Female Reproductive Anatomy

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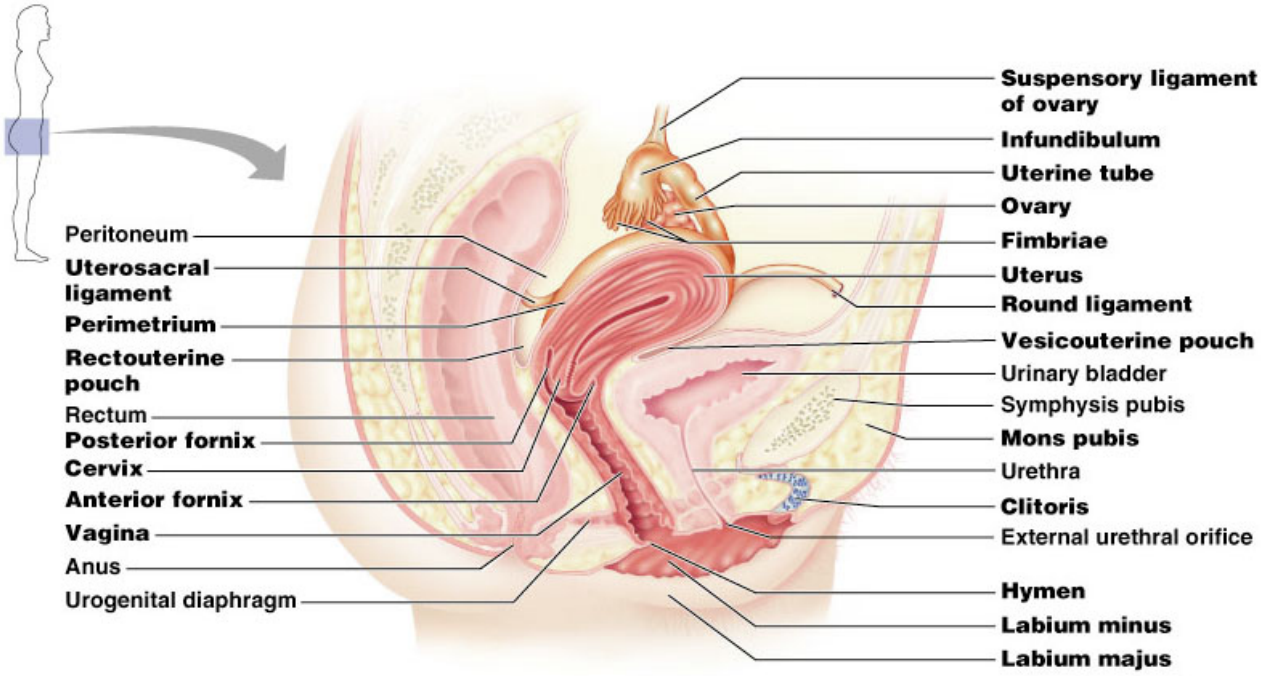


Overview - Function

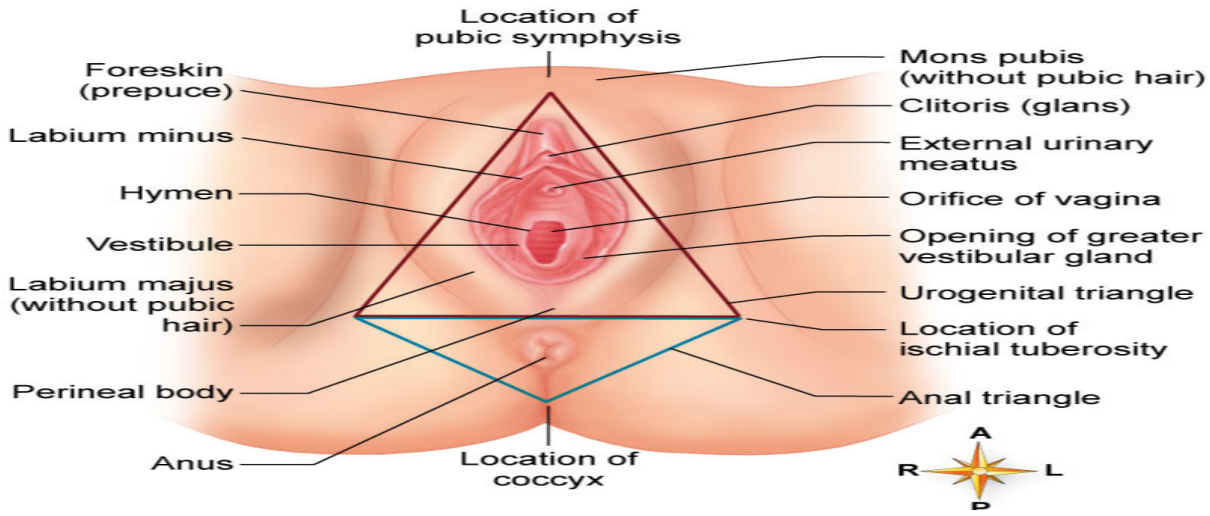
- To produce offspring and thereby ensure continuity of the genetic code
- To produce eggs, or female gametes, each of which has the potential to unite with a male gamete to form the first cell of an offspring
- To provide nutrition and protection to the offspring for up to several years after conception
- Undergoes changes according to the menstrual cycle
    - Menstrual cycle is the monthly cycle as it affects all female reproductive organs

Structural plan of the female reproduction system

- Reproductive organs are classified as essential or accessory
    - Essential organs: gonads are the paired ovaries; gametes are ova produced by the ovaries; ovaries are also internal genitals
    - Accessory organs
        - Internal genitals: uterine tubes, uterus, and vagina—ducts or duct structures that extend from the ovaries to the exterior
        - External genitals: the vulva
        - Additional sex glands such as the mammary glands

Perineum

- The skin-covered region between the vaginal orifice and the rectum
- Area that may be torn during childbirth

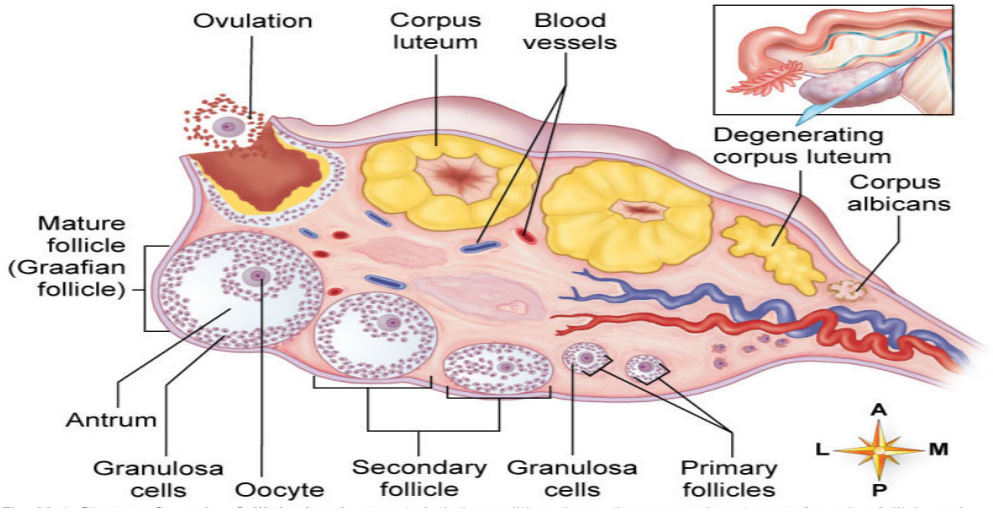


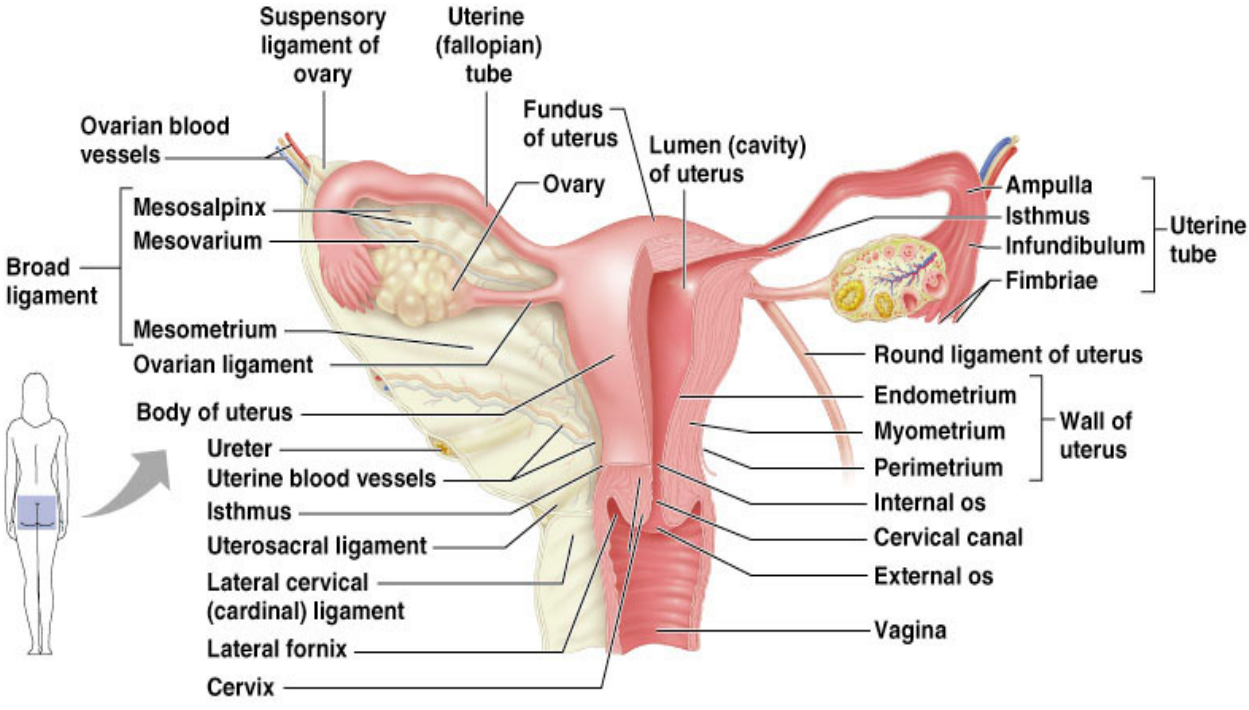
The Ovaries

- Almond size and shape
- Consists of connective tissue beds filled with follicles
- Each follicle consists of an immature egg called an oocyte
- They are also endocrine glands that produce reproductive hormones.
- The ovarian vessels, lymphatics, and nerves cross the pelvic brim, passing to and from the superolateral aspect of the ovary within a peritoneal fold, the suspensory ligament of the ovary, which becomes continuous with the mesovarium of the broad ligament.
- The ovaries are typically found laterally between the uterus and the lateral pelvic wall during a manual or ultrasonic pelvic examination.
- Functions
    - Ovaries produce ova, the female gametes
    - Oogenesis: process that results in formation of a mature egg
    - Ovaries are endocrine organs that secrete the female sex hormones (estrogens and progesterone)
- Paired organs on each side of the uterus held in place by several ligaments
    - Ovarian and Suspensory – anchors the ovary to the pelvic wall
    - Mesovarium – suspends the ovary in between
    - Broad ligament – contains the suspensory ligament and the mesovarium
- Each ovary is suspended by a short peritoneal fold or mesentery, the mesovarium.
- The mesovarium is a subdivision of a larger mesentery of the uterus, the broad ligament.

The Ovaries

- Deep in the ovaries is a highly vascular connective tissue with many saclike structures called ovarian follicles
- Each follicle consists of an immature egg called an oocyte
- Follicles at different stages of maturation are distinguished by their structure
- Because the ovary is suspended in the peritoneal cavity and its surface is not covered by peritoneum, the oocyte expelled at ovulation passes into the peritoneal cavity.
- However, its intraperitoneal life is short because it is normally trapped by the fimbriae of the infundibulum of the uterine tube and carried into the ampulla, where it may be fertilized.
- The female fetus, by the 7th month, has all the ova that she will ever have during her lifetime - There are 400,000 ova by the 7th month
- Ova were formed in yolk sac (not the ovary) and migrated to the ovaries
- The ova start discharging – ovulation – from 10 years to 50 years
    - 480 ovulations for reproductive life
- At ovulation, the fimbria engorge with blood to grasp the ovary
- Takes 3-4 days to go down the tube so fertilization can occur in the tube
        - Tubal pregnancy vs. ectopic pregnancy





Uterus - Structure of the uterus

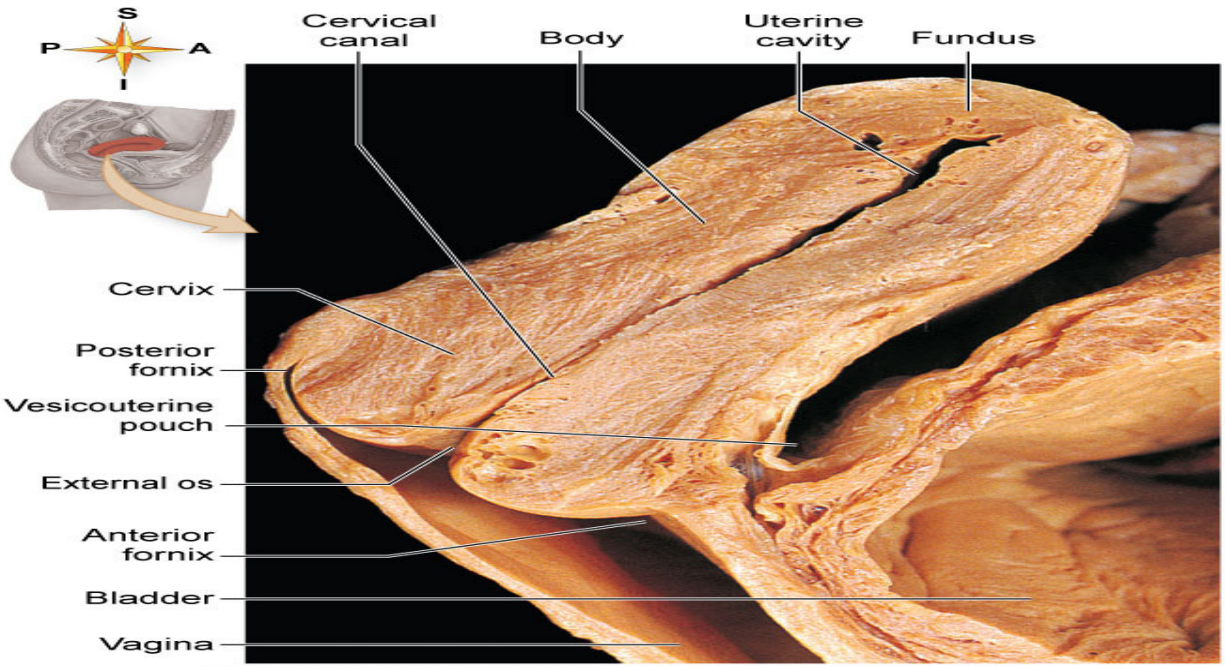
- Size and shape of the uterus
  - The uterus is pear shaped and has two main parts: the cervix and the body
- Wall of the uterus is composed of three layers: the inner endometrium (mucous membrane), the middle myometrium (smooth muscle), and the perimetrium (outer incomplete layer of parietal peritoneum)
- Cavities of the uterus are small because of the thickness of the uterine walls
  - The body cavity's apex constitutes the internal os and opens into the cervical canal, which is constricted at its lower end and forms the external os that opens into the vagina
- Uterine arteries supply blood to the uterus

Uterus - Location of the uterus

- Located in the pelvic cavity between the urinary bladder and the rectum
- Position of the uterus is altered by age, pregnancy, and distention of related pelvic viscera
- The uterus descends, between birth and puberty, from the lower abdomen to the true pelvis
- The uterus begins to decrease in size at menopause
- Body lies flexed over the bladder
- Cervix points downward and backward, joining the vagina at a right angle
- Several ligaments hold the uterus in place but allow some movement

Uterus - Functions of the uterus

- The uterus is part of the reproductive tract and permits sperm to ascend toward the uterine tubes
- If conception occurs, an offspring develops in the uterus
    - The embryo is supplied with nutrients by endometrial glands until the production of the placenta
    - The placenta is an organ that permits the exchange of materials between the mother's blood and the fetal blood but keeps the two circulations separate
    - Myometrial contractions occur during labor and help push the offspring out of the mother's body
- If conception does not occur, outer layers of endometrium are shed during menstruation—a cyclical event that allows the endometrium to renew itself

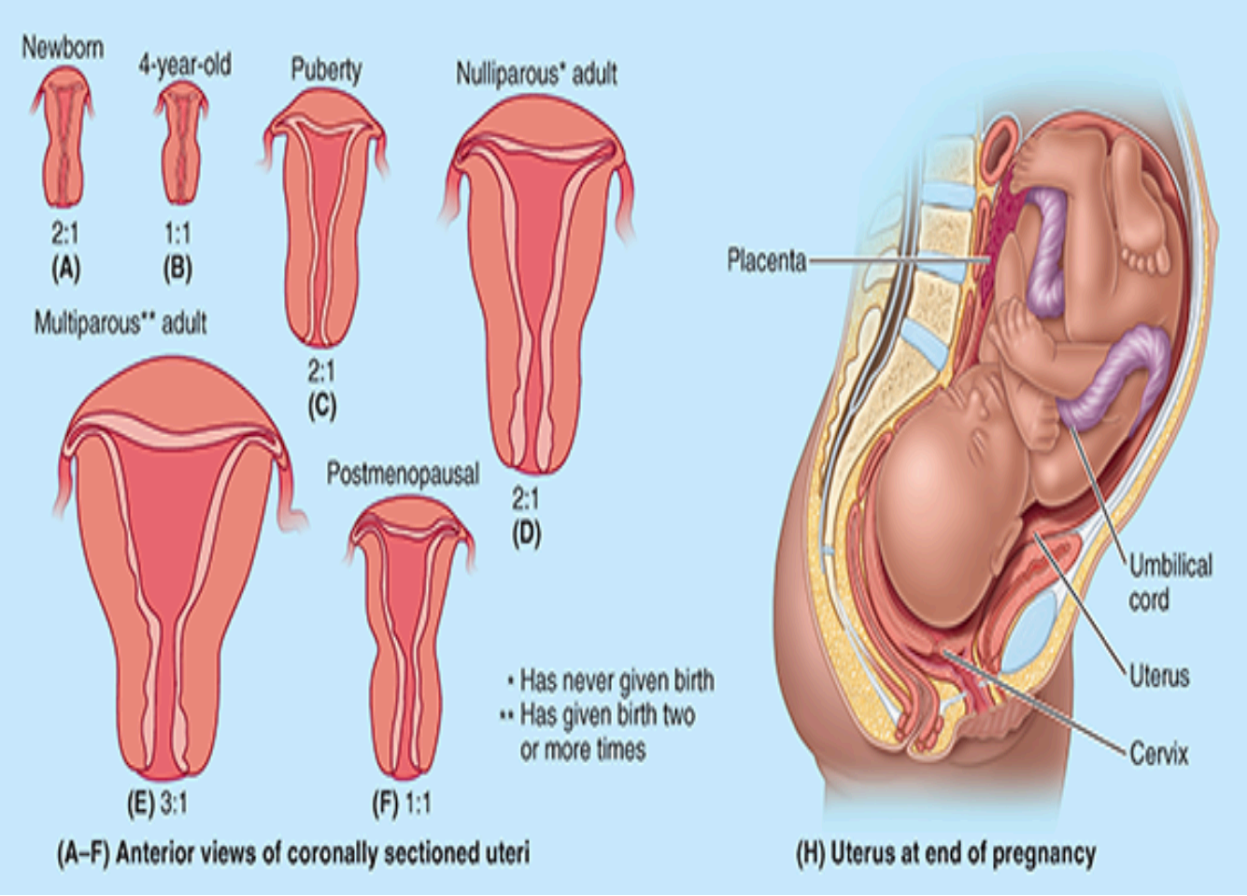


Relations of Uterus

- The adult uterus is usually tipped relative to the axis of the vagina, and flexed or bent so that its mass lies over the bladder.
- Consequently, when the bladder is empty, the uterus typically lies in a nearly transverse plane. The position of the uterus changes with the degree of fullness of the bladder and rectum and stage of pregnancy.
- Although its size varies considerably, the nongravid (not pregnant) uterus is approximately 3" long, 2" wide, and 1" thick and weighs approximately 3-4 ounces.
- Anteriorly - superior surface of the bladder. Part of the cervix is related to the bladder and is separated from it by only fibrous connective tissue.
- Posterior - Small intestine and the anterior surface of rectum.
- Lateral - Side of the cervix and vagina.

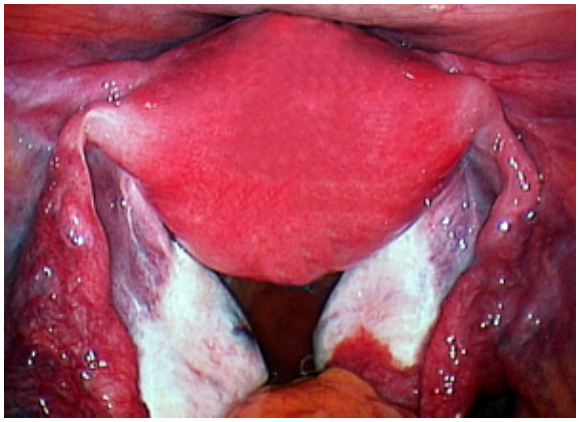
Lifetime Changes in Anatomy of Uterus

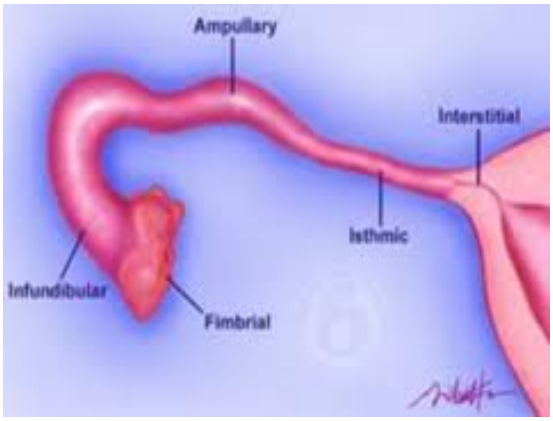
- The uterus is possibly the most dynamic structure in human anatomy.
  - At birth, the uterus is relatively large and has adult proportions (body to cervical ratio = 2:1) due to the influence of the maternal hormones.
  - Several weeks after childbirth, childhood dimensions and proportions are obtained.
  - The body and cervix are approximately of equal length (body to cervical ratio = 1:1).
- Because of the small size of the pelvic cavity during infancy, the uterus is mainly an abdominal organ.
- The cervix remains relatively large (approximately 50% of total uterus) throughout childhood.
- During puberty, the uterus (especially its body) grows rapidly in size, once again assuming adult proportions.
- In the post pubertal, premenopausal, nonpregnant woman, the body of the uterus is pear shaped.
- The thick-walled superior two thirds of the uterus lies within the pelvic cavity. During this phase of life, the uterus undergoes monthly changes in size, weight, and density in relation to the menstrual cycle.



Uterine Tubes

- Uterine tubes are also called *fallopian tubes,* or *oviducts*
- Uterine tubes are attached to the uterus at its upper outer angles and extend upward and outward toward the sides of the pelvis
- Function: serve as transport channels for ova and as the site of fertilization
- Structure
  - Uterine tubes consist of mucous lining, smooth muscle, and serous lining
  - Mucosal lining is directly continuous with the peritoneum lining the pelvic cavity
  - Tubal mucosa is continuous with that of the vagina and uterus, which means it may become infected with organisms introduced into the vagina
  - Each uterine tube has three divisions: isthmus, ampulla, and infundibulum
- Infundibulum: the funnel-shaped distal end of the tube that opens into the peritoneal cavity through the abdominal ostium.
- The finger-like processes of the fimbriated end of the infundibulum (fimbriae) spread over the medial surface of the ovary.
- Ampulla: the widest and longest part of the tube, which begins at the medial end of the infundibulum; fertilization of the oocyte usually occurs in the ampulla.
- Isthmus: the thick-walled part of the tube, which enters the uterine horn
- Uterine part: the short intramural segment of the tube that passes through the wall of the uterus
- At ovulation, the fimbria engorge with blood to grasp the ovary
- Tube is made of simple columnar epithelium with cilia
- Takes 3-4 days to go down the tube
- Fertilization occurs in the tube
  - Tubal pregnancy – fertilization imbeds in the tube
  - Ectopic pregnancy – fertilization imbeds and drops into the peritoneum
- Fertilized ova moves to the uterus to develop





Arterial Supply and Venous Drainage of Ovaries and Uterine Tubes

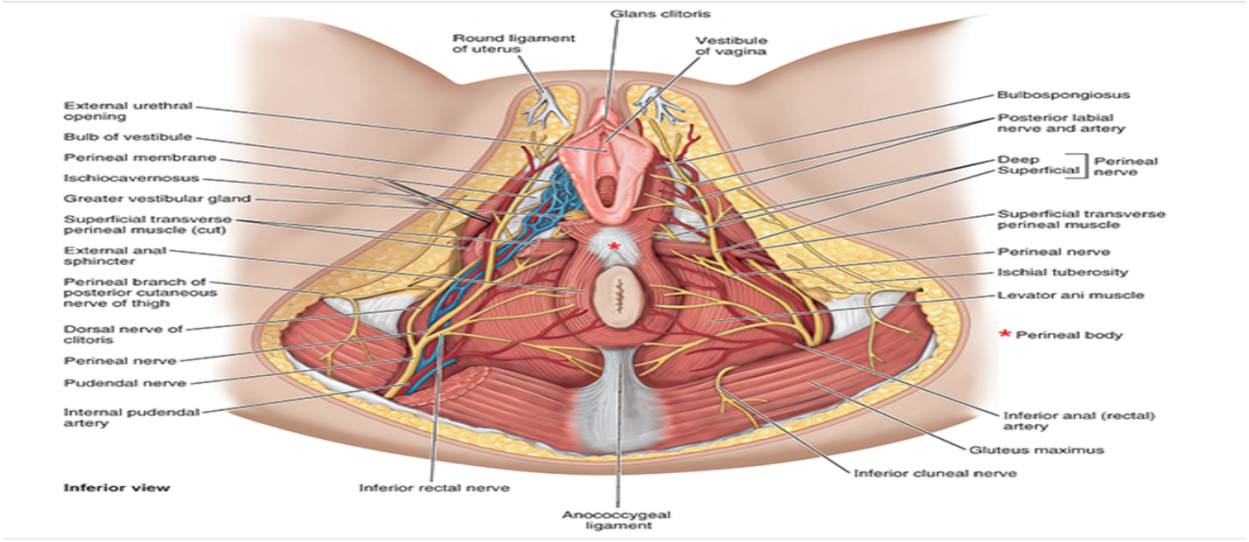
- The ovarian arteries arise from the abdominal aorta and descend along the posterior abdominal wall.
- At the pelvic brim, they cross over the external iliac vessels and enter the suspensory ligaments, approaching the lateral aspects of the ovaries and uterine tubes.
- Veins draining the ovary form a vine-like pampiniform plexus of veins in the broad ligament near the ovary and uterine tube.
- The veins of the plexus usually merge to form a singular ovarian vein, which leaves the lesser pelvis with the ovarian artery.
- The right ovarian vein ascends to enter the inferior vena cava.
- The left ovarian vein drains into the left renal vein.

Vagina

- A tubular organ located between the rectum, urethra, and bladder
- Structure of the vagina
    - The vagina is a collapsible tube capable of distention, composed of smooth muscle, and lined with mucous membrane arranged in rugae
    - The anterior wall is shorter than the posterior wall because the cervix protrudes into its uppermost portion
    - Hymen: a mucous membrane that typically forms a border around the vagina in young premenstrual girls
- The vagina lies posterior to the urinary bladder and urethra.
- The vagina lies anterior to the rectum, passing between the medial margins of the levator ani (puborectalis) muscles.
- Four muscles compress the vagina, acting as sphincters: pubovaginalis, external urethral sphincter, urethrovaginal sphincter, and bulbospongiosus.
- Functions of the vagina
    - The lining of the vagina lubricates and stimulates the penis during sexual intercourse and acts as a receptacle for semen
    - The vagina is the lower portion of the birth canal
    - The vagina transports tissue and blood sheds during menstruation outside the body

Vulva – External Genitalia

- The female external genitalia include the mons pubis, labia majora, labia minora, clitoris, bulbs of vestibule, and greater and lesser vestibular glands.
- The synonymous terms vulva and pudendum include all these parts; the term pudendum is commonly used clinically.
- The vulva serves
  - as sensory and erectile tissue for sexual arousal and intercourse
  - to direct the flow of urine
  - to prevent entry of foreign material into the urogenital tract
- Mons pubis - superficial fat pad over symphysis pubis
- Labia majora - folds of skin with glands that protect vestibule
- Labia minora
  - Folds of skin with glands that protects clitoris, urethra and vagina
- Clitoris
  - Erectile tissue with exposed glans
  - Clitoris contains sensory receptors that send information to the sexual response area of the brain
- Perineum
  - Area between pubic arch and coccyx
  - Episiotomy
- Greater vestibular glands – Bartholin's Glands
  - Small pea-sized glands inside vagina at 5 & 7
  - Keep the vestibule moist and lubricated
- Bulbospongiosus muscle
  - Deep in the vestibule the engorges with blood during stimulation which squeezes the urethra shut
- Lesser vestibular glands – Skene's Glands
  - Also called paraurethral glands in anterior vaginal wall
  - Composed of erectile tissue
    - When stimulated, it prevents urination and increases the orgasmic potential.



The Big Picture

- Reproductive system imparts immortality to genes and ensures survival of the species
- Relation of the female reproductive system with other body systems
    - Close proximity to the urinary system; share a common structure: the vulva
    - Anatomical relation with the skeletal muscles in the perineum
    - Breasts are modifications of the skin in the integumentary system