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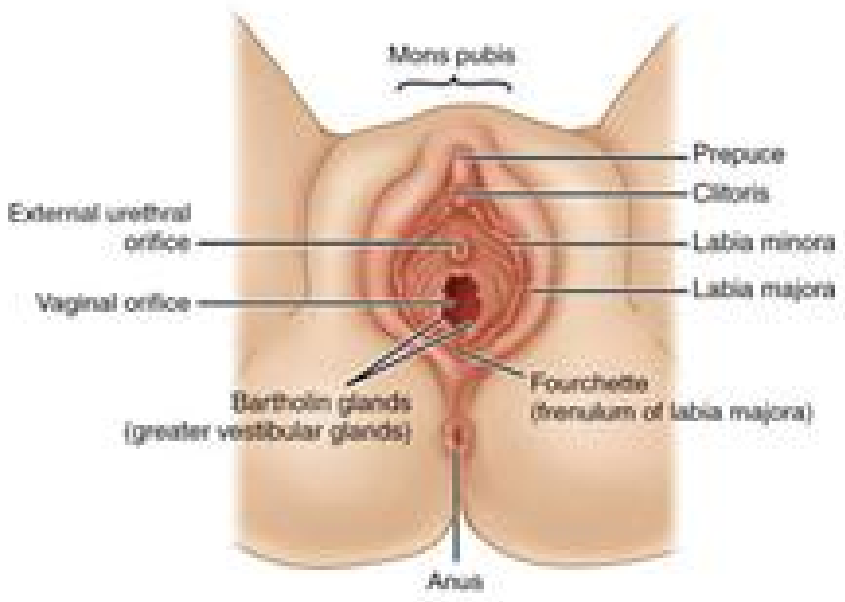

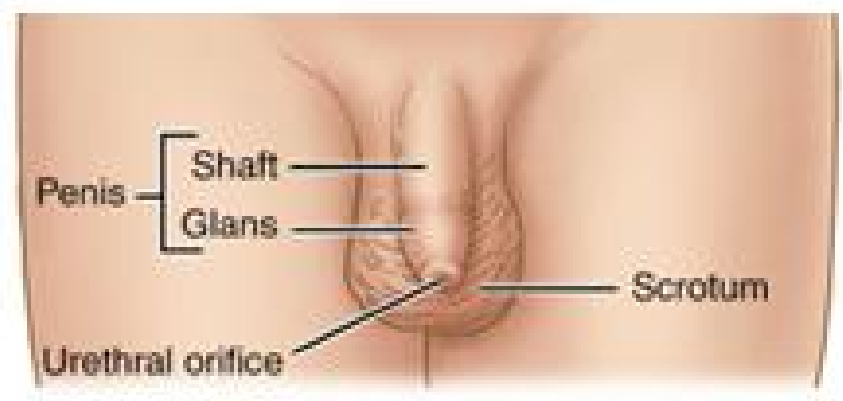

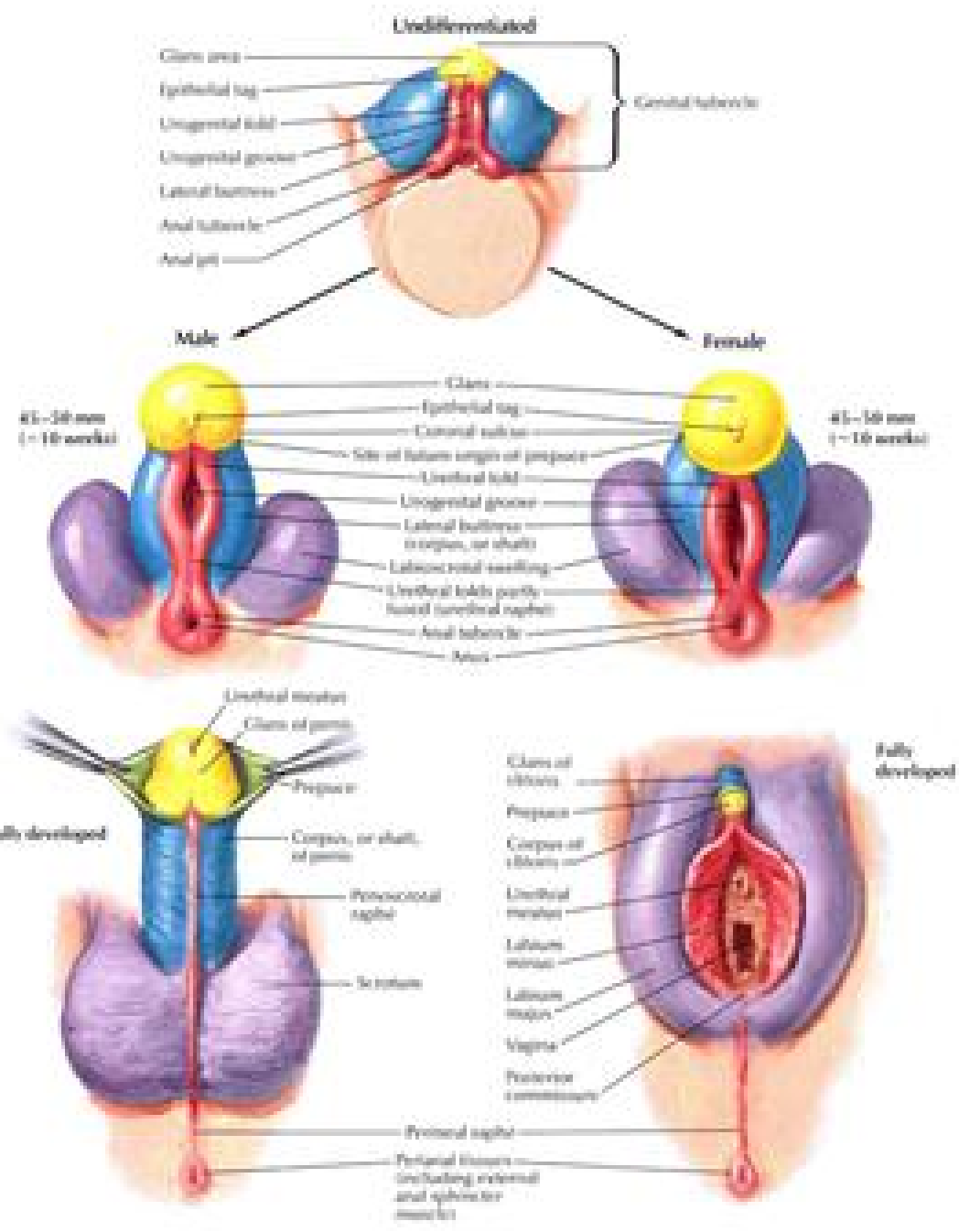

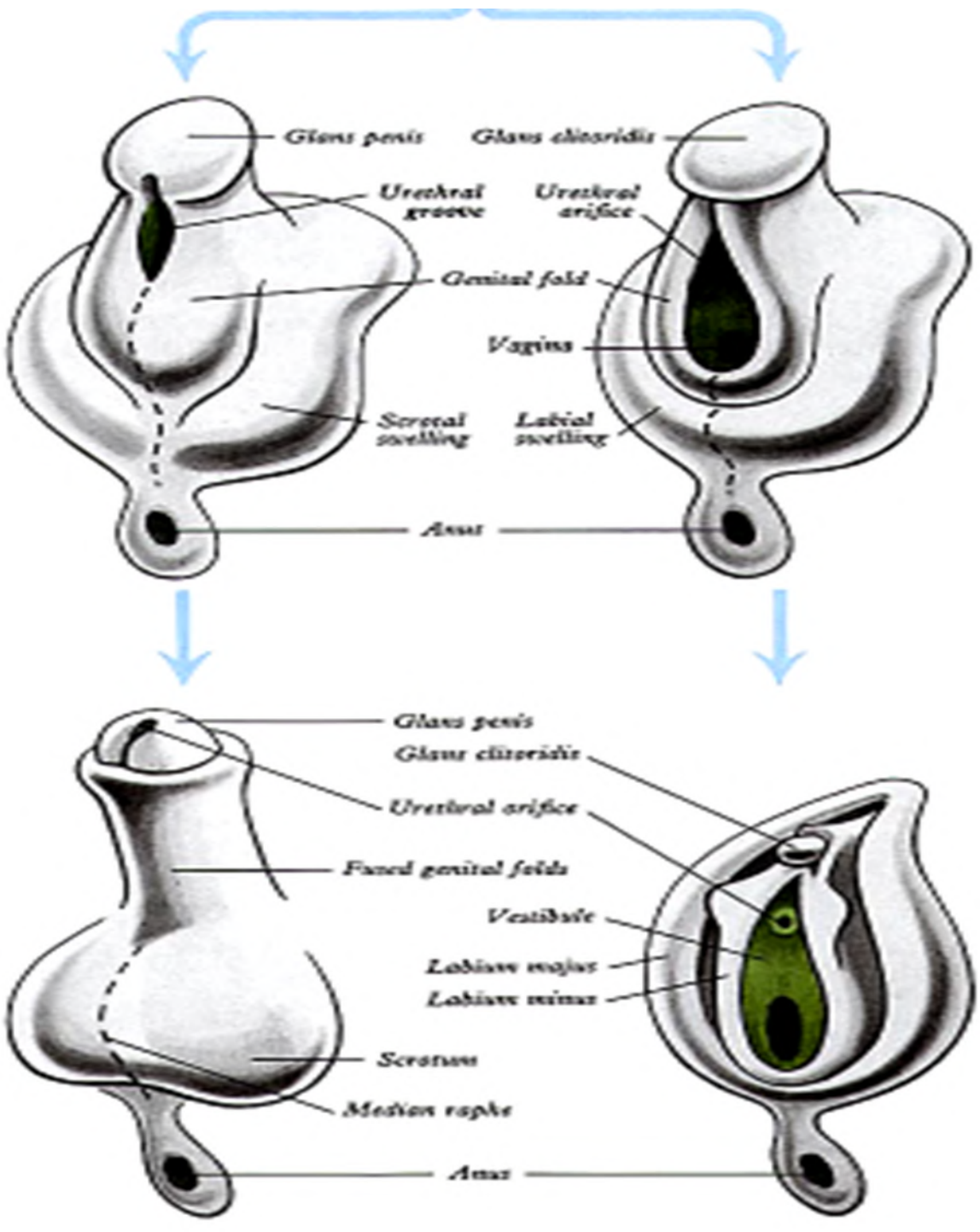

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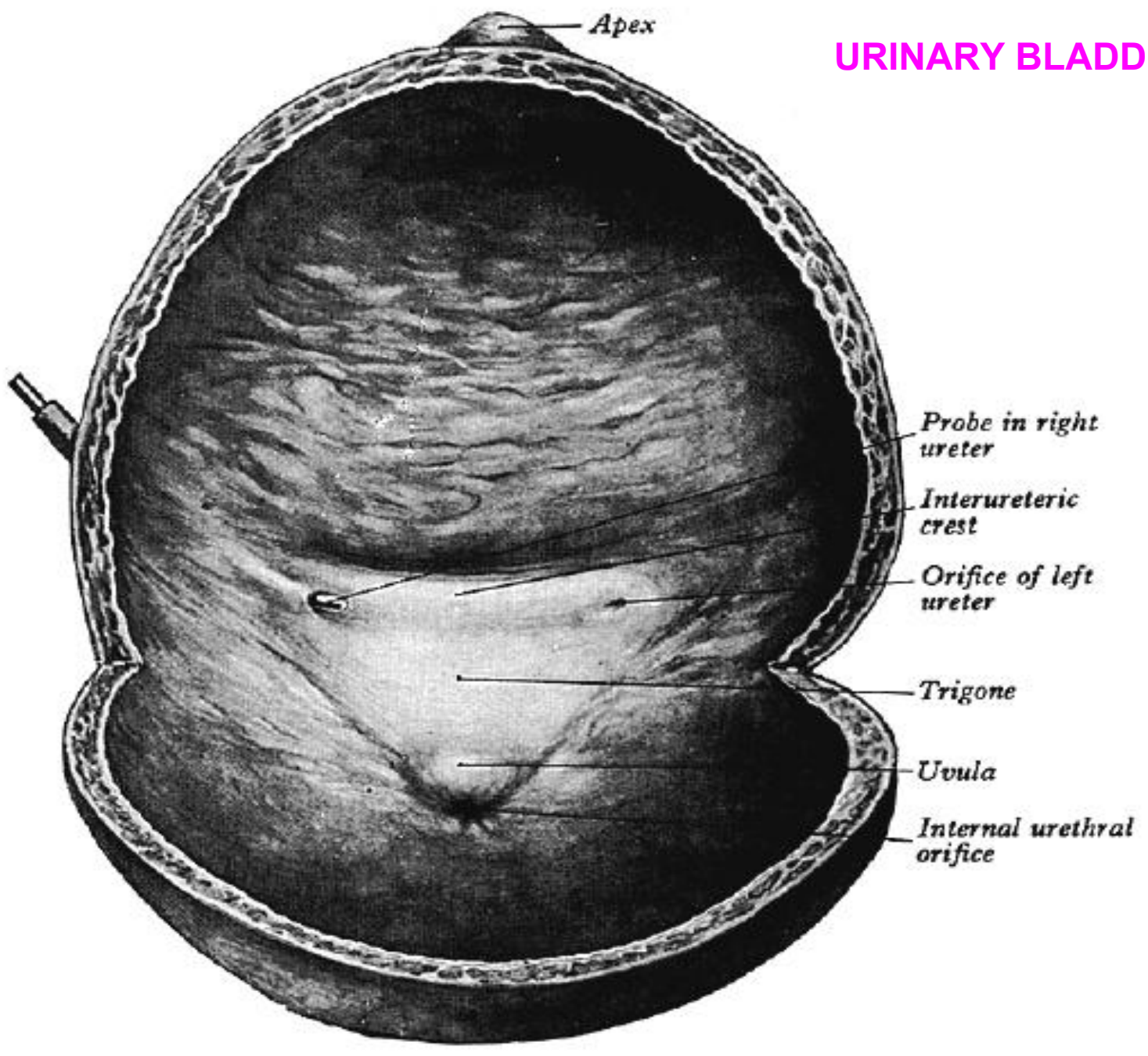
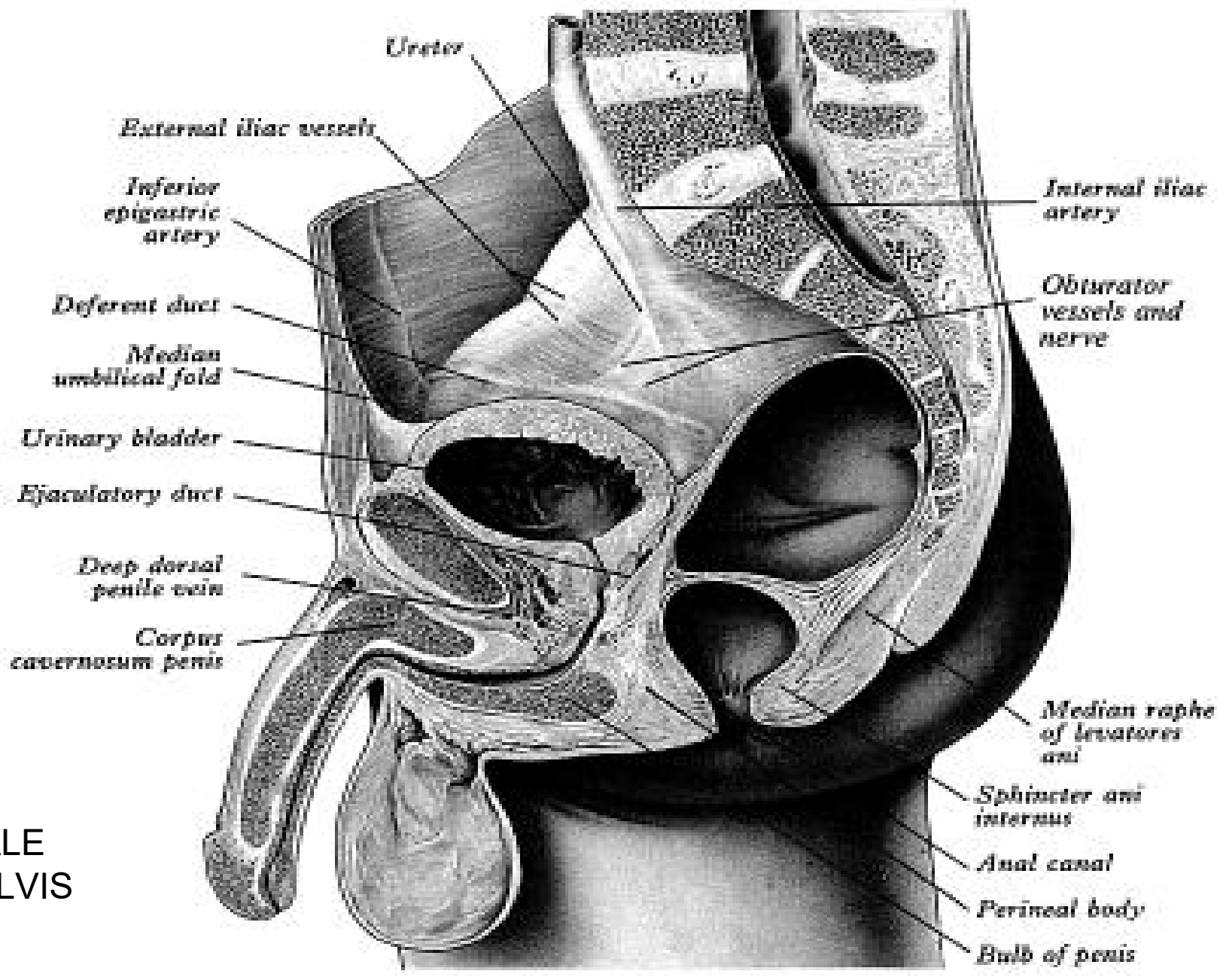
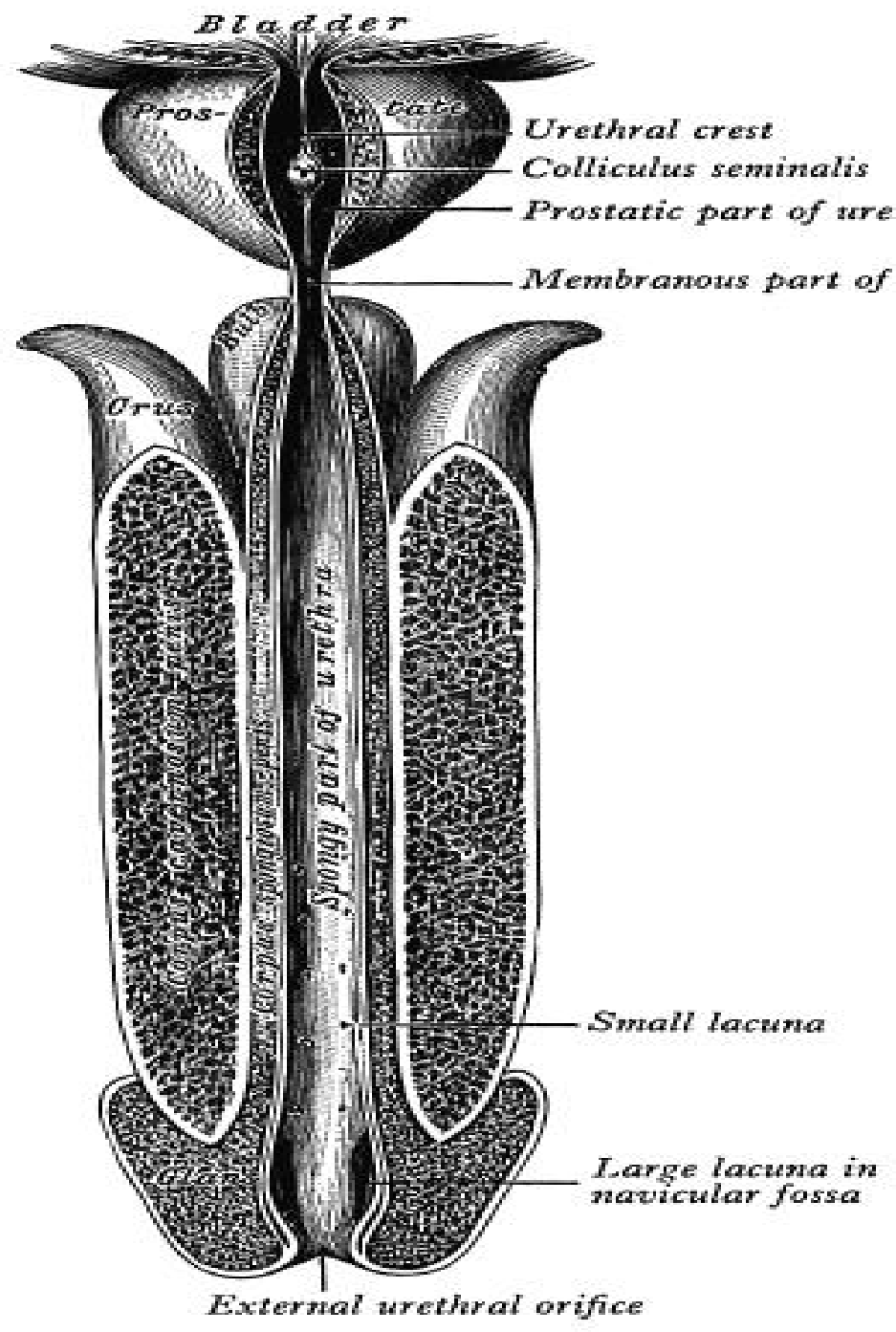
URINARY BLADDER

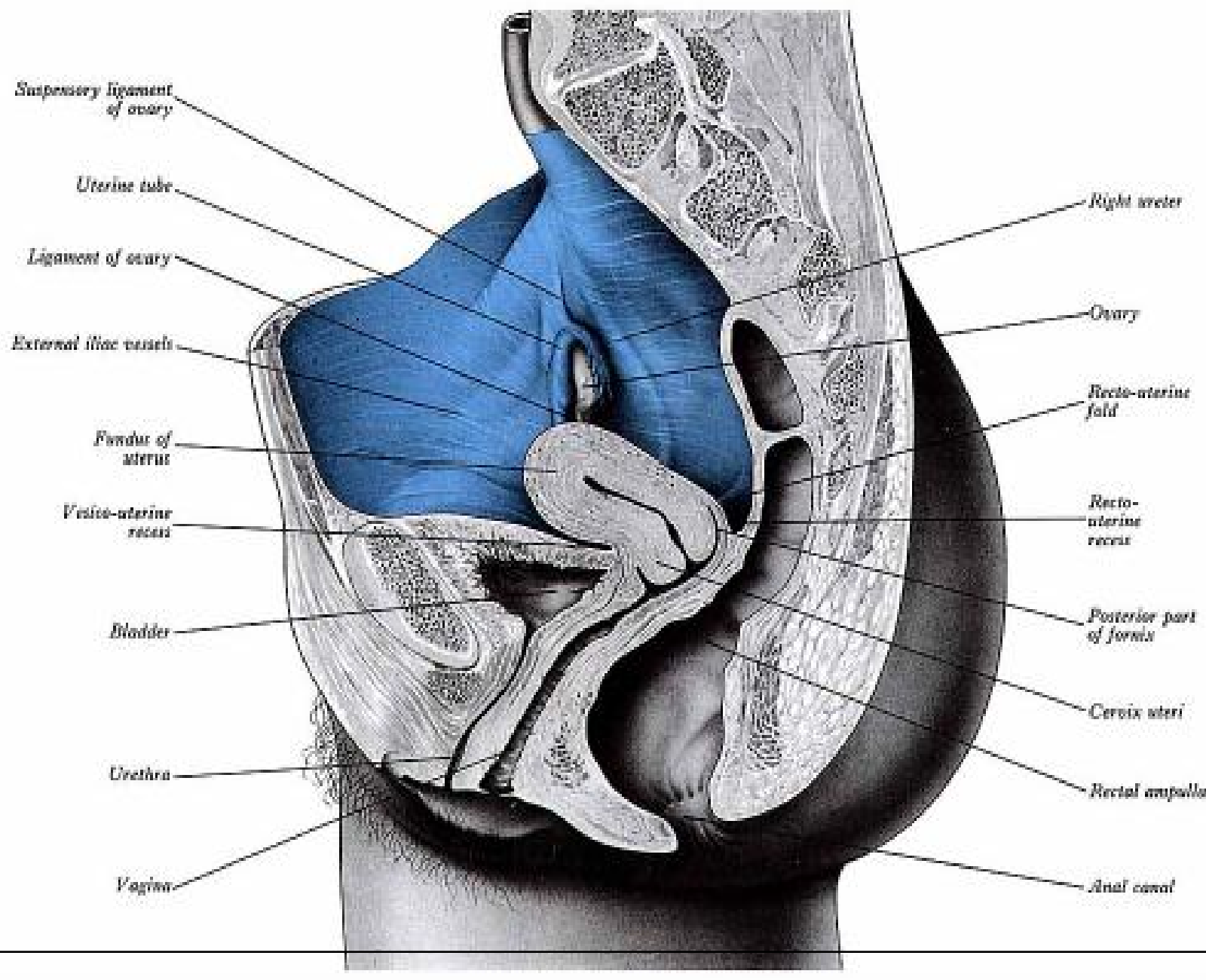


MALE PELVIS



MALE URETHRA





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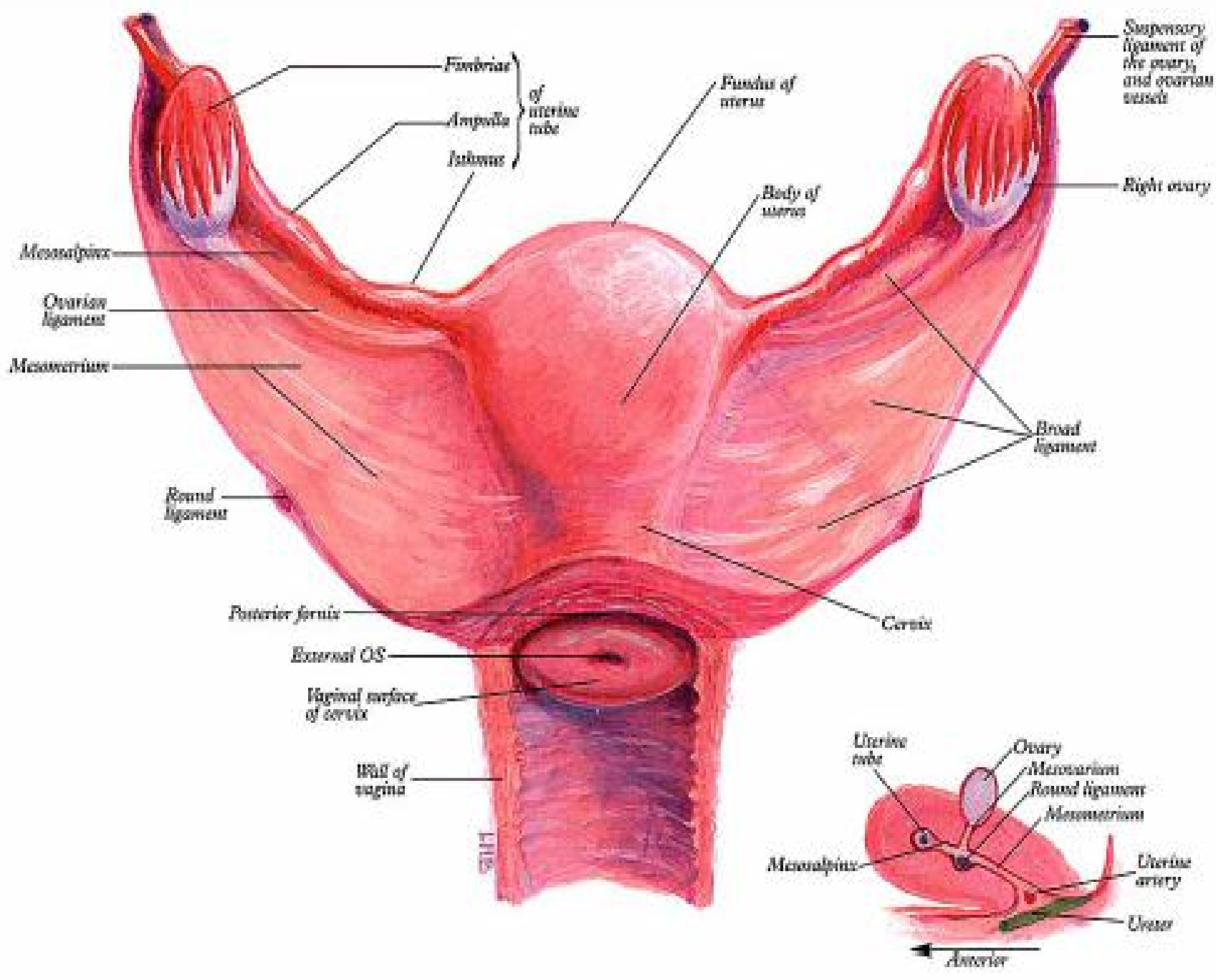
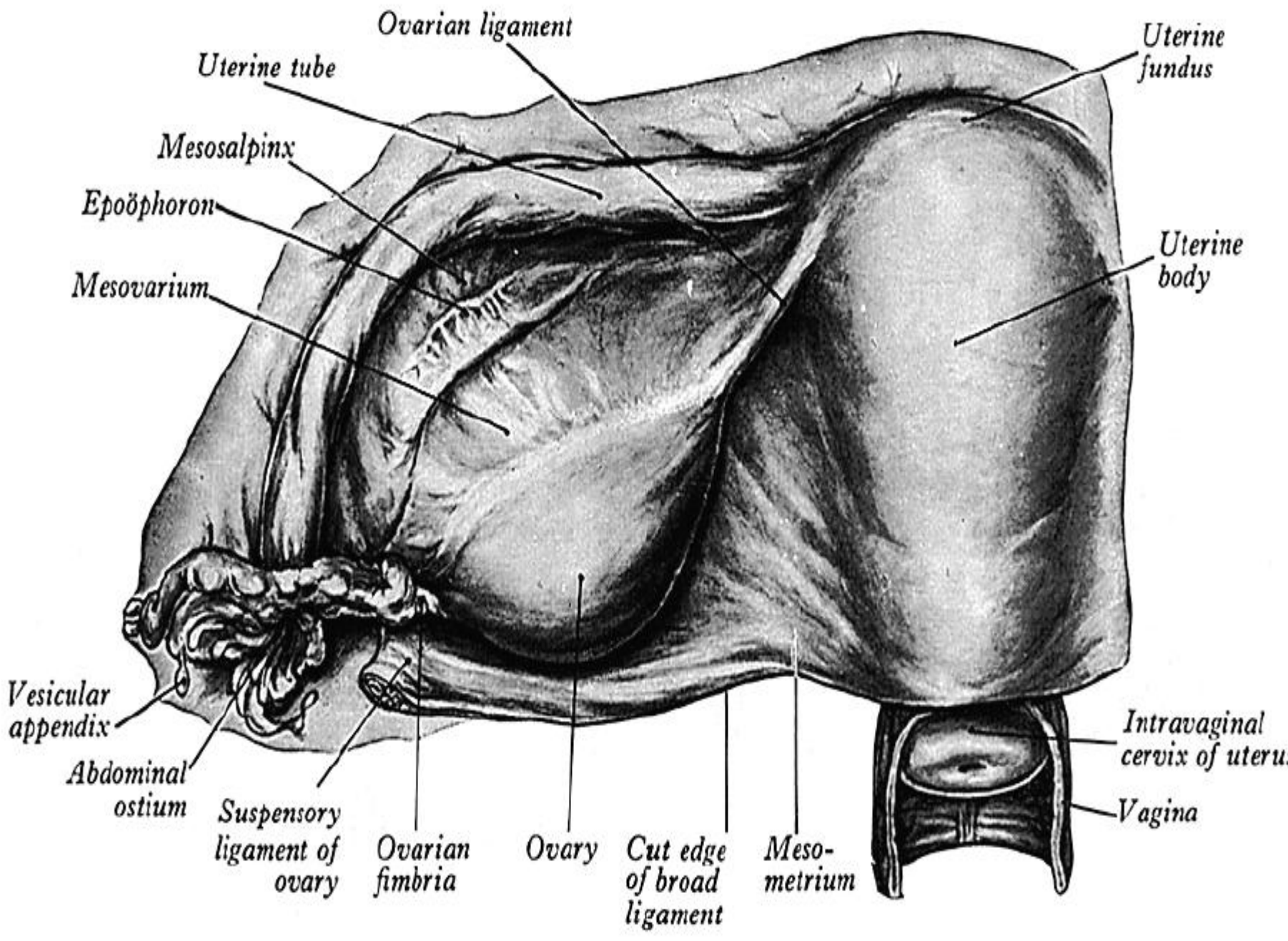
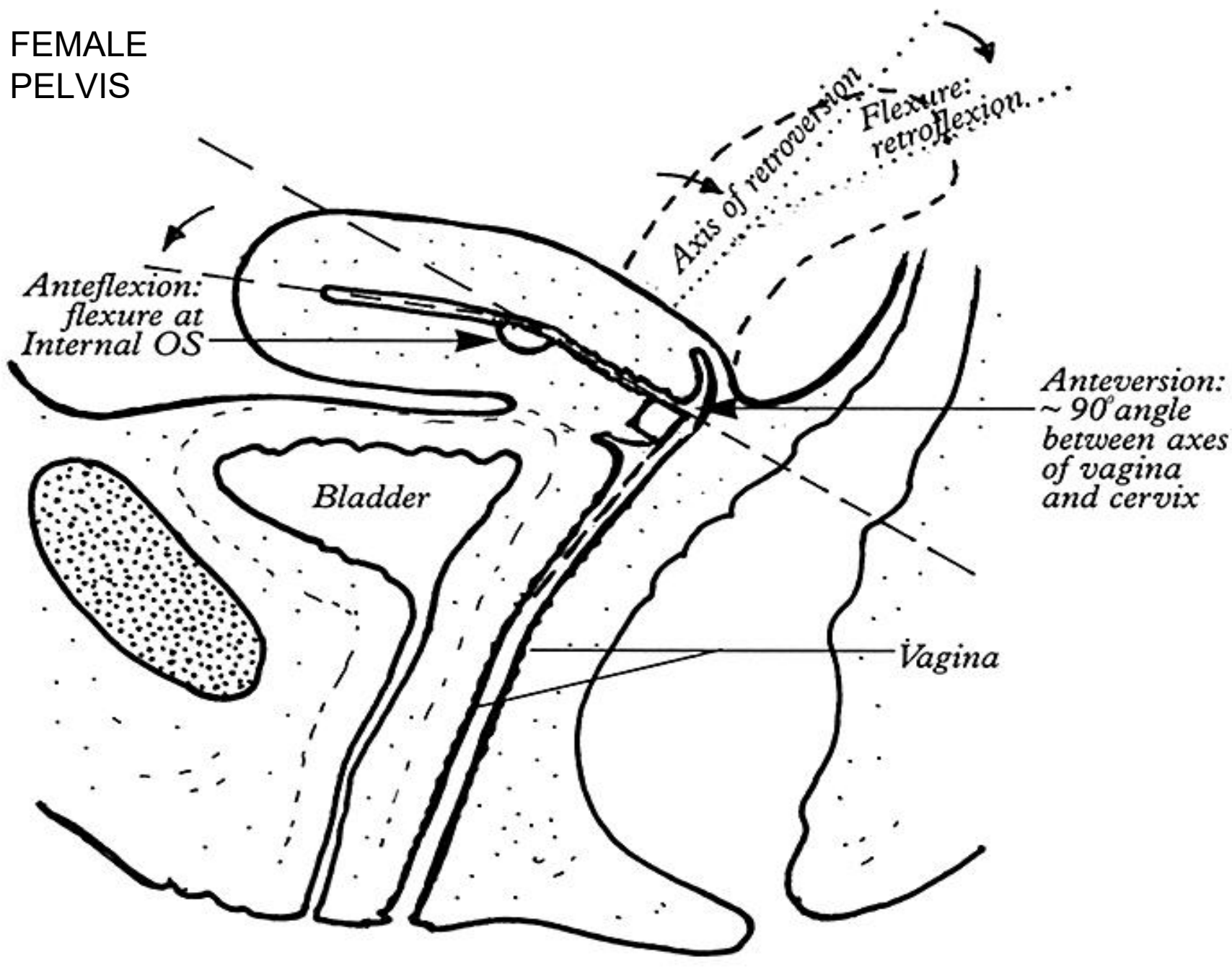
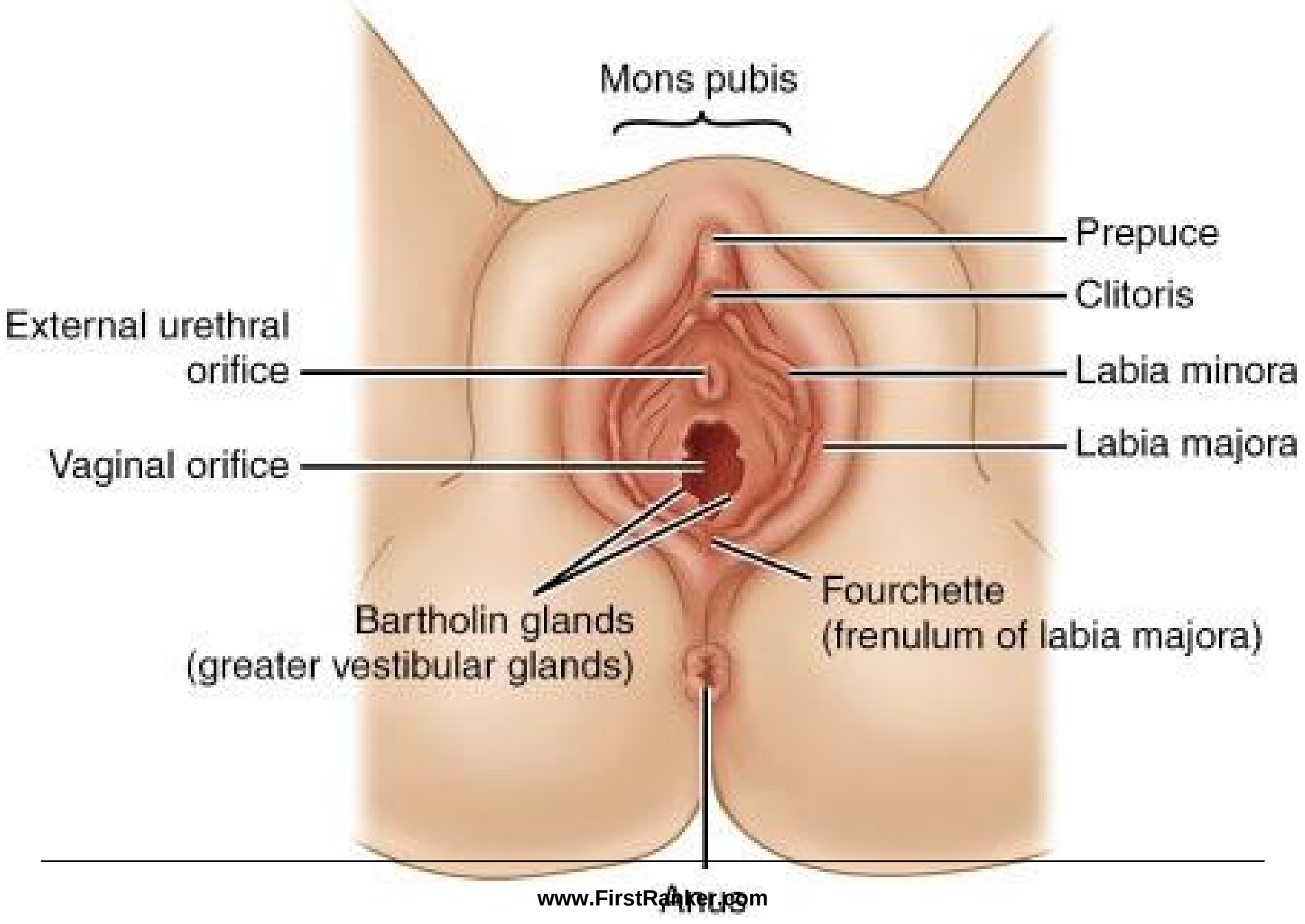




FEMALE PELVIS





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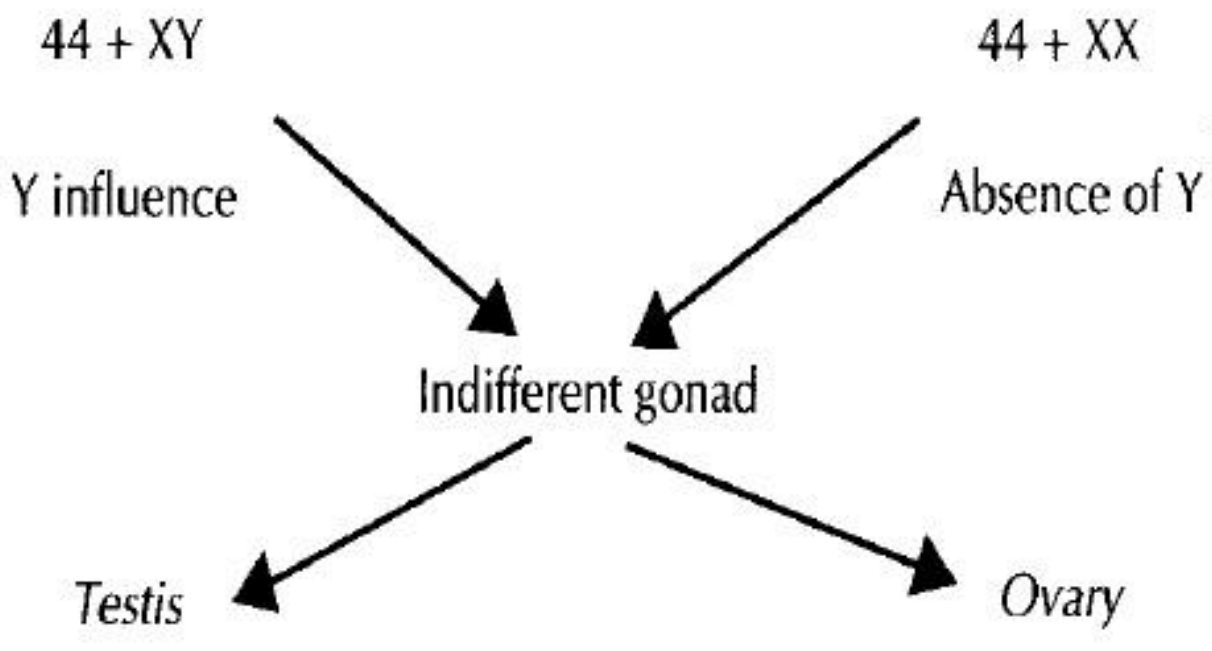
GENITAL SYSTEM

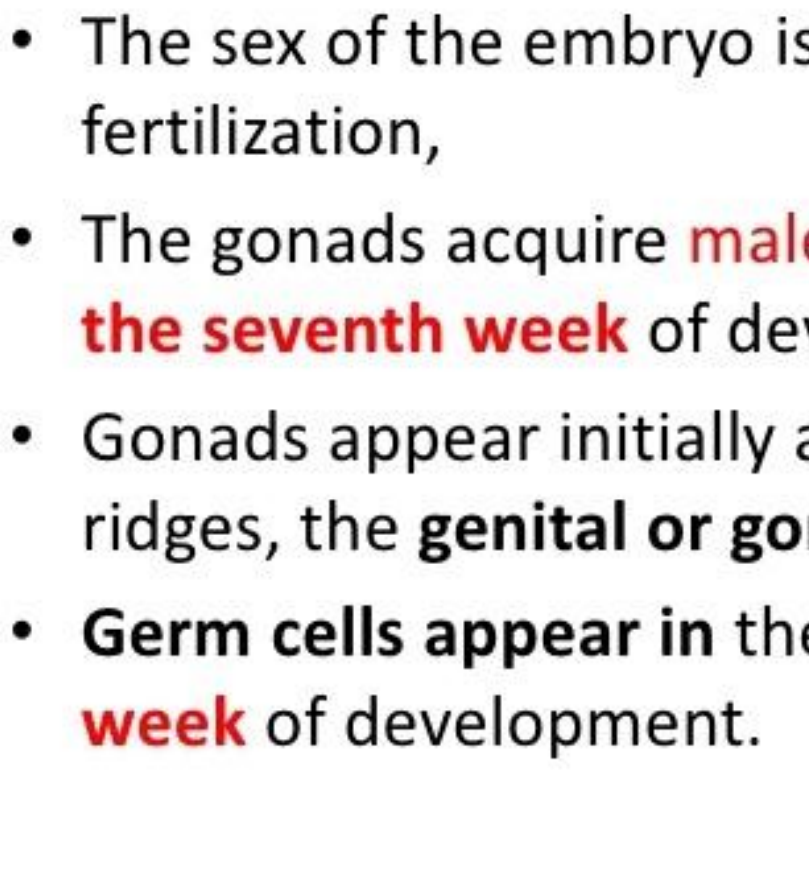
- Sex differentiation is a complex process that involves many genes, including some that are autosomal.
- The key to sexual dimorphism is the Y chromosome, which contains the ***SRY (sex-determining region on Y) gene on its*** short arm (Yp11).
- *The protein product of this gene is a transcription factor initiating a cascade of downstream genes that determine the fate of rudimentary sexual organs.*
- The SRY protein is the **testis-determining factor; under** its influence male development occurs;
- In its absence female development is established.



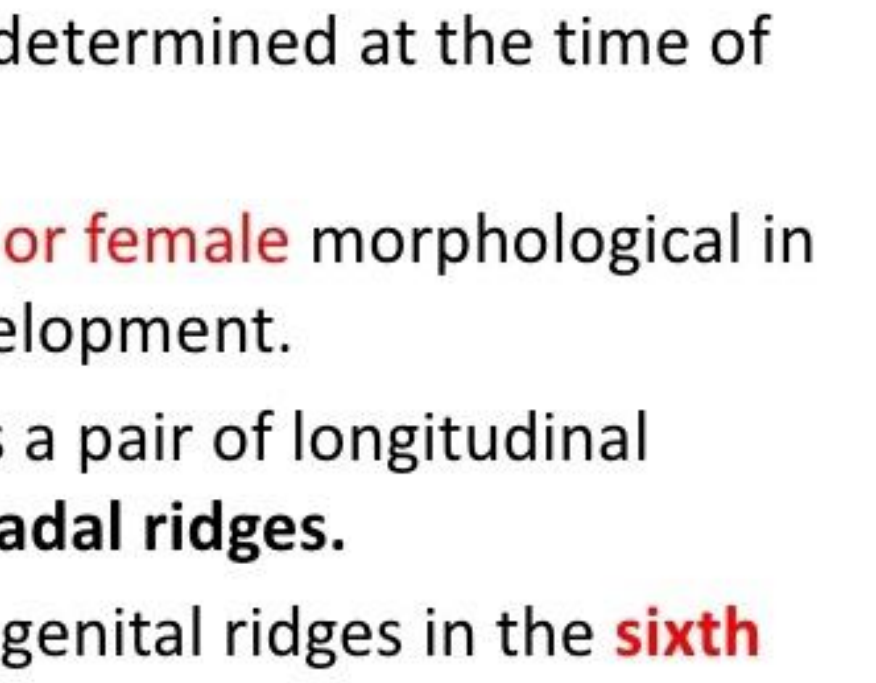
Influence of primordial germ cells on indifferent gonad

GONADS

- The sex of the embryo is determined at the time of fertilization,
- The gonads acquire male or female morphological in **the seventh week** of development.
- Gonads appear initially as a pair of longitudinal ridges, the **genital or gonadal ridges.**
- **Germ cells appear in** the genital ridges in the **sixth week** of development.



Relation of the genital ridge and the mesonephros showing location of the mesonephric duct



Transverse section through the mesonephros and genital ridge

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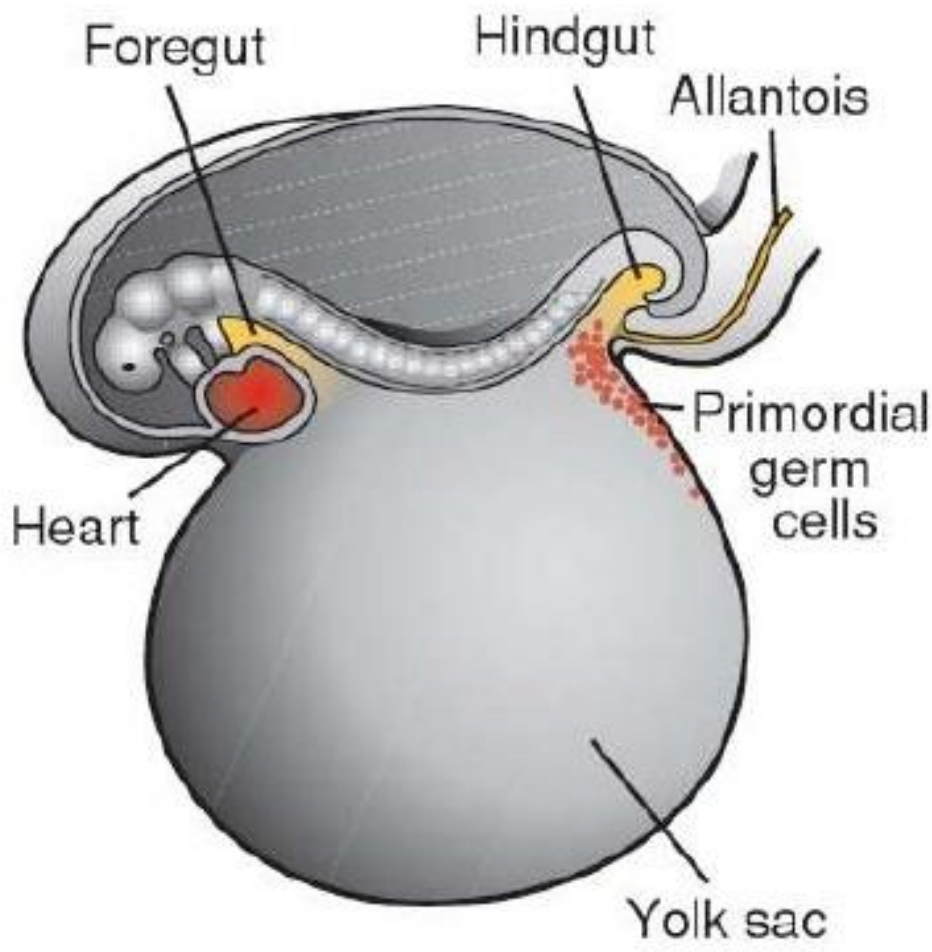
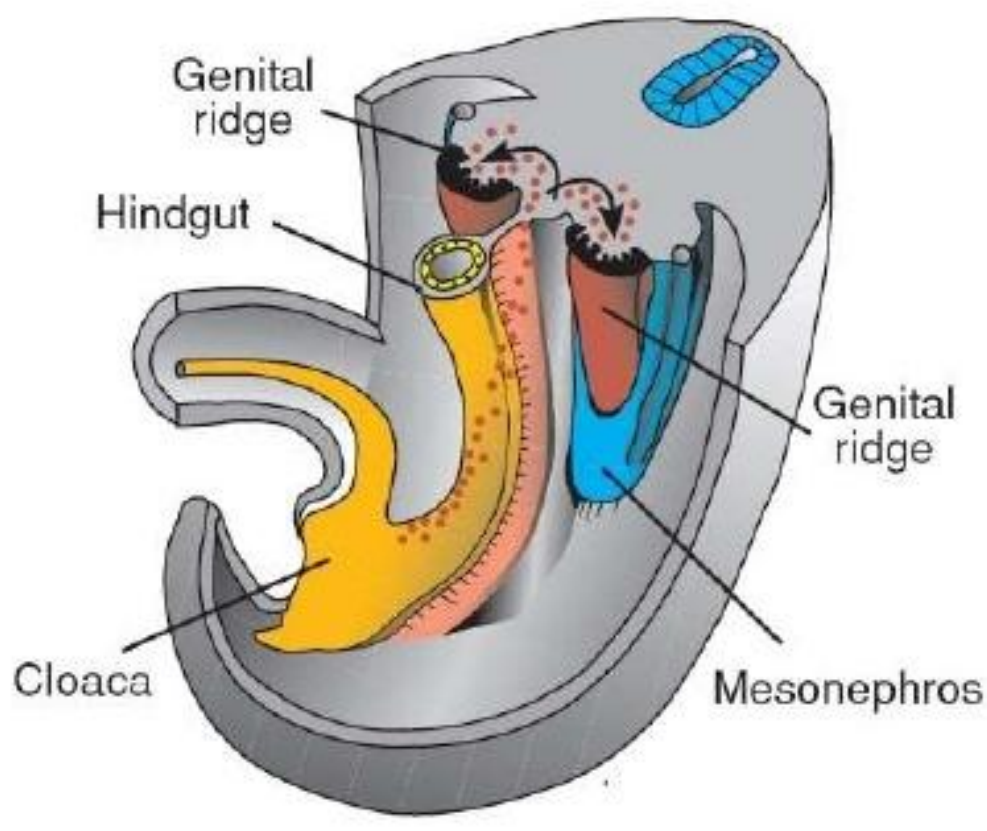
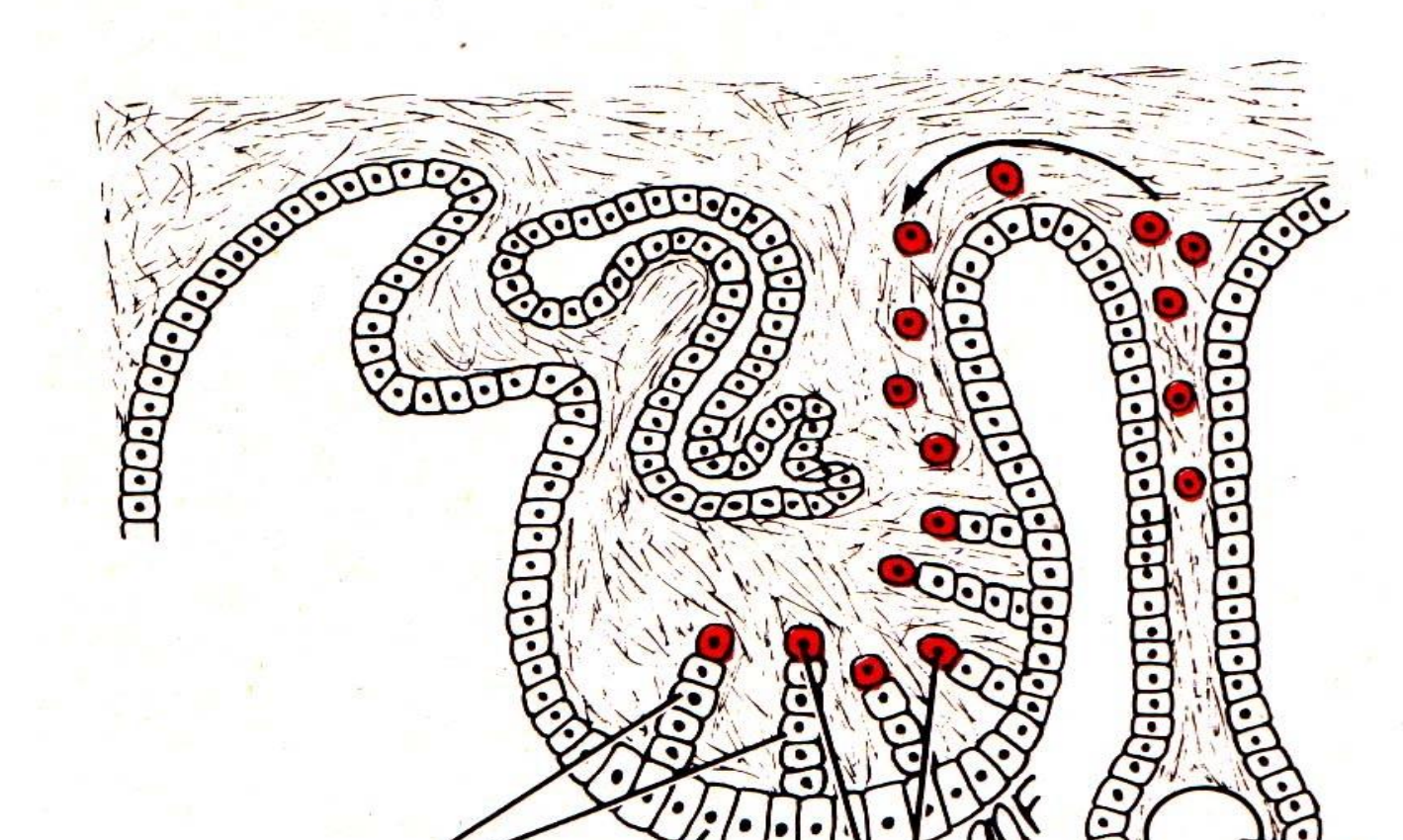
A 3-week-old embryo showing the primordial germ cells in the wall of the yolk sac close to the attachment of the allantois



Migrational path of the primordial germ cells along the wall of the hindgut and the dorsal mesentery into the genital ridge



indifferent gonad



Transverse section through the lumbar region of a 6-week embryo showing the **indifferent gonad** with the primitive sex cords.

Some of the primordial germ cells are surrounded by cells of the primitive sex cords.

Shortly before and during arrival of primordial germ cells, the epithelium of the genital ridge proliferates, and epithelial cells penetrate the underlying mesenchyme

They form the **primitive sex cords.**

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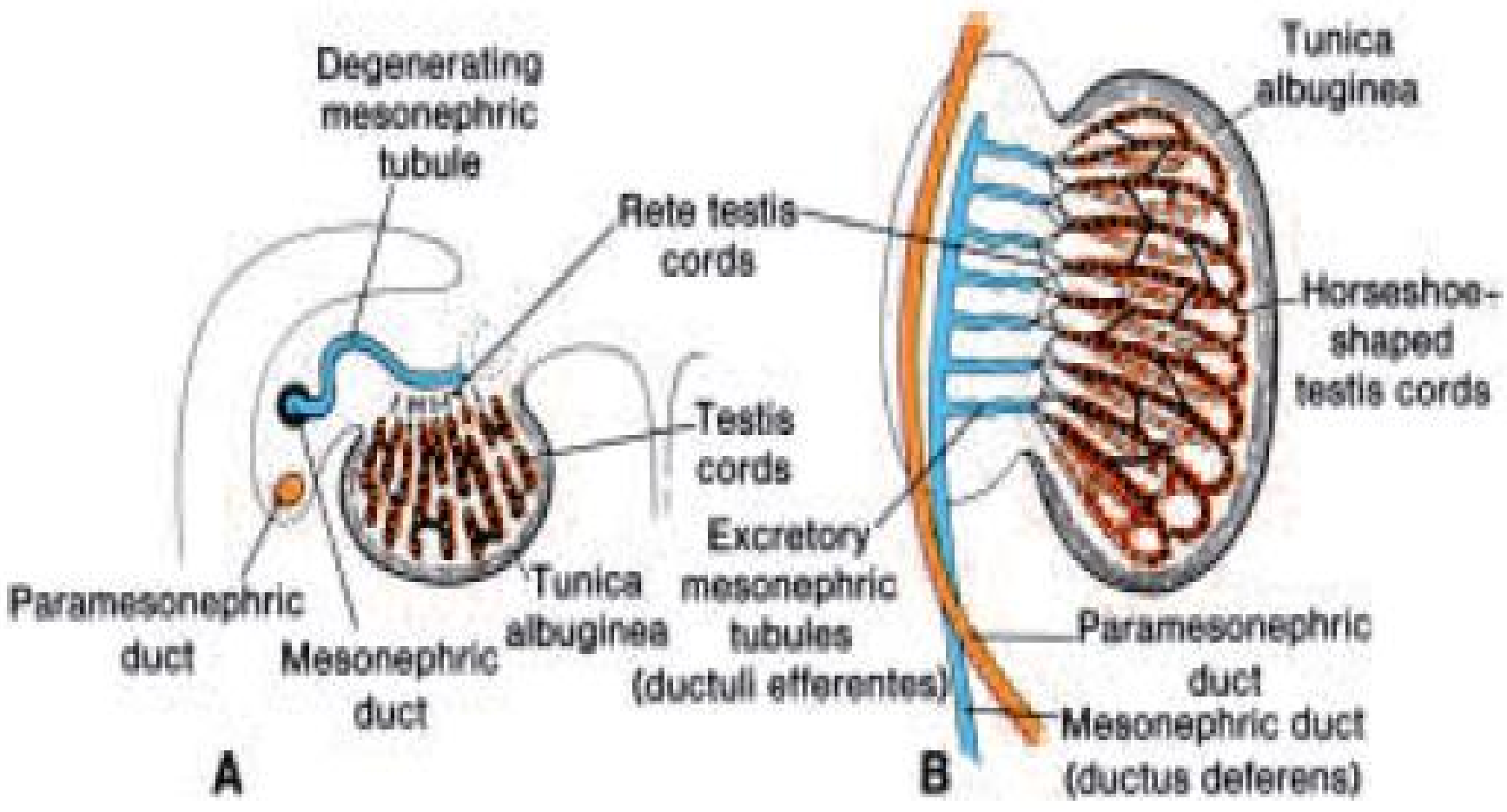
TESTIS

- If the embryo is genetically male, the primordial germ cells carry an XY sex chromosome complex.
- The **primitive sex** cords continue to proliferate and penetrate deep into the medulla to **form** the **testis or medullary cords.**
- **Toward the hilum of the gland the cords break up** into a network of tiny cell strands that later give rise to tubules of the **rete testis.**
- ***During further development, a dense layer*** of fibrous connective tissue, the **tunica albuginea,** separates the testis cords from the surface epithelium.



Transverse section through the testis in the eighth week, showing the tunica albuginea, testis cords, rete testis, and primordial germ cells. The glomerulus and Bowman's capsule of the mesonephric excretory tubule are degenerating. **B.** Testis and genital duct in the fourth month. The horseshoe-shaped testis cords are continuous with the rete testis cords. Note the ductuli efferentes (excretory mesonephric tubules), which enter the mesonephric duct.

TESTIS

- In the fourth month, the testis cords become horseshoe shaped, and their extremities are continuous with those of the rete testis.
- **Testis cords are now composed of;**
  - primitive germ cells
  - and **sustentacular cells of Sertoli derived from the surface epithelium of the gland.**
- **Interstitial cells of Leydig, derived from the original mesenchyme of the** gonadal ridge, lie between the testis cords.
- They begin development shortly after onset of differentiation of these cords.
- By **the eighth week of** gestation, Leydig cells begin production of **testosterone,**
- **and the testis is able to influence** sexual differentiation of the genital ducts and external genitalia.

TESTIS

- Testis cords remain solid until puberty, when they acquire a lumen, thus forming the **seminiferous tubules.**
- **Seminiferous tubules are** canalized, they join the rete testis tubules,
- **Rete testis** in turn enter the **ductuli efferentes.**
- **These efferent ductules are the remaining parts of the excretory tubules of the mesonephric system.**
- **They link the rete testis and the mesonephric or wolffian duct**, which becomes the **ductus deferens.**

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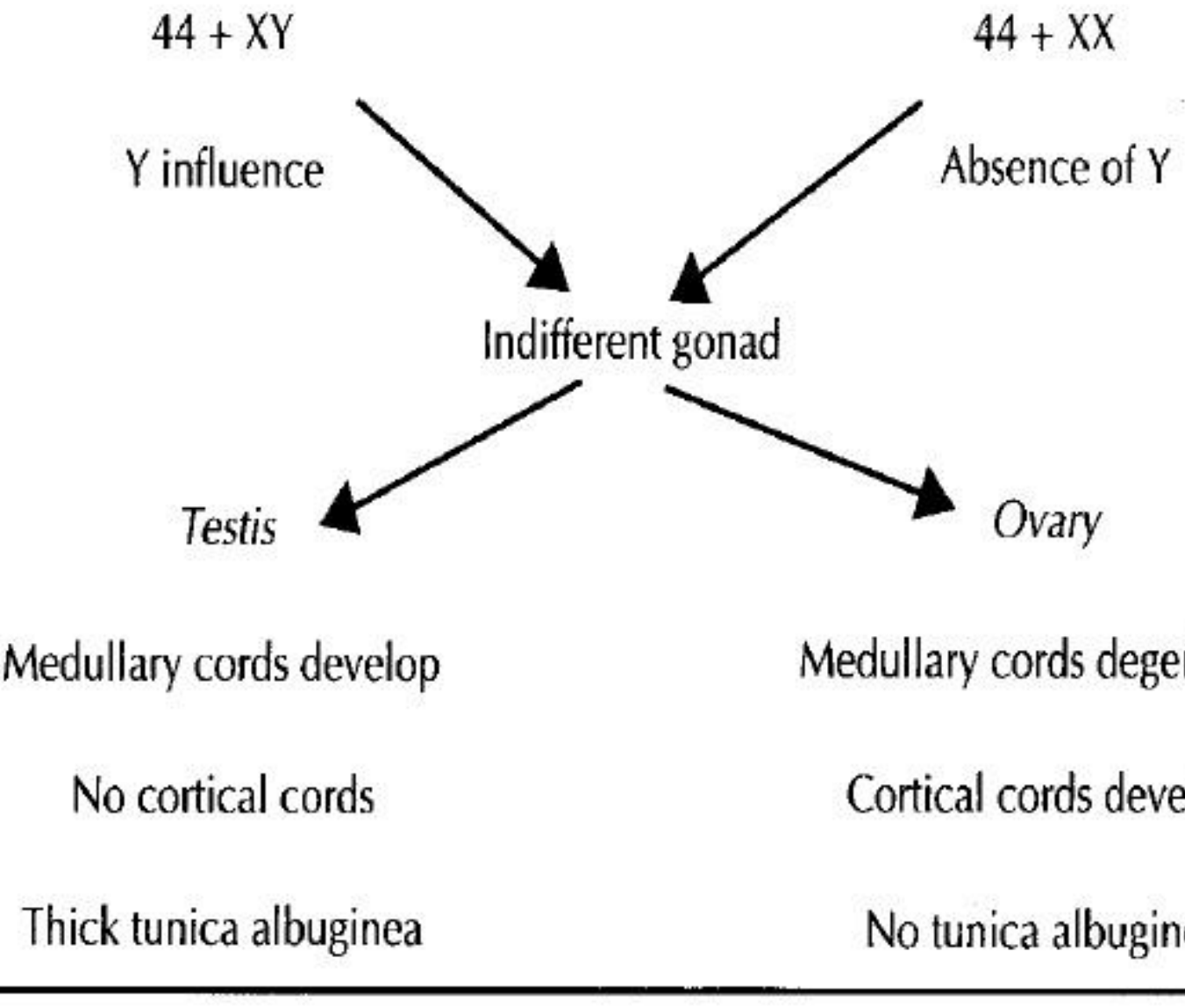
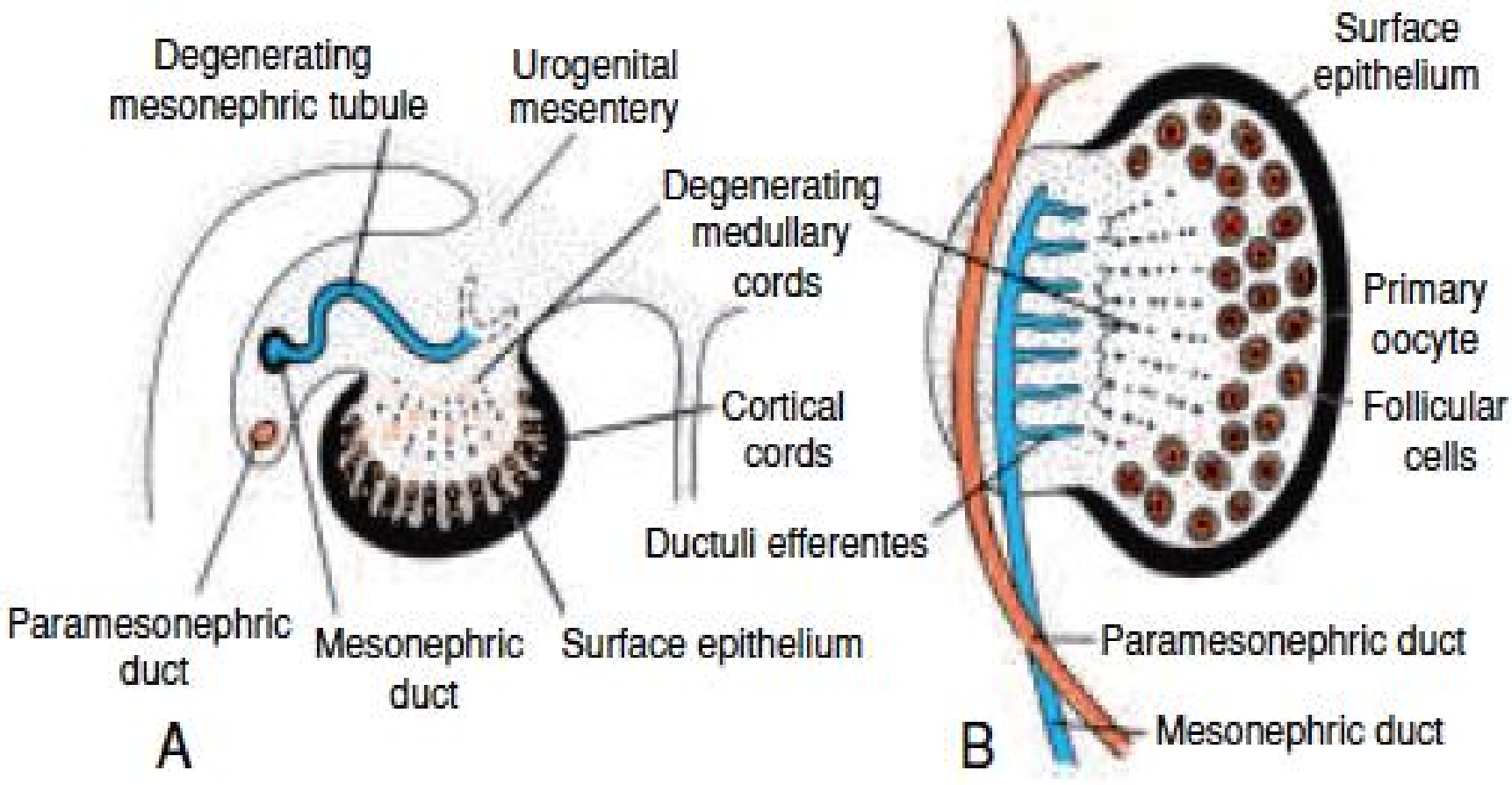


Influence of primordial germ cells on indifferent gonad

Ovary

- **In female embryos with an XX sex chromosome complement and no Y chromosome,**
- **primitive sex cords** dissociate into irregular
- cell clusters.
- **The clusters, containing groups of primitive germ cells,**
- *the clusters* **Later they disappear**
- **and replaced by a vascular stroma** (forms the **ovarian medulla).**
- Surface epithelium continues to proliferate.
- **In the seventh week,** it gives rise to a second generation of cords, **cortical cords,**
- **In the fourth month, *these cords split into* isolated cell clusters, with each surrounding one or more primitive germ cells.**
- **Germ cells** *develop into* **oogonia,**
- **the surrounding epithelial cells** form **follicular cells.**



A. Transverse section of the ovary at the seventh week, showing degeneration of the primitive (medullary) sex cords and formation of the cortical cords. **B.** Ovary and genital ducts in the fifth month. Note degeneration of the medullary cords. The excretory mesonephric tubules (efferent ductules) do not communicate with the rete. The cortical zone of the ovary contains groups of oogonia surrounded by follicular cells.

Ovary

- It may thus be stated that the genetic sex of an embryo is determined at the time of fertilization, depending on whether the spermatocyte carries an X or a Y chromosome.
- In embryos with an **XX sex** chromosome configuration, **medullary cords of the gonad regress**, and a **secondary** generation of cortical **cords develops**.
- In embryos with an **XY sex** chromosome complex, **medullary cords develop into testis cords**, and **secondary** cortical cords **fail to develop**.

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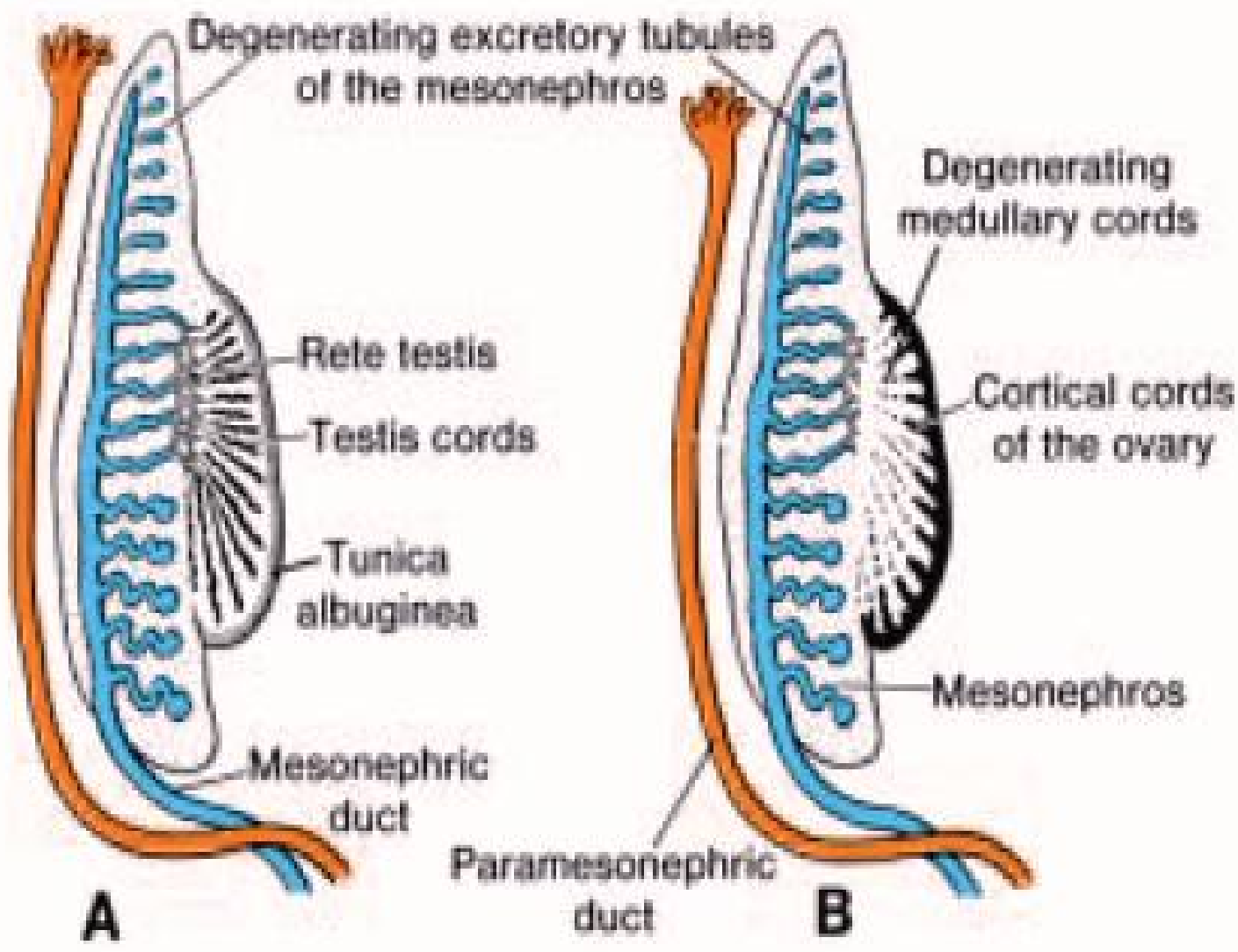


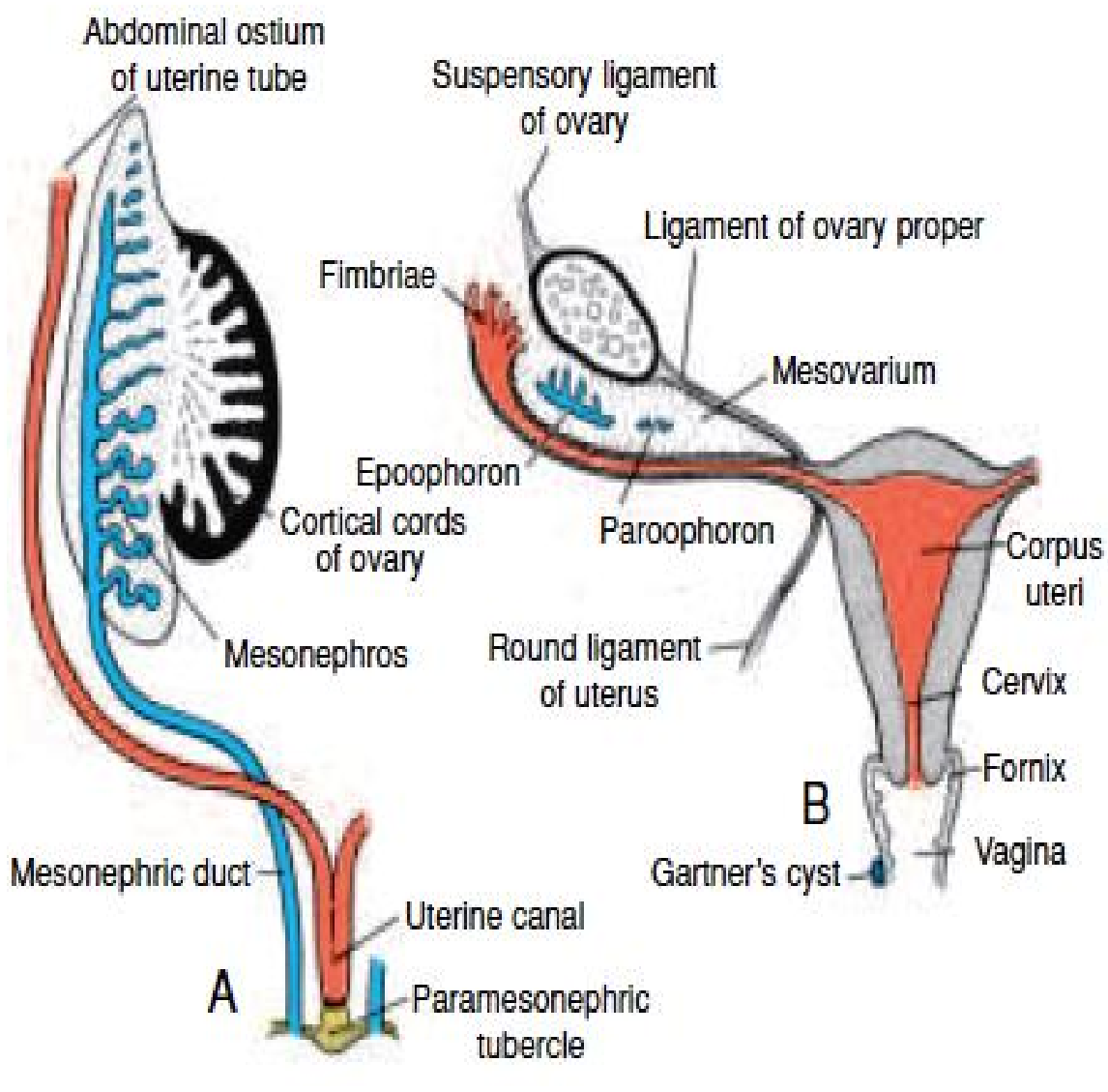
Genital ducts in the sixth week in the male **(A)** and female **(B)**. The mesonephric and paramesonephric ducts are present in both. Note the excretory tubules of the mesonephros and their relation to the developing gonad in both sexes.

GENITAL DUCTS
Indifferent Stage

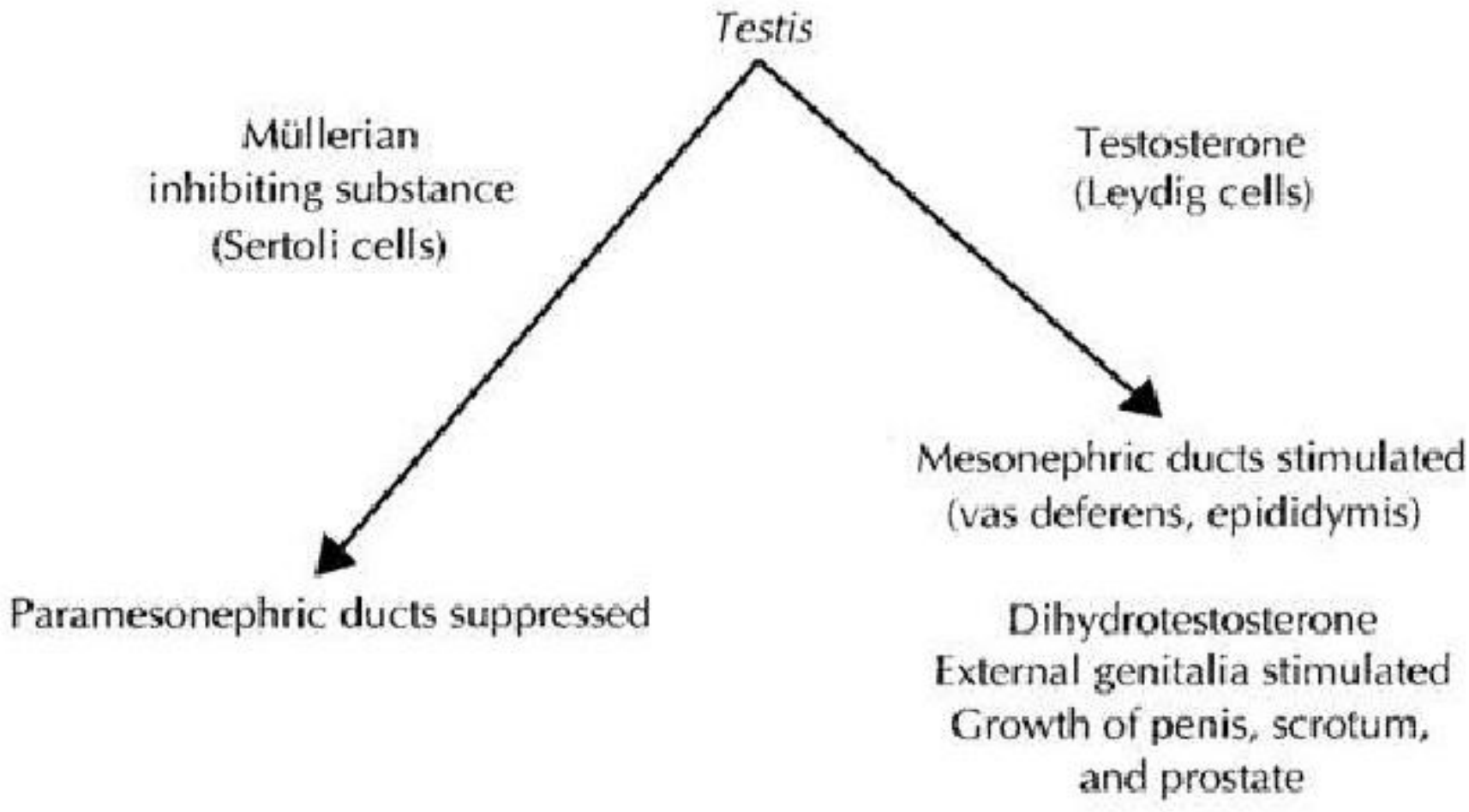
- **Initially both male and female embryos have two pairs of genital ducts**;

1. **MESONEPHRIC (WOLFFIAN) ducts**
2. **PARAMESONEPHRIC (M¨ ULLERIAN) ducts.**

- Cranially the paramesonephric duct opens into the abdominal cavity with a funnel-like structure.
- **Caudally** the paramesonephric duct first runs lateral to the mesonephric duct, then crosses it ventrally to grow caudomedially.
- **In the midline** it comes in close contact with the paramesonephric duct from the opposite side. The two ducts are initially separated by a septum but later fuse to form the **uterine canal.**
- **The caudal tip of the combined ducts** projects into the posterior wall of the urogenital sinus as (**the paramesonephric or m¨ullerian tubercle)**.
- **The mesonephric ducts open into the urogenital sinus on either side of the m¨ullerian tubercle.**



Genital ducts in the female at the end of the second month. Note the paramesonephric (m¨ullerian) tubercle and formation of the uterine canal. **B.** Genital ducts after descent of the ovary. The only parts remaining from the mesonephric system are the epoophoron, paroophoron, and Gartner's cyst. Note the suspensory ligament of the ovary, ligament of the ovary proper, and round ligament of the uterus.



Influence of the sex glands on further sex differentiation

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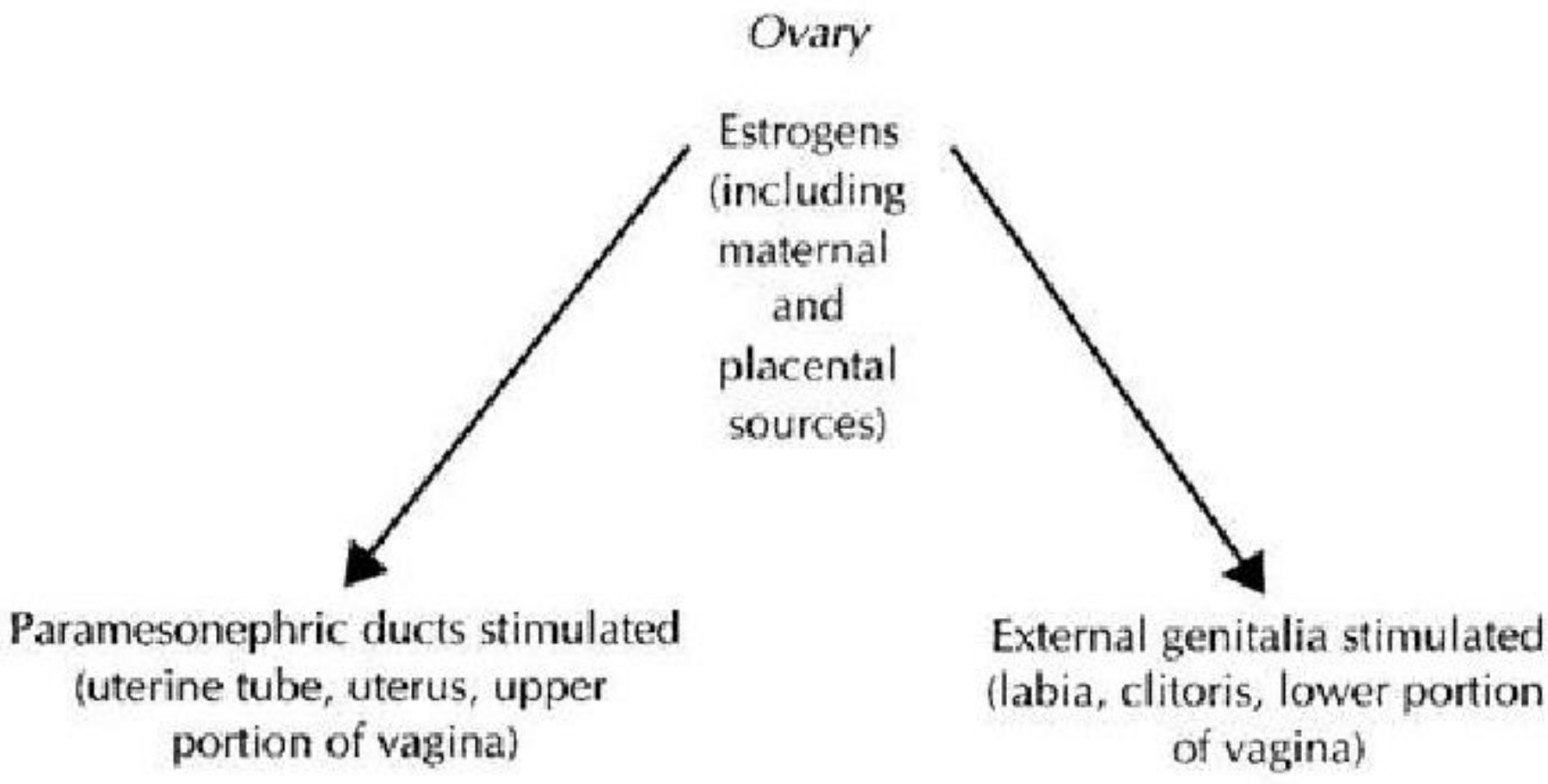
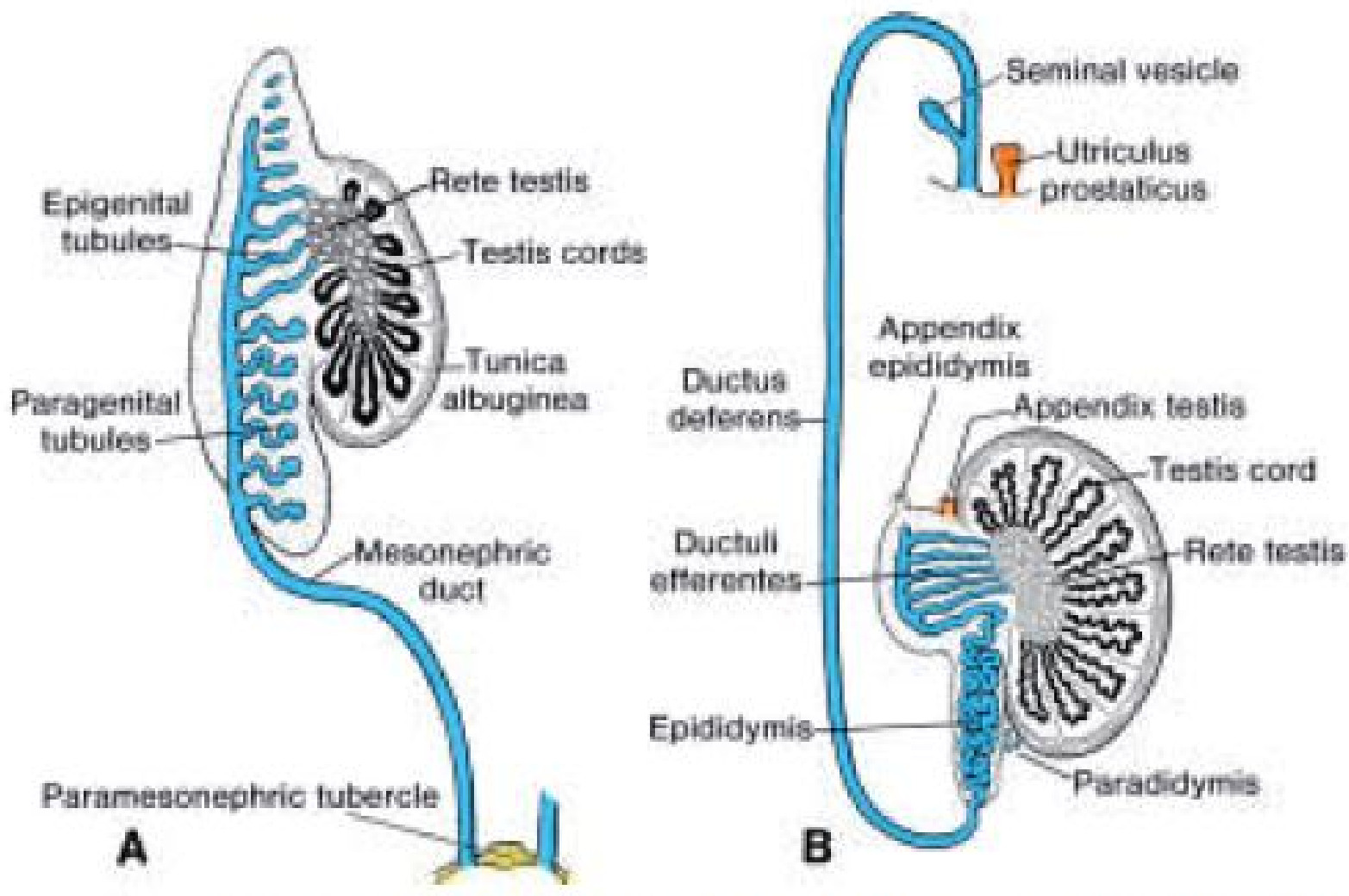


Influence of the sex glands on further sex differentiation

Genital Ducts in the Male

- As the mesonephros regresses, a few excretory tubules, the **epigenital tubules,** establish contact with cords of the rete testis and finally form the **efferent ductules of the testis.**
- **Excretory tubules along the caudal pole** of the testis, the **paragenital tubules, do not join the cords of the rete testis**.
- *Their vestiges are collectively known as the* ***paradidymis.***
- Except for the most cranial portion, **the** mesonephric ducts persist and form the main genital ducts.
- the **(ductus) epididymis.**
- the **ductus deferens.**
- **ejaculatory duct.**
- **The paramesonephric ducts** in the male degenerate except for a small portion at their cranial ends, the **appendix testis.**



A. Genital ducts in the male in the fourth month. Cranial and caudal (paragenital tubule) segments of the mesonephric system regress. **B.** Genital ducts after descent of the testis. Note the horseshoe-shaped testis cords, rete testis, and efferent ductules entering the ductus deferens. The paradidymis is formed by remnants of the paragenital mesonephric tubules. The paramesonephric duct has degenerated except for the appendix testis. The prostatic utricle is an outpocketing from the urethra.

Genital Ducts in the Female

- The paramesonephric ducts develop into the main genital ducts of the female. Initially, three parts can be recognized in each duct:

1. Cranial vertical portion that opens into the abdominal cavity,
2. Horizontal part that crosses the mesonephric duct,
3. Caudal vertical part that fuses with its partner from the opposite side.

- The first two parts develop into the **uterine tube**
- **The caudal parts fuse** to form the **uterine canal.**
- *After the ducts fuse in the midline,* **the broad ligament of the uterus** is established,.
- **The uterine tube lies in** its upper border, and the ovary lies on its posterior surface.
- ***The*** **uterus and broad ligaments divide the pelvic cavity into the uterorectal pouch uterovesical pouch.**
- **The fused paramesonephric ducts give rise to the corpus and cervix of the uterus.**
- **They are surrounded by a layer of mesenchyme** that forms the muscular coat of the uterus, the **myometrium, and its peritoneal** covering, the **perimetrium.**

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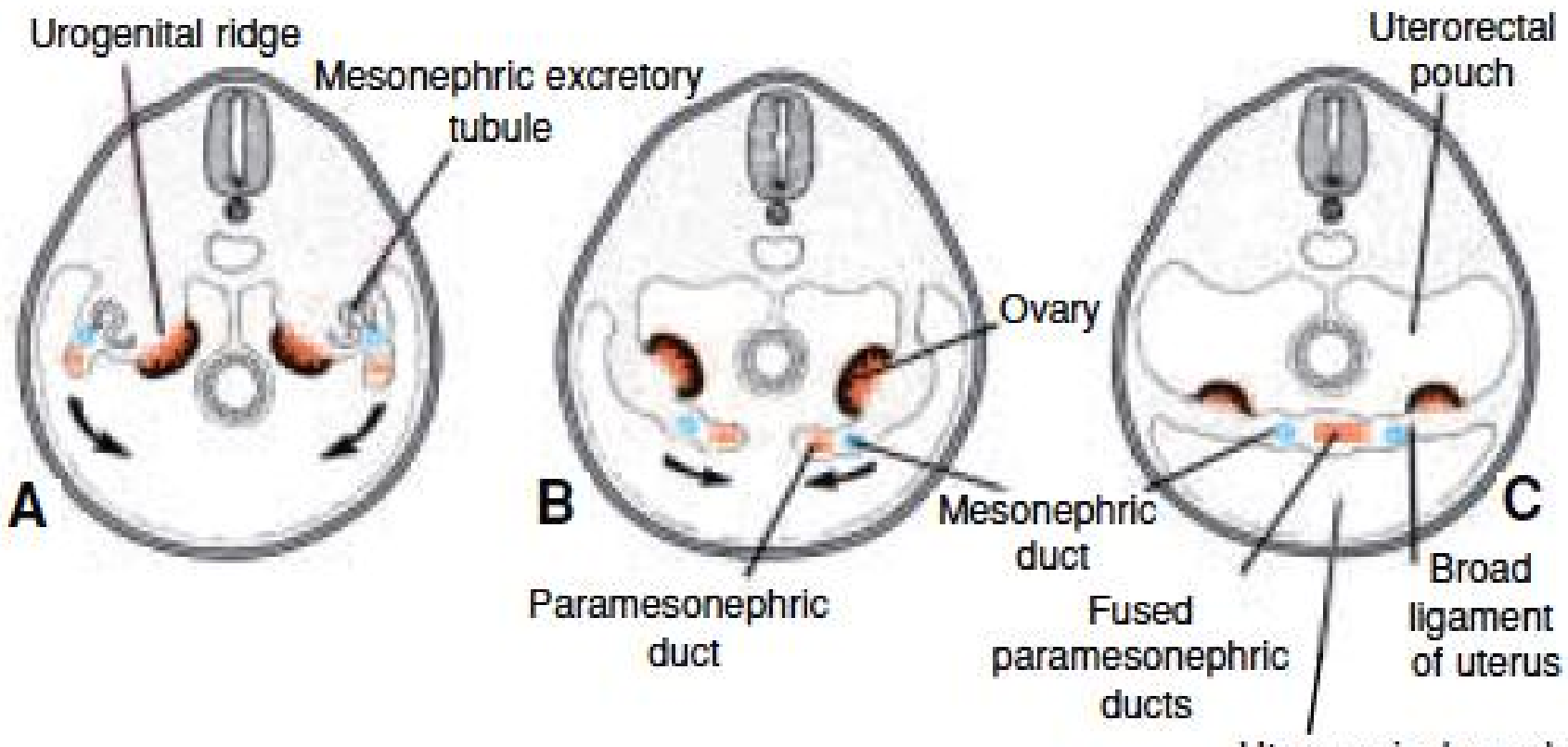

Transverse sections through the urogenital ridge at progressively lower levels. **A.** and **B.** The paramesonephric ducts approach each other in the midline and fuse. **C.** As a result of fusion, a transverse fold, the broad ligament of the uterus, forms in the pelvis. The gonads come to lie at the posterior aspect of the transverse fold.

VAGINA

- The paramesonephric ducts reaches the urogenital sinus , *gives rise to* the **sinovaginal bulbs, which give rise to**
- **Solid vaginal plate.**
- **By the fifth month, the vaginal outgrowth is entirely canalized.**
- The **vaginal fornices, are of paramesonephric origin.**
- Thus, the vagina has a **dual origin**, with the upper portion derived from the uterine canal and the lower portion derived from the urogenital sinus.
- The lumen of the vagina remains separated from that of the urogenital sinus by a thin tissue plate, the **hymen.**
- *The **mesonephric duct gives rise to*** **Gartner's cyst.**
- **Epoophoron and Paroophoron are remnant of excretory tubule in the mesovarium.**

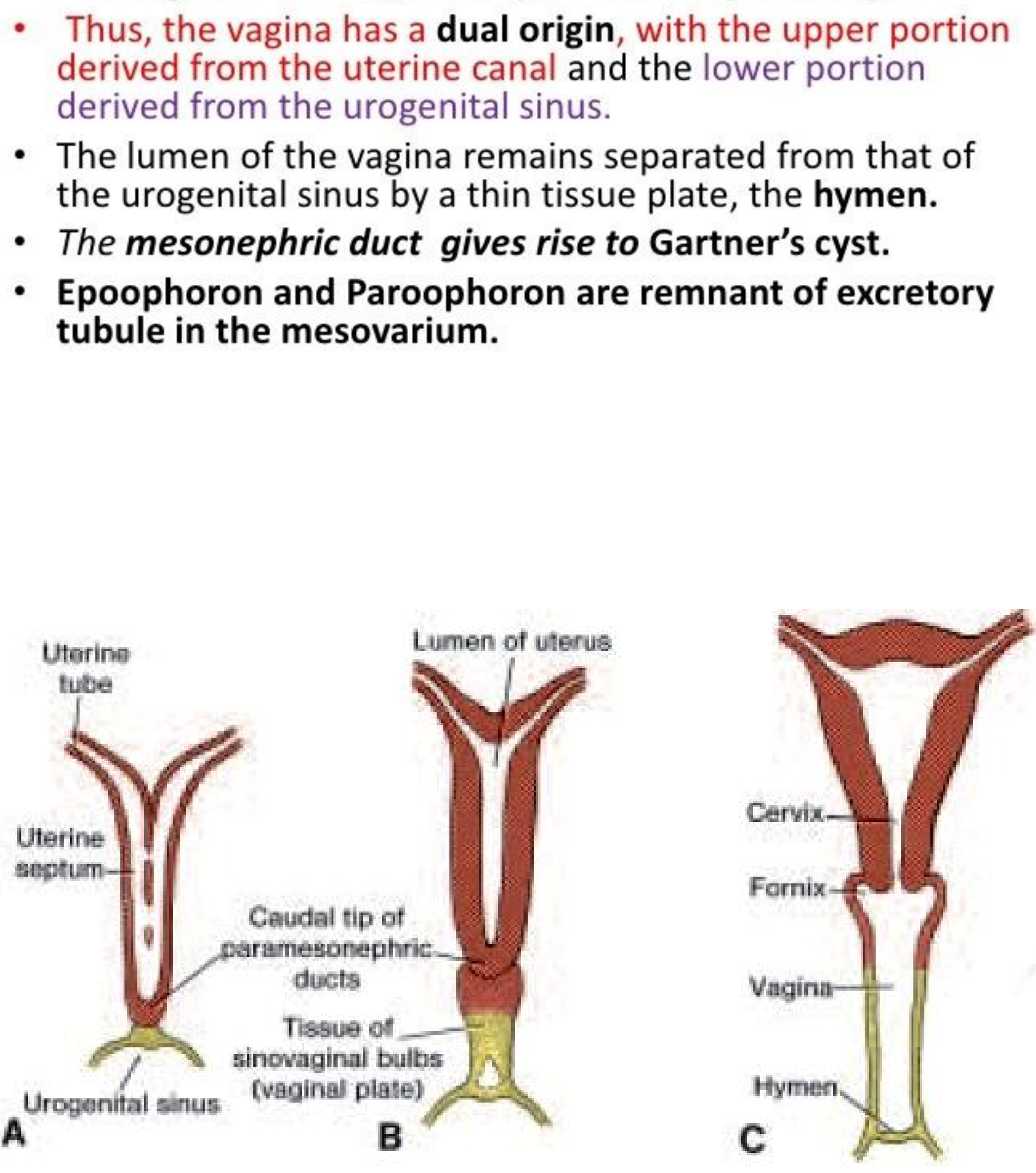

Figure Formation of the uterus and vagina. **A.** 9 weeks. Note the disappearance of the uterine septum. **B.** At the end of the third month. Note the tissue of the sinovaginal bulbs. **C.** Newborn. The fornices and the upper portion of the vagina are formed by vacuolization of the paramesonephric tissue, and the lower protion of the vagina is formed by vacuolization of the sinovaginal bulbs.

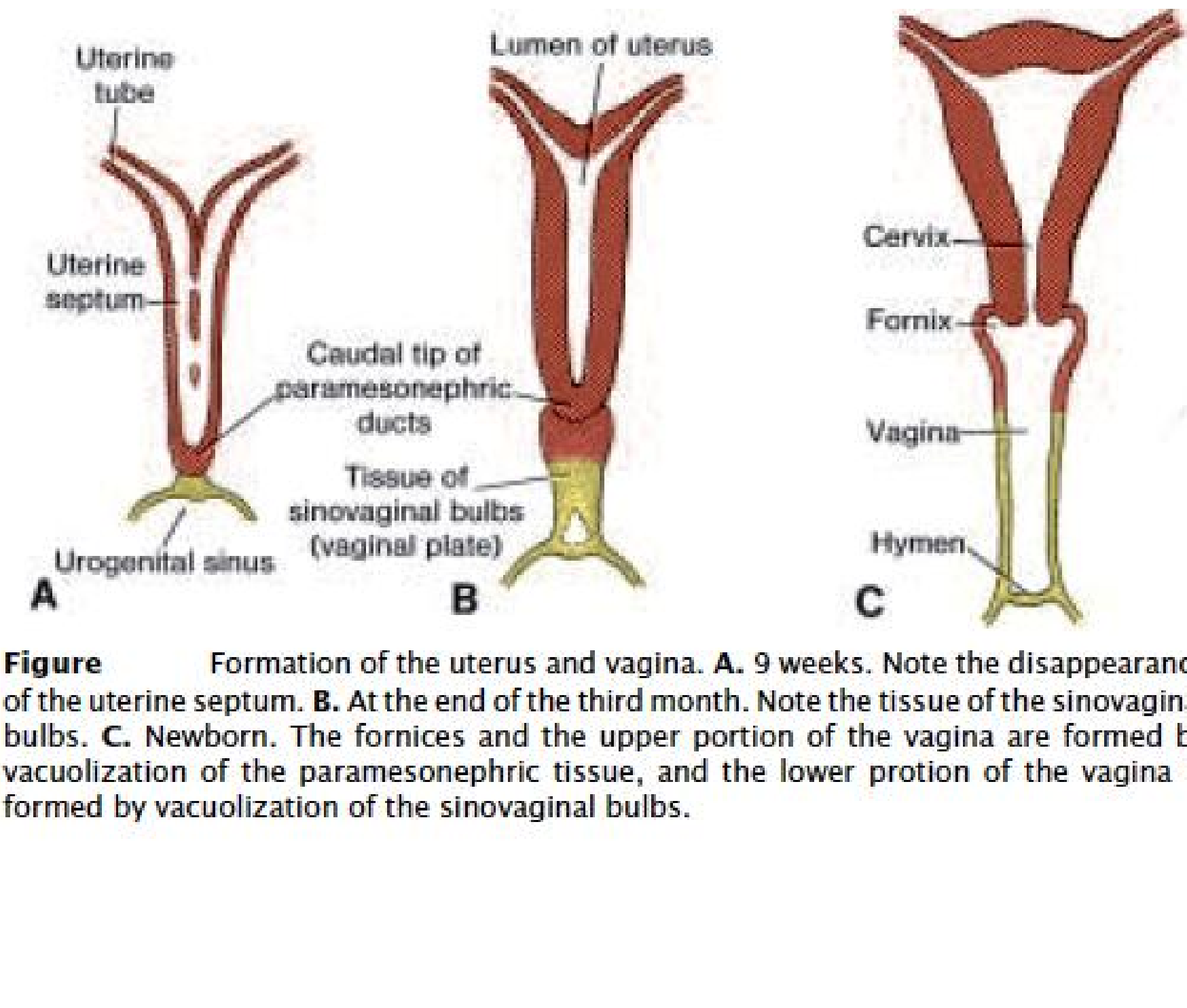

Figure Sagittal sections showing formation of the uterus and vagina at various stages of development. **A.** Nine weeks. **B.** End of third month. **C.** Newborn.

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CLINICAL CORRELATES

Uterine and Vaginal Defects

- **Duplications of the uterus**
  - **uterus didelphys**
  - **uterus arcuatus**
  - ***uterus bicornis***

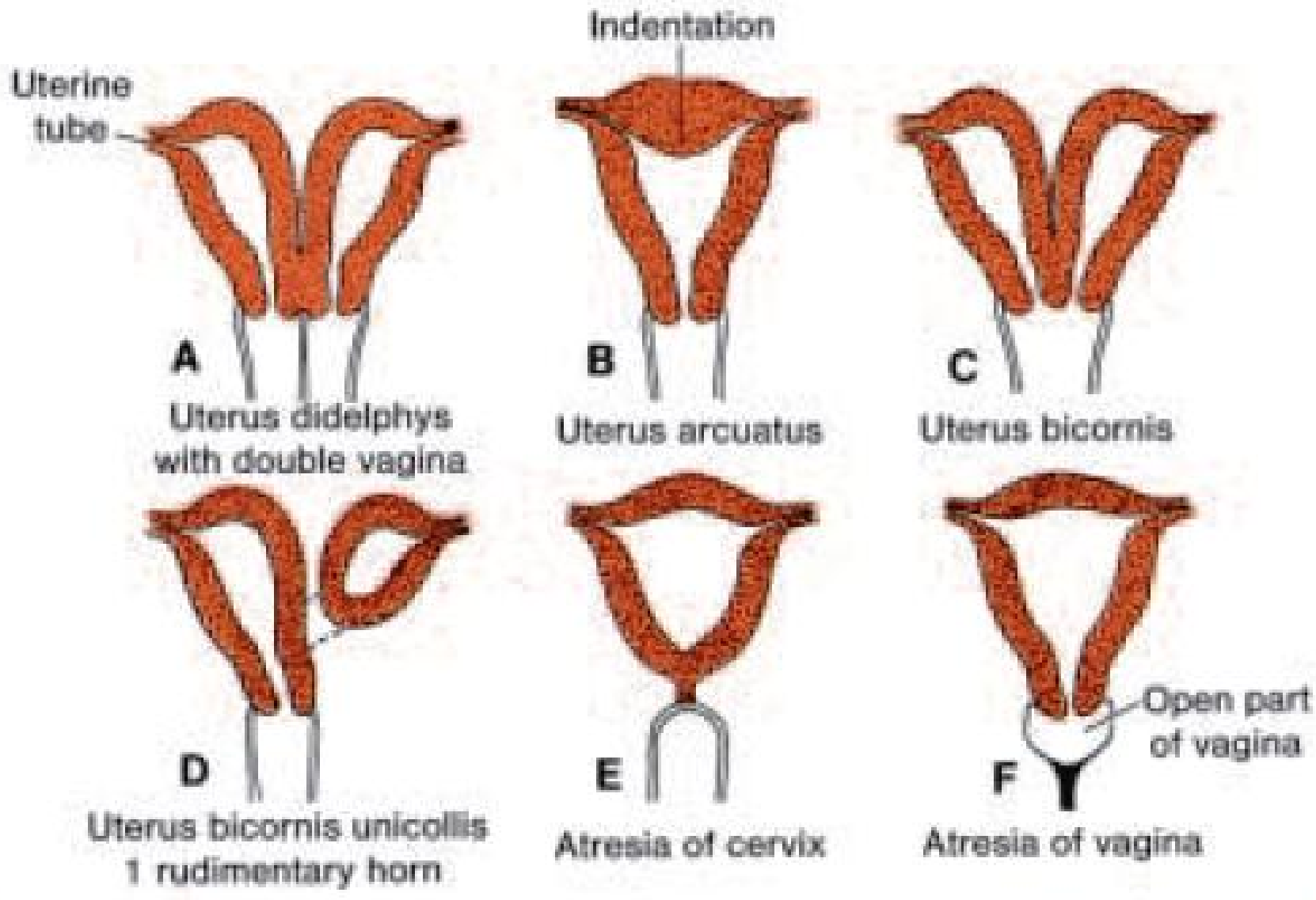

Figure Main abnormalities of the uterus and vagina, caused by persistence of the uterine septum or obliteration of the lumen of the uterine canal.

EXTERNAL GENITALIA

Indifferent Stage

- In the third week of development, mesenchyme cells originating in the region of the primitive streak migrate around the cloacal membrane to form a pair of slightly elevated **cloacal folds.**
- The folds unite to form the **genital tubercle.**
- **Caudally the folds are subdivided** into **urethral folds anteriorly and anal folds posteriorly.**
- Another pair of elevations, the **genital swellings, becomes** visible on each side of the urethral folds. These swellings later form the **scrotal swellings in the male *and the labia majora in the female***.
- *At the end of the sixth week, however, it is impossible to distinguish* between the two sexes.

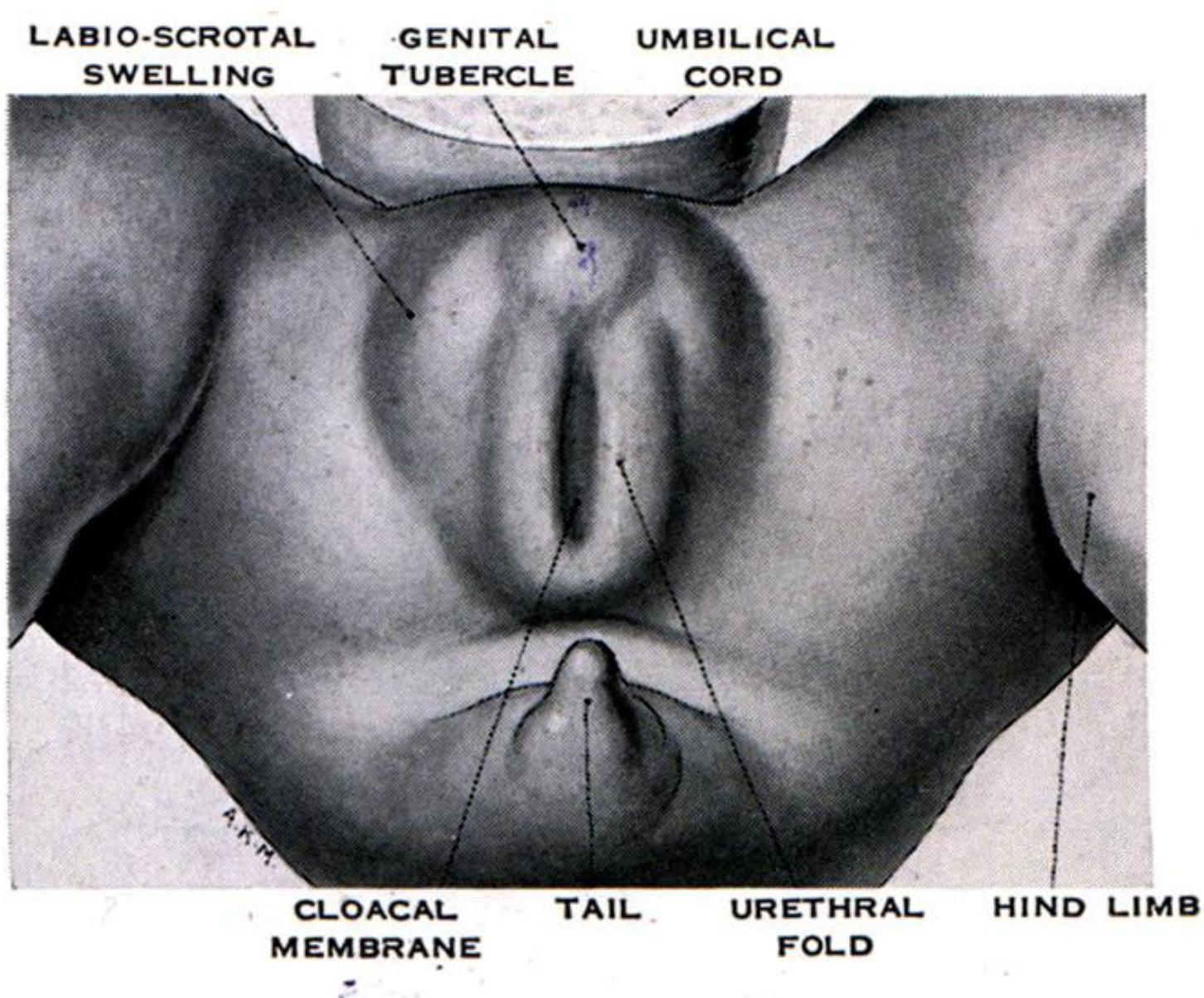

FIG. 383.—The undifferentiated stage in the development of the external genitalia (after Spaulding).

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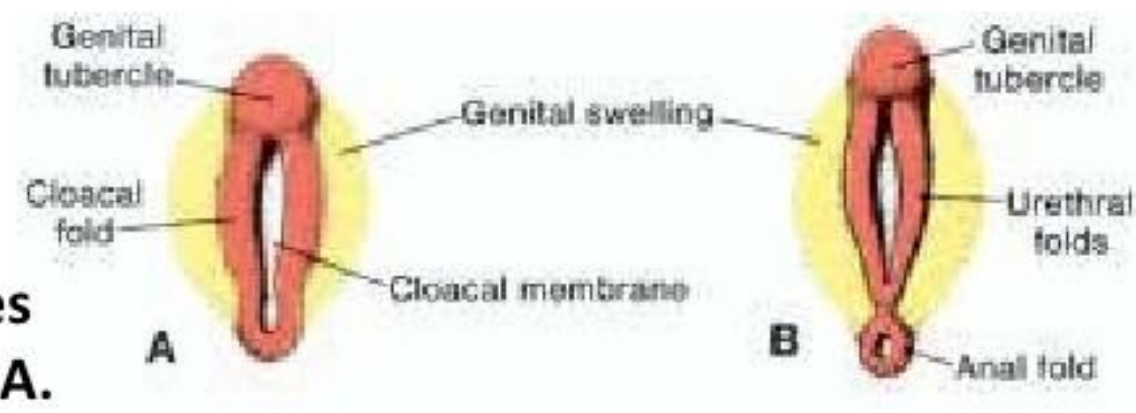
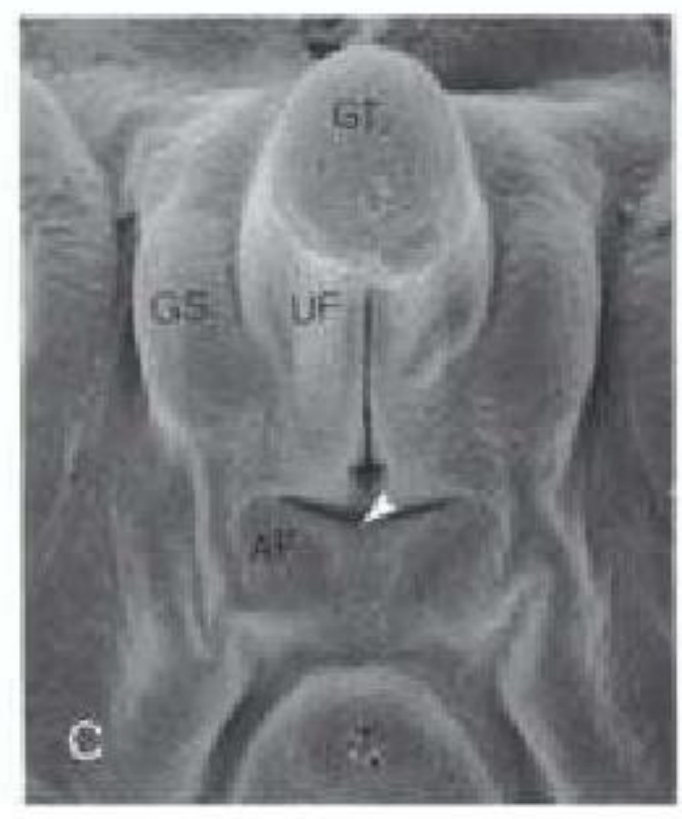
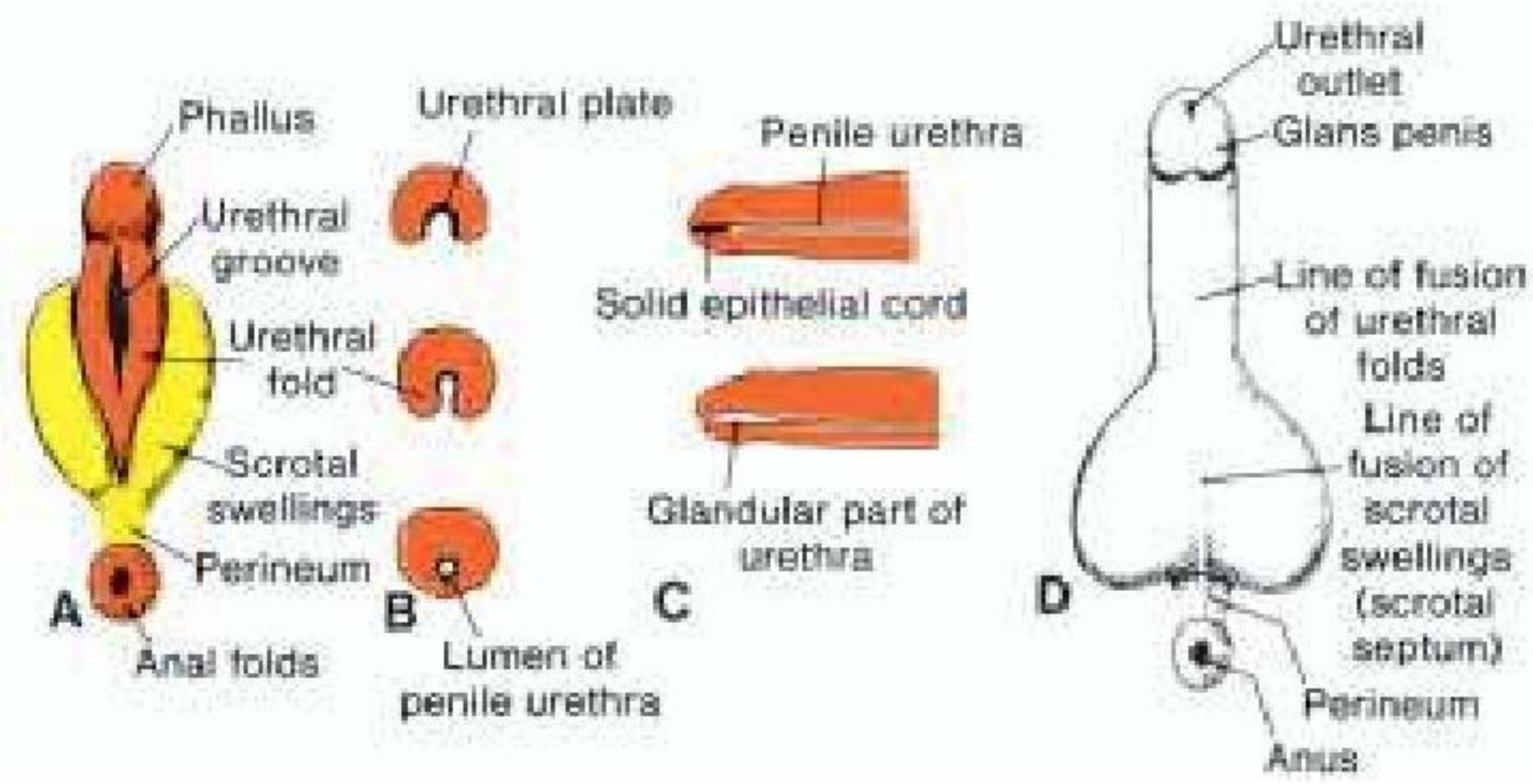


A and B. Indifferent stages of the external genitalia. A. Approximately 4 weeks. **B. Approximately 6 weeks. C. Scanning electron micrograph of the external** genitalia of a human embryo at approximately the seventh week. *AF, anal fold; arrowhead,* anal opening; *GS, genital swelling; GT, genital tubercle; T, tail; UF, urethral fold.*





A. Development of external genitalia in the male at 10 weeks. Note the deep urethral groove flanked by the urethral folds. **B. Transverse sections through** the phallus during formation of the penile urethra. The urogenital groove is bridged by the urethral folds. **C. Development of the glandular portion of the penile urethra. D. Newborn.**

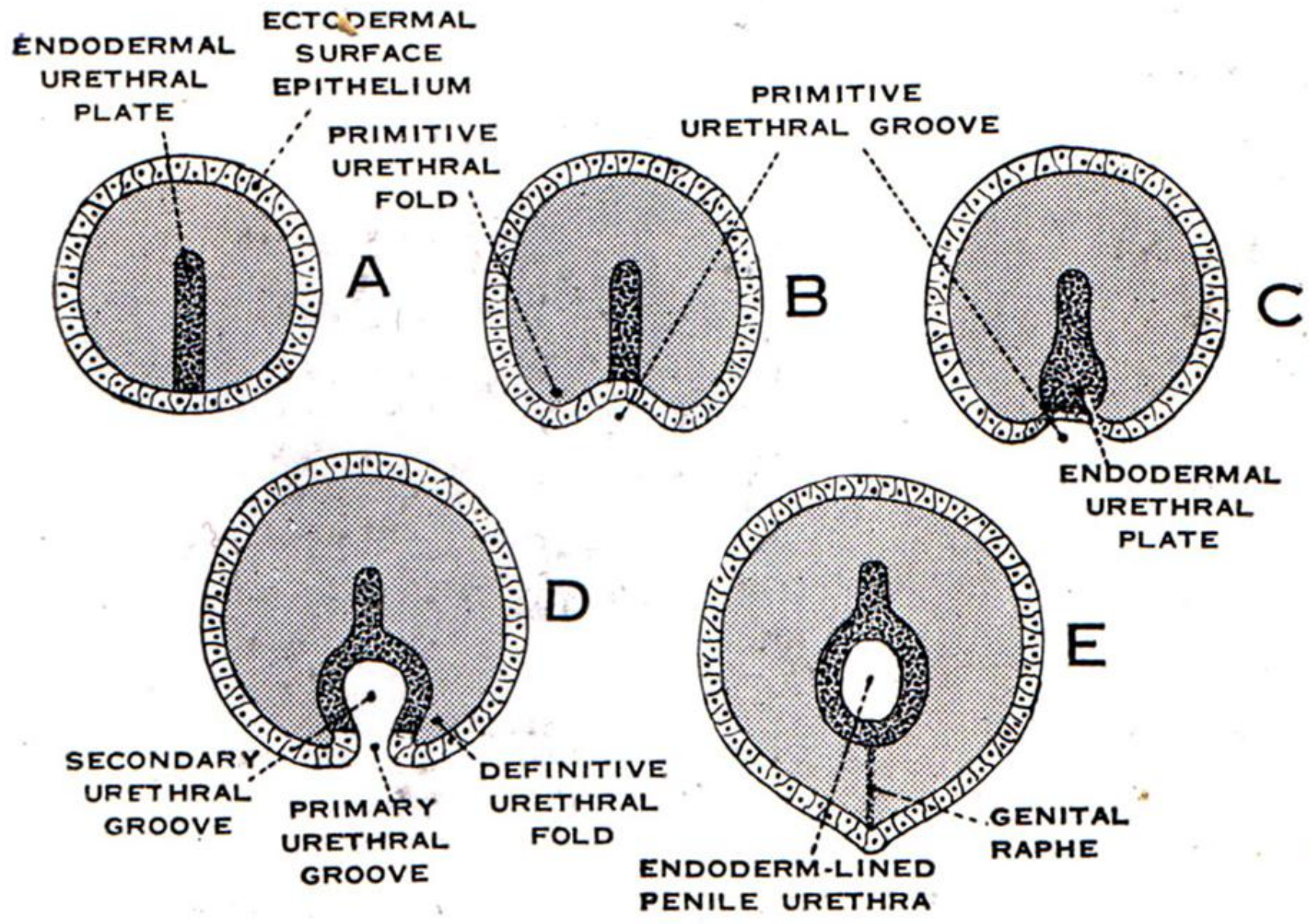
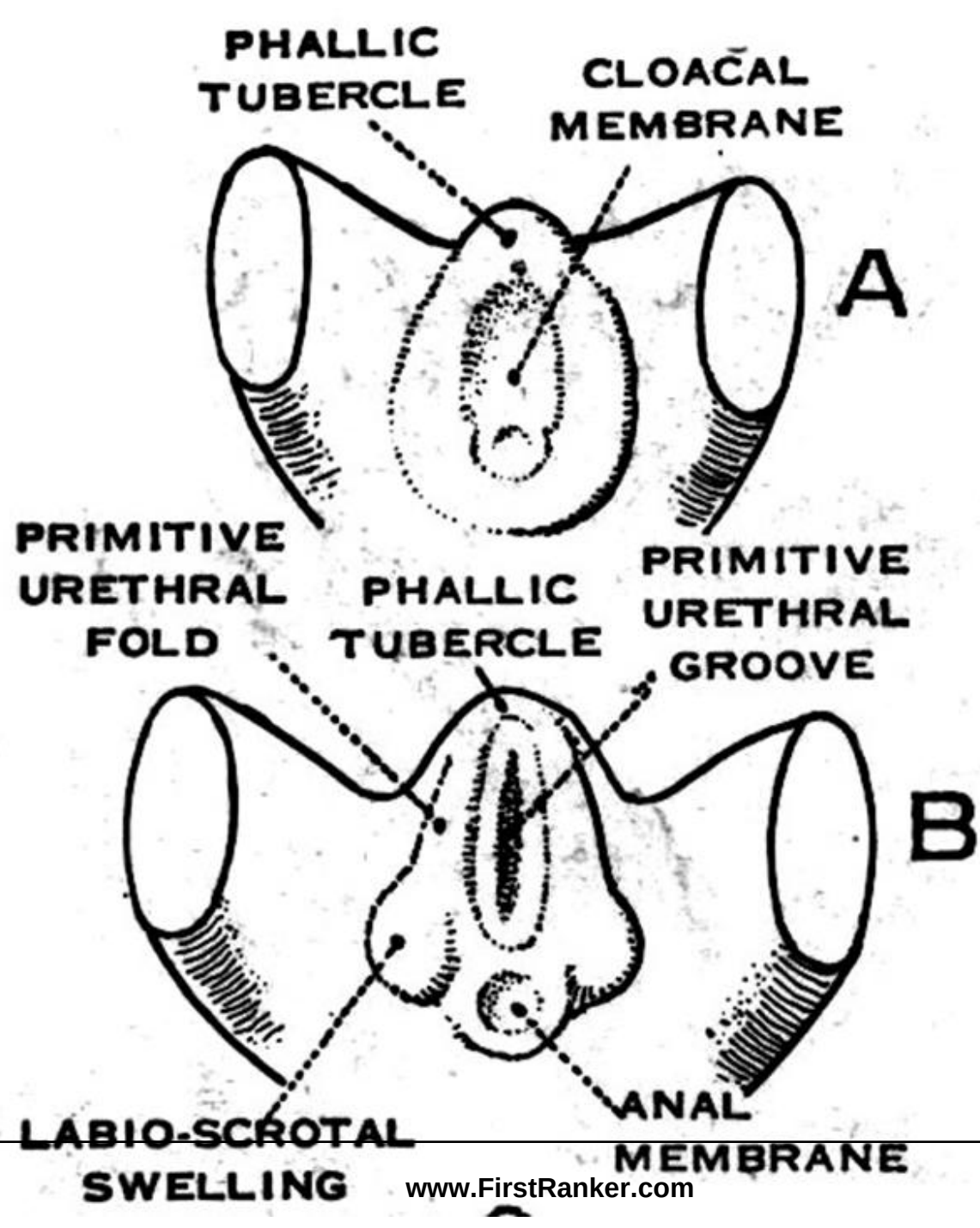


FIG. 384.—Schematic transverse section through the developing phallus to show the formation of the primitive and definitive urethral grooves and the penile urethra.



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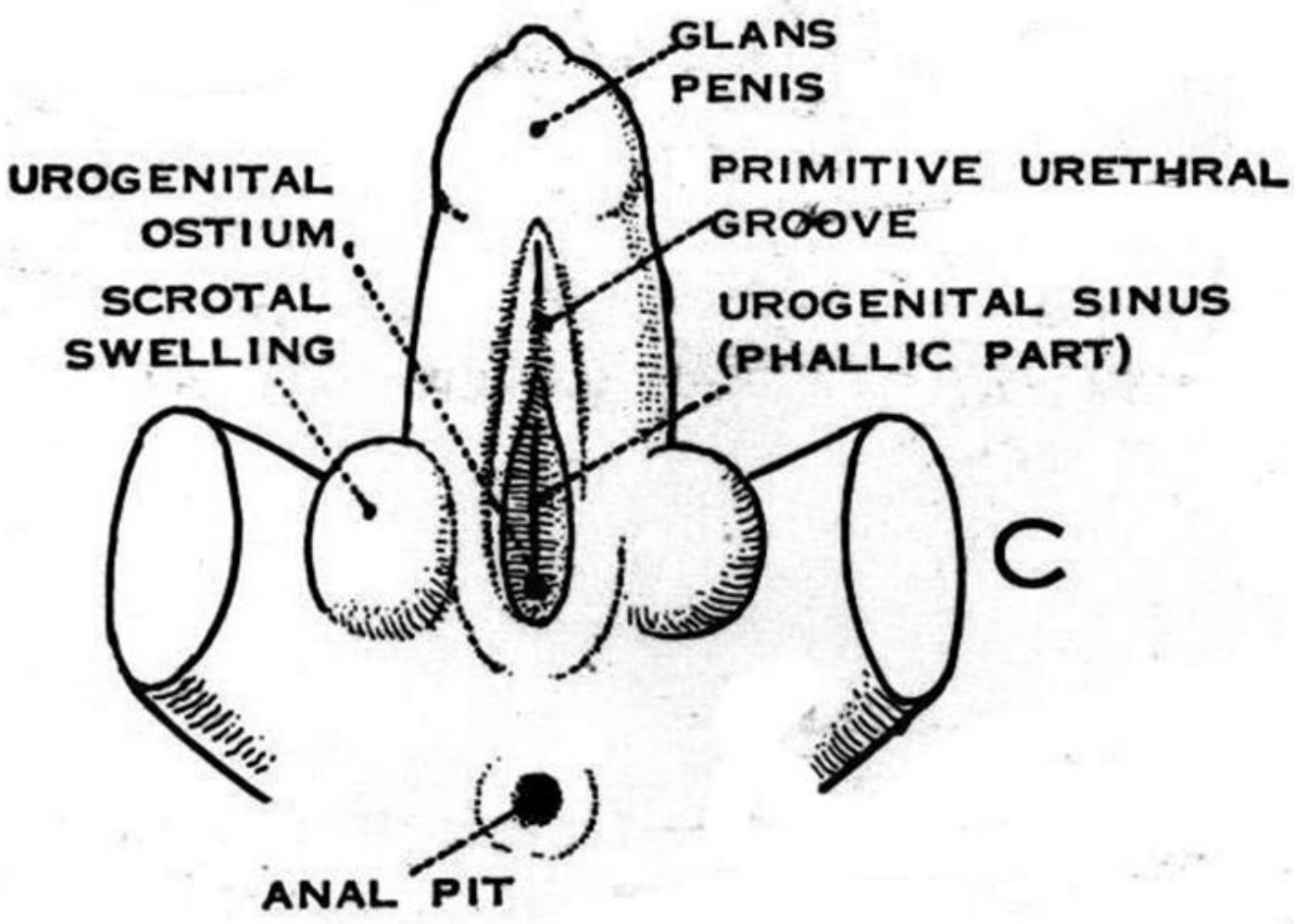

External Genitalia in the Male

- Development of the external genitalia in the male is under the influence of androgens secreted by the fetal testes and is characterized by rapid elongation of the genital tubercle, which is now called the **phallus.**
- During this elongation, the phallus pulls the urethral folds forward so that they form the lateral walls of the **urethral groove.**
- **This groove extends along the** caudal aspect of the elongated phallus but does not reach the most distal part, the glans.
- The epithelial lining of the groove, which originates in the endoderm, forms the **urethral plate.**

External Genitalia in the Male

- At the end of the third month the two urethral folds close over the urethral plate, forming the **penile urethra.**
- ***This canal does*** not extend to the tip of the phallus.
- This most distal portion of the urethra is formed during the fourth month, when ectodermal cells from the tip of the glans penetrate inward and form a short epithelial cord.
- This cord later obtains a lumen, thus forming the **external urethral meatus.**
- The genital swellings, known in the male as the scrotal swellings, arise in the inguinal region.
- With further development they move caudally, and each swelling then makes up half of the scrotum.
- The two are separated by the **scrotal septum.**

CLINICALCORRELATES

Defects in the Male Genitalia

- **Hypospadias**
- **Epispadias**
- **Exstrophy of the bladder,**
- **Micropenis**
- **Bifid penis or double penis**

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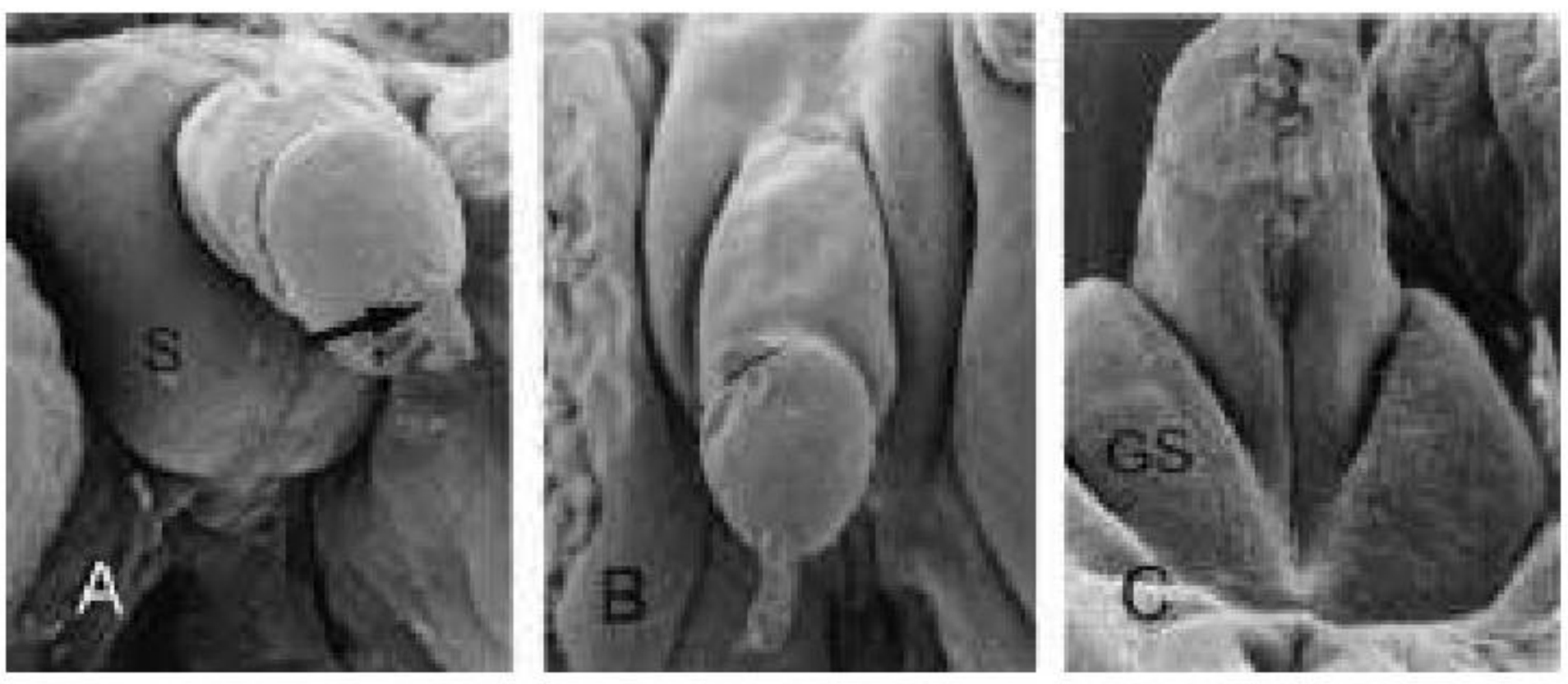
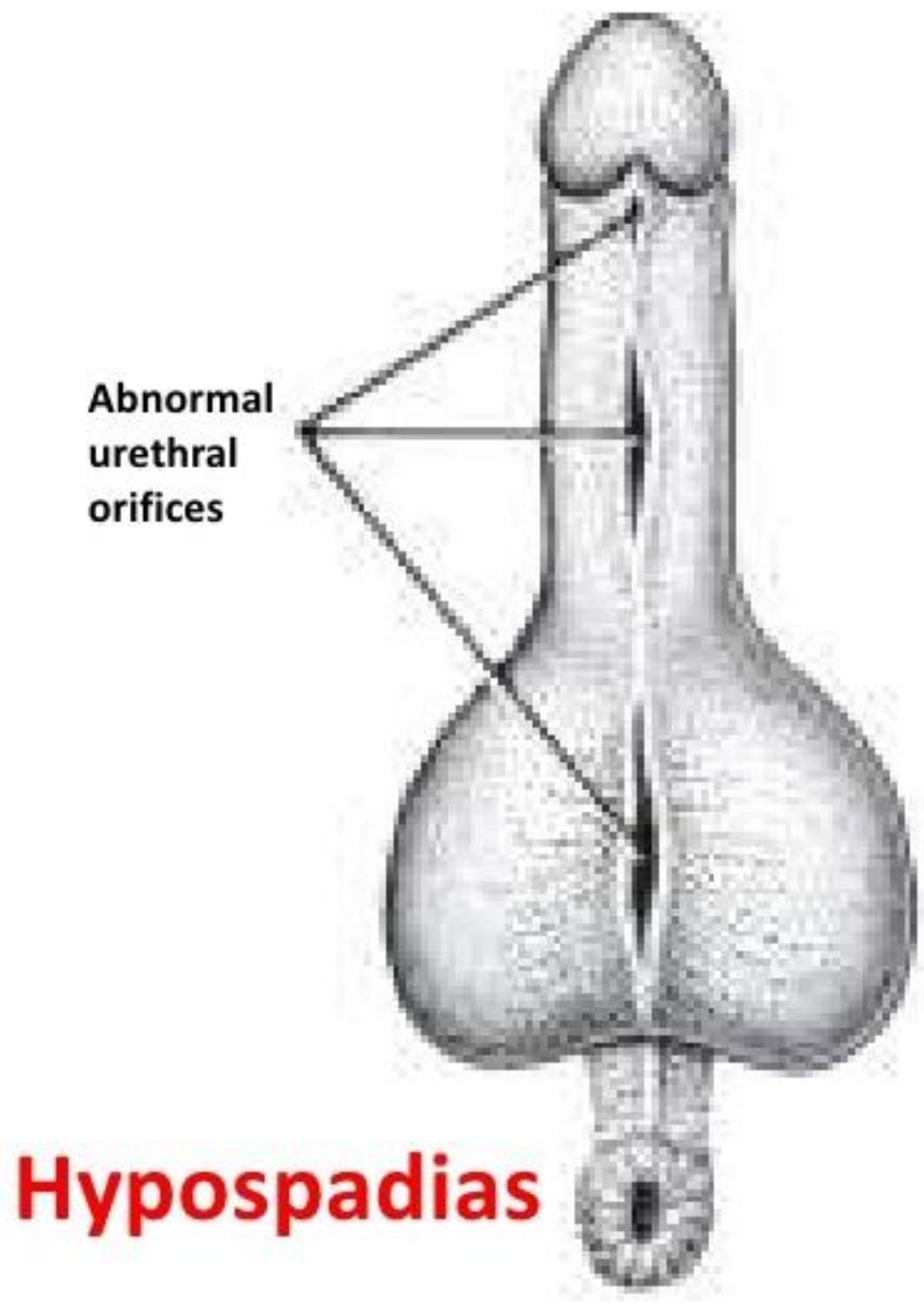


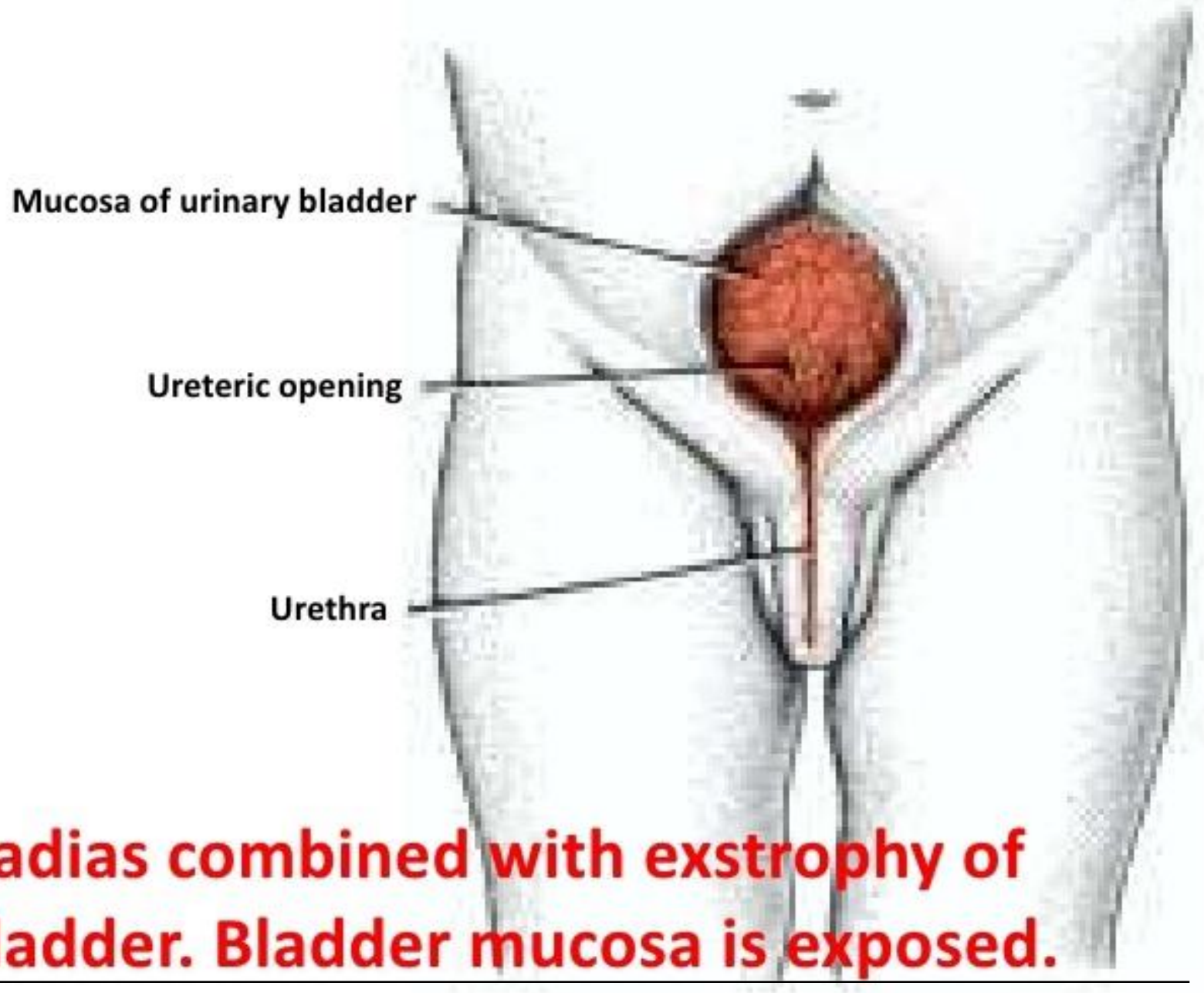
A. Genitalia of a male fetus at 14 weeks, showing fusion of the scrotal swellings (*S). Arrow, epithelial tag.* ***B and C. Dorsal and ventral views, respectively, of*** the genitalia of a female fetus at 11 weeks. The genital tubercle at this stage is longer than in the male **(A), and the genital swellings (*GS) remain unfused.***



Hypospadias showing the various locations of abnormal urethral orifices

Hypospadias

Patient with hypospadias. The urethra is open on the ventral surface of the penis.



Epispadias combined with exstrophy of the bladder. Bladder mucosa is exposed.

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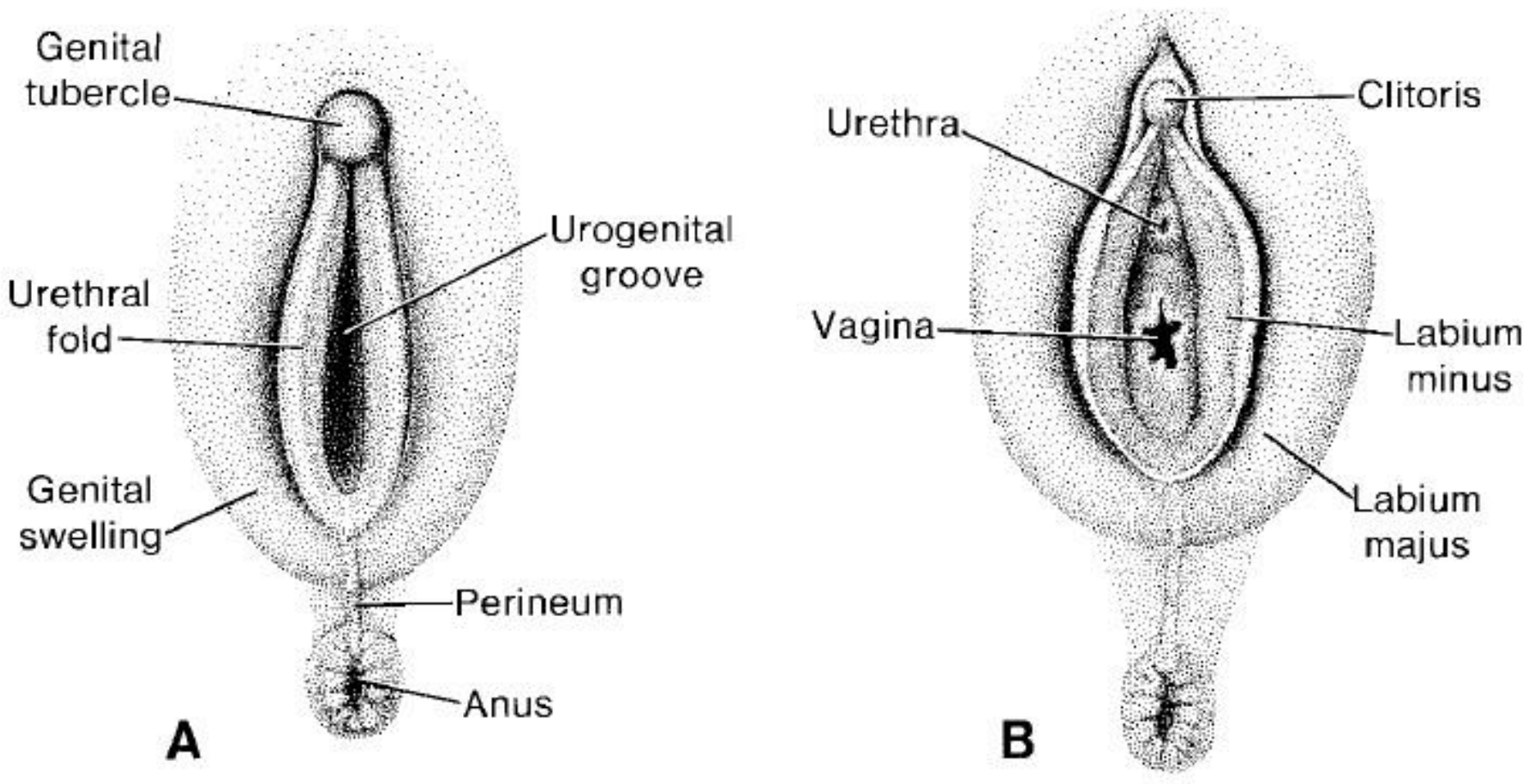
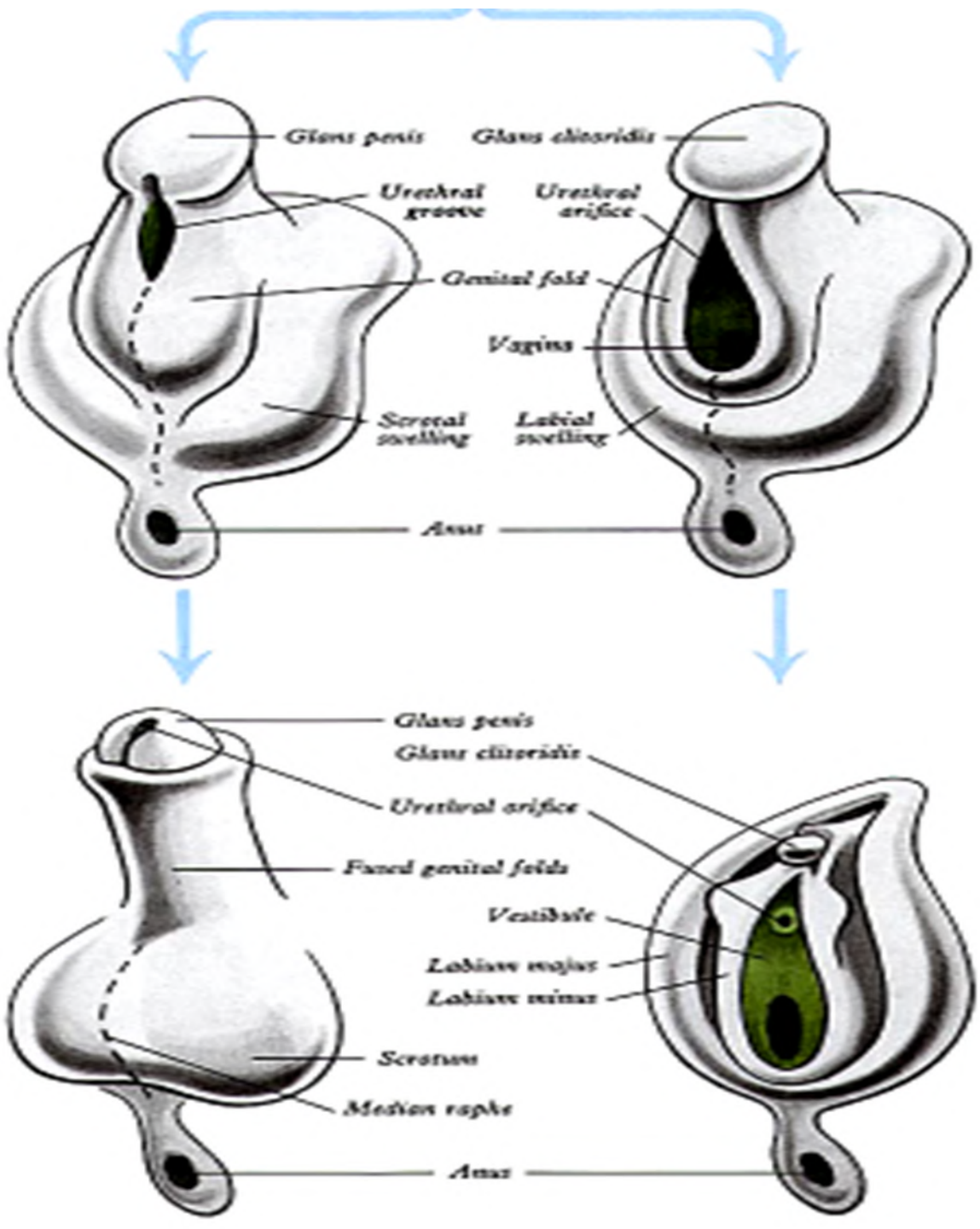
External Genitalia in the Female

- Estrogens stimulate development of the external genitalia of the female.
- The genital tubercle elongates only slightly and forms the **clitoris.**
- urethral folds do not fuse, *as in the male, but develop into the* ***labia*** **minora.**
- **Genital swellings enlarge and form the labia majora.**
- **The urogenital** groove is open and forms the **vestibule.**
- ***Although*** the genital tubercle does not elongate extensively in the female, it is larger than in the male during the early stages of development.



Development of the external genitalia in the female at 5 months **(A) and** in the newborn **(B).**



CLINICALCORRELATES

Defects in Sex Differentiation

- **Klinefelter syndrome,**
- **gonadal dysgenesis/ XY female gonadal dysgenesis (Swyer syndrome)/ Turner syndrome**
- **Hermaphrodites / pseudohermaphrodites/**

Female pseudohermaphroditism is most commonly caused by congenital adrenal hyperplasia (adrenogenital syndrome)

- **Male pseudohermaphrodites have a 46,XY chromosome complement,**
- and their cells are usually chromatin-negative.
- **Androgen insensitivity syndrome (formerly testicular feminization)**

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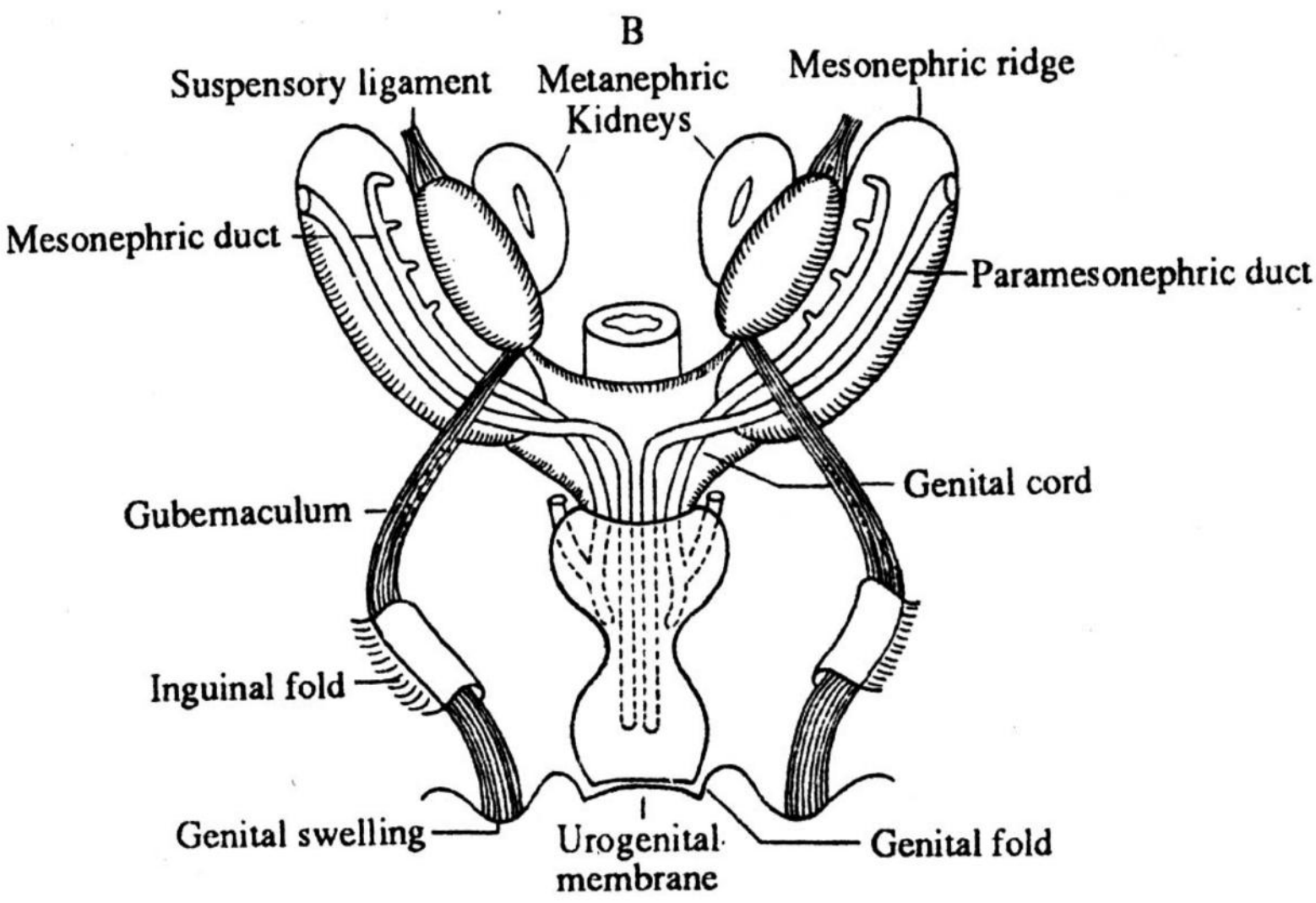
DESCENT OF THE TESTES

- TOWARD THE END OF THE SECOND MONTH, THE UROGENITAL MESENTERY ATTACHES THE TESTIS AND MESONEPHROS TO THE POSTERIOR ABDOMINAL WALL
- WITH DEGENERATION OF THE MESONEPHROS, THE ATTACHMENT SERVES AS A MESENTERY FOR THE GONAD
- CAUDALLY, IT BECOMES LIGAMENTOUS AND IS KNOWN AS THE CAUDAL GENITAL LIGAMENT.
- ALSO EXTENDING FROM THE CAUDAL POLE OF THE TESTIS IS A MESENCHYMAL CONDENSATION RICH IN EXTRACELLULAR MATRICES, THE GUBERNACULUM

- PRIOR TO DESCENT OF THE TESTIS, THIS BAND OF MESENCHYME TERMINATES IN THE INGUINAL REGION BETWEEN THE DIFFERENTIATING INTERNAL AND EXTERNAL ABDOMINAL OBLIQUE MUSCLES.
- LATER, AS THE TESTIS BEGINS TO DESCEND TOWARD THE INGUINAL RING, AN EXTRA-ABDOMINAL PORTION OF THE GUBERNACULUM FORMS AND GROWS FROM THE INGUINAL REGION TOWARD THE SCROTAL SWELLINGS.
- WHEN THE TESTIS PASSES THROUGH THE INGUINAL CANAL, THIS EXTRA-ABDOMINAL PORTION CONTACTS THE SCROTAL FLOOR



- Oblique tilt of gonads and formation of genital cord and inguinal folds

Testes, before and after descent

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FACTORS CONTROLLING DESCENT OF THE TESTIS

- **OUTGROWTH OF THE EXTRA-ABDOMINAL PORTION OF THE GUBERNACULUM PRODUCES INTRA-ABDOMINAL MIGRATION**
- **AN INCREASE IN INTRA-ABDOMINAL PRESSURE DUE TO ORGAN GROWTH PRODUCES PASSAGE THROUGH THE INGUINAL CANAL**
- **REGRESSION OF THE EXTRA-ABDOMINAL PORTION OF THE GUBERNACULUM COMPLETES MOVEMENT OF THE TESTIS INTO THE SCROTUM**
- **NORMALLY, THE TESTES REACH THE INGUINAL REGION BY APPROXIMATELY 12 WEEKS' GESTATION,**
  - **MIGRATE THROUGH THE INGUINAL CANAL BY 28 WEEKS**
  - **REACH THE SCROTUM BY 33 WEEKS**
  - **THE PROCESS IS INFLUENCED BY HORMONES, INCLUDING ANDROGENS AND MULLERIAN INHIBITING SUBSTANCE (MIS)**
  - **DURING DESCENT, BLOOD SUPPLY TO THE TESTIS FROM THE AORTA IS RETAINED, AND TESTICULAR VESSELS EXTEND FROM THEIR ORIGINAL LUMBAR POSITION TO THE TESTIS IN THE SCROTUM.**
  - **INDEPENDENTLY FROM DESCENT OF THE TESTIS, THE PERITONEUM OF THE ABDOMINAL CAVITY FORMS AN EVAGINATION ON EACH SIDE OF THE MIDLINE INTO THE VENTRAL ABDOMINAL WALL.**
  - **THIS EVAGINATION, THE PROCESSUS VAGINALIS, FOLLOWS THE COURSE OF THE GUBERNACULUM TESTIS INTO THE SCROTAL SWELLINGS**
  - **HENCE THE PROCESSUS VAGINALIS, ACCOMPANIED BY THE MUSCULAR AND FASCIAL LAYERS OF THE BODY WALL, EVAGINATES INTO THE SCROTAL SWELLING, FORMING THE INGUINAL CANAL**
  - **THE TESTIS DESCENDS THROUGH THE INGUINAL RING AND OVER THE RIM OF THE PUBIC BONE AND IS PRESENT IN THE SCROTUM AT BIRTH.**
  - **THE TESTIS IS THEN COVERED BY A REFLECTED FOLD OF THE PROCESSUS VAGINALIS**
  - **THE PERITONEAL LAYER COVERING THE TESTIS IS THE VISCERAL LAYER OF THE TUNICA VAGINALIS;**
  - **THE REMAINDER OF THE PERITONEAL SAC FORMS THE PARIETAL LAYER OF THE TUNICA VAGINALIS**
  - **THE NARROW CANAL CONNECTING THE LUMEN OF THE VAGINAL PROCESS WITH THE PERITONEAL CAVITY IS OBLITERATED AT BIRTH OR SHORTLY THEREAFTER**

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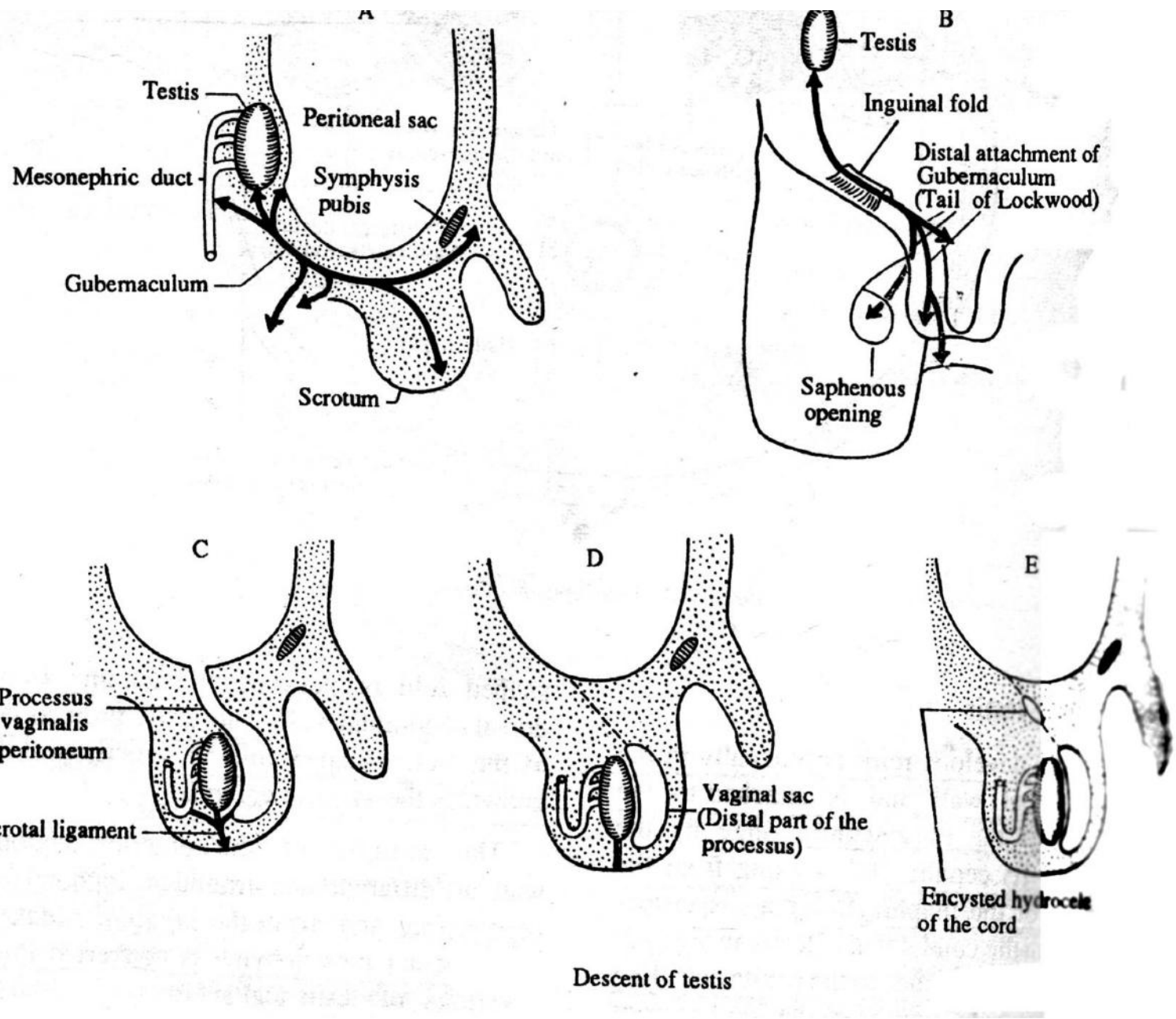
- IN ADDITION TO BEING COVERED BY PERITONEAL LAYERS DERIVED FROM THE PROCESSUS VAGINALIS, THE TESTIS BECOMES ENSHEATHED IN LAYERS DERIVED FROM THE ANTERIOR ABDOMINAL WALL THROUGH WHICH IT PASSES.
- THUS, THE TRANSVERSALIS FASCIA FORMS THE INTERNAL SPERMATIC FASCIA
- THE INTERNAL ABDOMINAL OBLIQUE MUSCLE GIVES RISE TO THE CREMASTERIC FASCIA
- MUSCLE, AND THE EXTERNAL ABDOMINAL OBLIQUE MUSCLE FORMS THE EXTERNAL SPERMATIC FASCIA
- THE TRANSVERSUS ABDOMINIS MUSCLE DOES NOT CONTRIBUTE A LAYER, SINCE IT ARCHES OVER THIS REGION AND DOES NOT COVER THE PATH OF MIGRATION.



HERNIAS AND CRYPTORCHISM

- THE CONNECTION BETWEEN THE ABDOMINAL CAVITY AND THE PROCESSUS VAGINALIS IN THE SCROTAL SAC NORMALLY CLOSES IN THE FIRST YEAR AFTER BIRTH
- IF THIS PASSAGEWAY REMAINS OPEN, INTESTINAL LOOPS MAY DESCEND INTO THE SCROTUM, CAUSING A CONGENITAL INGUINAL HERNIA
- SOMETIMES OBLITERATION OF THIS PASSAGEWAY IS IRREGULAR, LEAVING SMALL CYSTS ALONG ITS COURSE.
- LATER THESE CYSTS MAY SECRETE FLUID, FORMING A HYDROCELE OF THE TESTIS AND/OR SPERMATIC CORD

- IN 97% OF MALE NEWBORNS, TESTES ARE PRESENT IN THE SCROTUM BEFORE BIRTH. IN MOST OF THE REMAINDER, DESCENT WILL BE COMPLETED DURING THE FIRST 3 MONTHS POSTNATALLY.
- IN LESS THAN 1% OF INFANTS, ONE OR BOTH TESTES FAIL TO DESCEND. THE CONDITION IS CALLED CRYPTORCHIDISM AND MAY BE CAUSED BY DECREASED ANDROGEN (TESTOSTERONE) PRODUCTION.
- THE UNDESCENDED TESTES FAIL TO PRODUCE MATURE SPERMATOZOA AND THE CONDITION IS ASSOCIATED WITH A 3% TO 5% INCIDENCE OF RENAL ANOMALIES.

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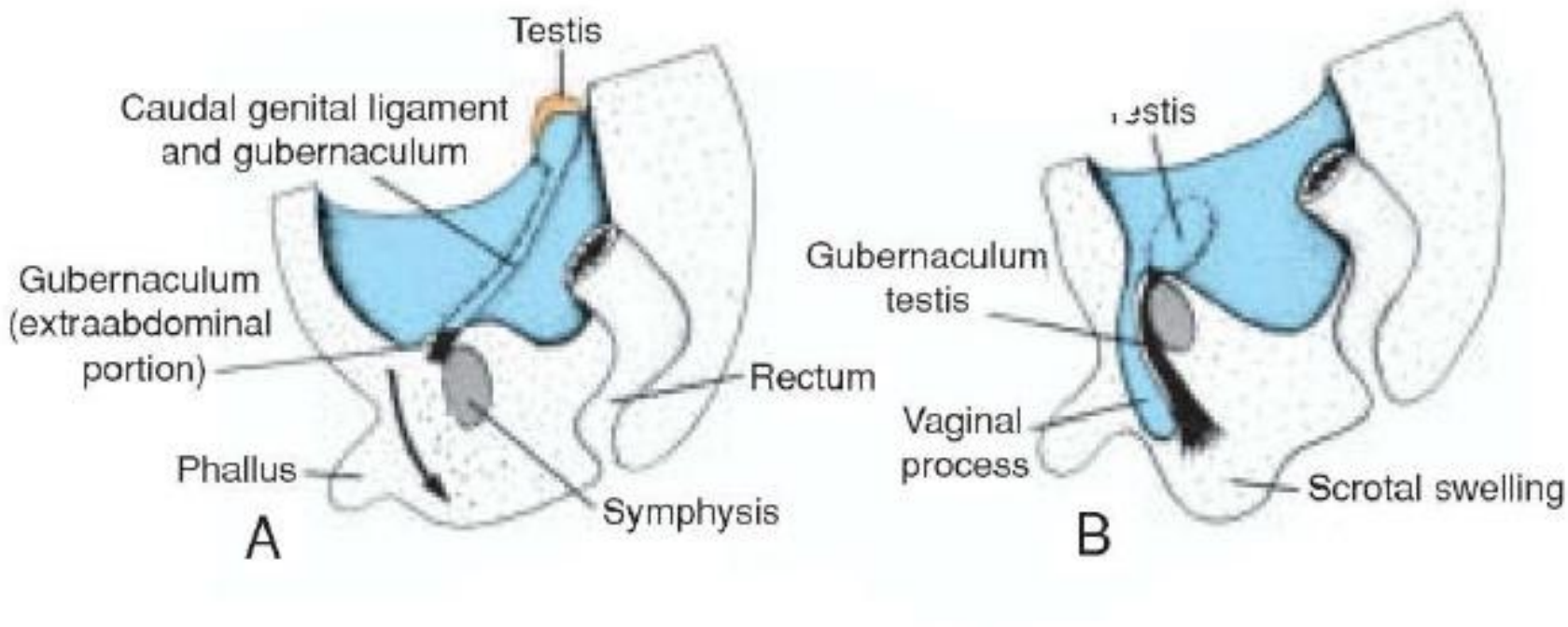
CLINICALCORRELATES

Hernias and Cryptorchism

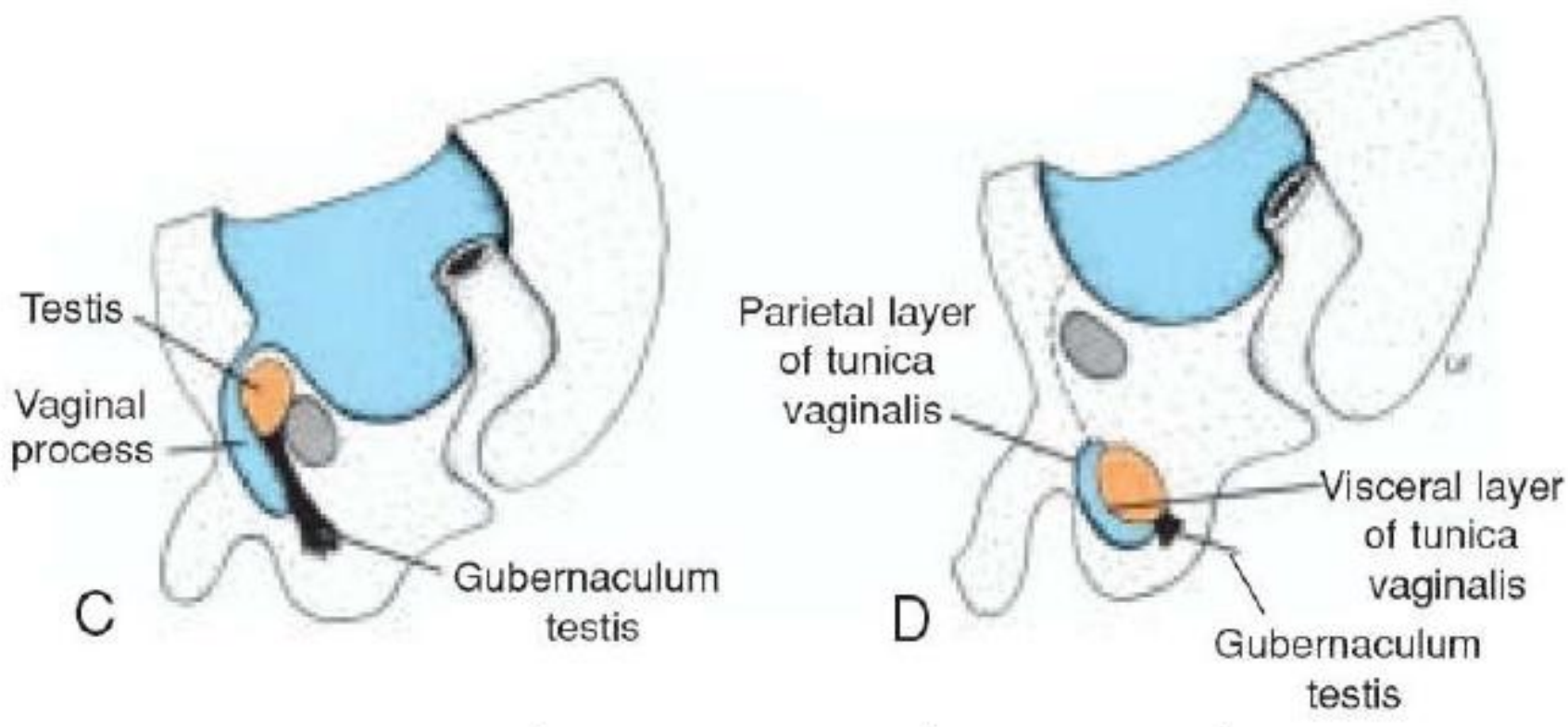
- **The connection between the abdominal cavity and the processus vaginalis in the scrotal sac normally closes in the first year after birth. If remains opened** causing a **congenital inguinal hernia.**
- ***Sometimes obliteration*** of this passageway is irregular, leaving small cysts along its course. Later these cysts may secrete fluid, forming a **hydrocele of the testis and/or spermatic cord.**
- In 97% of male newborns, testes are present in the scrotum before birth.
- In most of the remainder, descent will be completed during the first 3 months postnatally.
- However, in less than 1% of infants, one or both testes fail to descend.
- The condition is called **cryptorchidism and may be caused by decreased** androgen (testosterone) production. The undescended testes fail to produce mature spermatozoa and the condition is associated with a 3% to 5% incidence of renal anomalies.

DESCENT OF THE OVARIES

- Descent of the gonads is considerably less in the female than in the male,
- and the ovaries finally settle just below the rim of the true pelvis. The cranial
- genital ligament forms the **suspensory ligament of the ovary, whereas the** caudal genital ligament forms the **ligament of the ovary proper and the round**
- **ligament of the uterus (Fig. 14.24). the latter extends into the labia majora.**



Descent of the testis. **A. During the second month. B. In the middle of the** third month. Peritoneum lining the coelomic cavity evaginates into the scrotal swelling, where it forms the vaginal process (tunica vaginalis).



C. In the seventh month.

D. Shortly after birth

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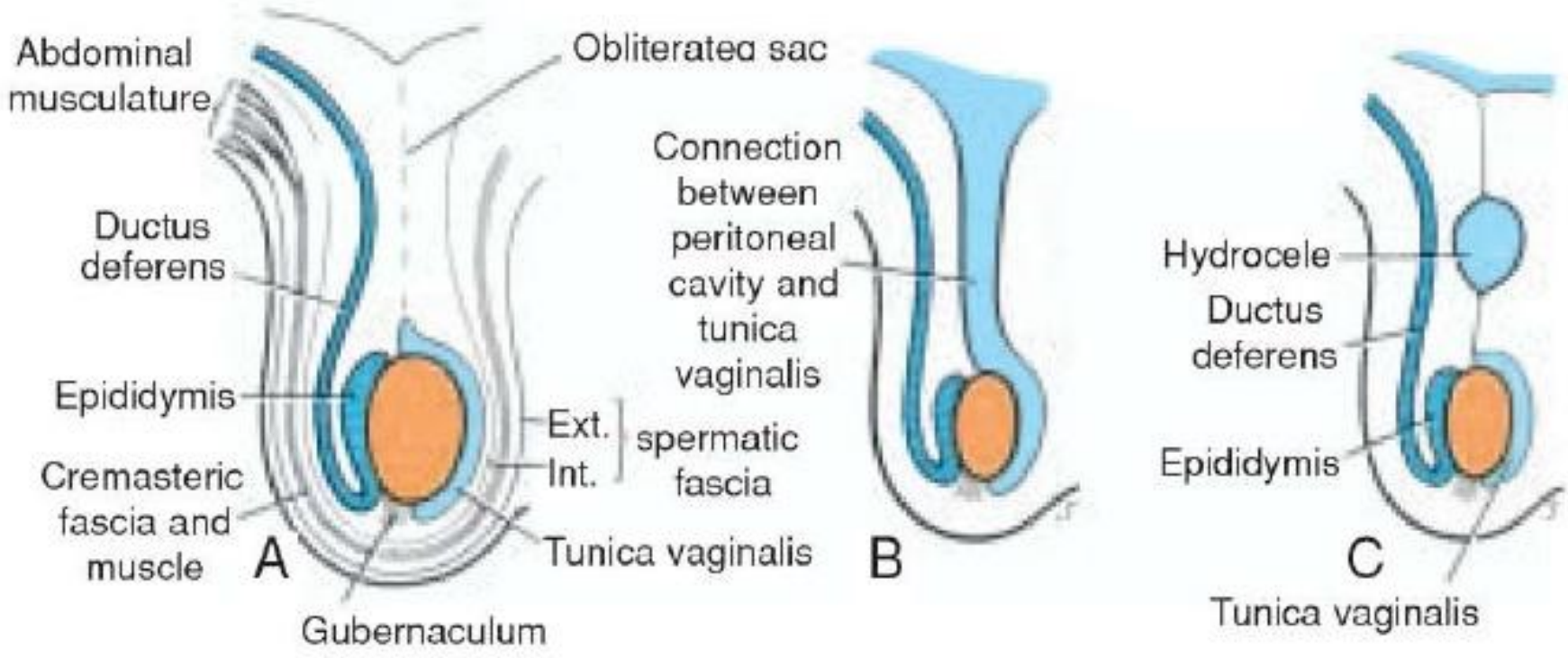
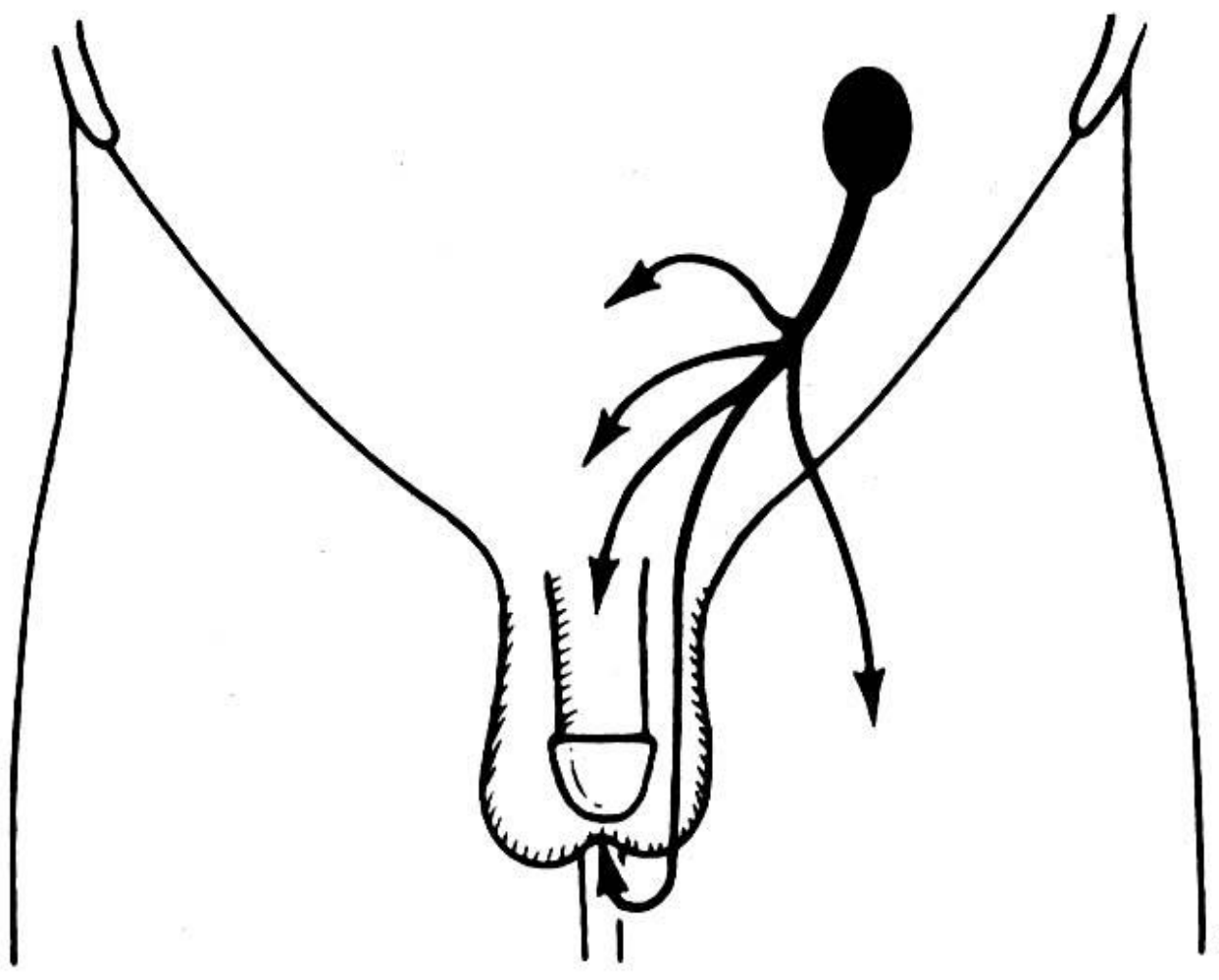
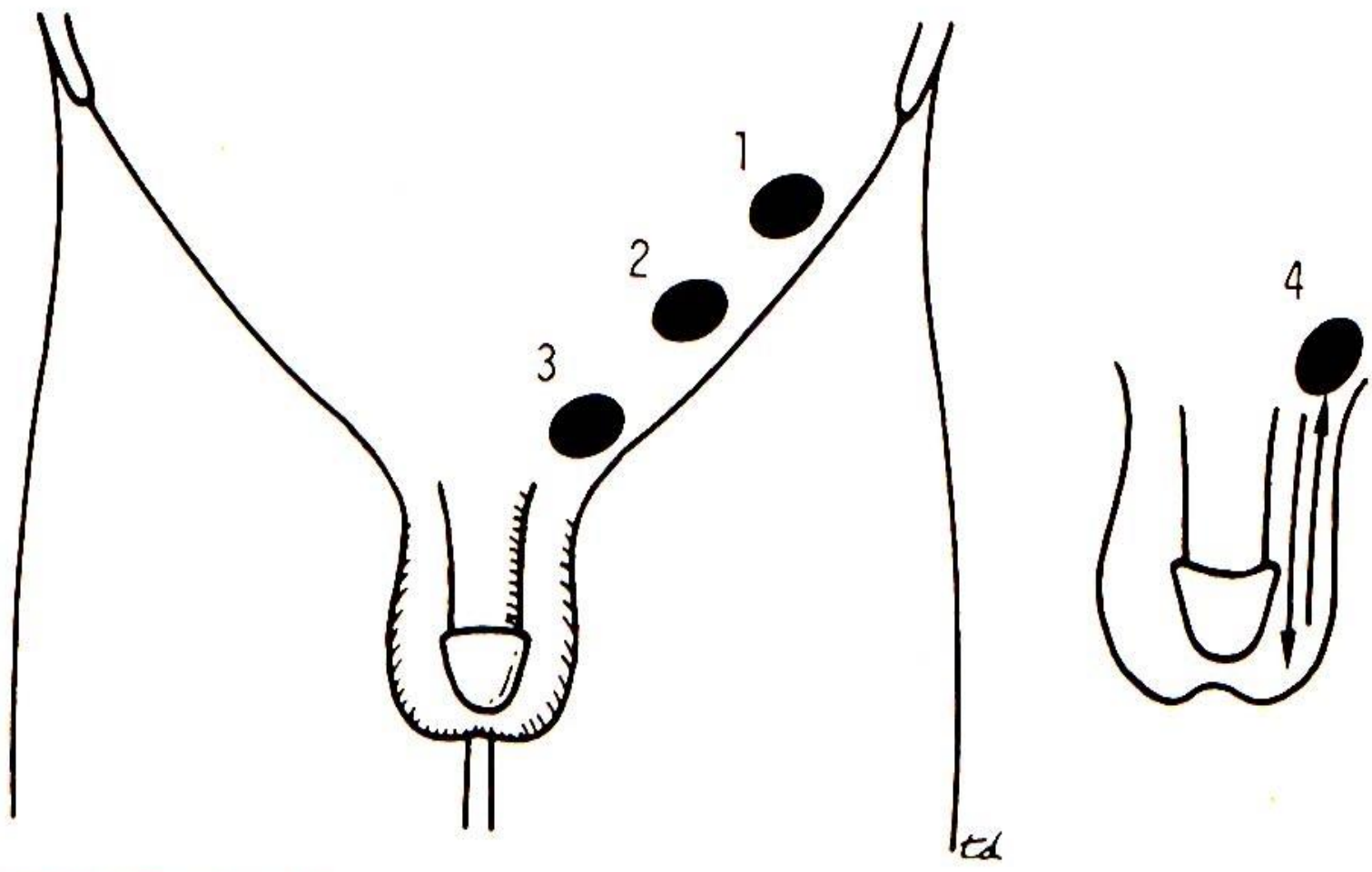


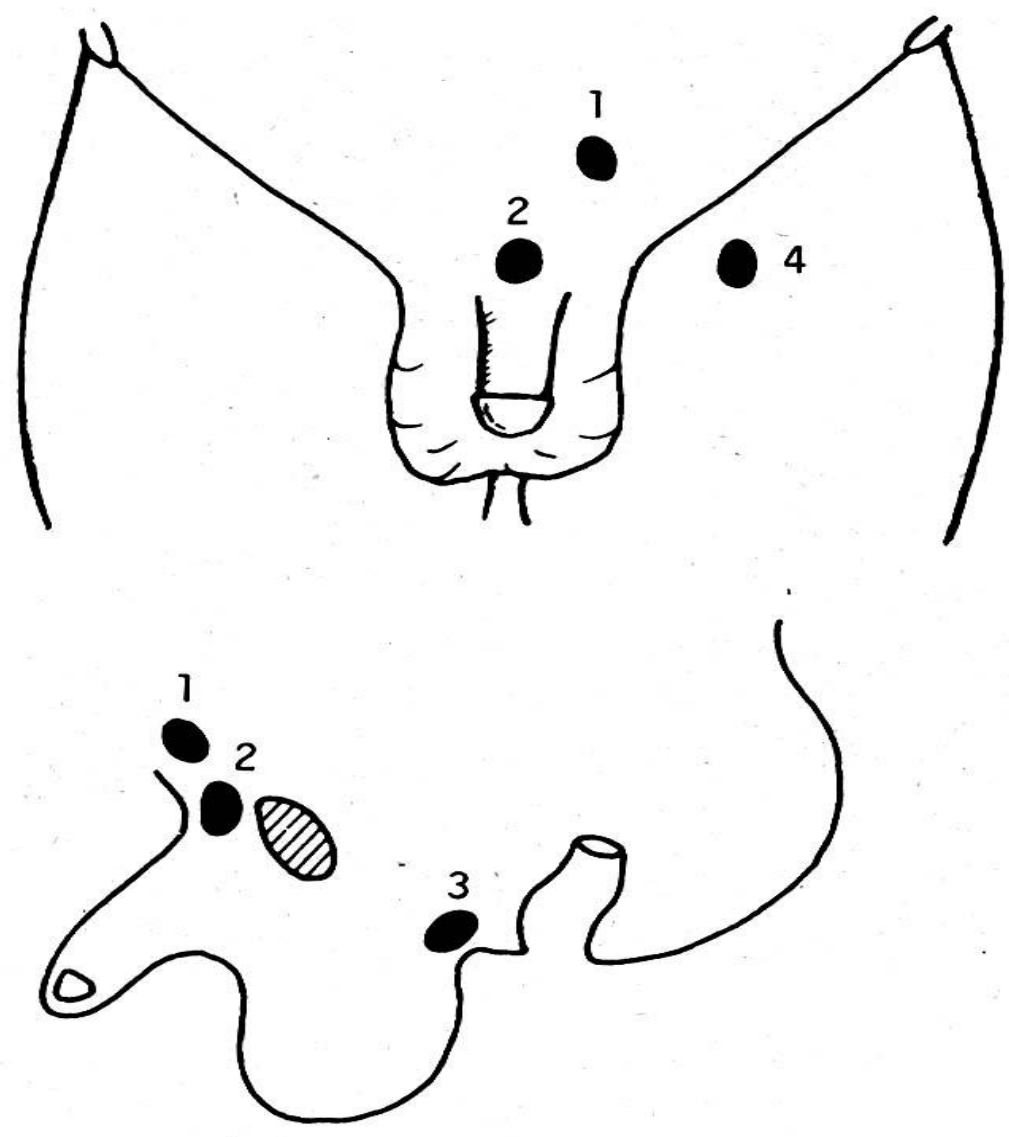
A. Testis, epididymis, ductus deferens, and various layers of the abdominal wall that surround the testis in the scrotum. **B. Vaginal process in open communication** with the peritoneal cavity. In such a case, portions of the intestinal loops often descend toward and occasionally into the scrotum, causing an inguinal hernia. **C. Hydrocele.**



. . *A split gubernaculum. As the testis descends, it may be shunted onto one of the side pathways.*



. *The common sites of incomplete descent of the testis: (1) abdominal, (2) inguinal canal, (3) superficial inguinal ring, and (4) retractile testis.*



. *The common sites of maldescent of the testis: (1) abdominal, (2) root of penis, (3) perineum, and (4) femoral triangle.*

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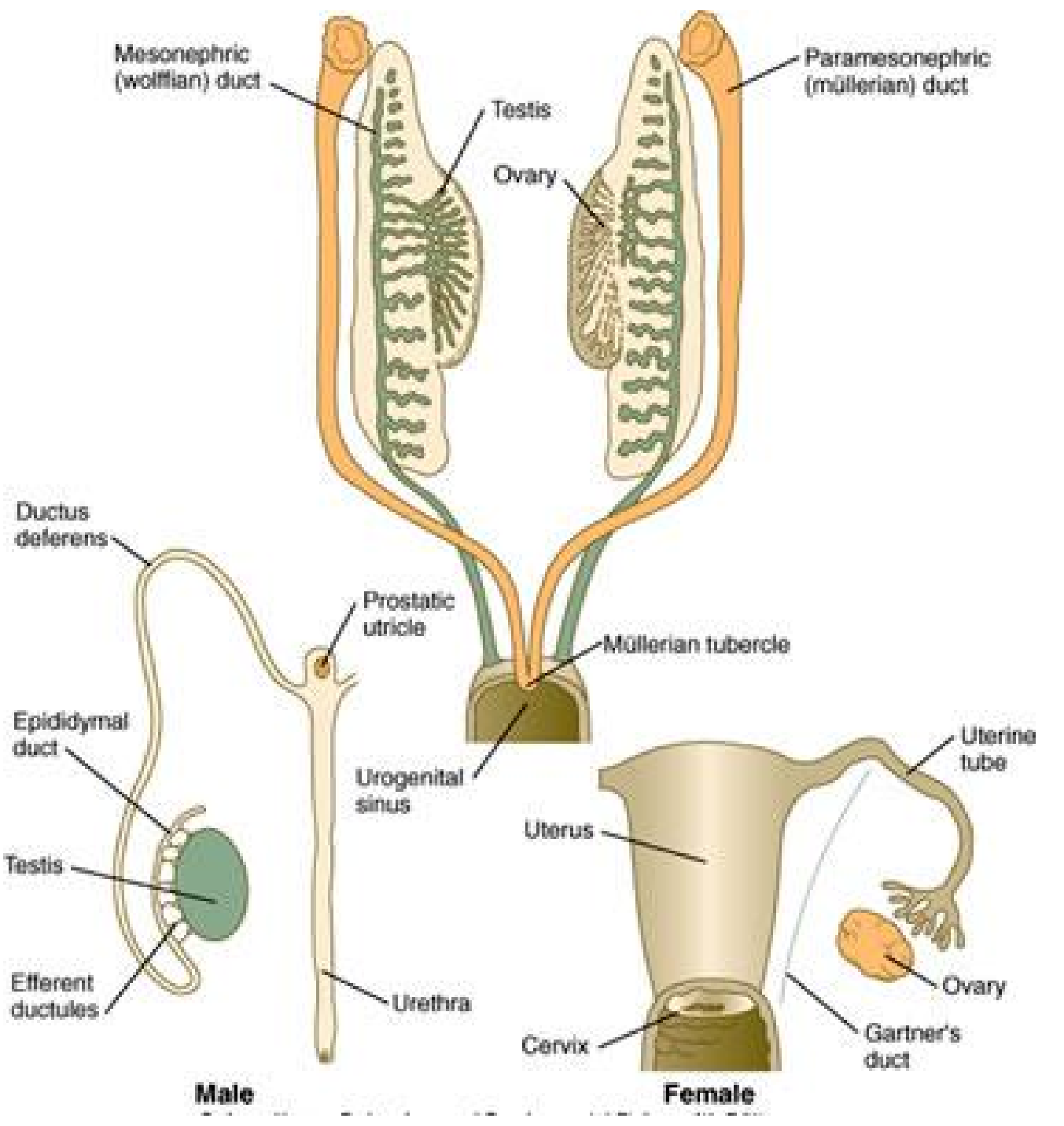

DERIVATIVES OF THE MESONEPHERIC DUCT

- **MALES:**

  FUNCTIONAL:

  1. EFFERENT DUCTULES OF TESTIS
  2. DUCT OF EPIDIDYMIS
  3. VAS DEFERENCE
  4. SEMINAL VESICLES
  5. COMMON EJACULATORY DUCT
  6. URETRIC BUD – COLLECTING PART OF KIDNEY
  7. TRIGONE OF BLADDER

NON FUNCTIONAL DERIVATIVES OF MESONEPHERIC TUBULES

- **MALE:**
- **1. SUPERIOR ABERRANT DUCTULES OF TESTIS**
- **2. INFERIOR ABERRANT DUCTULES OF TESTIS**
- **3. APPENDIX OF EPIDIDYMIS**

REMNANTS OF PARAMESONEPHERIC DUCTS

- **MALES;**
- **1. APPENDIX OF TESTIS**
- **2. PROSTATIC UTRICLE**

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REMANANTS OF THE MESONEPHERIC TUBULES

- **FEMALES:**
- **1. TUBULES OF EPOOPHORON**
- **2. TUBULES OF PARA EPOOPHORON**

REMANANTS OF THE MESONEPHERIC DUCT

- **1. DUCT OF EPOOPHORON– GARTNERS DUCT**
- **2. DUCT OF PARA EPOOPHORON**

When to suspect

- Micropenis: Stretched penile length<2.5cm in a term newborn
- Asymmetry of labioscrotal folds
- A penis with B/L nonpalpable testis
- U/L cryptorchidism with hypospadias
- Perineoscrotal or penoscrotal hypospadias with or without microphallus even if testes are descended.
- Apparently female external genitalia with clitoromegaly or inguinal hernia
- Overtly abnormal genitals like cloacal exstrophy
- Discordance of external genitalia with prenatal karyotype.

Types

46,XX virilized female

- **Congenital adrenal hyperplasia**
  - 21-hydroxylase deficiency,
  - 11-hydroxylase deficiency
  - 3 beta hydroxysteroid dehydrogenase deficiency
- Aromatase deficiency(fetal and maternal)
- Glucocorticoid receptor gene mutation
- Virilizing maternal conditions
  - CAH
  - Adrenal/ovarian tumors
  - Drugs-progestin,androgen

46,XY undervirilized male

- **Defects in testicular differentiation**
- **Defects in testicular biosynthesis**
- **Defects in androgen action**

Ovotesticular DSD

- XX
- XY
- XX/XY chimera

Sex chromosome DSD

- 45X(turner syndrome)
- 47XXY(klinefelter syndrome)
- 45,X/46,XY(mixed gonadal dysgenesis)
- 46,XX/46XY

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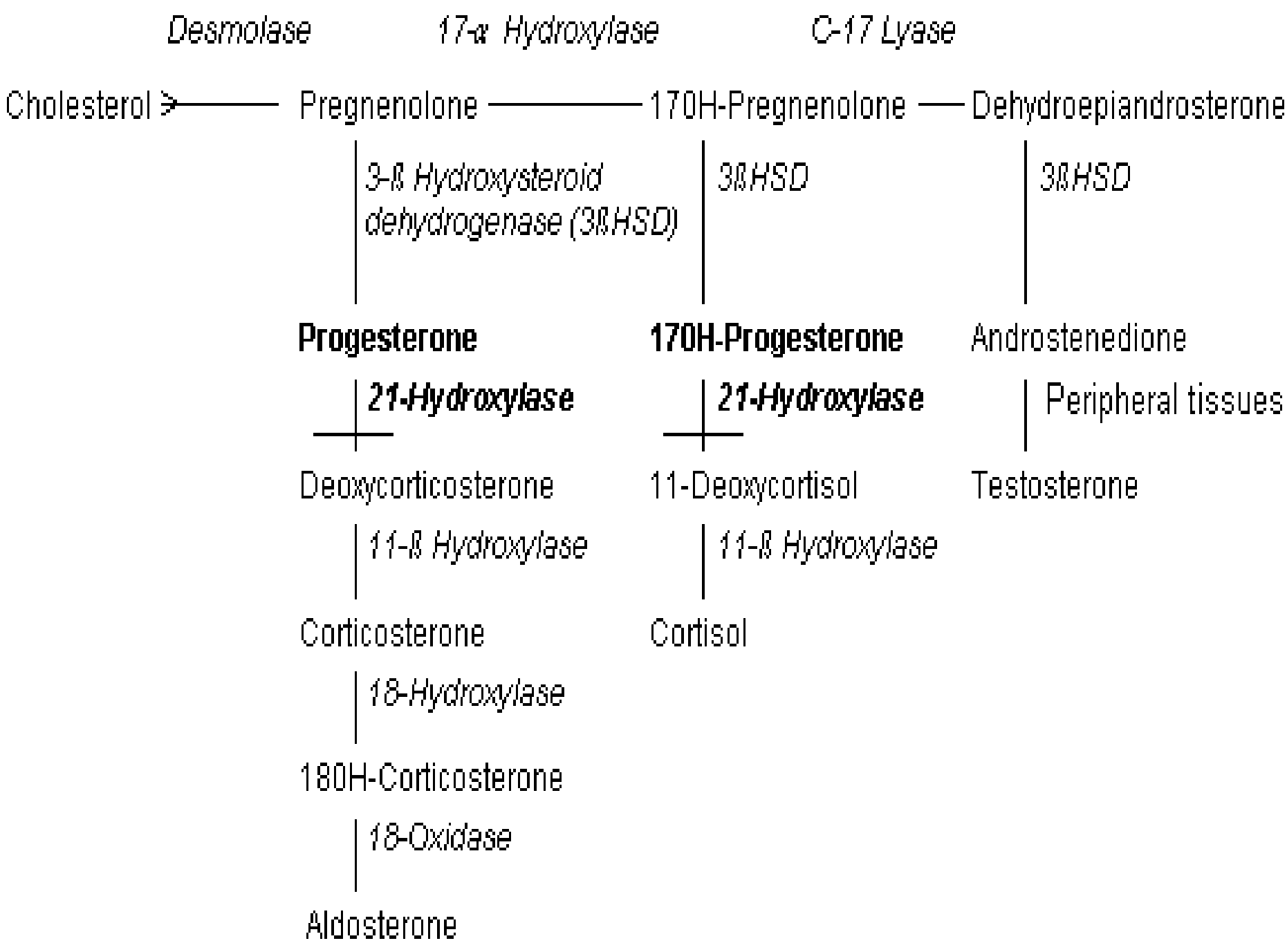

- 1. When does the metanephros become
- functional?
- (A) At week 3 of development
- (B) At week 4 of development
- (C) At week 10 of development
- (D) Just before birth
- (E) Just after birth

- 1. When does the metanephros become
- functional?
- (A) At week 3 of development
- (B) At week 4 of development
- (C) At week 10 of development(+)
- (D) Just before birth
- (E) Just after birth

. The proximal convoluted tubules of the definitive adult kidney are derived from the

- (A) ureteric bud
- (B) metanephric vesicle
- (C) mesonephric duct
- (D) mesonephric tubules
- (E) pronephric tubules

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- The proximal convoluted tubules of the
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- (A) ureteric bud
- (B) metanephric vesicle(+)
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- (D) mesonephric tubules
- (E) pronephric tubules

- The transitional epithelium lining the urinary bladder is derived from
- (A) ectoderm
- (B) endoderm
- (C) mesoderm
- (D) endoderm and mesoderm
- (E) neural crest cells

- The transitional epithelium lining the urinary
- bladder is derived from
- (A) ectoderm
- (B) endoderm(+)
- (C) mesoderm
- (D) endoderm and mesoderm
- (E) neural crest cells

- The transitional epithelium lining the
- ureter is derived from
- (A) ectoderm
- (B) endoderm
- (C) mesoderm(+)
- (D) endoderm and mesoderm
- (E) neural crest cells

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- The transitional epithelium lining the
- ureter is derived from
- (A) ectoderm
- (B) endoderm
- (C) mesoderm(+)
- (D) endoderm and mesoderm
- (E) neural crest cells

- Immediately after birth of a boy, a moist, red protrusion of tissue is noted just superior to his pubic symphysis. After observation, urine drainage is noted from the upper lateral corners of this tissue mass. What is the diagnosis?
- (A) Pelvic kidney
- (B) Horseshoe kidney
- (C) Polycystic disease of the kidney
- (D) Urachal cyst
- (E) Exstrophy of the bladder

- Immediately after birth of a boy, a moist,
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- (A) Pelvic kidney
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- (D) Urachal cyst
- (E) Exstrophy of the bladder(+)

- The indifferent embryo begins
- phenotypic sexual differentiation during
- (A) week 3 of development
- (B) week 5 of development
- (C) week 7 of development
- (D) week 12 of development
- (E) week 20 of development

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- The indifferent embryo begins
- phenotypic sexual differentiation during
- (A) week 3 of development
- (B) week 5 of development
- (C) week 7 of development(+)
- (D) week 12 of development
- (E) week 20 of development

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- (A) broad ligament
- (B) suspensory ligament of the ovary
- (C) round ligament of the uterus
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- (A) testosterone
- (B) MIF
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- Bilateral cryptorchidism usually results in
- (A) impotence
- (B) sterility
- (C) male pseudo-intersexuality
- (D) female pseudo-intersexuality
- (E) testicular feminization syndrome

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