



## ANATOMY

Sheet

Slide

Handout

Number

8

Subject

Female reproductive system

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Doctor

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Date:

Price:

This sheet was written according to the section 2 recording.

I'm going to write the page numbers of the handout that the Dr. used, followed by what he said about each page, this way it's easier to study the handout with the record at the same time.

The Dr. began the lecture by mentioning what he talked about in the previous lecture:

(Page number 22 of handout)

### ❖ The uterus:

We cannot feel the uterus through simple palpation of the anterior abdominal wall; it can only be felt by a 'bimanual exam', which was explained previously. We also said the position of the uterus is called 'anteverted /anteflexed' which refers to the 2 angles: the first between the body of the uterus and the cervix, forming an 'Angle of anteflexion' (125 degrees), and the second between the cervix and the vagina, forming the 'Angle of anteversion' (90 degrees).

There is also a constriction that lies between the body of the uterus and the beginning of the cervix, which is called the 'isthmus', but truly this is an old name. The isthmus is actually formed by the upper third of the cervix that grows into part of the body of the uterus during pregnancy called the 'lower uterine segment'. (The isthmus is initially part of the cervix (upper third), after the third month of pregnancy it grows and forms the lower part of the body of the uterus) So the lower uterine segment is part of the cervix, and at the same time forms the lower part of the uterus. It was called this name because structurally, it is similar to the body of the uterus.

The 'broad ligament' extends from each side of the uterus and contains the uterine tube and 2 ligaments: the **ovarian ligament** (between the uterus and the ovary) and the **round ligament** that extends from the uterus down to the external genitalia.

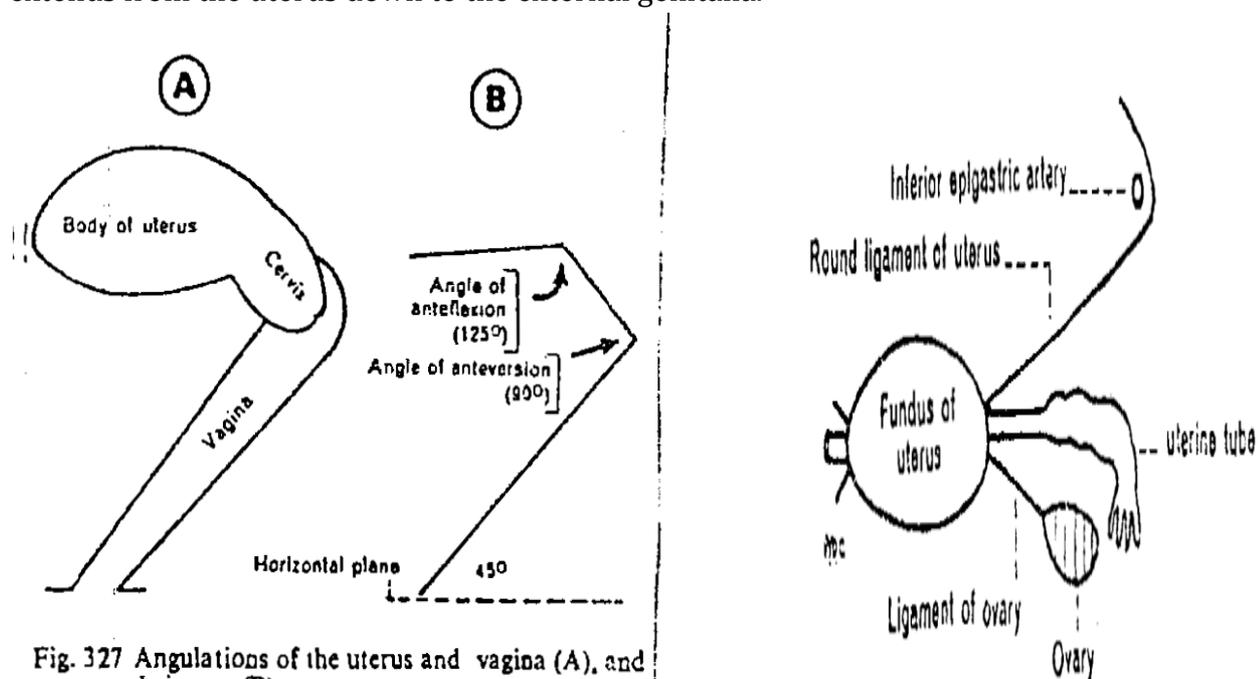
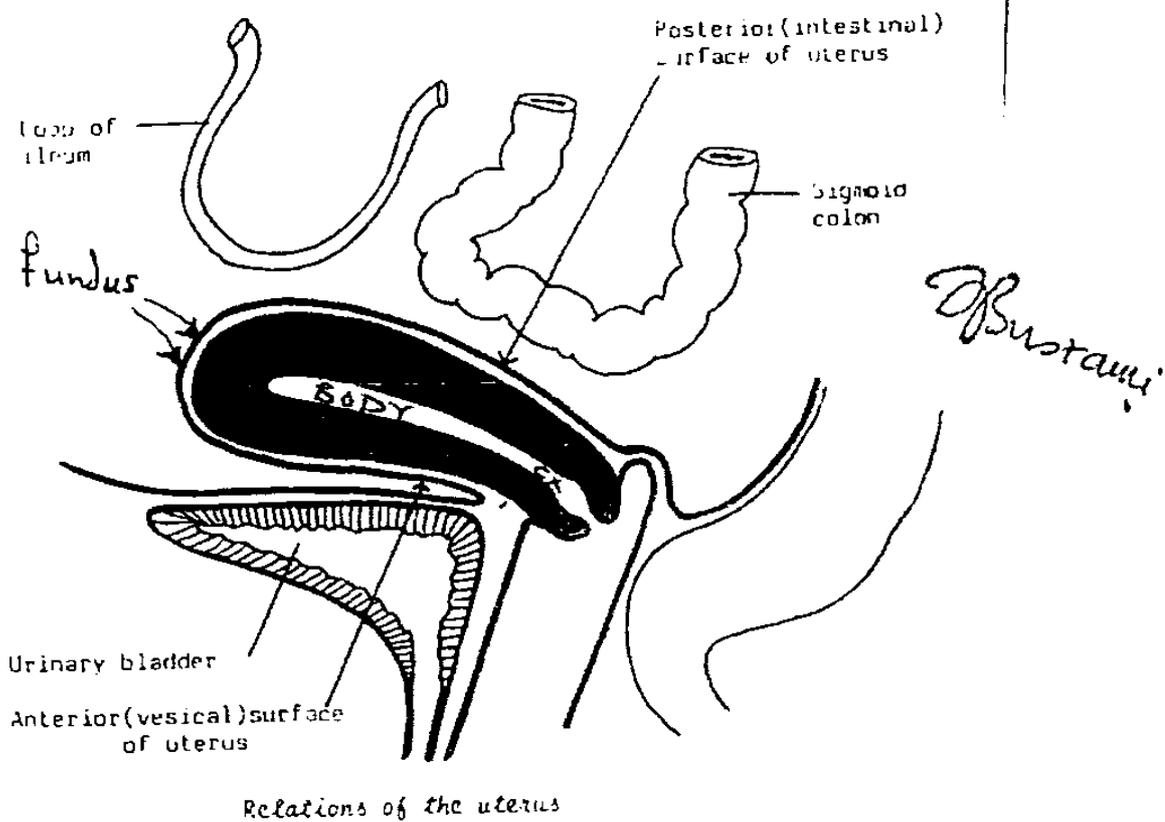


Fig. 327 Angulations of the uterus and vagina (A), and their axes (B).



### Relations of the uterus:

- Superior to the uterus we have sigmoid colon, and loops of small intestine (ileum).
- Below the uterus we have the urinary bladder.

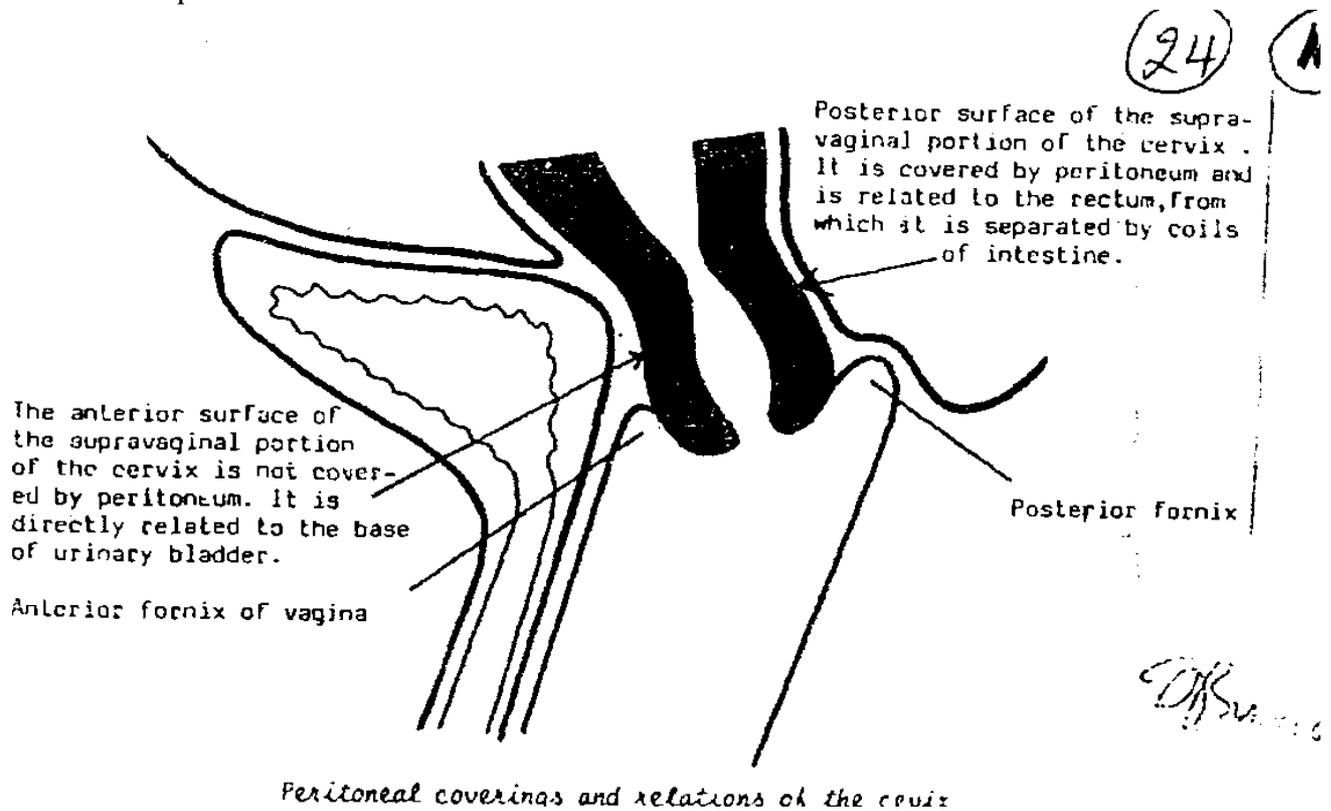
### Peritoneum coverings of uterus + parts of cervix:

Speaking of the peritoneal reflection; the peritoneum will be reflected from the rectum (junction of middle and lower thirds) to the vagina. Before reaching the uterus, it covers the vagina. The upper quarter of the posterior wall of the vagina is covered by peritoneum, called **peritoneum of Douglas pouch**. After covering the vagina, the peritoneum covers an area called the **fornix**, it then covers the posterior supravaginal part of the cervix, the body of uterus from above, the fundus, then the body of uterus from below. (Look at image on page 23 of handout) However, it does NOT cover the anterior part of the cervix.

The dr. then pointed to the uterovesical pouch and the rectovaginal/rectouterine/douglas pouch. We have a supravaginal part and a vaginal part of cervix. The vaginal part of the cervix has an opening to the vagina called the **external os** and its wide in a woman that has given birth (**multipara**), but narrow in a woman that hasn't (**nullipara**). The cervix also has an internal opening to the uterus called the '**internal os**'.

2cm lateral to the supravaginal part of the cervix is the **ureter**, which is crossed by the **uterine artery**. So if a patient has carcinoma of the cervix it can spread and close up the ureter, as the ureter is close to the cervix. The vaginal part of the cervix is surrounded by an anterior fornix, a posterior fornix, and 2 lateral fornices. The most important of these is the posterior fornix, due to the fact that if you put a needle or an instrument through it, it will enter the Douglas pouch and enter the pelvis and the abdomen.

These are the important relations of the uterus and the cervix.



Peritoneal coverings and relations of the cervix

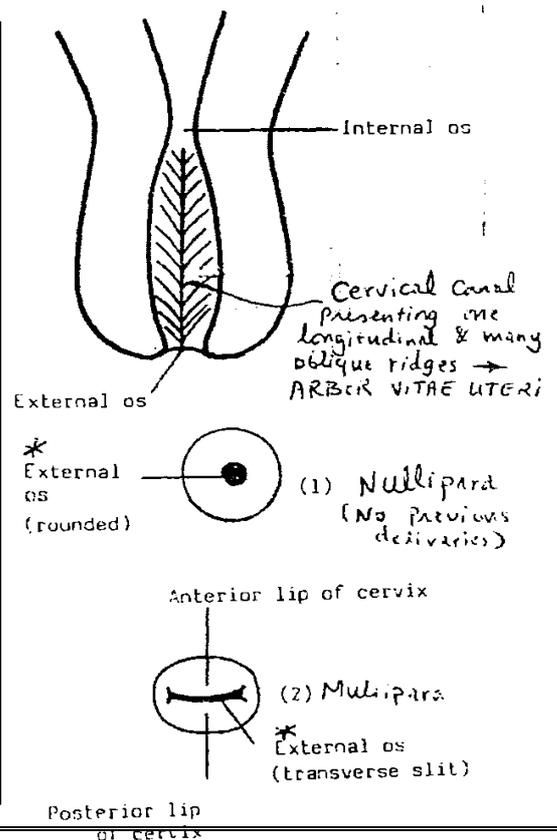
(page 25 of handout)

The Dr. repeated the same information, but added the following:

From the front (anterior) the supravaginal part of the cervix is stuck to the bladder, so it is not covered by peritoneum.

Between the internal os and the external os, we have the '**cervical canal**'. The cervical canal has mucosa, and the mucus membrane is thrown into folds, like branches of a tree, called, '**Arber vitae uteri**'. Usually this part of the cervix is closed by a mucus plug, to prevent bacteria from ascending. During fertilization, the prostaglandins that are produced by the seminal vesicles in males makes the mucus plug less viscous, so that the sperm can penetrate it.

The external os in multipara female is slit-like, and rounded in nullipara.



## The stages of labor:

Progressive dilation of the cervix is the first thing to occur. At the beginning, you can fit a finger. Then two, then three etc... when the cervix is fully dilated, the child is ready to come down. After birth, the cervix returns to a smaller size again, but it doesn't return to the way it was exactly, it is now slit-like.

Page 26 Handout

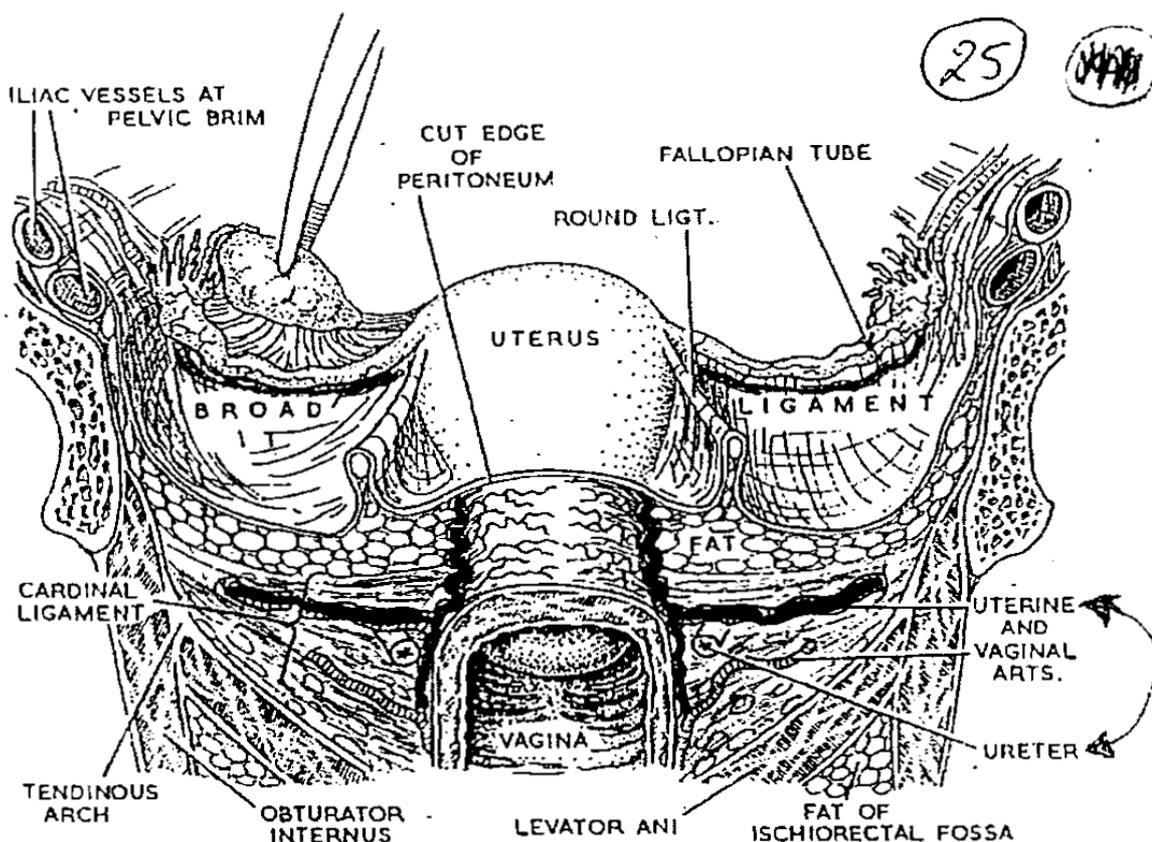


Fig. 1.6 Coronal section of female pelvis, viewed from in front.

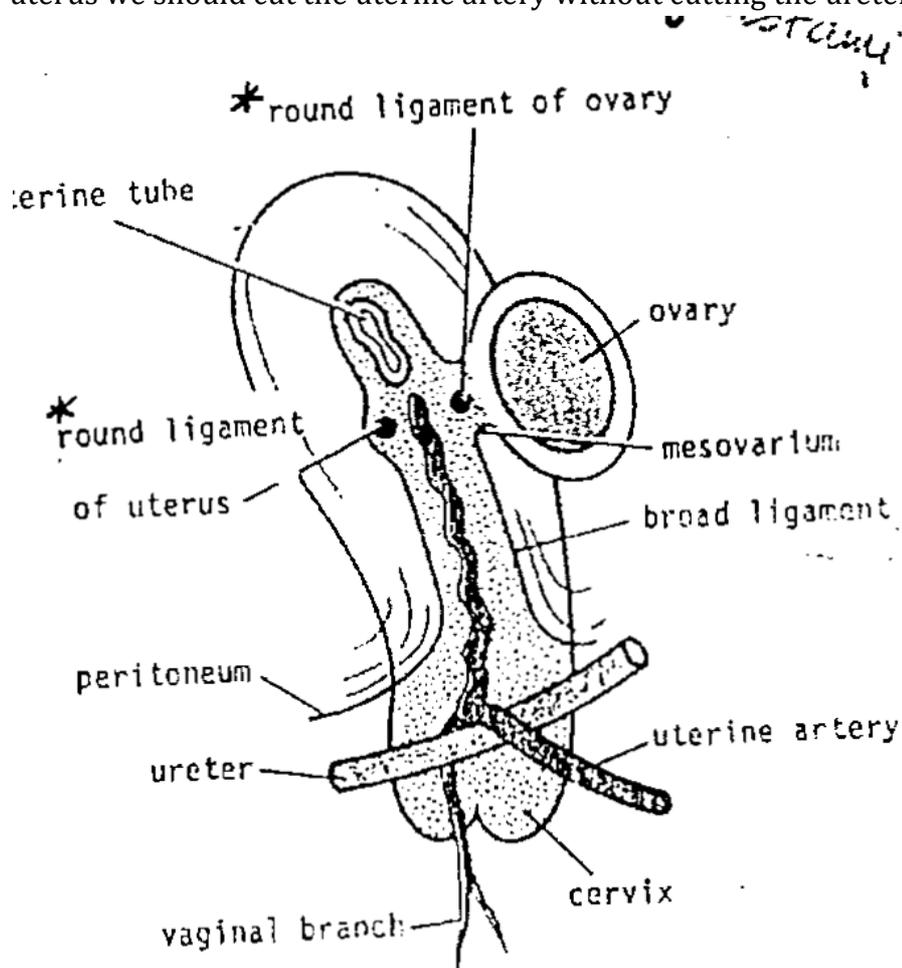
### ❖ The broad ligament:

We said that on either side of the uterus there is a fold of peritoneum called the broad ligament. It attaches to the lateral wall of the uterus, and laterally it attaches to the pelvic wall. It contains many important structures. When the bladder is distended, the uterus moves backward, giving the broad ligament an upper border and a lower border. The broad ligament has an **upper free border** and a **lower attached border**. In the upper border we have the **uterine tube**. Close to the lower border we have the **uterine artery**, which is above the ureter. The uterine artery and the ureter are enclosed in dense connective tissue called the **transverse cervical ligament**. This ligament extends from the cervix and vagina to the pelvic wall. *It is the most important structure keeping the*

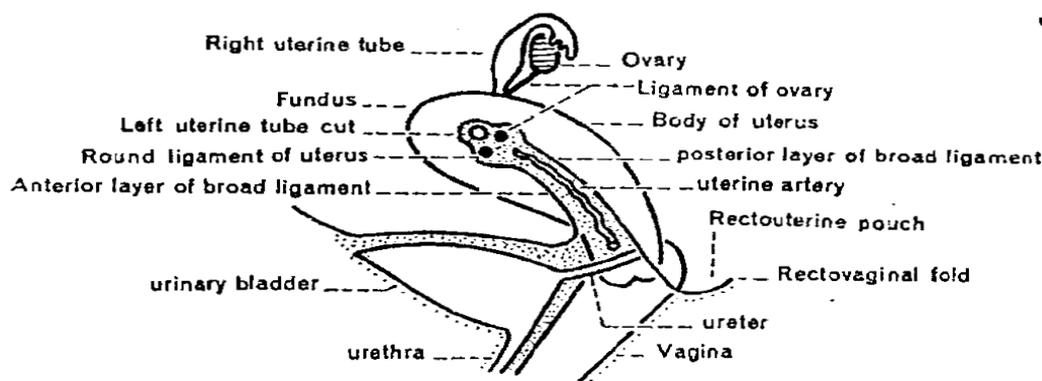
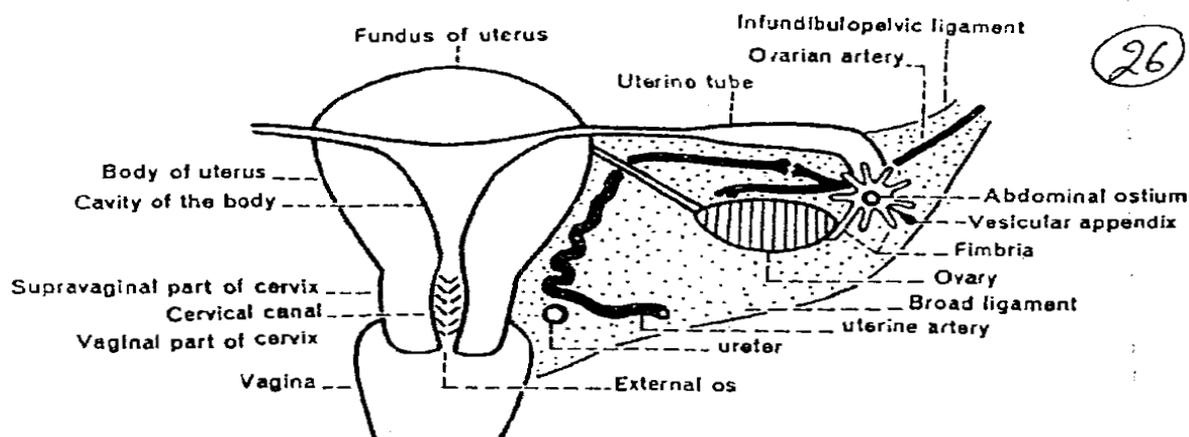
*uterus in position.* The broad ligament also contains 2 ligaments. The first is the **ovarian ligament**, connecting the ovary to the uterus. It is present on the **posterior surface**. The second is the **round ligament**. It extends from the uterus through the inguinal canal to the external genitalia. This ligament is present on the **anterior surface** of the broad ligament.

If we take a sagittal/parasagittal segment of the broad ligament, we see that the ovary used to be inside the broad ligament. The ovary gets pushed through the posterior layer of the broad ligament and takes part of it with it. (recall the broad ligament is made of nothing but peritoneum) so the ovary is covered in peritoneum. This means that when the egg leaves the ovary it has to pass through the peritoneum in order to get out. Once the ovary gets pushed through the posterior layer of broad ligament it becomes hung from it by mesentery, called **mesovarium**.

A branch of the ovarian artery gives blood supply to the ovary by passing through the mesovarium. If I wanted to remove an ovary, I would do this by cutting the mesovarium, not the ovarian artery. We do this because the ovarian artery continues and also supplies the uterus. We can also see the uterine artery in the broad ligament passing above, close to the ureter. If we want to remove the uterus we should cut the uterine artery without cutting the ureter.



**Broad ligament and arterial supply:** (page 27 of handout)



Part of the broad ligament attaches to the outer part of the uterine tube that's called the **infundibulum**. This part of the broad ligament extends from the infundibulum to the pelvic wall, and we call it, **infundibulopelvic ligament**. This ligament also attaches to the ovary, so it is also named '**suspensory ligament of ovary**'. The infundibulopelvic ligament/suspensory ligament of ovary is a really important part of the broad ligament, because *the ovarian artery enters the broad ligament through it*. The ovarian artery is a direct branch of the abdominal aorta and descends on the posterior abdominal wall.

It enters the upper part of the broad ligament. (through the infundibulopelvic ligament). As we said the ovarian artery supplies the ovary through a branch that enters the mesovarium, then the artery continues and anastomoses with the **uterine artery**. The uterine artery (from the lower part) passes above the ureter from lateral to medial, then ascends upwards and anastomoses with the ovarian artery. The uterine artery is a branch of the internal iliac artery. As we can see, the ovarian artery not only supplies the ovary, it also gives branches to the **uterus**, to the **lateral third of the uterine tube**, and it also gives branches to the **ureter**.

**The venous drainage:**

On each side of the uterus we find a **plexus of veins**. They receive blood from the uterus, the ovaries, and the vagina, and then pour this blood in to the **internal iliac vein**.

**Structures keeping the uterus in position.** (page 28 of the handout)

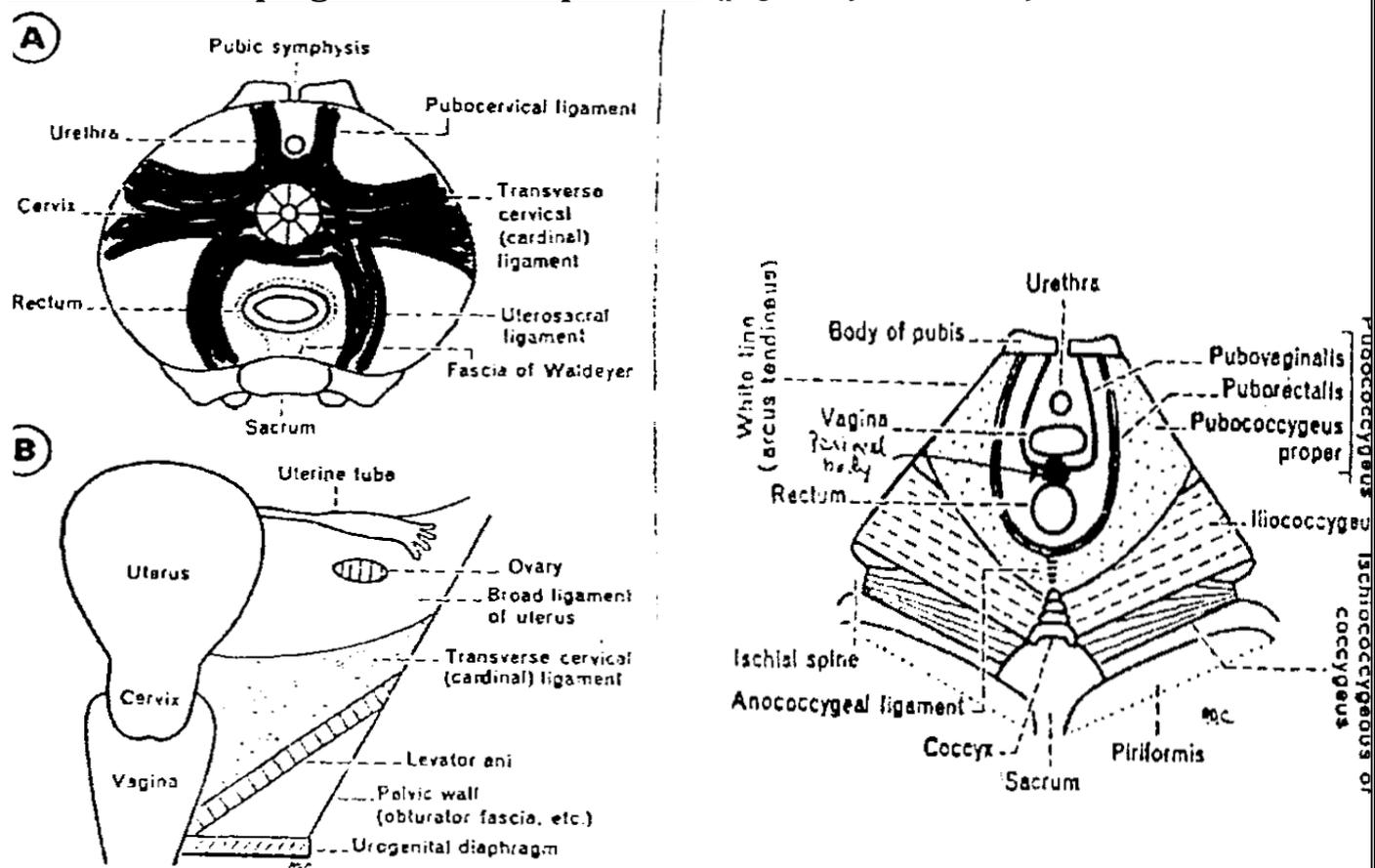


Fig 331 Condensations of pelvic fascia forming the supports of the pelvic organs. (A) Superior view of the ligamentous supports of uterus and rectum. (B) Coronal view of the right cardinal ligament.

Many structures keep the uterus in position. We said that the uterus is a pelvic organ because it is above the levator ani/pelvic diaphragm, thus the **pelvic diaphragm** supports the uterus. Under the pelvic diaphragm we have the urogenital diaphragm, and the vagina passes through it. So the **urogenital diaphragm** stabilizes the vagina, and *anything that stabilizes the vagina also stabilizes the uterus*. If the vagina slipped down the uterus would follow it, as the uterus is attached to the vagina. The cervix enters the vagina making it stick to the uterus. Behind the posterior wall of the vagina we have the **perineal body**, keeping the vagina in place. The perineal body therefore also plays a role in keeping the uterus in place.

Other factors:

We previously said between the layers of the broad ligament we have *thickened connective tissue/thickened pelvic fascia*, which forms ligaments, one of which is called **transverse cervical ligament** or **cardinal ligament**. It attaches medially to the supravaginal part of the cervix and the upper part of the vagina. While laterally, it attaches to the pelvic wall. If we cut this dense connective tissue the uterus and vagina would immediately descend below, causing **prolapse**. This proves that cardinal ligament is the most important of the ligaments keeping the uterus in place. Another ligament formed by the dense connective tissue is called the **pubocervical** ligament. And posteriorly, the **uterosacral** ligament.

### **The specific role of the levator ani:**

The front part of the levator ani is formed by a group of fibers called the '**pubovaginalis**' that surrounds the vagina. We see the pubovaginalis on both sides, and it attaches to the perineal body. Anything that stabilizes the perineal body stabilizes the wall of the vagina; and therefore, the uterus.

### **The role of the round ligament:**

Does the round ligament support the position of the uterus? No, it does not. As we said the round ligament stretches from the body of the uterus, passes through the inguinal canal, emerges through the superficial inguinal ring and attaches to the external genitalia. The round ligament of uterus pulls the uterus to the front, while the **uterosacral ligament** pulls the uterus to the back. These two ligaments provide opposing forces against each other. The net result of these two forces is that the uterus remains bent forward; anteverted, laying on the bladder.

If the round ligament of uterus was cut the uterus would not fall downwards. However if the transverse cervical ligament was cut, the uterus would fall downwards.

### **The vagina:** (page 29 of handout)

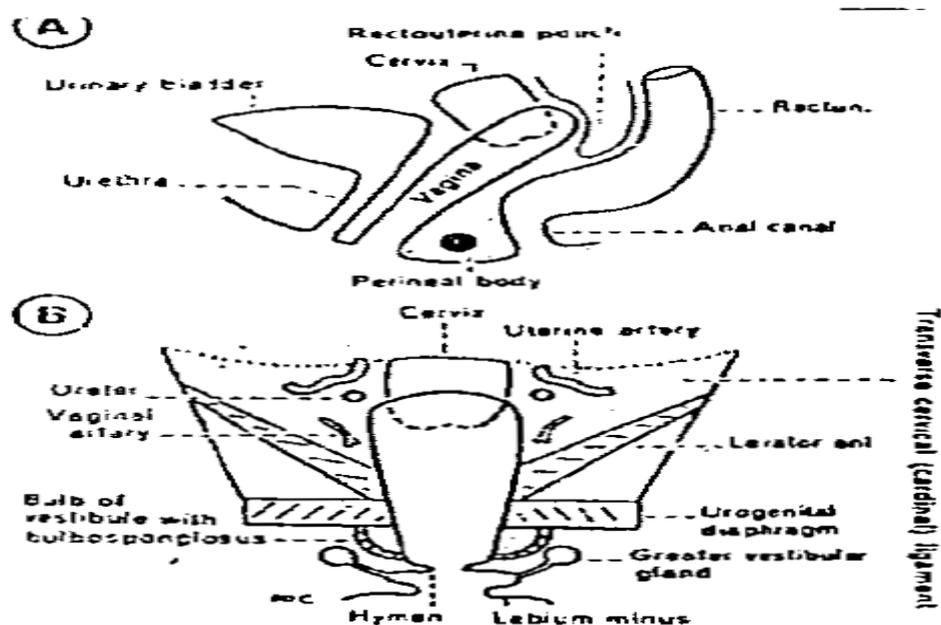


Fig. 333 Relations of vagina. (A) Left view of a sagittal section of female pelvic organs after removing the body of uterus; and (B) a coronal section of the female pelvis through the vagina with uterine cervix.

The vagina has two walls: the **anterior wall** and the **posterior wall**.

The anterior wall: the cervix enters the vagina through this wall, so it becomes shorter than the posterior wall. The anterior wall is 3 inches long, and the posterior wall is 4 inches long.

## **Relations of the Vagina:**

### **The anterior wall:**

In front of the **upper half** of the anterior wall, we have the **base of the bladder**.

In front of the **lower half** of the anterior wall we have the urethra. If there was a *prolapse* in the anterior vaginal wall, the anterior wall will slip down and it will take the urethra and the bladder with it. This results in the female getting '**stress incontinence**'. If the female laughed or coughed urine would leak.

### **The posterior wall:**

The posterior vaginal wall has 4 relations. The posterior wall is divided into quarters; **the upper quarter, the two middle quarters and the lower quarter**. The **upper quarter** is covered by peritoneum of Douglas pouch. The **two middle quarters** are separated from the rectum by loose connective tissue. The **lower quarter** is really important. Behind it lies the perineal body, which separates it from the anal canal.

If a woman were to give birth alone, at home, or any unsafe place, the vaginal wall could rupture and could spread to the perineal body and anal canal. This is called third or fourth degree perineal tear. With time, there will be prolapse of the posterior wall of the vagina. This could cause prolapse of the uterus, as we said anything that stabilizes the vagina also stabilizes the uterus. The perineal body is important as it supports the posterior wall of the vagina.

### **Lateral relations:**

(looking at a sagittal section. The previous relations were using coronal sections)

The **upper third of the vagina** is related to the transverse cervical ligament. Inside this ligament we have vaginal veins and the uterine artery passing above the ureter. The lower third of the vagina enters the urogenital diaphragm. Under the urogenital diaphragm we have the **root of clitoris**. Males have root of penis, and females have root of clitoris. We said that the root of penis has a bulb and two crura. We also said that the root of penis attaches to the lower surface of the UG diaphragm, called the perineal membrane. This is the same here. The root of clitoris is made of a bulb and two crura, attached to the perineal membrane. Although there is one difference. The bulb of penis in the males contained the urethra. The bulb of clitoris does not contain the urethra. When the vagina enters the bulb of clitoris it splits it into two 'bulb of vestibule' on each side. Under the bulb on each side we have the **greater vestibular gland** or called **Bartholin's gland**. This gland becomes inflamed by sexually transmitted diseases.

It's important to remember that parts of the vagina are above the pelvic diaphragm and some are below it. Some parts of the vagina are above the urogenital diaphragm and some are below it.

### **Nerve supply:**

The lower third of the vagina is pain sensitive. If we cut the wall of the vagina during labor in order to make giving birth easier, the patient would feel this because the lower third is pain sensitive.

The nerve supply to all external genitalia (male and female) is the **Pudendal nerve; S2,3,4**. The

Pudendal nerve has a branch called **perineal branch**, and this gives **labial branches**. These labial branches reach the **lower third of the vagina**.

The **upper two thirds** of the vagina are supplied by **autonomic nerves; sympathetic L1,2, parasympathetic S2,3**. Sympathetic causes vasoconstriction and parasympathetic causes vasodilation. This is the only place in our body where this occurs. (Usually: if sympathetic is working, we get vasoconstriction. If sympathetic isn't working, we get vasodilation.)

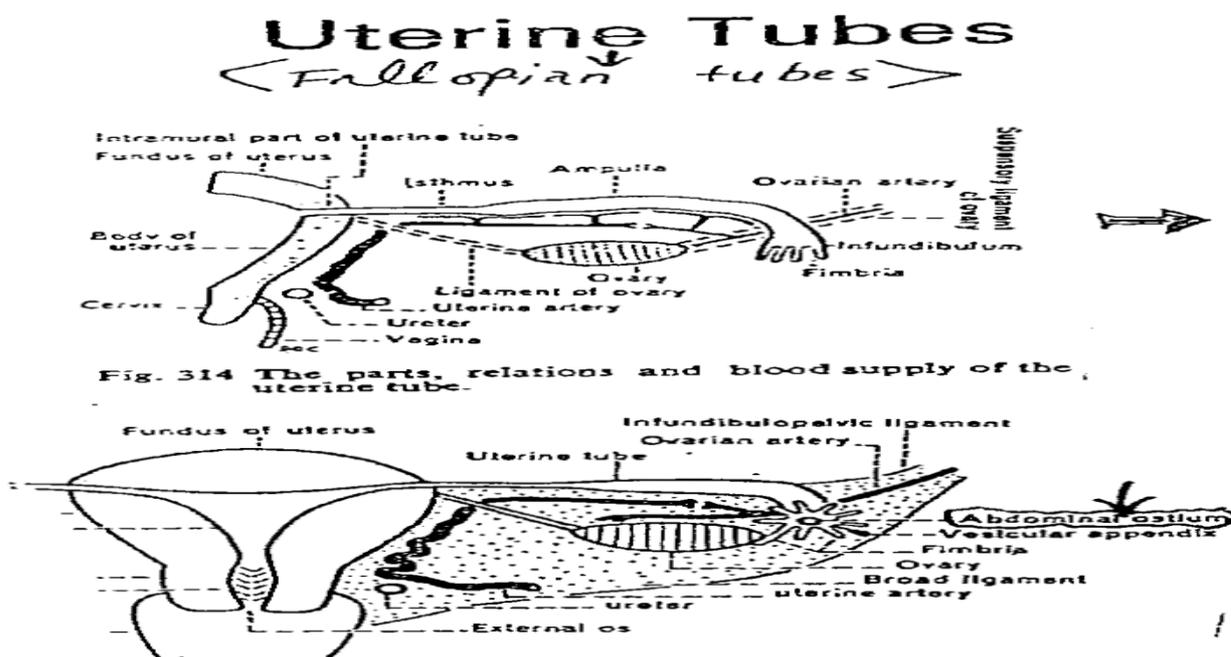
### Lymphatic drainage:

Lymph from the upper third of the vagina goes through lymph vessels to the lymph nodes around the **external iliac artery**.

Lymph from the middle third goes to lymph nodes around the **internal iliac artery**.

The lower third sends its lymph to the **medial group of superficial inguinal lymph nodes**. These lymph nodes would become enlarged if a female needed an episiotomy (cutting the vaginal wall during labor), and the area got infected. Because the area that gets cut is in the lower third of vagina, and this parts drains its lymph to the superficial inguinal lymph nodes.

### Uterine tubes: (page 30 of handout)



Anatomical position: upper free border of broad ligament. It can be felt easily during surgery. It is 10 cm long.

Parts:

**Intramural part:** this is the first part and it is present inside the wall of the uterus. It is 1 cm long, and 1 mm in diameter. This shows that it is very narrow. The smallest amount of inflammation could close it.

Clinical importance: sexually transmitted diseases are dangerous in females. Any sexually transmitted disease could close up the uterine tubes. **Gonorrhea** is an example. If it ascended up

through the vagina and uterus to the uterine tube, within hours the tube could be closed. *If the uterine tube gets closed, the female becomes infertile.* In order for fertilization to take place the sperm must go through the uterine tube to reach the egg. This cannot occur if the uterine tube is closed. The simplest way to stop a female getting pregnant is to tie these uterine tubes.

**Isthmus:** second part of uterine tube. It is next to the intramural part. It is the medial one third of the uterine tube. Its diameter is 2 mm.

**Ampulla:** third part of uterine tube. It is the lateral two thirds. Its diameter is the widest; 4 mm. This part of the uterine tube is where the sperm meets the egg (that's coming from the ovary) and fertilization takes place.

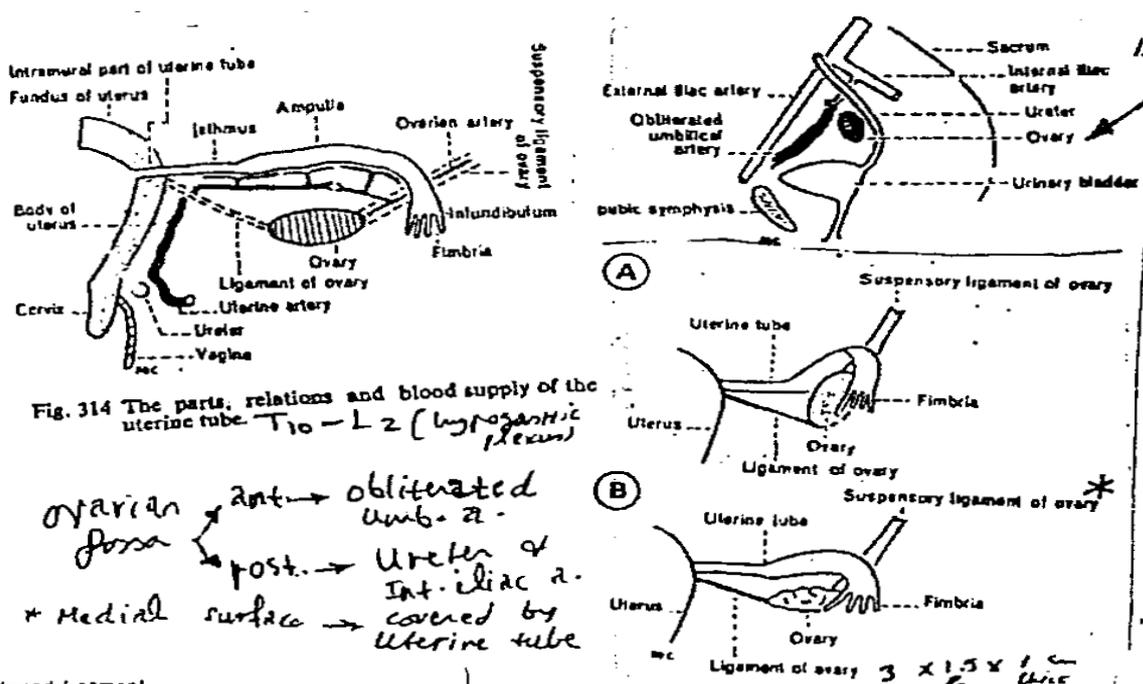
**Infundibulum:** final and most lateral part of the uterine tube. Contains an opening called the **abdominal ostium**.

The uterine tube has two openings. One that opens in to the uterus, called the '**uterine ostium**'. This opening allows the sperm to enter the uterine tube from the uterus. The second is the '**abdominal ostium**' it opens at the abdominal cavity to receive the egg from the ovary. However, this reminds us that since the uterine tube opens into the peritoneal cavity, a severe infection in the uterine tube could cause peritonitis. The infundibulum has 'fimbriae' which are finger like projections. One of these fimbria is longer than the others and it's called the 'ovarian fimbria'. This ovarian fimbria receives the egg. The mucosa of the fimbriae are ciliated columnar. These cilia move (not stereocilia) and help the egg that has exited from the ovary to enter the uterine tube.

Blood supply of uterine tube:

The **outer third** of the uterine gets its blood supply from the ovarian artery. The ovarian artery reaches this part of the uterine tube through the infundibulopelvic ligament. The ovarian artery then continues to give branches to the ovary, and then anastomoses with the uterine artery. The **medial two thirds** of the uterine tube gets its blood supply from the uterine artery.

**The ovaries:** (page 31 of handout)



(30)

The position of the ovaries is very variable. However we will talk about the most common position. In a nullipara female the position is usually vertical. This gives the ovary an upper pole and a lower pole. In a multipara the position is usually horizontal. The upper pole becomes lateral and the lower pole becomes medial.

Initially the ovary is attached to the posterior wall of the broad ligament through a piece of peritoneum called mesovarium. (As we've said before the ovary used to be INSDIE the broad ligament and got pushed through its posterior wall.) But when we put the ovary in the anatomical position, we do see that it is attached to the posterior wall by the mesovarium, but we also see that it's position is in a hole in the lateral wall of the pelvis. This hole is called the '**ovarian fossa**'. This shows that the ovary has 2 positions.

Anterior to the ovarian fossa, there is the '**obliterated umbilical artery**'.

Posterior to the ovarian fossa there is the **ureter** and behind it the **internal iliac artery**. The ureter came under the uterine artery. The ureter is not far from the ovary. So any operation that involves the ovary could injure the ureter.

(The Dr. repeated information about the mesovarium and the cutting of is during operations, mentioned above)

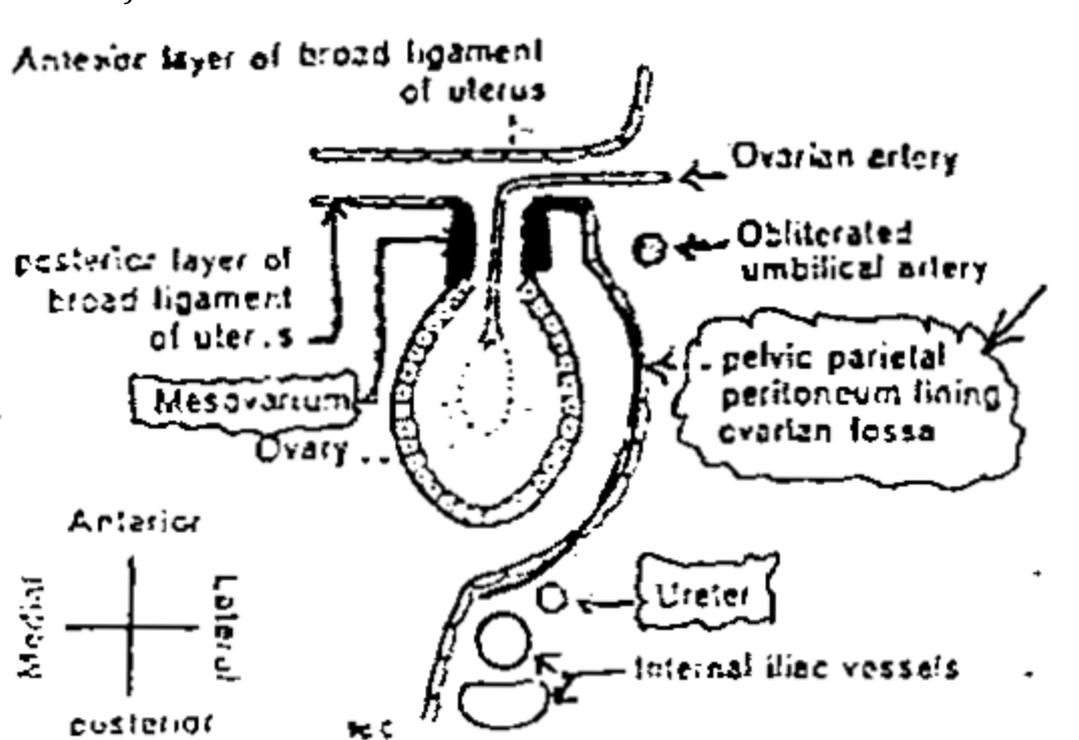


Fig. 313 Superior view of a horizontal section through the right ovarian fossa and the lateral part of the broad ligament of uterus.

❖ External genitalia of females: (page 32 of handout

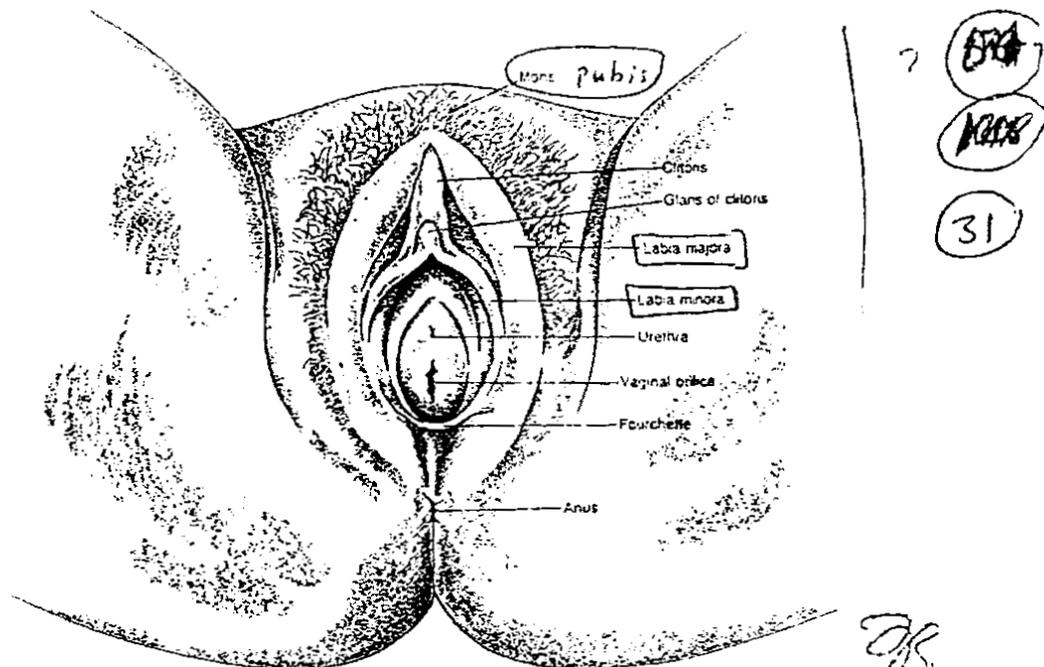


FIGURE 18-8. Features of female external genitalia. Labia majora and minora have been separated to show the deeper structures.

'Vuvla' means female external genitalia.

Parts of external genitalia:

**Labia majora:** there are 2, one on each side. It is a fold of skin containing a lot of fat. The space that's between the two labia majora is called the **pubental cleft**. The two labia meet at an area anteriorly called the **mons pubis**. This is the area where hair grows. Inside the labia majora we have another fold of skin called the **labia minora**, and this one does not contain fat. The two labia minora meet anteriorly around the **clitoris**. The clitoris does not contain corpus spongiosum nor urethra, unlike the penis .

The space between the two labia minora is called the vaginal vestibule, and it is the entrance to the vagina. Inside the vagina we have a fold of mucus membrane called the **hymen**, which is a membrane that has openings in it. The virgin, the membrane is intact. There are openings in the hymen to allow blood to exit during periods. A female could be born with an 'imperforated hymen' which is a hymen that has no openings in it. She presents at puberty with severe pain in the lower abdomen, due to the collection of blood in the vagina and uterus.

The urethra also opens in the vaginal vestibule. It opens approximately 1 inch behind the clitoris. The opening of the urethra is really close to the opening of the vagina. This is important clinically when inserting a catheter in to the urethra. It should not be mixed with the vaginal opening.

❖ The pelvic diaphragm: (page 33 of handout)

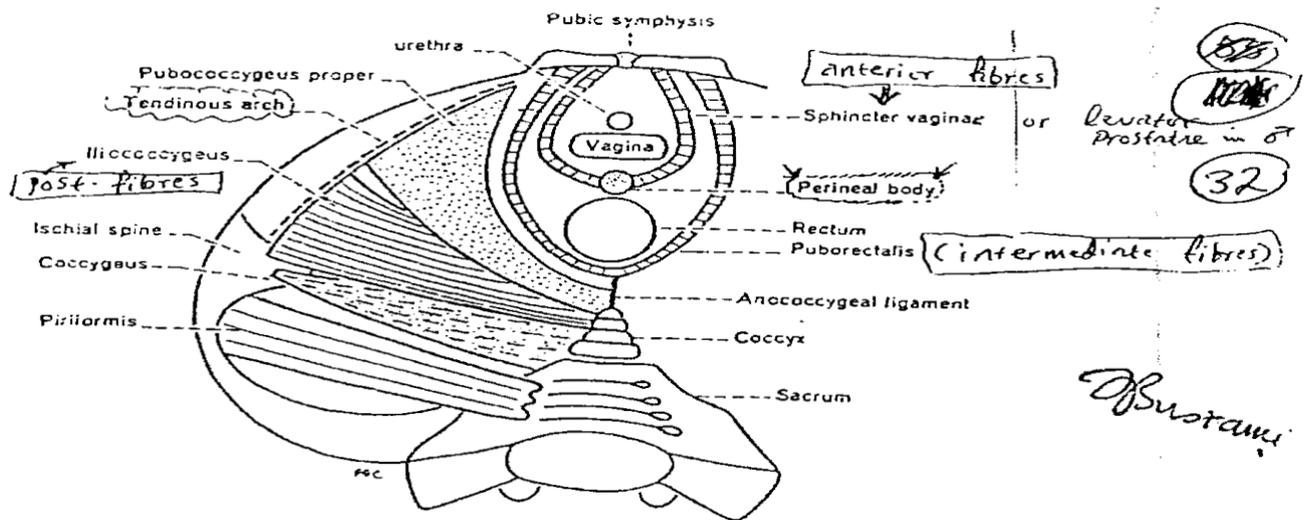


Fig. 345 The levator ani, coccygeus and piriformis in a female shown on the left side.

The pelvic diaphragm is made up of two muscles, a main one and a small one. The main one is the levator ani on each side, and the small ones are the coccygeus muscles. The pelvic diaphragm is not closed completely; in the anterior part there is an opening. This opening is for the passage of the urethra in males, and for the passage of the urethra and vagina (posterior to the urethra) in females.

**The origin and insertion of levator ani muscles:**

The origin of the anterior fibres of the levator ani (pubovaginalis) are at the back of the pelvic bone. Then they twist around the vagina forming something called the '**sphincter vagini**' or '**pubovaginalis**' (levator prostatae in males). This forms a sphincter around the vagina. The two muscles on each side insert into the perineal body. Tearing in the perineal body causes prolapse of the vagina and therefore the uterus. This could occur in labor at home.

The intermediate fibres of the levator ani form a loop called the '**puborectalis**'. The origin of the puborectalis is also from the back of the pubic bone. It loops around the junction between the rectum and anal canal.

The other part that forms the intermediate fibres is the '**pubococcygeus proper**'. The origin of the pubococcygeus proper is actually from a thickening of deep fascia that covers the **obturator internus**. This thickening of deep fascia is called the **tendinous arch**. **Iliococcygeus** which forms the posterior fibres also takes its origin from the tendinous arch. This muscle along with the pubococcygeus proper insert into the **anococcygeal ligament/body**. This ligament is between the anal canal and the coccyx.

Importance of this:

The anal canal is surrounded by the external anal sphincter. The external anal sphincter is made up of three parts; the subcutaneous part, the superficial part, and the deep part. It is said that the puborectalis contributes to the external anal sphincter. Its job is the same as that of the external anal sphincter; to stop the descent of stool.

**Functions of the pelvic diaphragm:**

- 1- Supports the pelvic viscera
- 2- Opposes the increase in intra-abdominal pressure (stops the increase) for example when a female is giving birth she pushes on herself and increases the pressure in the abdominal cavity, the pelvic diaphragm opposes this increase in pressure. This transfers all the pressure to the uterus, for the child to come out. It is also useful during defecation; the increase in pressure goes to the rectum.

**The perineal body:**

Fibrous tissue and muscles contribute to the formation of the perineal body.

Muscles:

- 1- bulbospongiosus: covers the bulb of penis.
- 2- Superficial and deep transverses perinei
- 3- External anal sphincter
- 4- Smooth muscles inside the rectum and anal canal.

These all help in the formation of the perineal body, which is an important support for the posterior wall of the vagina.

I apologies for any mistakes.