



Anatomy of the Female Genital System.

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What is the reproductive system?

Consists of:

- 1ry sex organs
- 2ry sex organs
- sex glands.



The primary function: perpetuate the species

Primary Sex Organs



Primary Sex Organs

External Genitalia (Vulva)

Vagina

External genitalia (vulve)

- Definition: Lower end of female genital tract. Parts:
- A) Mons pubis (mons veneris): Pad of fat on symphysis pubis covered by hairy skin (pubic hair).
- B) Labia majora:
- Definition: 2 thick skin folds forming the lateral boundaries of vulva.
- Homologous to: Male scrotum.



- Labia majora (continue): Histology: Consist of:
- 1) Keratinized stratified squamous epithelium e hair follicles (on lateral aspects only) &
 - numerous sebaceous & sweat glands.
- 2) Thin layer of smooth muscles (tunica Dartos).3) Fascial layer.
- 4) Adipose tissue containing numerous nerve endings(for pain, touch & pressure) &, terminal portions of round ligaments.

- The 2 labia unit anteriorly below mons pubis to form anterior commissure & posteriorly in front of anus to form posterior commissure.
- Labia minora:
- **Defnition: 2 delicate skin folds medial to labia** majora
- • 1) Homologus: Penile urethra In male.
- **Histology: Consist of:**

Stratified squamous epithelium (keratinized on lateral surface only) with sebaceous & sweat glands (but no hair follicles). Thin layer of smooth muscles continuous with tunica Dartos.

- 3) Erectile tissue that becomes turgid & congested with sexual excitement. 4) S.C. tissue é little or no fat & contains nerve endings similar to that of labia majora but less abundant.
- **Union of both labia:**
- Each labium minus splits anteriorly into 2 laminas:
- Anterior lamina unites é its opposite fellow above clitoris to form prepuce of clitoris. Posterior lamina unites é its opposite fellow below clitoris to form frenulum of clitoris.

Anatomy of Female Genital organs D) Clitoris: Definition: small erectile structure (about 2.5 cm long) Homologues: Male penis (about doesn't contain urethra) **Composition: Formed of:** 1) 2 crura: Unite to form shaft which consist of 2 corpora cavernosa. 2) Glans: Covered by prepuce from above & frenulum from below. Histology: Covered by stratified squamous epithelium, with numerous sebaceous & sweat glands.

Attachments:

- 1) from outside to ischiocavernosus muscle.
- 2) Bulbocavernosus muscle is inserted into its root.
- 3) to symphysis pubis by suspensory ligament. Blood Supply:
- 1)Artial: Dorsal & deep arteries of clitoris.
- 2)Venous: Through vulval venous plexus.

- Lymphatic drainage:
- 1) superficial inguinal LNs.
- 2) Directly to external iliac LNs via gland of Cloquet.
- Nerve supply: It is the most sensitive structure during sexual arousal due to its content of many specialized nerve endings "Dogiel Krause corpuscles".
- Applied anatomy (clinical & surgical importance):
- 1) Main part removed in FGM (this USUALLY affects woman's sexuality).
 - 2) Clitoromegaly occurs in hyperandrogenism

Vestibule:

- 1) 2) **Definition: Diamond-shaped area between 2** labia minora.
 - **Boundaries:**
 - **Anteriorly: Clitoris.**
 - **Posteriorly: Fourchette.**
- 3) Laterally: Labia minora.
- 1) Structures opening into it:
 - Anteriorly: Urethra (by external urethral meatus).
- 2) 3) **Posteriorly: Vaginal orifice.**
 - **On each side: Ducts of Bartholin's glands.**

- F) Vestibular bulbs:
- Definition: 2 flask shaped masses of erectile tissue surrounding vaginal orifice on each side.
- Homologous to: Corpora spongiosa in male.
- Site: <u>Deep to</u>: bulpocavernosus muscles & <u>anterior to</u>: Bartholin's glands.
- G) Bartholin's glands (greater vestibular glands):
 Definition: Bilateral pea sized (1 cm) compound racemose glands lined by cuboidal to columnar epithelium.
 - Homologous to: Cowper's glands in male.

- Site: Situated deep in the posterior 1/3 of labia majora; in contact é posterior parts of vestibular bulbs (normally, glands are not palpable except if diseased).
- Ducts of glands: Each gland has duct (2 cm) which opens between hymen & labium minus at 5& 7 o'clock positions (normally, duct openings are not visible except if diseased).
- Applied anatomy (clinical & surgical importance)
- 1) Secrete thin mucoid alkaline fluid during sexual excitement which acts as colital lubricant & has antimicrobial activities.
- 2) If any swelling appears at posterior 1/3 of labium \rightarrow considered Bartholin's gland swelling.

- 3) If duct opening is seen →means obstrucction or inflammation.
- 4) If gland is surgically removed →may lead to severe Hge as it is in Contact è posterior part of vestibular bulb.
- 5) Bartholin's gland carcinoma drains directly to deep inguinai LNS.
 - Marsupialization of Bartholm's duct cyst. A vertical incision is made over the center of the cyst to dissect it free of mucosa. The cyst wall is everted and approximated to the edge of the vestibular mucosa with interrupted sutures.

Hymen

- Definition: Membrane covered on both sides by stratified squamous epithelium partially closing vaginal orifice in virgins with opening to allow flow of menses.
- Shapes of hymenal opening: Annular, crescentic, cribriform or biperforate.
- Applide anatomy (surgical & clinical importance)
- 1) If it is imperforate \rightarrow causes cryptomenorrhea.
- It is torn by 1st coitus <u>unless</u> opening is patulous or hymen is elastic (so, intact hymen isn't absolute proof of virginity).
- 3) It may be torn also by trauma (so, ruptured hymen isn't indicator of coitus).

- 4) It is torn more & more during 1st vaginal delivery & remnants of hymen in women are called Caranculae myriformis
- 5) Depression between hymen & fourchette is called fossa navicularis which is found only in virgins.
 Blood supply:
- A) Arterial supply: Vulva is extremely vascular & is supplied by:
- Internal pudendal artery: Main arterial supply.
 Origin: One of 2 terminal branches of anterior division of internal iliac artery.

Branches:

- a) Inferior rectal artery.
- b) Artery of bulb.
- c) Dorsal & deep arteries of clitoris: 2 terminal branches that supply clitoris.
- 2) External pudendal artery: From femoral artery (from external iliac artery)
- 3) Azygos artery of vagina.
- B) <u>Venous drainage</u>: Through vulval venous <u>plexus</u>. Lymphatic oraihaye: Vulval lymphatics anastomose on both sides across middle line; draining to superficial inguinal LNs & deep femoral LNS (Specially to gland of Cloquet) →external iliac LNs →common iliac LNs →para-aortic LNs.

Nerve supply:

- A) Pudendal nerve: Main nerve supply.
- Origine: **S**₂, **S**₃,&S₄.
- Course: Leaves pelvis through greater sciatic foramen & crosses behind ischial spine & curls around it then passes through lesser sciatic foramen to enter pelvis again & pass in pudendal canal (Alcock's canal) in ischiorectal fossa.
 Branches:
- As it enters pudendal canal: It gives inferior rectal nerve (supplies the rectum, anal canal, anal sphincter & skin around anus).

- 2) As it leaves pudenda canal: It gives:
- a) Muscular branches (supplies levator ani, peririeal muscles & external urethral sphincter).
- b) Perineal nerve (supplies lower vagina, labia & perineal
 - c) Dorsal nerve of clitoris.



Primary Sex Organs

Internal Genitalia



Female reproductive system: Vagina

- efinition:
- Fibromuscular canal forming female copulatory
 - organ.
- ape:
- Inverted flask in longitudinal section (its upper end is twice capacious than its lower one).
- Flattened H in cross section (anterior & posterior walls lie in contact but lateral walls remain rigid). Length:
- A) Anterior wall: 7-10 cm.
- **Posterior wall: 1-1.5 cm > anterior wall.**
- Extent: upwards & backwards from vestibule to cervix.

Female reproductive system: Ends:

- A) Lower end: closed by hymen in virgins.
- B) Upper end: Blind & is called vaginal vault.
- Axis: Longitudinal axis of vagina is parallel to plane of pelvic inlet forming angle of about e tiorizontal line in standing position & 90° é longitudinal axis of convix

of cervix.

- Vaginal fornices: Vaginal doom is transformed by cervix into 4 fornices:
- A) Anterior fornix: in front of cervix & it is the shallowest.
- B) Posterior fornix: Behind cervix & it is the deepest.
 - C) 2 lateral fornices: On each side of cervix.

Female reproductive system: Relations:

- A) Anterior wall:
- 1) Upper 2/3: Bladder base.
- 2) Lower part: Urethra.

B) Posterior wall:
1) Upper 1/4: Peritoneum of pouch of Douglas.
2) Middle 2/4: Ampulla of rectum (separated from it by rectovaginal septum).
3) Lower 1/4: Anal canal (separated from it by perineal body).

Female reproductive system:

- C) Lateral wall: From above downwards:
- 1) **Mackenrodt's ligament.**
- 2) Levator ani é pelvic cellular tissue above it.
- A) Perineal membrane.
 A) Vestibular bulb, Bartholin's gland & bulbocavernosus muscle.
- **Histoloay (structure):**
- A) Epithelium:
- Modified skin: Stratified squamous non keratinized epithelium which is elevated into rugae to permit distension of vagina during coitus & delivery.
 - Estrogen helps glycogen deposition in vaginal epithelium.

- Female reproductive system:
 Doderlein bacilli (lactobacilli) split glycogen into lactic acid giving vagina its acidic reaction (PH = 3.8-4.5) which protects it from infection.
- 3.8-4.5) which protects it from infection.
 There are no glands in vagina but it is kept moist by serous transudate from its wall & by cervical discharge.
- B) Tunica propria: Thin layer of elastic fibers & thick vascular CT.
- C) Muscle layer: Inner circular & outer longitudinal.
 D) Advntitia (paracolpos): Outer fibrous layer contains erectile venous plexuses, nerves & lymphatics & allows high distensibility of vagina.

- Female reproductive system: Blood Supply:
 - A) Arterial supply:
- 1) Vaginal artery: Main arterial supply (it arises either directly from internal iliac artery or from uterine artery).
- 2) Branches from uterine artery: Uterine artery gives circular artery of cervix which forms é its opposite fellow coronary anastomosis around cervix & gives anterior & posterior azygos arteries that pass downwards in midline anteriorly & posteriorly anastomose é vaginal arteries.
 - 3) Branches from middle rectal, inferior rectal & vesical arteries.

Female reproductive system: B) Venous drainage: Through vaginal venous plexus (around vagina) which drains by vaginal veins into internal iliac veins.

Lymphatic drainage: A) Upper 2/3: as the Cervix B) Lower 1/3 : as the vulva

Nerve Supply: A) Upper 2/3: as the uterus B) Lower 1/3: as the vulva Female reproductive system: Applied anatomy (clinical & Surgical importance) A) Age changes in vagina: 1) At birth: Vagina is under influence of maternal estrogen so, epithelium is well developed. 2) After few weeks: Effect of estrogen disappears & estrogen so, epithelium is well developed. ý 3) **PH /** $\uparrow\uparrow$ to 7 & epithelium atrophies. At puberty: Estrogen **\^** & epithelium develops again & PH returns acidic (3.5-4). After menopause: Vagina tends to shrink & epithelium atrophies.

-emale reproductive system: **B)** Surgical anatomy of anterior vaginal wall: Anterior vaginal wall has 3 transese mucosal folds (Sulci) to allow stretch during coitus & delivery & also they are surgical landmarks in treatment of anterior vaginal wall prolapse: Submeatal sulcus: Above external urethral meatus.

- Transverse vaginal sulcus: At level of bladder neck.
- 3) Bladder sulcus: At upper limit of bladder attachment (bladder base)

Female reproductive system: C) Prolapse:

- Descent of anterior vaginal wall: Causes urethrocele (lower 1/3) or cystocele (upper 2/3).
- 2) Descent of posterior vaginal wall: Causes rectocele (middle 2/4) or enterocele (upper ¼).
 D) Culdocentesis: Aspiration of contents of pouch of Douglas by needle inserted through posterior fornix

Development & congenital anomalies: See embryology



Internal Genitalia


Anatomy: the following items must be fulfilled:

 Definition 	•Cavity (cervical canal)	•Lymphatic drainage
•Size	 Position 	•Nerve supply
•Shape	•Pritoneal covering & relations	•Ligamnts of cervix
•Parts	•Histology (structure)	 Applied anatomy
 Cervix/corpus ratio 	•Blood supply	•Development & anomalies

The uterus:

Def.: child bearing organ in female Shape: hollow flattened pear-shaped muscular Size: 3 X 2 X 1 inches Weight: 50-70 gm Parts: (Corpus, Isthmus, Cervix) Corpus:-2X2X1 inches - above the anatomical I.O. - Cornu:- point of insertion of the tube. -the most vascular - Fundus: above the insertion of the tubes

The uterus:

Isthmus:- 5-6 mm; between the anatomical internal os from above & the histological one from below. - lined by modified endometrium. - forms the lower uterine segment during pregnancy.

Female reproductive system: The uterus:

- Cervix: - neck of the uterus.

- 1 X 1 inch.
- 2 parts: Supra vaginal
 - portiovaginalis.
- cylindrical with central spindle-shaped canal between external Os and internal Os
- external Os: rounded in nulliparas tranverse slit: in those with previous vaginal delivery.

- CX./ Corus: -at birth=2/1, puberty=1/1, adult=1/2

Female reproductive system: The uterus:

- -<u>Uterine Index</u>= [(Uterine Length- Cervical Length)/ Cervical Length] X ¹/₂.
 - Normally ≥1; if <1: uterine hypoplasia.
- Uterine Cavity:
- Potential space (4-6 ml volume), 6-7.5 cm from the external Os to the upper end.
- Triangular: inferior angle: internal os. superolateral angles: tubal ostia.

Thin cover (serosal layer) Thick layer of muscle (myometrium) Womb lining (endometrium) Neck of womb (cervix)

Female reproductive system: The uterus:

- -<u>Position</u>= central pelvic; slight *dextrorotation*.
 <u>Anteverted Anteflexed</u>:
- <u>Anteversion</u>: forward angulation; angle between the longitudenal axis of the vagina and that of the cervix (90).
- <u>Anteflexion</u>: forward angulation; angle between
- the longitudenal axis of the corpus and that of the cervix (150-160).
- *Internal Os*: upper border of the symphysis pubis in standing.
- *External Os*: ischial spines in standing.

- **Covering & Relations:**
- <u>A</u>- Corpus:
- 1- Fundus:
- Completely covered é peritoneum.
- Related to ileum & pelvic colon.
- **2- Anterior (Vesical) Surface:**
- Covered é peritoneum of vesico-uterine pouch.
- Related to bladder.
- **3- Posterior (intetinal) surface:**
- Covered é Peritoneum of Pouch of Douglas.
- Related to ileum & pelvic colon.

- 4- Lateral border: Related to:
- a) <u>3 Structures attached to cornu:</u>
- 1- Fallopian tube.
- 2- Round ligament (in front of tube).
- **3- Ovarian ligamen (behind tube).**
- b) Broad ligament.
- c) <u>Uterine artery</u>: Runs between 2 layers of board ligament
- **B) Cervix:**
- 1) Supravaginal portion:
- a) Anteriorly: Not covered é peritoneum & related to bladder base.

- b) Posteriorly: covered é peritoneum of pouch of Douglas & related to ileum & rectum.
- c) Laterally: Related to mackenrodt's ligament, uterine artery & ureter.
 2) Vaginal Portion: Projects in vagina & is surrounded by vaginal fornices.

Female reproductive system: Uterine body:

- Histology (structure):
- A) Ulterine body:
- 1) Endometrium:
- Hormone dependant layer; variable according to hormonal levels of menstrual cycle & it consists of:
- a) Surface epithelium.
- b) Glands: Formed by dipping of surface
- epithelium into underlying strorma.
- c) Stroma: In between glands & it consists of cells, blood vessels & lymphatics.

Uterine Body (continue)

2) Myoetrium:

- The middle muscular layer that represents the main uterine bulk. About 1.2 cm (1/2 Inch) thick. Muscle fibers are arranged in 3 layers: a) Inner circular-layer. b) Outer longitudinal layer. C) Middle interlacing criss-cross layer forming figures of 8 around blood vessels to control
- bleeding.

Female reproductive system: Uterine Body (continue)

- 3) Peritoneum: Firmly attached to uterus except in isthmus where it is loose.
- Anteriorly; reflected on bladder forming vesicouterine pouch.
- Posteriorly: Covers cervix & upper vagina then reflected on rectum forming pouch of Douglas (Cul-de-sac).
- Laterally: Forms broad ligaments.

- **B)** Cervical Histology:
- 1) Epithellum:
- Ectocervix: lined by non keratinized stratified squamous epithelium.
- Endocervix: (cervical canal) is lined by tall
- columnar ciliated epithelium e basal nuclei
- which invaginate to form <u>compound</u>
- <u>racemose glands</u>embedded in <u>fibrous stroma</u>
- of cervix. These glands secrete alkaline cervical mucus (PH= 8.5) that contains proteins & fructose for nourishment of ascending sperms.

Female reproductive system: Cervical Histology (cont.)

 Line between both epithelia is called squarnocolumnar junction (SCJ) which moves inwards.

 Area between old & new SCJ is called transformation zone (TZ).

Explatation: Peri-pupertal cervical changes: disproportionate growth with relative excess of the inner layer (columnar epithelium) than the outer layer (squamous epithelium) resulting in eversion of the endocervical epithelium like the response of the petals of the flower to the sun rise).

The exposed columner epithelium undergoes squamous metaplasia under the effect of the vaginal acidity; with preservation of the glands openings.



Ectocervix covered by stratified squamous epithelium



Endocervix lined by columner epithelium with mucinous cytoplasm of the endocervical glands cells.



Squamous metaplasis of uterine cervix. The endocervical columnar epithelium may be replaced by stratified squamous epithelium (arrowhead); the overlying columnar epithelium, and glands are still found (arrow) Transformation Zone: is the area between the original sqamo-columner junction and the new one.

- Original S-C J - New S-C J - T.Z.



Colposcopy

3% Acetic acid applied to cervix Cervix viewed under magnification and green light Entire transformation zone must be visualized



•2) Muscle layer:
Consists of inner circular & outer longitudinal layers.
more prominent in supravaginal portion than in vaginal portion where fibrous tissues (elastic & collagenous fibers)↑↑

3) Adventitis (Paramerrum) Layer of cellular CT.

Female reproductive system: Blood Supply:

- A) Arterial supply:
- 1) Uterine artery: Main supply.
- Origin: anterior division of internal iliac artery.
 Course:
- Passes anteromedially on pelvic floor along root of broad ligament.
- About 2 cm from cervix, it crosses above & in front of ureter.

- When it reaches lateral aspect of cervix, it turns upwards & runs tortuous course in medial part of broad ligament along lateral border of uterus supplying uterine body.
- Near uterine cornu, it passes laterally below fallopian tube.
- Termination: By anastomosis with ovarian artery below tube.
- Branches:
- a) Descending cervical artery: Passes on lateral aspect of cervix & gives branches on anterior & posterior cervical walls then anastomoses with vaginal artery.

Female reproductive system: **Branches of uterine A. (continue)** b) Circular artery of cervix: Forms e its opposite fellow a coronary anastomosis around cervix & gives anterior & posterior azygos arteries that pass downwards in middle line anteriorly & posteriorly & anastomose a vagina, arteries. c) Vaginal artery: May arise from it. d) Branches to tube, uterine ligaments, ureter & bladder.

2) Ovarian artery: Contributes through uteroovarian anastomosis. **Female reproductive system:** B) Venous drainage: Through <u>uterine venous</u> plexuses (along lateral borders of uterus between 2 layers of broad ligament) \rightarrow <u>uterine</u> vein on each side \rightarrow internal iliac veins.

Lymphatic drainage: A) Uterine body: 1) Upper Part:

→ para-aortic LNs

→ few pass along round ligament → <u>superficial</u> inguinal LNs. → internal iliac (hypogastric) LNs. 2) <u>Middle Part</u>: → internal iliac (hypogastric) LNs. 3) Lower Part: As cervix.

Female reproductive system:			
 B) Cervix (Lymphatic drainage): 1) Anteriorly: → obturator & external iliac LNs. 2) Laterally: → parametrial & internal iliac LNs. 3) Posteriorly: → lateral sacral LNs. Nerve Supply: Cervix is sensitive to dilatation & uterus is sensitive to distension. - both are insensitive to: touch, cutting, burning or freezing 			
	A) Sympathetic	B) Parasympathetic	
Effects	muscular relaxation & VD	muscular contraction & VC	
Origin	T5-T6 (mainly motor) T10- L1(mainly sensory)	S2, S3, &S4	
Course	Via lee Frankenhuser plexus		

- Ligamentous Supports of uterus:
- A) Ligaments of the corpus: 1) Round ligament:
- Definition: Fibromuscular band representing remnant of lower part of gubernaculum of fetus.
- Length: 12 cm.
- Upper attachment: cornu in front & below tubal insertion.
- Course: Runs downwards, forwards & laterally beneath anterior fold of broad Ligaments to reach <u>deep inguinal ring</u> where it passes through it then traverses <u>inguinal canal</u> & emerges through <u>superficial</u> inguinal ring.
- Lower attachment: Labium majus.

- Applied anatomy (surgical & clinical importance)
 - Aids in maintaining normal uterine position.
 - Used in many surgical procedures to correct RVF.
- a) b) c) d) Steadies uterus in pregnant woman & with uterine contractions.
 - If hypertrophied during pregnancy →may cause inguinal pain.

e) hernia of canal of nuck : patent processus vaginalis.

Female reproductive system: 2) Ovarian ligament: •Definition: Fibromuscular band representing remnant of upper part of fetal gubernacukum

•Extent: between 2 layers of broad ligament from uterine end of ovary to uterine cornu behind & below tubal insertion. Female reproductive system: 3) Broad ligament: •Definition: Broad quadrangular double-layered fold of peritoneum which suspends to lateral pelvic wall.

•Extent: Extends transversely in pelvic cavity between lateral border of uterus to side wall of Pelvis.

- •Parts:
- a) Mesometrium: between body of uterus, ovarian ligament & root (lower border) of broad ligament.
 b) Mesosalpinx: between tube & ovarian ligament.
 c) Mesovarium: Short fold connecting ovary to the posterior layer of broad ligament (through which, ovarian vessels & nerves enter the ovary).

Female reproductive system: d) Infundibulopelvic ligament (suspensory ligament of ovary): Lateral 1/5 of broad ligament which extends from infundibulum of the tube & tubal end of ovary to lateral pelvic wall (it transmits ovarian vessels & nerves from pelvic brim to ovary).

- **Contents of broad lig.:**
- a) Fallopian tube: In medial 4/5 of the upper free border.
- b) Ligaments:
- 1- Round ligament.
- **2- Ovarian ligament.**
- **3- Mackenrodt's ligament (in its lower end)**

Female reproductive system: Contents of broad lig. (continue.):

- c) Vessels:
- 1- Uterine vessels (near uterus).
- 2- Ovarian vessels (run in infundibulopelvic ligament then through mesovarium)
- 3- Utero-ovarian anastomosis (below tube).
- d) Nerves: Uterovaginal & ovarian plexuses.
- e) Embryological remnants:
- **1- Gartner's duct**
- 2- Epoophoron & Paroophoron.
- **3- Hydatid cyst of Morgani.**
- f) Others: Lymphatics & LNs & fibroareolar tissue (parametrium).

Female reproductive system: B) Ligaments of the cervix: 1) Pubocervical ligament:

- Horizontal band of thickened fascia passing from <u>back of pubis</u> to anterior aspect of <u>supravaginal</u> cervix & <u>anterior vaginal</u> fornix.
- Divided by presence of bladder & urethra in its course into <u>pubovesical</u> & <u>vesicocervical</u> ligaments.
- On its reflection on lower end of bladder, it units é Mackenrodt's ligament to form strong support to bladder known as <u>pillar</u>.

- **Female reproductive system:** 2) Mackenrodt's (cardinal, great cervical or transverse cervical) ligament:
- Thick fan-shaped fascial thickening passing from lateral aspect of supravaginal cervix & vaginal vault to lateral pelvic wall.
- Represents the largest & strongest fascial support of the genital tract.
- Its Upper margin is related to uterine blood vessels & ureter.
- Important in maintaining anteversion of uterus & preventing uterine prolapse

Female reproductive system: 3)Uterosacral ligament:

- Band passing from back of <u>supravaginal</u> cervix & <u>upper vagina</u> to <u>2nd sacral piece</u>.
- Considered true anatomical ligament.
- Important in maintaining <u>anteversion</u> of uterus & <u>preventing</u> uterine prolapse

- Female reproductive system: Applied anatomy (clinical & surgical importance):
- A) Anatomical changes taking place at level of internal os:
- 1) Reflection of peritoneum from uterine body on bladder dome.
- 2) Uterine artery meets uterus & changes its course from horizontal to vertical direction.
- B) Uterine changes during pregnancy: See obstetrics.
- C) Prolapse. see
- D) Development & congenital anomalies: See embryology.

Primary Sex Organs


Female reproductive system: the fallopian tubes...

Tube widens to form the ampulla (am pyu lah)

The isthmus is the portion that connects to uterus

Fimbria (fihm bree ah) are the finger-like projections around the opening that trap the egg as it leaves the ovary End of tube is called the infundibulum (in fun DIB yū lum)

> Opening is called the ostium (ah stē um)

Female reproductive system: the fallopian tubes...





The fallopian tube is 4-6 inches long. The egg, released from the ovary, is captured by the fimbria and brought into the fallopian tube. The egg is moved along inside the tube by muscular contractions and the waving action of cilia. It takes an egg about 3-4 days to travel the length of the tube. If an egg is fertilized, it occurs here. Female reproductive system: Fallopian tubes (Uterine tubes) **Definition: 2 flbromuscular tubes transporting** ova from ovaries to uterus. Site: in the free border of the broad ligament extending from the uterine cornu to open into the peritoneal cavity.

Length: 10cm

Parts: 4 parts from medial to lateral:

A) Intersitial (intramural):

• **Present in uterine muscles.**

1-2 cm long & 0.25-1 mm in luminal diameter (shortest & narrowest part).

Female reproductive system:

- Has no peritoneal coat & no longitudinal muscle layer.
- **Opens into superior angle of uterine cavity by** uterine ostium.
- **B) Isthmus:**
- Narrow straight portion lateral to the uterus.
- 2-3 cm long & 1-2 mm in luminal diameter.
- C) Ampulla: (widest & longest part)
- **Tortuous part lateral to isthmus.**
- 5-6 cm long &1 cm in luminal diameter
- Infundibulum (fimbrial end):
- **Funnel-Shaped expansion at lateral tubal end.**

Female reproductive system:

- Contains orifice (abdominal ostium) which opens in peritoneal cavity so, infundibulum is natural opening of peritoneal cavity.
- Carries number of finger-like processes (fimbriae) & one of these fimbriae (fimbria ovarica) is longer than others & lies in contact with the ovary.
- Filmriae are important for ovum pick up at ovulation.
- Histology (Structure): No Submucosa, glands or shedding é menstruation.

Female reproductive system: Endosalpinx: Single layer of columnar epithelium (party ciliated, partly secretory) which is thrown into longitudinal folds (plicae). B) Muscle Layer: inner circular, outer longitudinal Adventitia. D) Peritoneal covering: Tubes are totally covered by peritoneum except narrow line between the **2 layers of the broad ligaments.**

Female reproductive system: Blood Supply:

- A) Arterial Supply: Double blood supply through uterine artery (Supplies medial 2/3)& ovarian artery (supplies lateral 1/3) that anastomose in mesosalpinx
- B) Venous drainage: Through uterine & pampiform venous plexuses to uterine & ovarian veins.

Lymphatic drainage: Most of tubal lymphatics accompany those of ovary & pass along ovarian vessels to para-aortic LNs. Nerve supply: Mainly from ovarian plexus.

Female reproductive system:

- Applied anatomy (clinical & surgical importance):
- A) Has dual blood supply so, gangrene doesn't occur.
- **B) Site of fertilization (in ampulla)**
- C) The commonest site of ectopic pregnancy.
- D) Tubal block causes infertility.
- E) Site of ART (as GIFT& ZIFT) in infertility.
- F) Tubal ligation is a method of contraception. Development & congenital anomalies: See
 - embryology.

Primary Sex Organs

Internal Genitalia

Ovaries

Female reproductive system: the ovaries... The two ovaries are attached to each Fallopian side of the uterus tube by a ligament. They Ovary are oval-shaped, Uterus about the size of a Cervix_ large olive, and lie Vagina close to the fimbria at the end of the fallopian tubes.

Each ovary is filled, already at birth, with eggcontaining sacs called follicles. Each egg is called

<u>an ovum.</u>

Female reproductive system: the ovaries and ova

Once every 21 days, one follicle in one ovary ripens. This mature follicle is a graafian (GRAW fee un) follicle. The follicle ruptures in response to hormones from the pituitary gland, releasing the ovum/egg... a process called ovulation.



Female reproductive system: the Supportive muscle of Ovary

The vagina extends from the cervix to the outside of the body. It is a 3 ½ inch long muscular tube that expands in length and width during sexual arousal.



The vagina is the female organ for copulation (sexual intercourse), receiving the seminal fluid from the male penis. It is also a passageway for menstruation or the birth of a fetus. Female reproductive system: **Ovaries**

- Definition: 1ry sex organ of female. Site:
- Intraperitoneal organ that lies on side wall of true pelvis
- In nulliparas, it lies in fossa in posterior part of lateral pelvic wall called ovarian fossa which has the following boundaries:
- Anteriorly: Obliterated umbilical artery.
 Posteriorly: Internal iliac artery & ureter Posteriorly: Internal iliac artery & ureter (in front of artery).
- 3) **Above: Bifurcation of common iliac artery.**
- 4) **Below: Its lower border is ill-defined.**

Female reproductive system: 5) Floor: Obturator internus muscle, obturator vessels & nerves. Shape: Almond-shaped Size: 3 x 2 x 1 cm. Weight: 5-10 gm Parts: 3 regions: A) Hilum: Area through which vessels, nerves & lymphatics enter & leave ovary. B) Cortex: Consists of dense CT strorma in which there are Scattered Graffian follicles in various stages of development & atresia. C) Medulla: Consists of CT enclosed by cortex.

Female reproductive system: **Histology (Structure):** . Divided into outer cortex & inner medull. . Covered by layer of surface epithelium (germinal epithelium) separated from cortex by layer of dense CT called Tunica albuginea. . Not covered by Peritoneum (ovary is the only intraperitoneal pelvic organ) **Blood supply:** A) Arterial Supply: 1) Ovarian artery: Main supply. . Origin: from abdominal aorta just below origin of renal arteries. **<u>Course</u>: Passes downwards retroperitoneally**

Female reproductive system: crossing abdominal ureter (RT one crosses IVC also) then descends lateral to ureter till reaching pelvic brim where it joins infundibulopelvic ligement after crossing external iliac artery & urete (again) & Passes medially below fallopian tube towards uterine cornu.

- **Termination:** By anastomosis with uterine artery below Fallopian tube.
 - **Branches:**
 - a) ovarian & tubal branches.
 - **B) Ureteric branches.**
 - **C)Sampson artery to round ligament.**

Female reproductive system: 2) Uterine artery: utro-ovarian anastomosis.

B) Venous drainage:

Through pampiniform venous plexuses (in between 2 layers of broad ligaments) which drain into ovarian veins.

- 1) Rt ovarian vein drains into IVC.
- 2) Lt ovarian vein drains into Lt renal vein.

Lymphatic drainage: To para-aortic LNs.

- Female reproductive system: Ligaments of the ovary:
- A) Ovarian ligament: Attaches it to uterine cornu.
 B) Infundibulopelvic ligament: Attaches it to lateral pelvic wall.
- C) Mesovarium: Attaches it to posterior surface of broad ligament.
 - Applied anatomy (clinical & surgical importance)
- A) Ureter is present in floor of ovarian fossa & it can be injured in surgical maneuvers near this site (as clamping & cutting of infundibulopelvic ligament).
 - B) Ovarian & infundibulopelvic ligaments should be clamped before cutting contain vessels (ovarian or ovarian branches).

-emale reproductive system: C) Ovarian vessels attain spiral course in ovarian medulla to accommoda ovarian position over menstrual cycle & different stages of life. **Ovarian lymphatics communicate with tubal &** uterine fundal lymphatics; makes channels of spread of malignancy between both sides & to pelvic LNs & organs. E) Ovarian pain is felt referred to 10th & 11th thoracic segments just below umbilicus (if ovarian pathology irritates parietal peritoneum, pain is felt over the midinguinal point) F) Surface epithelium may dip into ovarian cortex → forms non neoplastic ovarian cyst.

Female reproductive system: Pelvic part of ureter

- Length: 12.5 cm (whole ureter =25 cm) Course:
- Enters pelvis retroperitoneally by crossing bifurcation of common iliac artery then runs downwards & backwards in front of internal iliac artery.
 - Opposite ischial spine, it changes its direction & passes forwards & medially through parametrium below broad ligament & lies lateral to uterosacral ligament then lies 2 cm lateral to supravaginal cervix & 1 cm above lateral vaginal fornix where It passes below, at right angle to uterine artery.

 Female reproductive system:
 It then enters ureteric canal in upper part of Mackenrodt's ligament then forwards & medially to enter trigone of bladder.

Blood Supply of ureter:

- A) Arterial supply:
 - Branches from inferior vesical, middle rectal, vaginal, uterine & ovarian arteries.
- 2) Separate branch from internal iliac artery called Michael's artery.

B) Venous drainage: By veins corresponding to arteries.

- Female reproductive system: Possible sites of ureteric injury during gynecological surgery: During the following
 - surgical maneuvers:
- A) Clamping of infundibulopelvic ligament.
- **B) Clamping of uterosacral ligament.**
- C) Clamping of uterine artery.
- D) Closing peritoneum after hysterectomy.
- E) Removing broad ligamentary mass.
- F) Removing cervical fibroid.
- G) Vaginal repair of prolapse.
- H) Presacral neurectomy (PSN).

Female reproductive system: **Pelvic floor Definition: Soft tissue closing pelvic outlet** from pelvic peritoneum above to Perineal skin below. Layers: from above downwards: A) Pelvic peritoneum. **B) Extraperitoneal CT.** C) Pelvic diaphragm. **D)** Perineum.

Female reproductive system: **Pelvic diaphragm Definition: Muscular diaphragm forming sling** across true pelvis separating pelvic cavity above from perineum below. Formation: By 2 levator ani Muscles with their superior & inferior fasciae. Levator ani Muscle: 1) Pubococcygeus: **Origin:** Posterior surface of body of pubic bone.

b) White line of pelvic fascia in front of

obturator canal.

 Female reproductive system:
 Insertion: Each muscle sweeps downwards, backwards & blend in medially to blend in midiline é its fellow of opposite side.

Female reproductive system: Parts:

- a) Pubourethralis: Medial fibers that blend é upper urethra & form loop around it.
- b) Pubovaginalis: intermediate fibers that blend é vagina & form loop around it (decussating fibers () vagina & rectum are called fibers of Lushka).
- c) Puborectalls: Lateral fibers that blend 6 anal canal & form ioop around anorectal junction.
- d) Pubococcygeus proper: Most lateral fibers that have margin of coccyx.
- 2) Iliococcygeus:
- Origin: white line of pelvic fascia behind obturator canal

Female reproductive system:

- Insertion: Blends é lateral fibers of pubococcygeus proper & is inserted into lateral margin of coccyx.
- 3) Ischiococcygeus (coccygeus).
- Origin: Tip of iscial spine.
- Insertion: its anterior fibers blend é posterior fibers of iliococcygeusn& are inserted into lateral border of coccyx & last sacral piece.
- Nerve supply: pudendal nerver.
- Actions (functions):
- Sphincter action for bladder, vagina & rectum (by pubococcygeus)

Female reproductive system: 2) Supportive function to pelvic viscera (by involuntary conntractio é any ** in intraabdominal pressure). 3) Important for internal rotation of fetal head during labor. 4)Helping in stabilization of sacrum (by ischiococcygeus). Gaps of levator ani: 1) Anterior gap (urogenital hiatus): Through which vagina & urethra pass. 2) **Posterior gap (rectal hiatus): Through which** rectum pusses.

Female reproductive system: Perineum

- Definition: Lewer and of trunk & represents the ouliet of pelvis
- Boundaries: 4 angies, 4 borders &roof
- A) Anterior angle: Lower border of symphsis publs.
 B) Posterior angle: Tip of coccyx.
- C) 2 lateral angles: 2 ischial tuberosities.
- D) 2 anterolateral borders: 2 inferior ischiopubic raml.
- E) 2Posterolateral borders: 2 Sacrotuberous ligaments covered by lowest fibers of gluteus maximus.
- F) Roof: Pelvic diaphragm.

Female reproductive system: **Divisions: Divided by imaginary line linking 2** ischial tuberosities into 2 triangles: A) Anteriorly: urogenital triangle. B) Posteriorly: Anal triangle (contains anal canal é external anal sphincter in middle & 2 ischiorectal fossae on both sides) **Uroegnital triangle: Contains the following** structure from blow upwards: A) Skin of labia & clitoris. B) Superficial fascia formed of 2 layers: Superficial fatty layer. Deep membranous layer (colles fasica).

Female reproductive system: C) Urogenital diaphragm:

- Definition structures closing urogenital triangle of anatomical pelvic outlet
- Components:

- Definition: triangular double layered fibrous sheet filling the space of pubic arch (it forms roof of superficial perineal pouch & floor of deep perineal pouch)
- Attachment: To Symphsis pubis (leaving hole through which deep dorsal vein of clitoris passes)

Female reproductive system: Structures piercing it: a)Urethra (anteriorly in midline) b)Vgina (posteriorly in midline) C)Internal pudendal artery d)Artery of bubl e) Dorsal nerve of clitoris

Female reproductive system: 2) Superficial & deep perineal pouches:

a) Superficial perineal pouch	b) Deep porineal pouch
Postential space () perineal membrane deeply & colles fasica superficially	Clsed space () perineal membrane superficially & deep pelvic fascia deeply
 1- Urethra 2- Vagina 3- Internal pudendal artery 4- Artery of bulb 5- Dorsal nerve of clitoris. 	
 6- Superficial perineal muscles: A- Superficial transverse perinii. B- Ischiocavernosus C- Blbocavernosus 7- Bulbs of vestibule 8- Bartholin's glands 9- Crura of clitoris 	6- Deep perineal muscles: A- Deep transverse perinii B- External urethral sphincter

N.B.:

• Perineal membrane = inferior fascia of urogenital diaphragm

•Deep pelvic fascia = Superior fascia of urogeital diaphragm

Female reproductive system: **Ischiorectal fossae:**

- • 1) **Definition: 2 pyramidal spaces on both sides** of rectum & anal canal
- Size: 5x5x2.5 cm
- **Boundaries:**
- **Anteriorly : perineal membrane**
- 2) Posterioriy: Sacrotuberous ligament covered by lowest fibers of gluteus maximus
- 3) Medially: fascia covering levator ani & external anal sphincter
- 4)Laterally: fascia covering obturator internus muscle

Female reproductive system: 5) Roof origin of levator ani from obturator fascia.

- 6) Floor: perineal skin & fascia.
- Content
- 1) Fat (main content)
- 2) Internal pudendal vessels & pudendal nerve In pudendal (Alcock's) canal
- 3) Inferior hemorhoidal vessels & never
- **Surgical importance:**
 - Common site for abscess formation & pus may get way to open in vagina rectum Causing fitula.

Female reproductive system: There is connection ()2 fossae & abscess in one fossae may enter the other fossa.

Perineal body:

- **Definition: Pyramidal fibromuscular mass that** lies () lower 1/3 of vagina & anal canal.
- **Synonyms: Central tendon of perineum or Central point of perineum.**
- **Apex: Lower end of rectovaginal septum.**
- **Base: skin area () posterior commissure &** anus.
 - Length: 5 cm nulliparas.
Female reproductive system:

- . 1. 2. 3. Formation: By fusion & decussation of the following structures:
 - Pubococcygeus.
 - **External anal sphincter.**
 - Deep & superficial transverse perinii.
- 4. **Bulbocavernosus muscle.**

N.B.: Perineum in gynecology:
Definition: Area that lies () vag anteriorly & anus posteriorly.
Formed of: Perinea! skin, SC to muscles that form perineal book Definition: Area that lies () vaginal orifice Formed of: Perinea! skin, SC tissue & perineal muscles that form perineal body.

Female reproductive system: the vulva...

The perineum is the area located between the vaginal opening and the anus. It is a muscular sheet that can be torn during childbirth.





Some doctors avoid uncontrolled tearing of the perineum by making a surgical incision called an episiotomy.

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