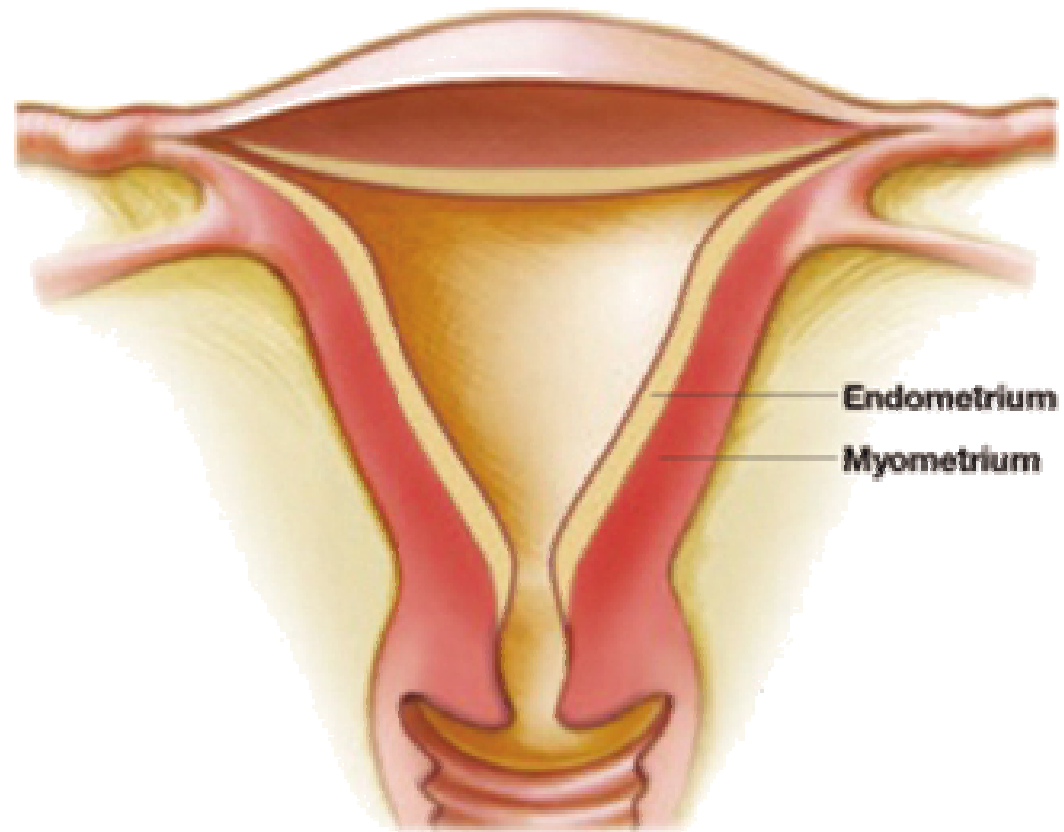
Histology of the Uterus

Three layers: •

1. Endometrium: –
(mucosa)

2. Myometrium –
(musculosa)

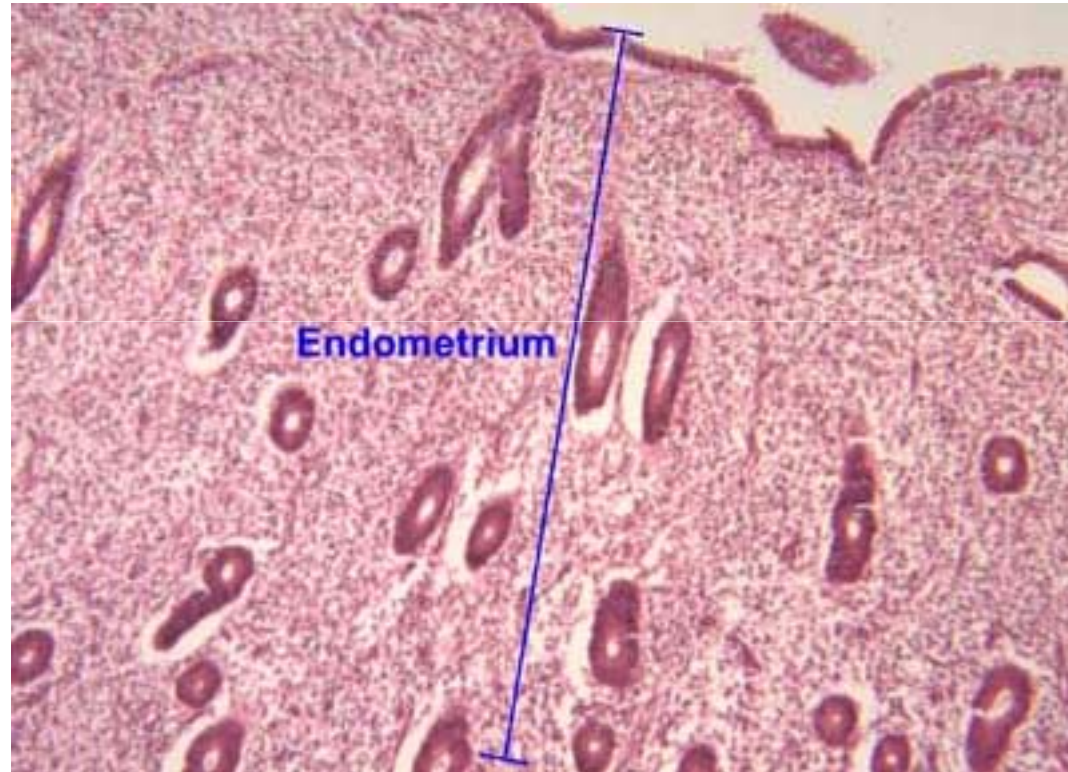
3. The peritoneal –
covering or
perimetrium



Histology of the Uterus

Endometrium:

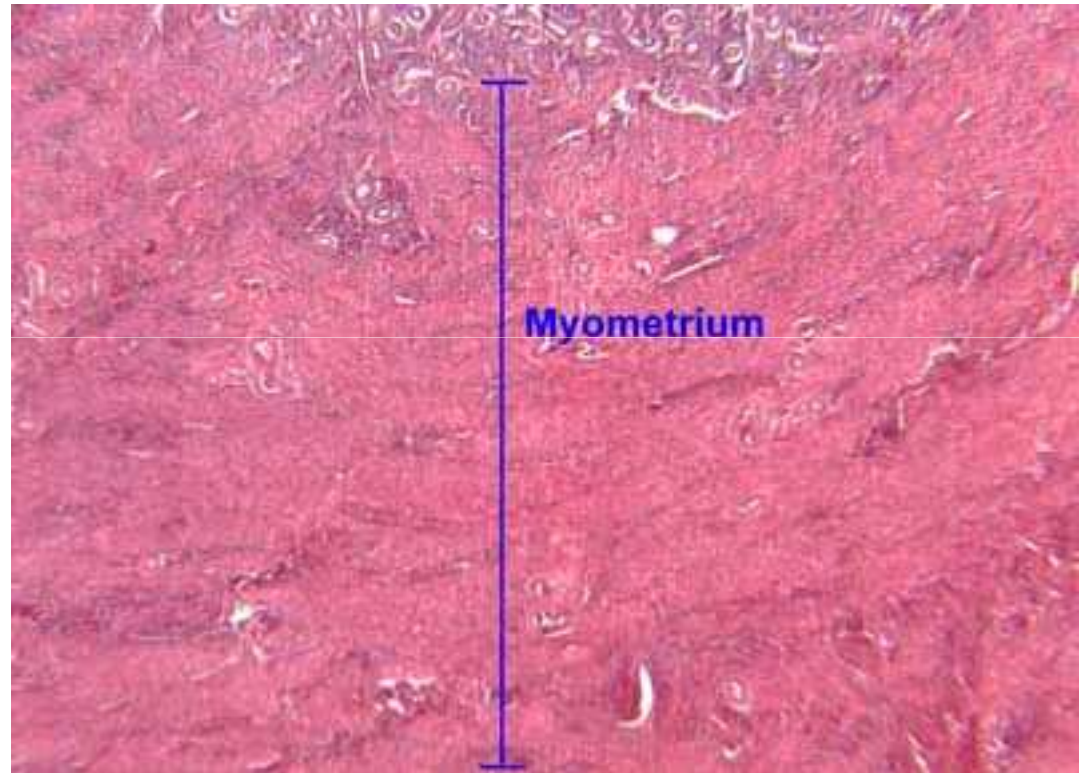
- Lined by simple cubical or columnar epithelium
- Contains tubular glands.
- Shows cyclic changes with the menstrual cycle under the influence of ovarian hormones



Histology of the Uterus

Myometrium

- Three layers
 - outer – longitudinal muscle layer
 - middle layer of – interlacing criss-cross muscle fibres surrounding the blood vessels
 - inner circular – muscle layer



Histology of the Uterus

Perimetrium:

Anteriorly: •

firmly attached to the fundus and body till the isthmus – where it becomes loose and is reflected on the superior surface of the urinary bladder forming the [vesicouterine pouch](#).

Posteriorly: •

firmly attached to the fundus, body, cervix, and – posterior vaginal fornix then is reflected on the pelvic colon forming the [Douglas pouch](#).

Laterally: •

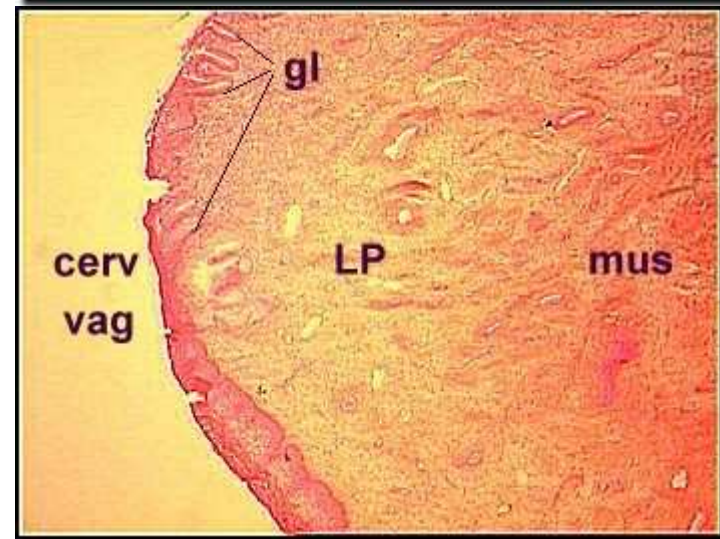
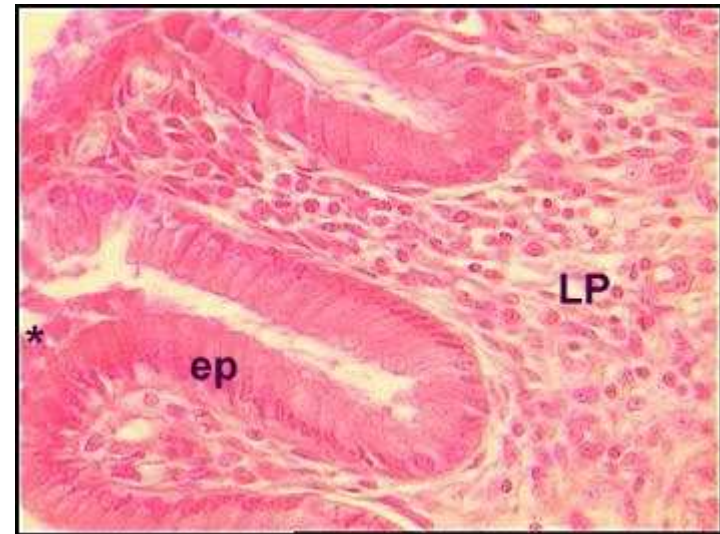
the anterior and posterior peritoneal coverings blend – as the anterior and posterior layers of the [broad ligaments](#).

Histology of the Cervix

- **Endocervix:** Lined by simple columnar epithelium with compound racemose glands or crypts that are liable to chronic infection. It secretes alkaline cervical mucus.

- **Muscle layer:** Outer longitudinal and inner circular muscles.(2 layers only)

- **Ectocervix:** Formed of stratified squamous epithelium covering the outer portion of the cervix. The junction between squamous and columnar epithelium at the external os is either abrupt or it may form a transitional zone 1-3 mm known as the transformation zone.



Blood Supply

Arterial supply:

THE UTERINE ARTERIES •

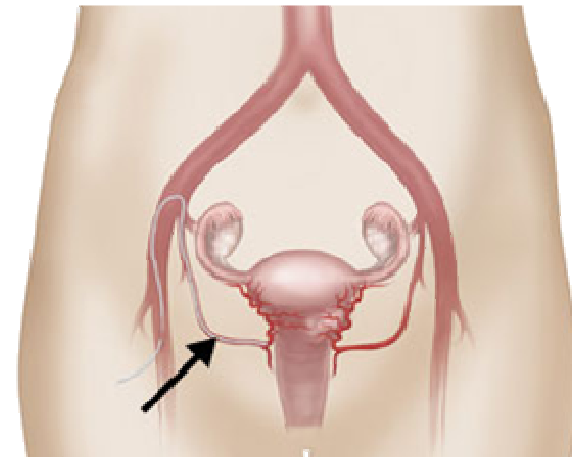
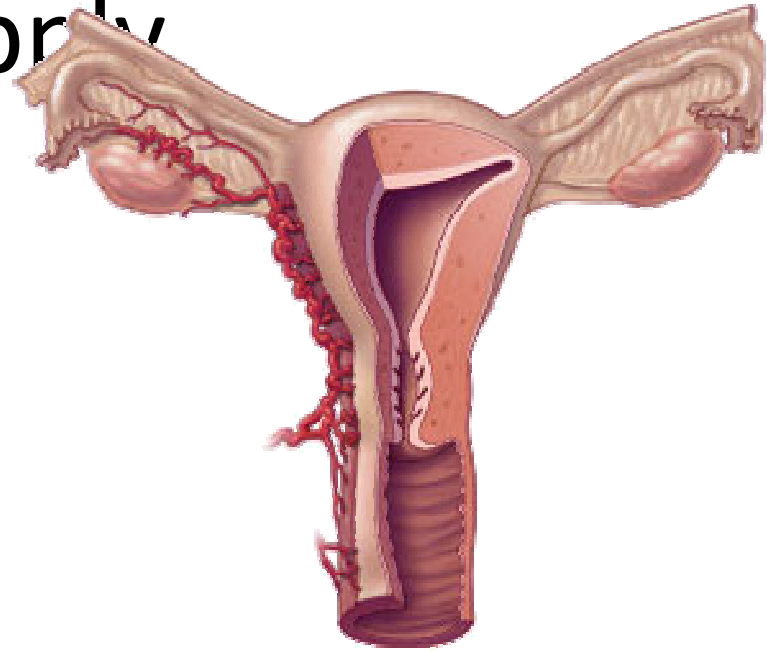
Arise from the anterior division –
of internal iliac artery.

in the base of the broad –
ligament, crossing above the
ureter 1/2 an inch lateral to the
supravaginal cervix.

2 branches: •

An ascending –

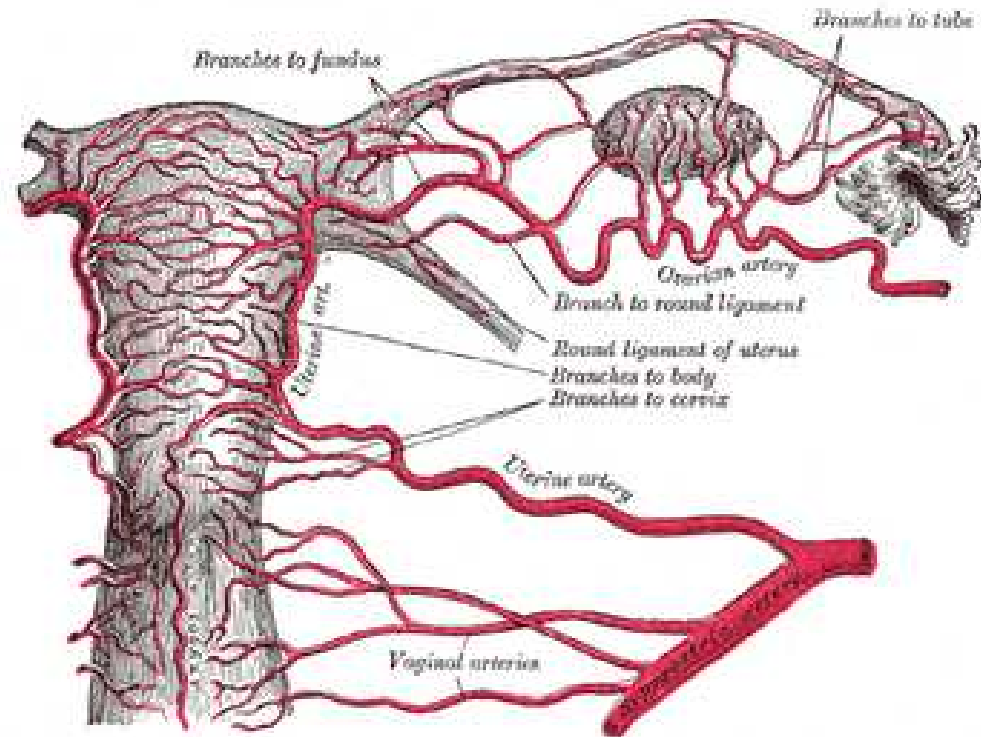
A descending branch –



Blood Supply

The ascending branches pass upwards in a tortuous manner parallel to the lateral border of the uterus between the 2 layers of the broad ligament to end by anastomosing with branches of the ovarian arteries near the uterine cornu.

The descending cervical branch supplies the lower cervix.



Blood Supply

Venous drainage: •

Starts as a plexus between the 2 layers of the broad ligament (**Pampiniform plexus**) that communicate with the vesical plexus and drains into the uterine and ovarian veins. —

Lymphatic drainage: •

Fundus: To the para-aortic lymph nodes via ovarian vessels. —

Cornu: To the superficial inguinal lymph nodes via lymphatics of the round ligament. —

Body: To the internal then external iliac lymph nodes via the uterine vessels. —

Isthmus: As that of the cervix. —

Cervix: Two groups of lymphatics: —

Primary groups: Paracervical, parametrial, obturator, internal and external iliac nodes. —

Secondary groups: Common iliac, para-aortic, and lateral sacral lymph nodes. —

Nerve supply of the Uterus

The cervix and body are relatively insensitive to touch, cutting and burning.

The cervix is sensitive to dilatation and the body is sensitive to distension.

Innervations

Parasympathetic from S2,3,4

Sympathetic from:

T5 and T6 (motor)

T10, T11, T12, and L1 (sensory).

Both reach the uterus through branches of inferior hypogastric plexus.

THE FALLOPIAN TUBE

2 tortuous tubes (10 cm in length) lie in the free •
upper part of the broad ligament.

They blend medially with the cornu of the uterus •

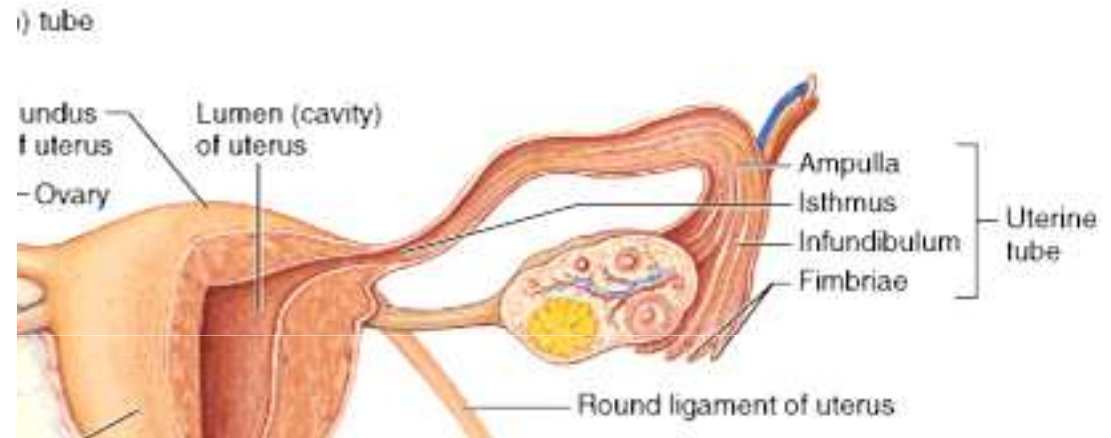
Laterally their free outer end curves backwards •
towards the ovary.

Their lumen communicates between the uterine •
and the peritoneal cavities.

THE FALLOPIAN TUBE

4 parts •

1. **Interstitial part (1 cm)**: pierces the uterine wall, very narrow, no peritoneal covering, no outer longitudinal muscles.



- **2. Isthmus (2 cm)**: straight, narrow, thick walled portion lateral to uterus.
- **3. Ampulla (5 cm)**: the widest, tortuous, thin walled outer part.
- **4. Infundibulum (2 cm)**: trumpet shaped outer end opens into the peritoneal cavity by the tubal ostium.
 - The ostium is surrounded by fimbriae, one of which is long and directed towards the ovary (fimbria ovarica).

Tubal functions

Ovum Pick Up, at the time of ovulation, by •
their free fimbrial end,

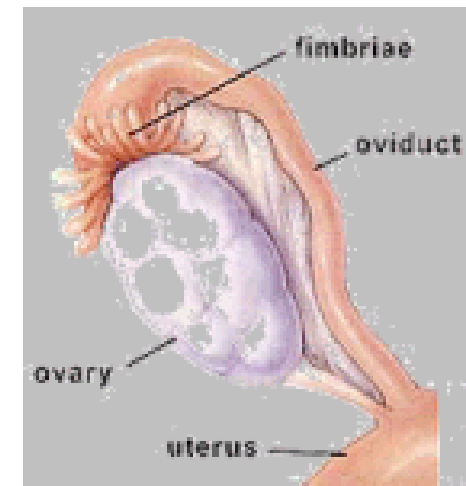
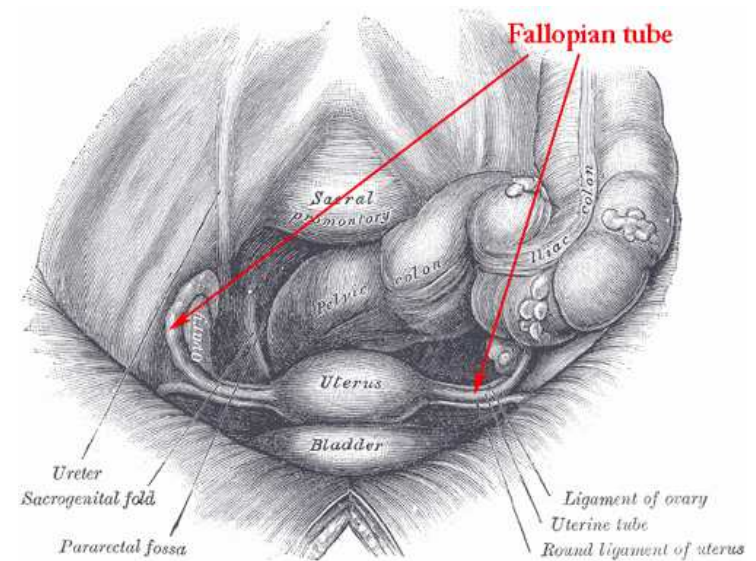
Transport Of The Ova through the tubal •
lumen, by their peristaltic and ciliary
movements, and

Production Of Secretions necessary for •
capacitation of the sperm and nutrition of the
ova during their journey, by their lining cells.

Anatomical Relations

- Bounded
 - above by loops of intestine
 - below by the broad ligament and its contents.
 - medially they blends with cornu of the uterus while
 - laterally they are bounded by the lateral pelvic wall.

- The ovaries lie posterior and inferior to the Fallopian tubes at each side.

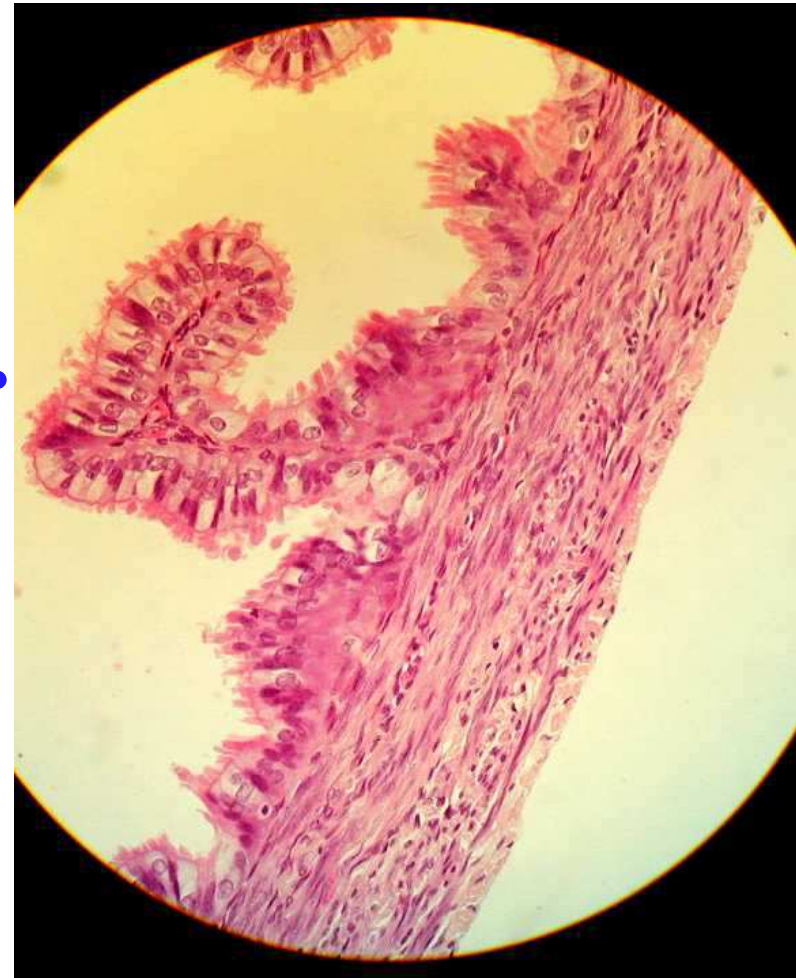


Histology of the Fallopian tubes

Mucosa (endosalpinx): Arranged into 4-5 main longitudinal ridges that give rise to subsidiary folds or plicae. It is lined by columnar partially ciliated epithelium.

Muscle layer: Outer longitudinal and inner circular involuntary smooth muscles. It is thick at the isthmus and thin at the ampulla.

Serosa (peritoneal covering): The extrauterine part is covered by peritoneum in the upper margin of the broad ligament.



Blood Supply & Lymphatic Drainage

Arterial supply: •

branches from both the uterine artery, and the ovarian – artery.

Venous drainage: •

Right ovarian vein drains directly into the IVC –

Left ovarian vein drains into the left renal vein. –

Lymphatic drainage: •

para-aortic LNs directly via ovarian lymphatics. –

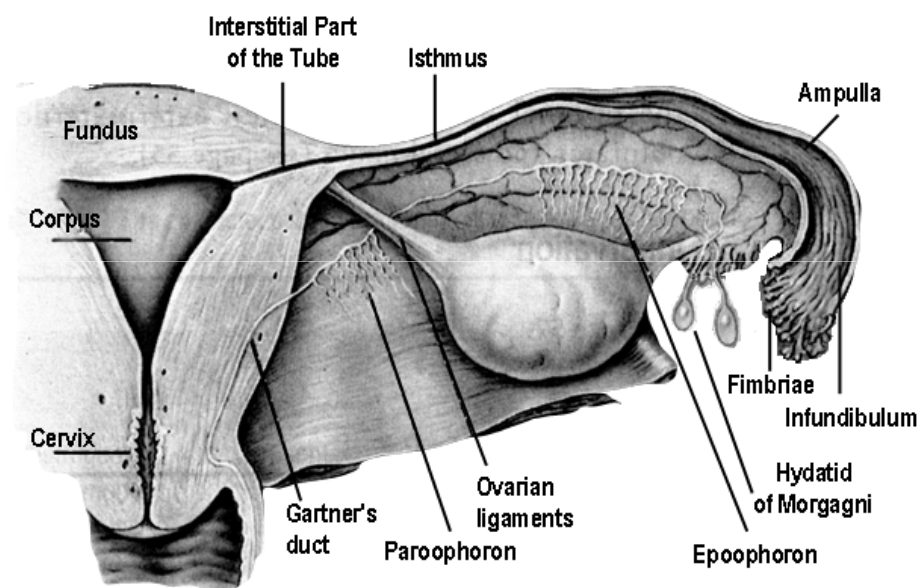
Nerve supply •

sympathetic and parasympathetic fibres –

•

THE OVARY

- Almond shaped
- Lying in the fossa ovarica on the lateral pelvic wall,
- Measuring 3 x 2 x 1 cm.
- Not covered by peritoneum.
- Surface is pearly white and corrugated by the effect of the monthly ovulatory activity.



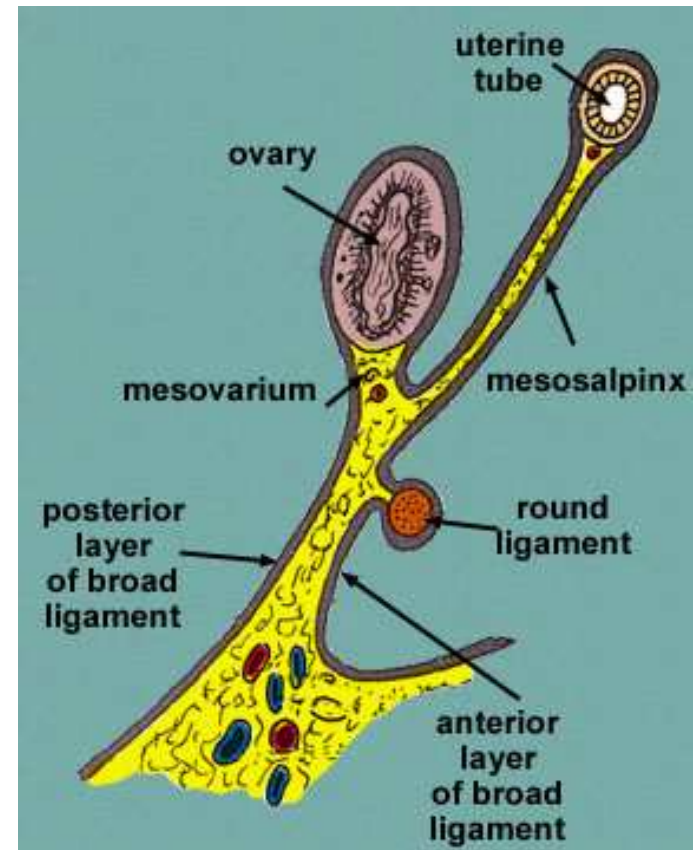
Ovarian Attachments

Three attachments: •

The mesovarium: A peritoneal —
fold that suspends the ovary to
the back of the broad ligament.

The infundibulopelvic ligament: —
suspends the upper pole of the
ovary to the lateral pelvic wall
and carries the ovarian vessels,
nerves and lymphatics.

The ovarian ligament: attaches —
the lower pole to the cornu of
the uterus.

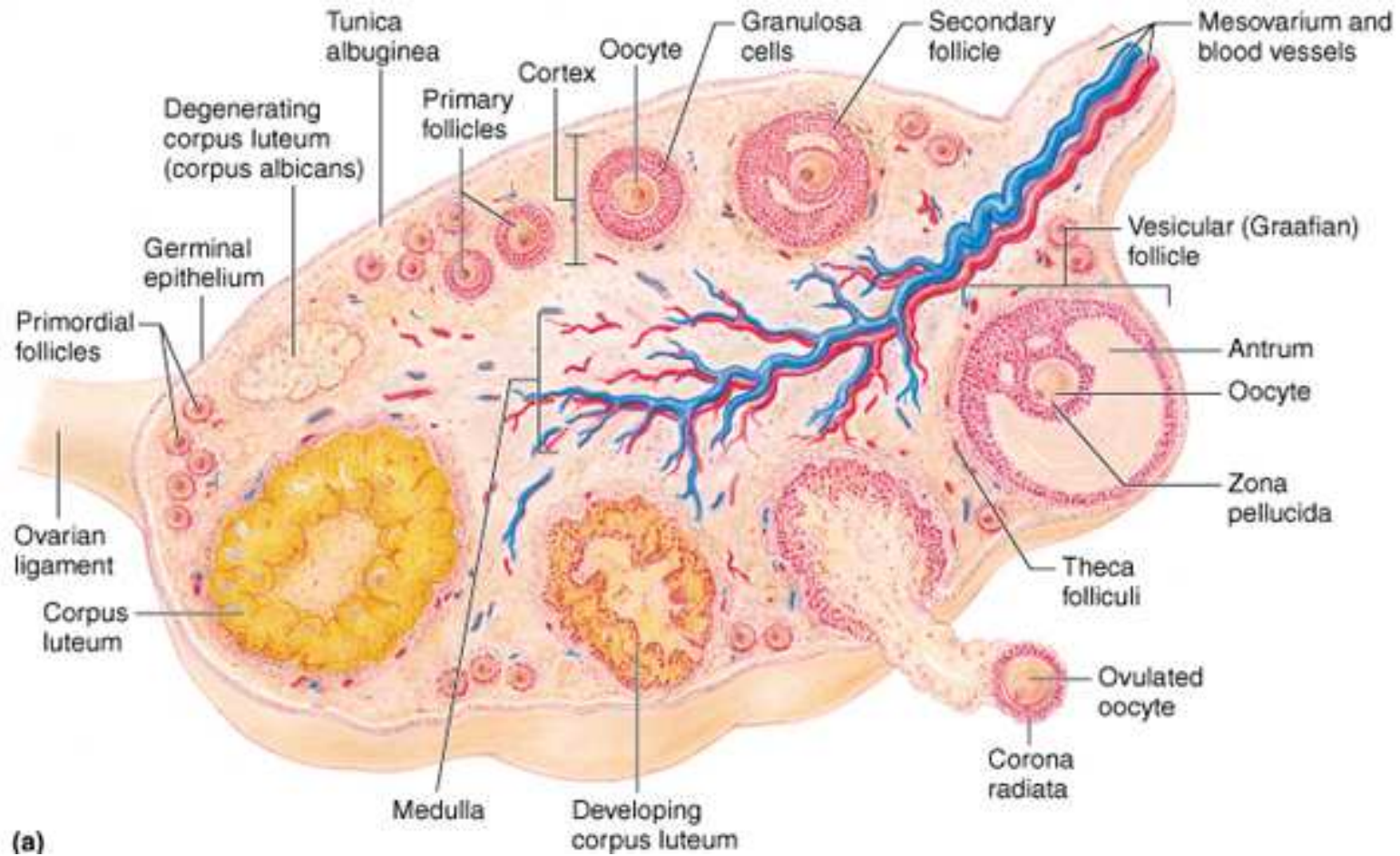


Anatomical Relations

- The ovary is bounded •
- medially by the Fallopian tube, —
 - laterally by the lateral pelvic — wall.
 - superiorly and anteriorly it is — surrounded by the small intestine
 - inferiorly by the ovarian fossa — where the ureter and the internal iliac vessels pass.



Histology of the Ovary



Blood Supply and Lymphatic Drainage

Arterial supply: •

Ovarian artery: Arises from the aorta at the level of L2 and passes –
through the infundibulopelvic ligament.

Ovarian branch from the uterine artery; which anastomose with the –
ovarian vessels at the broad ligament.

Venous drainage: •

The ovarian veins accompany the arterial supply, and join with the –
pampiniform plexus of veins and the uterine vein.

Lymphatic drainage: •

to the para-aortic LNs via the ovarian vessels. –

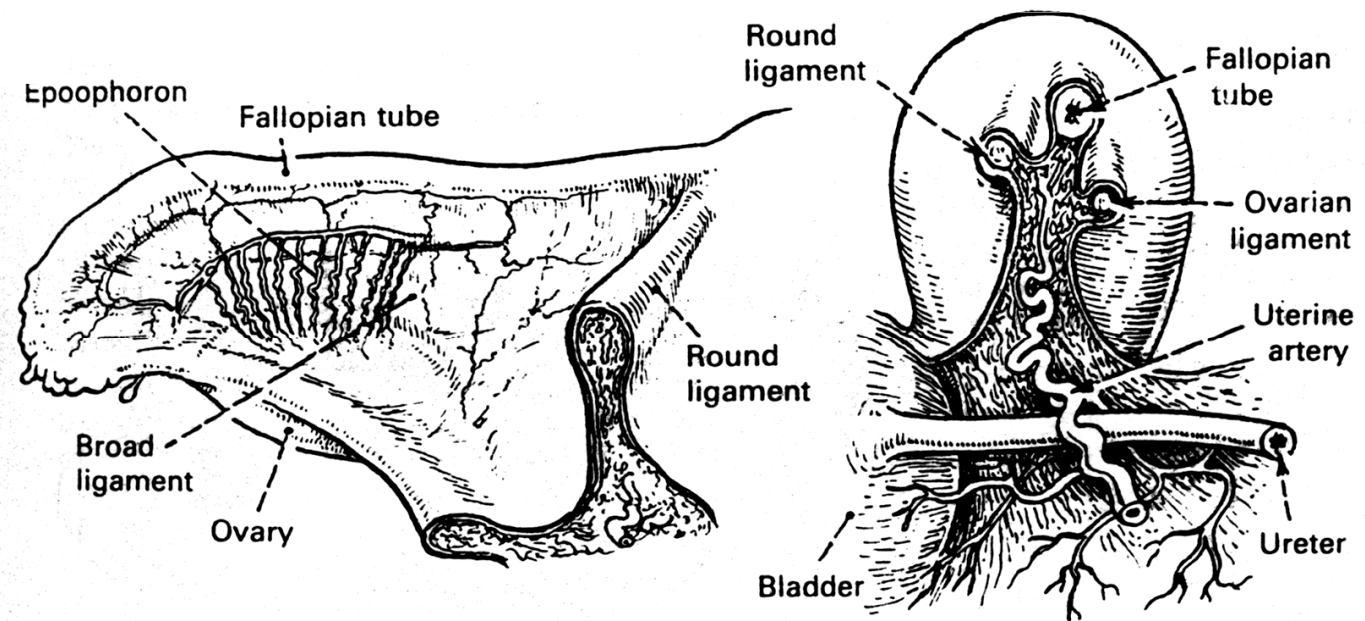
Nerve supply •

insensitive except to squeezing on P.V examination. –

sympathetic and parasympathetic nerves (T10 and T11) through the –
preaortic plexus that accompany the ovarian vessel.

UTERINE AND CERVICAL LIGAMENTS

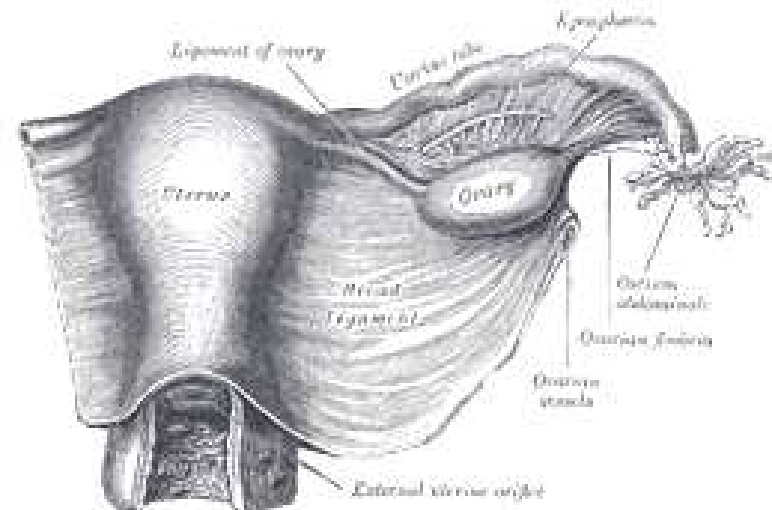
- Broad ligament •
- Round ligament •
- Ovarian ligament •



THE BROAD LIGAMENT

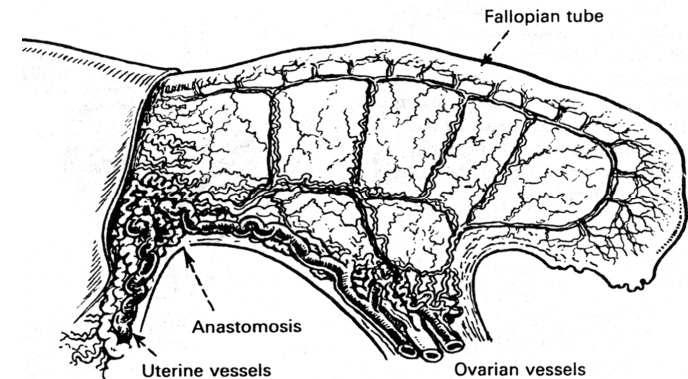
The broad ligament is a double sheet of •
peritoneum that extends from the lateral wall
of the uterus to the lateral pelvic wall.

Its outer upper part forms the •
infundibulopelvic ligament in which the
ovarian vessels traverse the
ovary.



Contents of the Broad Ligament

- Round ligament •
- Ovarian vessels •
- Uterine vessels •
- Ureter •
- Parametrial lymphatics and lymph nodes •
- Sympathetic and parasympathetic nerves •
- Parametrial pelvic cellular tissue and fascia •
- Embryological remnants of the Wolffian ducts •
- Hydatid cyst of Morgagni •
- Koblet's tubules •
- Epoophoron •
- Paroophoron Gartner's duct •



The Round Ligament

A fibromuscular ligament attached to the uterine cornu. •

Runs downwards and forwards in between the two leafs of the broad ligament to enter the inguinal canal via the internal inguinal ring and comes out of it at the external inguinal ring to be inserted in the upper part of the labium majus. •

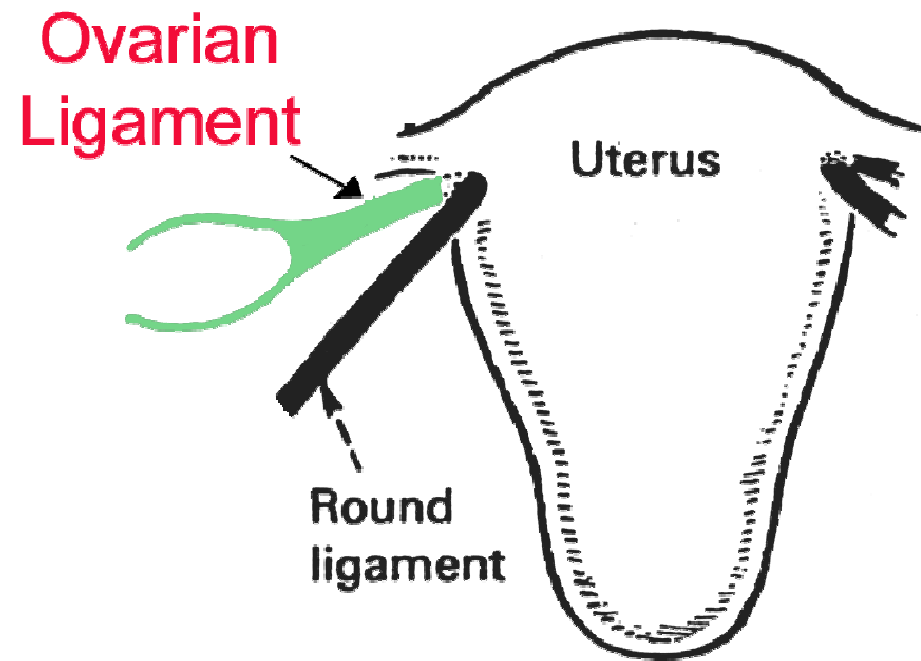
It pulls the uterus forwards and help keeping it in an anteverted position. •



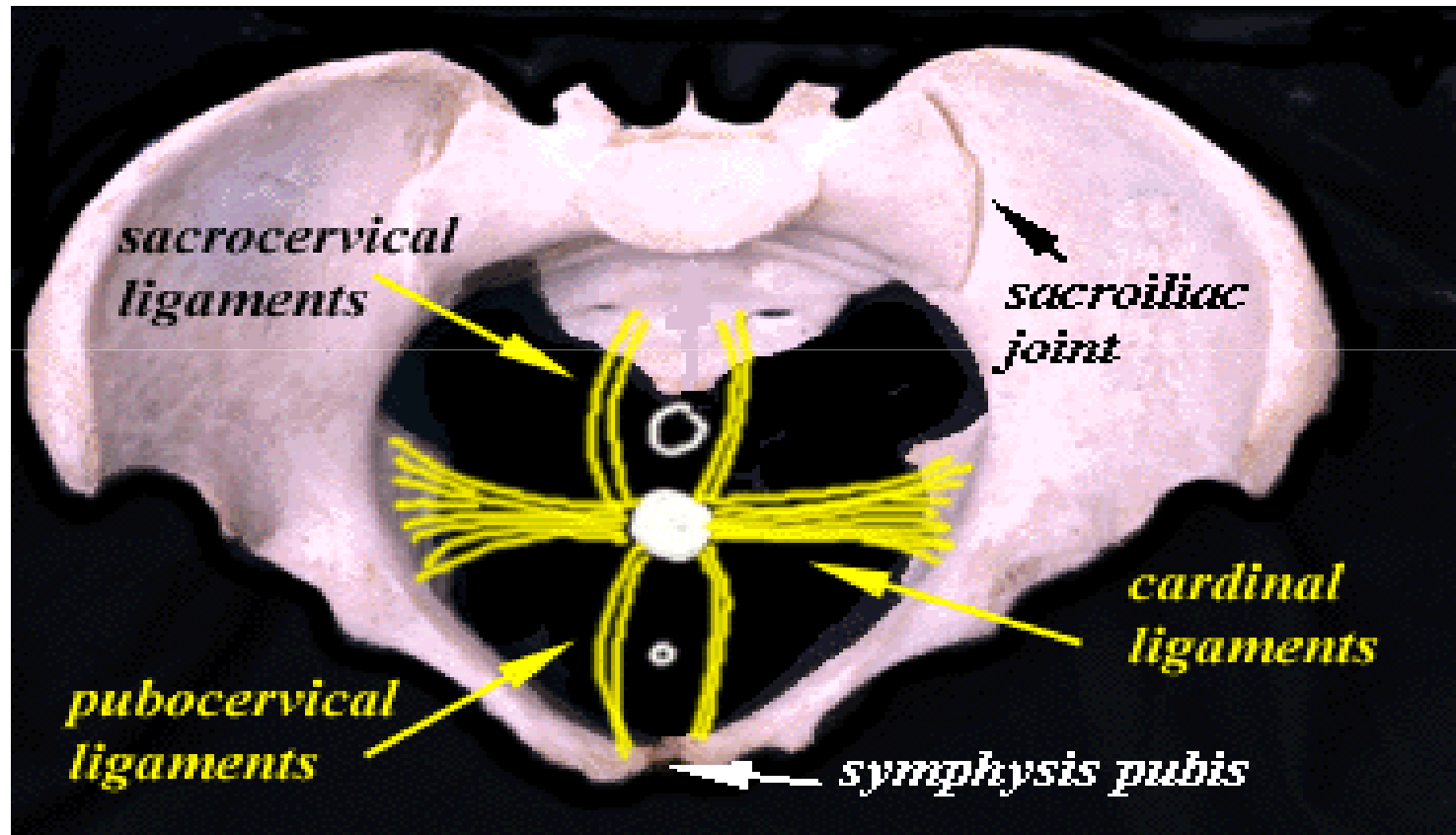
The ovarian ligament

A fibromuscular •
ligament that
attaches the
inner lower pole
of the ovary to
the cornu of the
uterus.

It plays no role in •
pelvic support of
the uterus.



THE CERVICAL LIGAMENTS



Three Pairs of Ligaments

Mackenrodt's ligaments (The cardinal ligaments of the cervix): spread out on either side from the lateral surface of the cervix and vagina, in a fan-shaped manner, and are inserted in the lateral pelvic wall. •

Utero-sacral ligaments: From the cervix and vagina, backwards surrounding the rectum and below the utero-sacral folds of peritoneum, to become inserted in the third piece of the sacrum. •

Pubo-cervical ligaments: extend from the anterior surface of the cervix and vagina, forwards beneath the bladder and surrounding the urethra, to the posterior surface of the pubis. •

