DEVELOPMENT OF MALE GENITAL SYSTEM

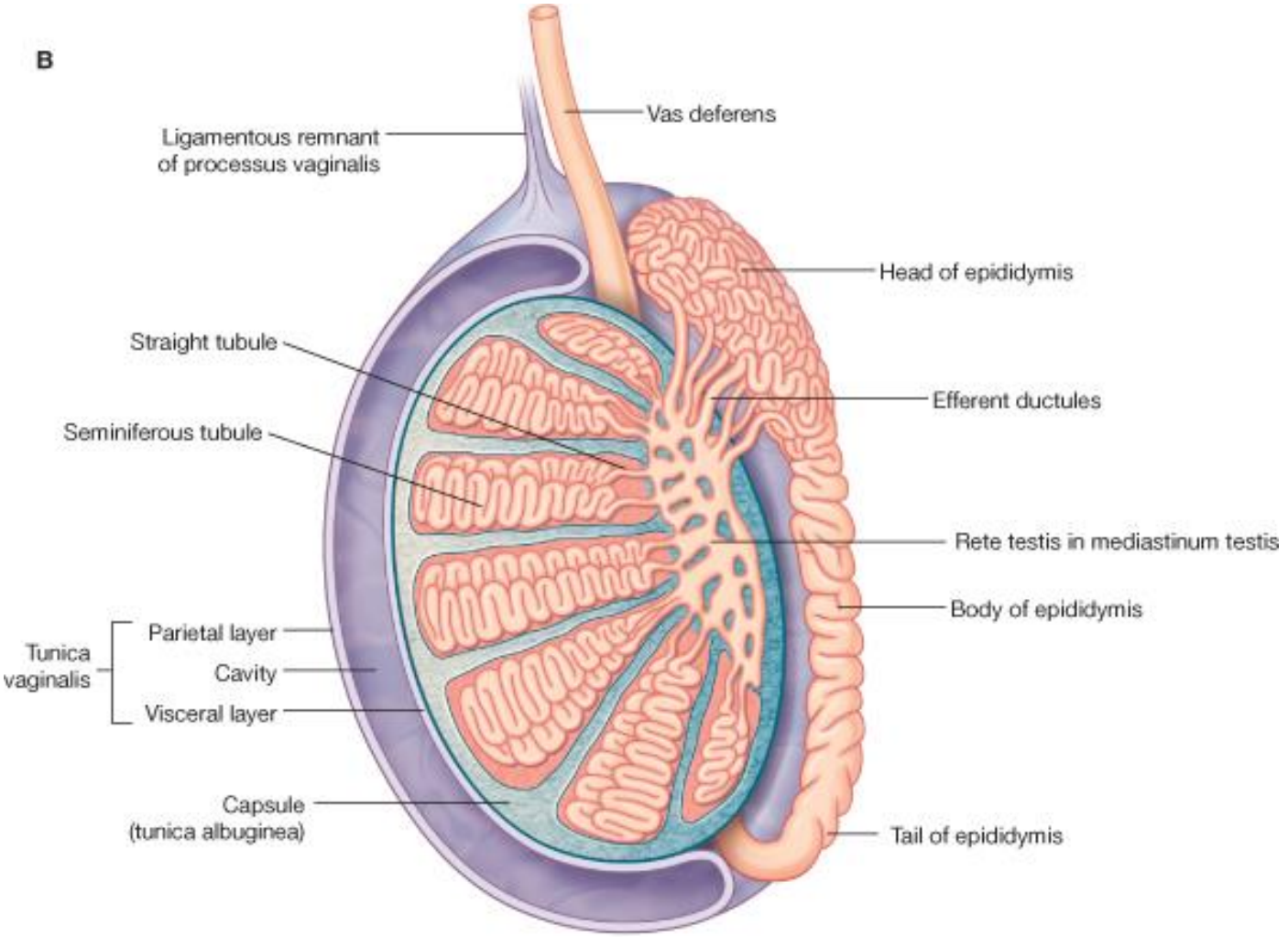
Prof. Ahmed Fathalla Ibrahim

OBJECTIVES

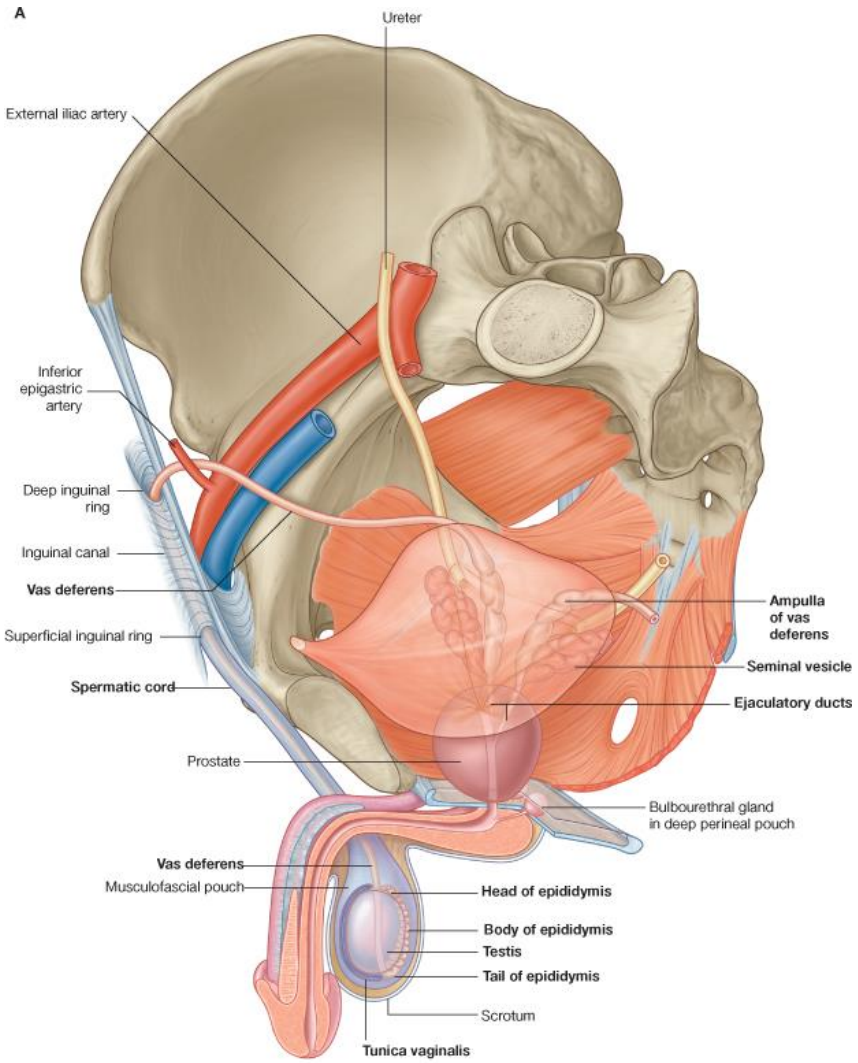
At the end of the lecture, students should be able to:

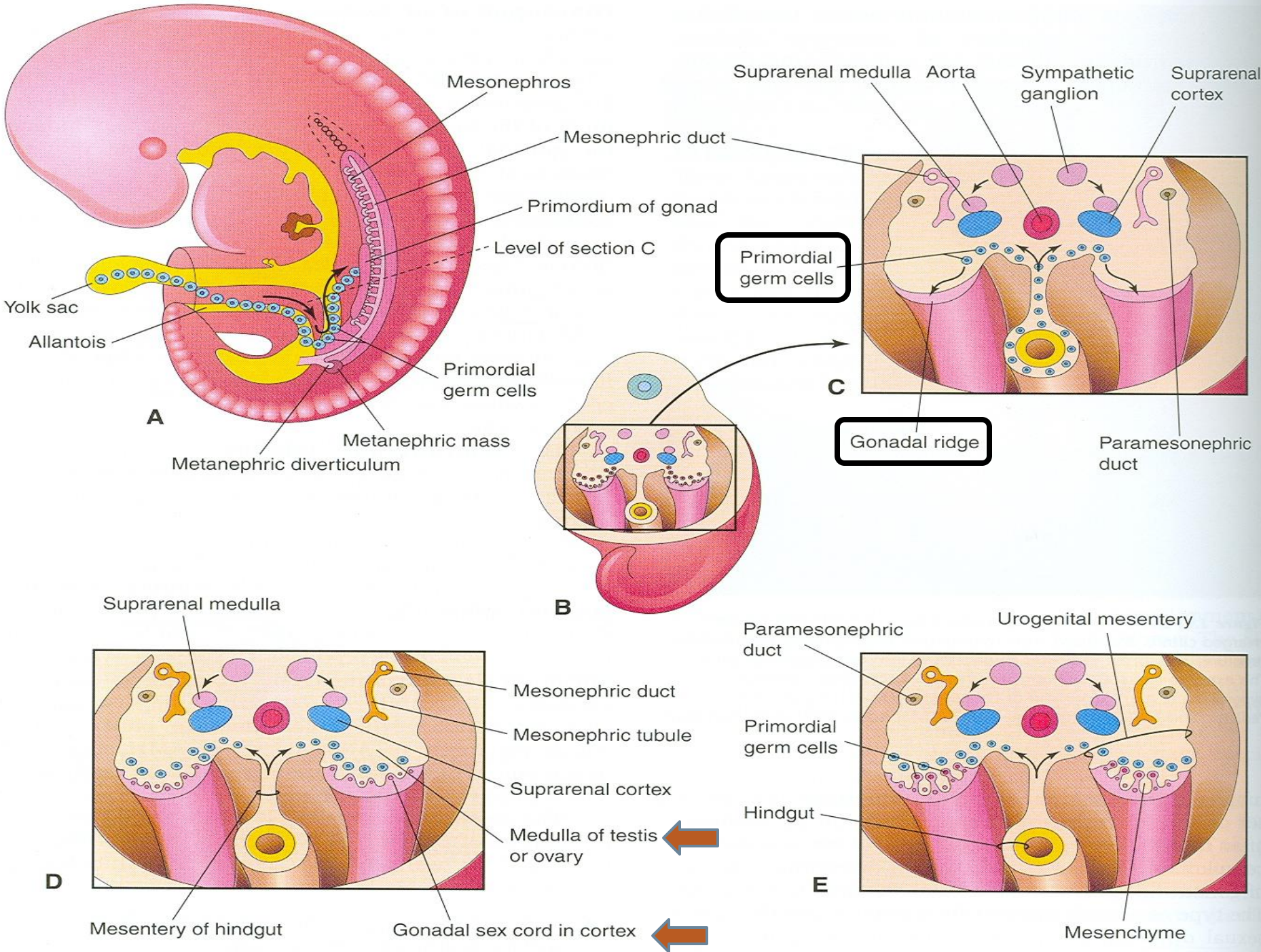
- **List the causes of differentiation of genitalia into the male type.**
- **Describe the origin of each part of the male internal & external genitalia.**
- **List the causes & describe the events of descent of testis.**
- **List the common anomalies of male genital system & describe the causes of each of them.**

TESTIS & EPIDIDYMIS



MALE GENITAL SYSTEM




Mesonephros
Mesonephric duct
Primordium of gonad
Level of section C
Yolk sac
Allantois
Primordial germ cells
A
Metanephric mass
Metanephric diverticulum
B
Suprarenal medulla
Aorta
Sympathetic ganglion
Suprarenal cortex
Primordial germ cells
C
Gonadal ridge
Paramesonephric duct
Suprarenal medulla
Mesonephric duct
Mesonephric tubule
Suprarenal cortex
Medulla of testis or ovary
D
Mesentery of hindgut
Gonadal sex cord in cortex
Paramesonephric duct
Urogenital mesentery
Primordial germ cells
Hindgut
E
Mesenchyme

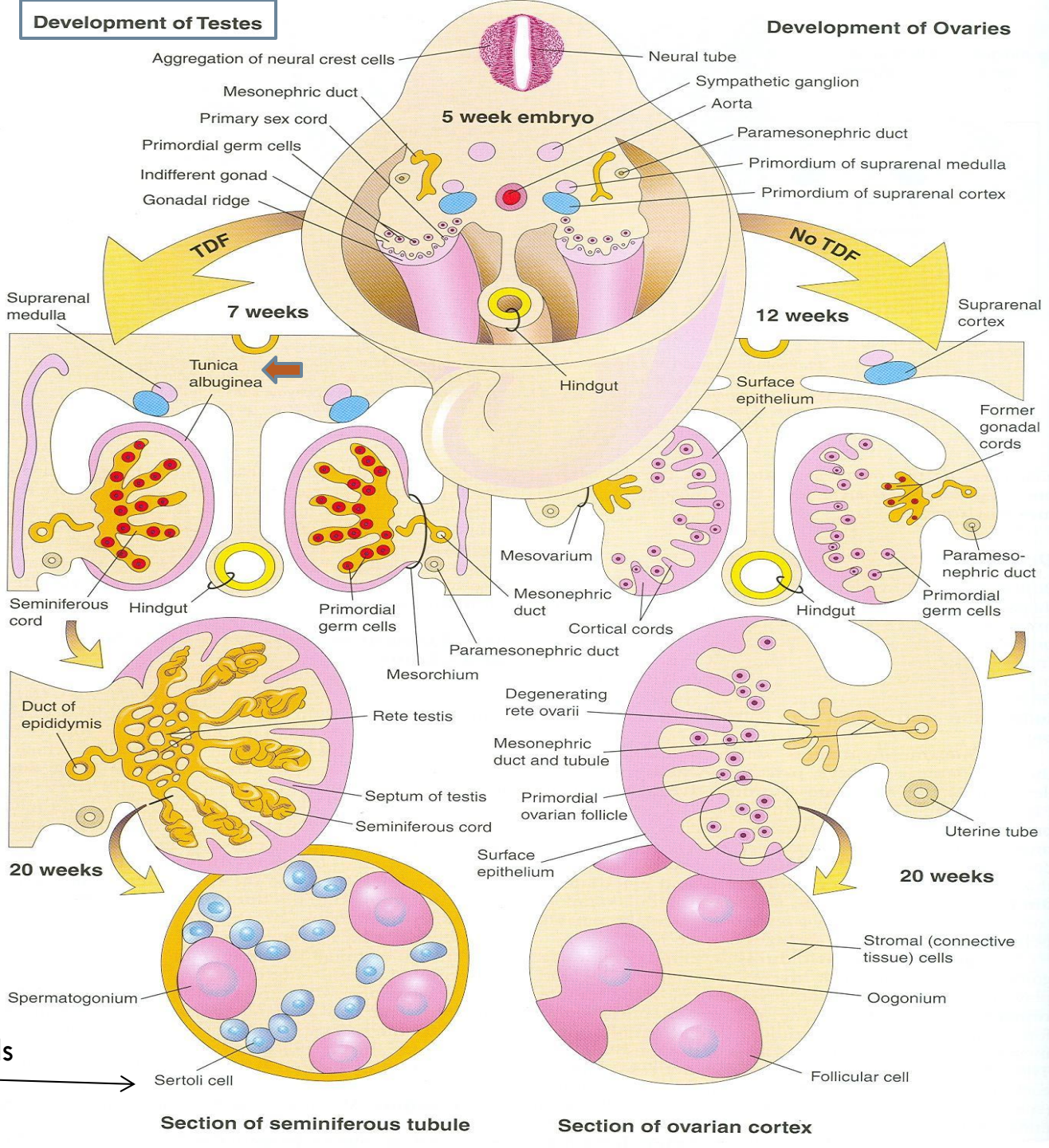
DEVELOPMENT OF GONADS

- **During 5th week: gonadal development occurs.**
- **Until 7th week: gonads are similar in both sexes.**
- **Gonads are derived from *3 sources:***

1. **Mesothelium (mesodermal epithelium lining the coelomic cavity)**
2. **Underlying mesenchyme**
3. **Primordial germ cells**

INDIFFERENT GONADS

- **Gonadal ridge:** a bulge on the medial side of mesonephros produced by:
1. *Proliferation of mesothelium* (cortex)
2. *Proliferation of mesenchyme* (medulla)
- **Gonadal (primary sex) cords:** The proliferating mesothelial cells fuse to form cords.
- **Primordial germ cells:** endodermal cells of the yolk sac migrate along dorsal mesentery of hindgut to gonadal ridges & become incorporated into gonadal cords.



In Medulla

Germ cells

Mesothelial cells

DEVELOPMENT OF TESTIS

The Y chromosome has a testis-determining factor (TDS) that differentiates gonad into testis.

At 7th week:

- Regression of cortex & differentiation of medulla into testis.
- Gonadal cords condense & extend into medulla to form seminiferous cords.
- The characteristic feature is the development of a thick fibrous capsule (tunica albuginea) that separates the enlarging testis from mesonephros.

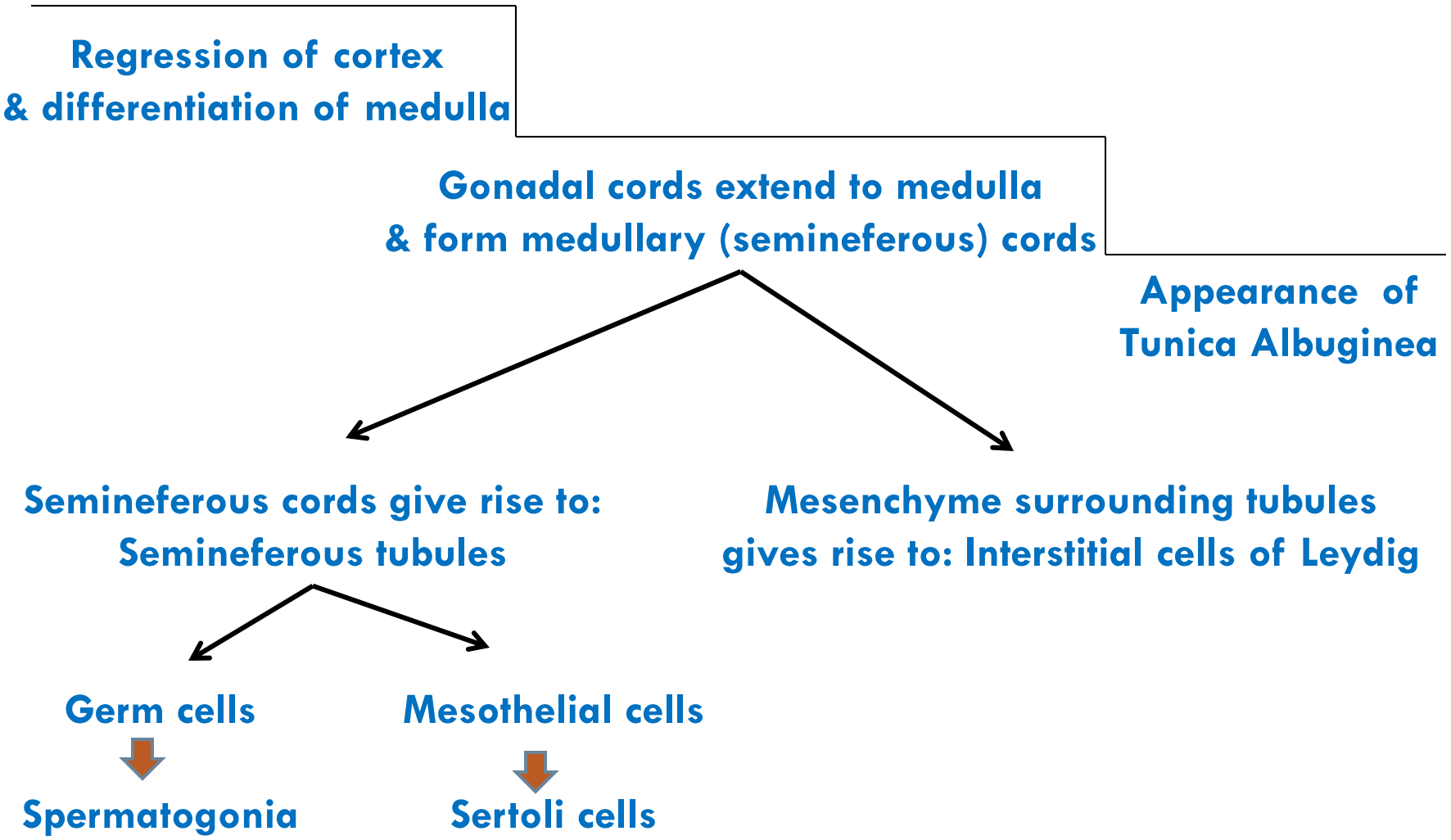
DEVELOPMENT OF TESTIS

- **Seminiferous cords develop into: *semineferous tubules***
- **Semineferous tubules remain solid until puberty. Its walls are composed of:**

1. ***Sertoli cells:* derived from surface epithelium of testis *(mesothelial cells)***
2. ***Spermatogonia:* derived from *primordial germ cells***

- **By eighth week, *mesenchyme* surrounding semineferous cords gives rise to *interstitial cells (of Leydig)* secreting testosterone**

DEVELOPMENT OF TESTIS (SUMMARY)



DEVELOPMENT OF MALE GENITAL DUCTS

Leydig's cells

Testosterone (8th week)

1) Masculine differentiation of mesonephric duct: epididymis, vas deferens, seminal glands, ejaculatory duct.
2) Masculine differentiation of external genitalia

Sertoli cells

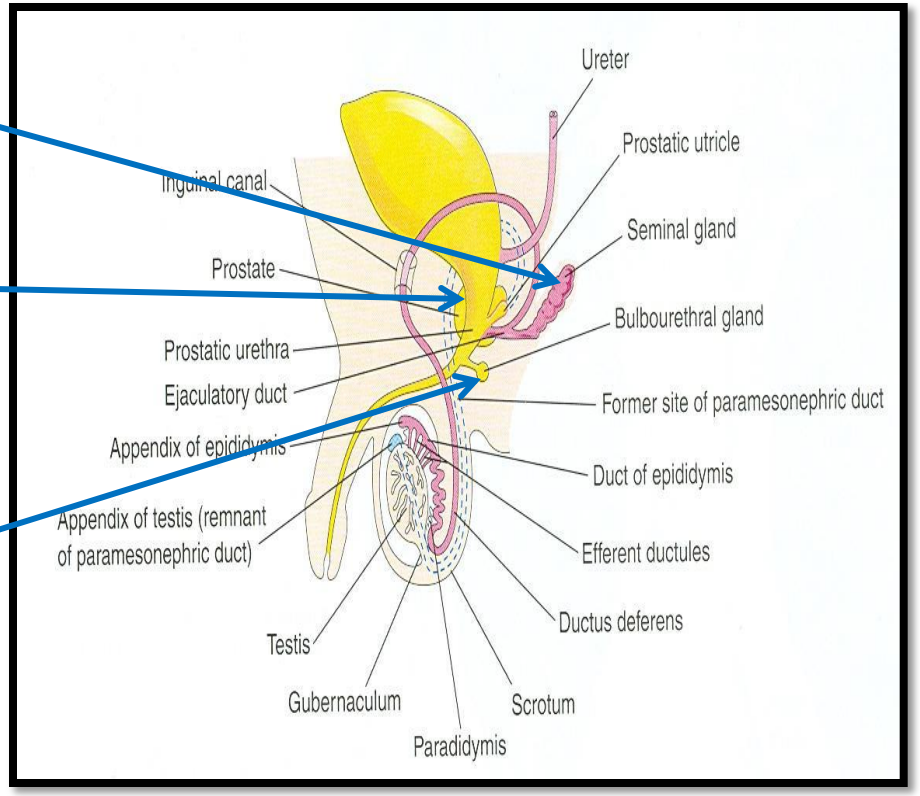
Müllerian inhibiting substance (Anti- Müllerian hormone) (7th week)

Suppression of development of paramesonephric (Müllerian) duct

DEVELOPMENT OF MALE GENITAL GLANDS

1. **SEMINAL GLAND:** mesodermal outgrowth from mesonephric duct.
2. **PROSTATE GLAND:** endodermal outgrowth from prostatic urethra.
3. **BULBOURETHRAL GLAND:** endodermal outgrowth from spongy urethra.

Stroma & smooth muscles in 2 & 3 are derived from surrounding mesenchyme



SUMMARY OF DEVELOPMENT OF MALE INTERNAL GENITALIA

MESODERMAL STRUCTURES

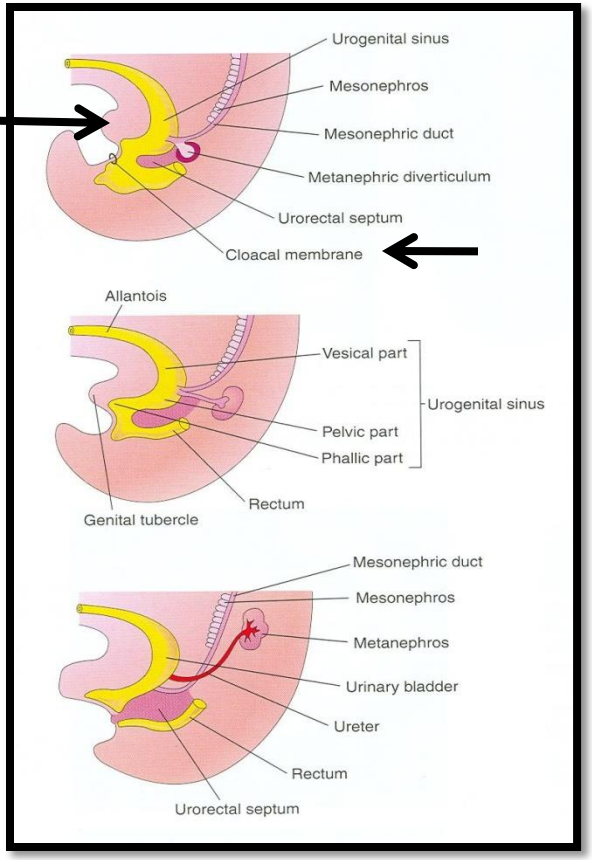
1. **Testis:** from medulla of genital ridge
2. **Semineferous tubules:** from medullar cords of ridge
3. **Sertoli cells:** from mesothelial cells of ridge
4. **Leydig's cells:** from mesenchyme surrounding the tubules

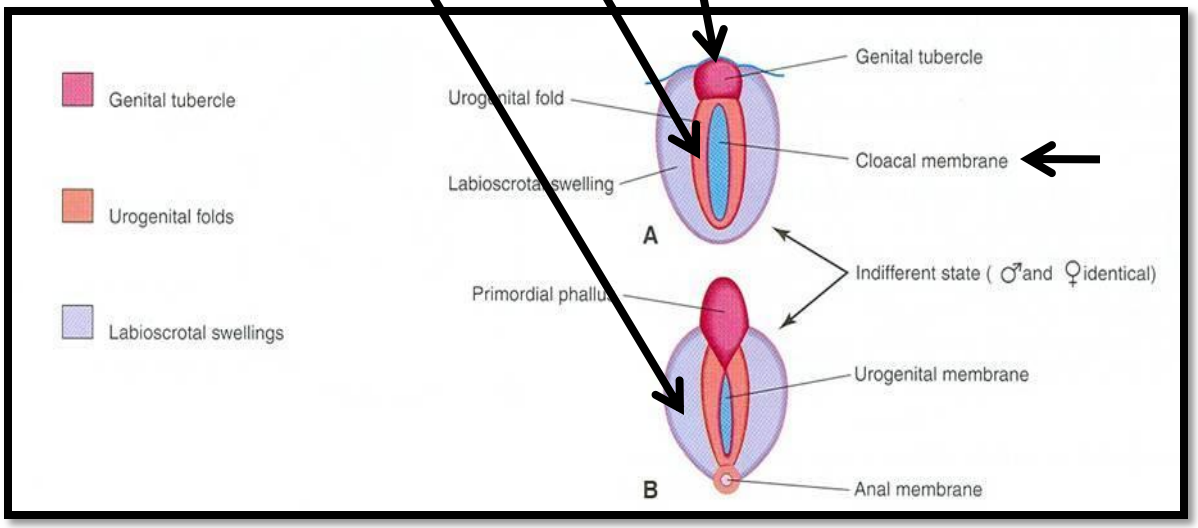
- **Epididymis, vas deferens, seminal glands, ejaculatory duct:** from mesonephric duct

ENDODERMAL STRUCTURES

1. **Spermotogonia:** from primordial germ cells of yolk sac
2. **Prostate gland:** from prostatic urethra
3. **Bulbourethral glands:** from spongy urethra

- **Genital tubercle:** produced from mesenchyme at the cranial end of cloacal membrane. It elongates to form a primordial phallus
- **Urogenital folds:** develop on each side of cloacal membrane
- **Labioscrotal swellings:** develop on each side of urogenital folds



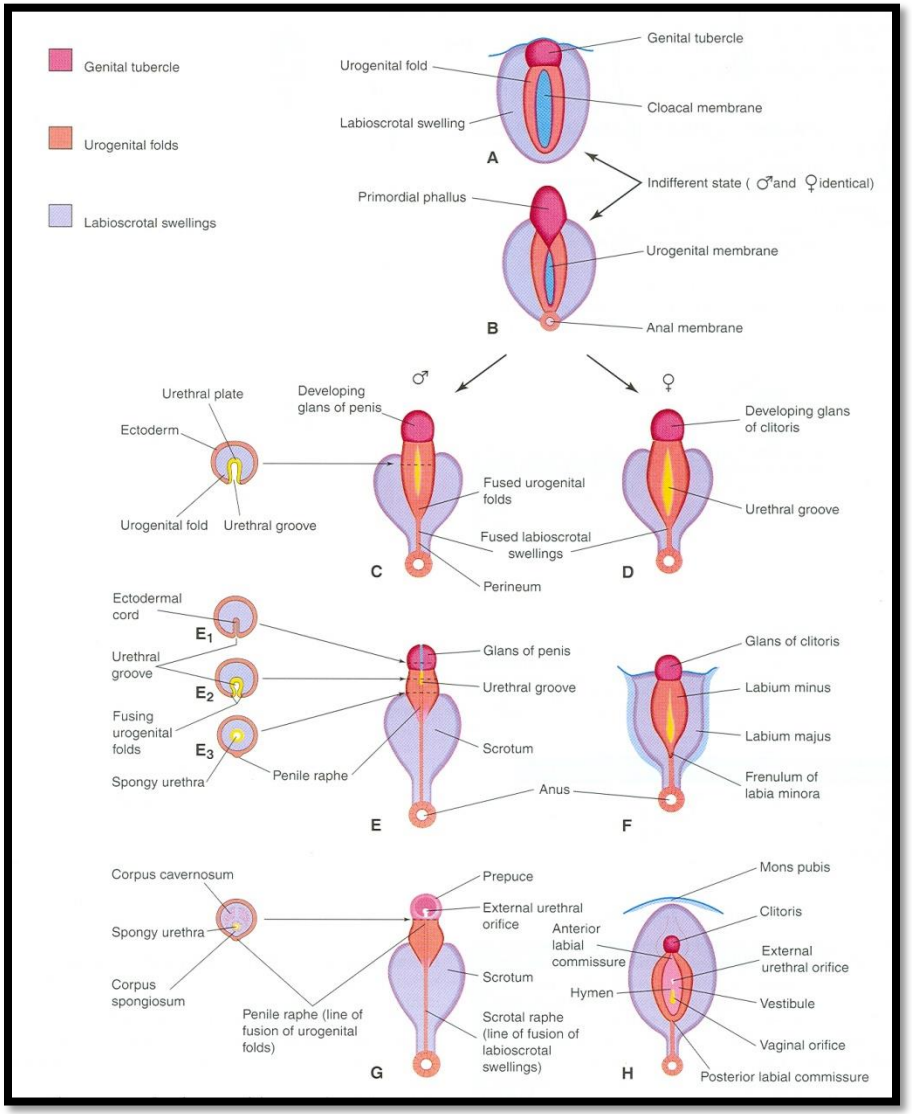


INDIFFERENT STAGE OF EXTERNAL GENITALIA (from 4th to 7th week)

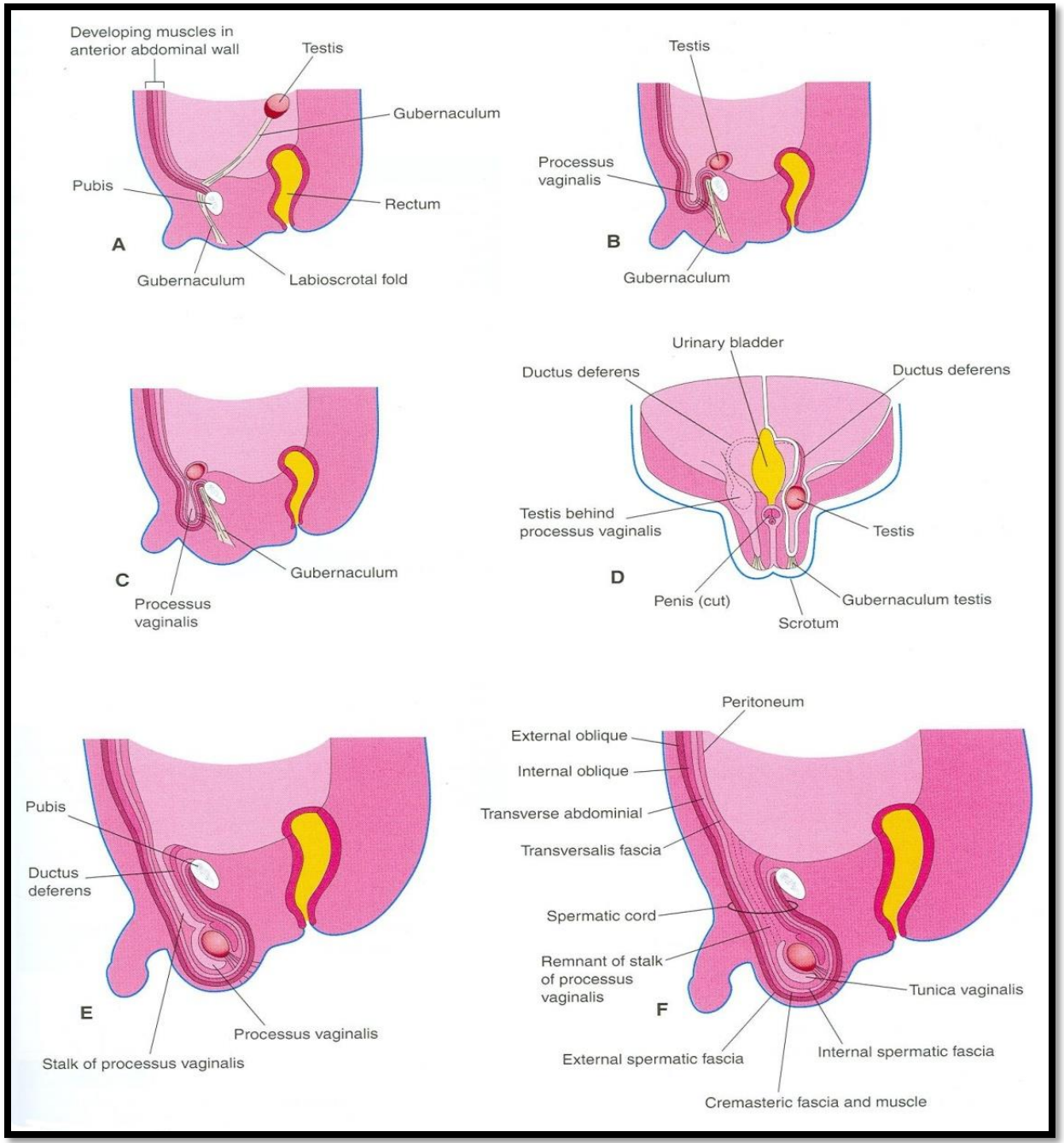
DEVELOPMENT OF MALE EXTERNAL GENITALIA
(stimulated by testosterone)

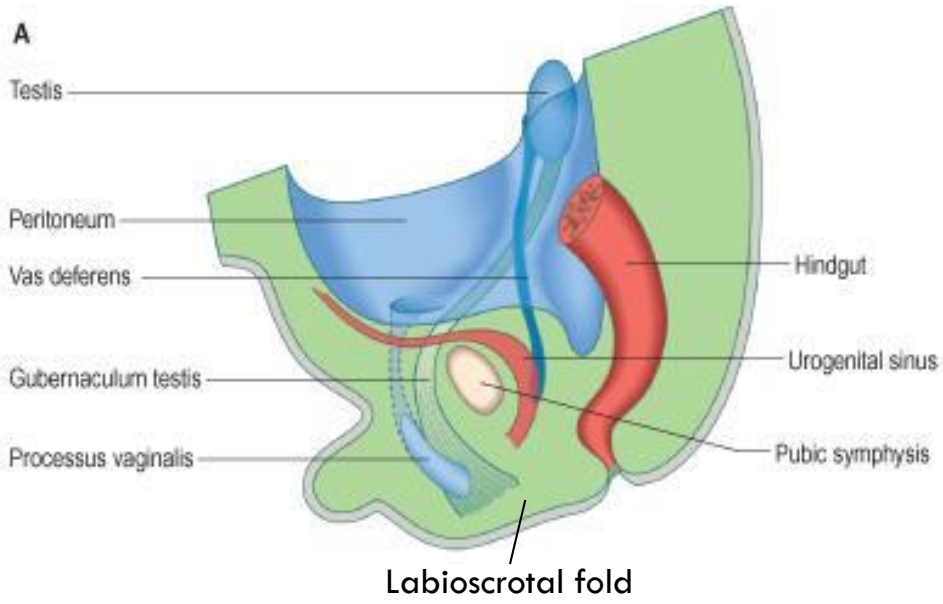
- Begins at 9th week
- Complete differentiation at 12th week:

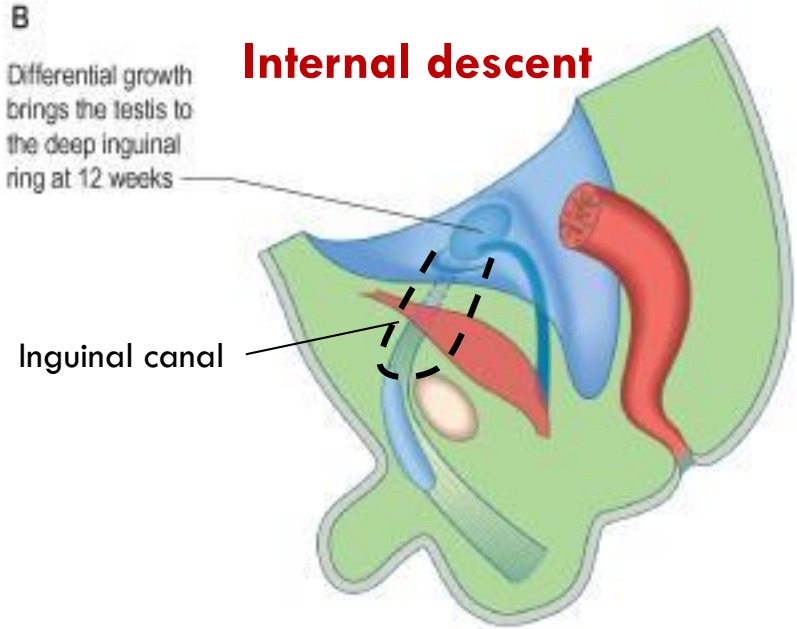
1. The phallus enlarges to form the penis
2. The urogenital folds fuse to form the spongy (penile) urethra
3. The labioscrotal folds (swellings) fuse to form the scrotum

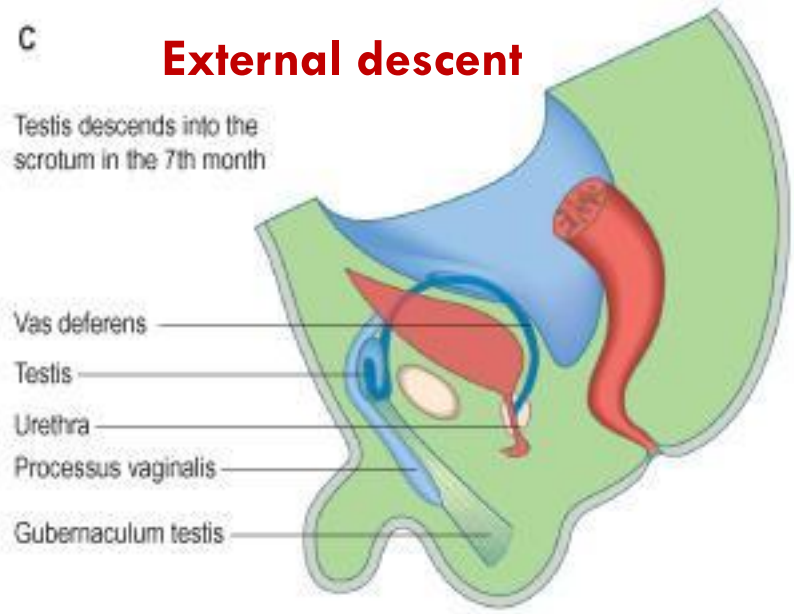


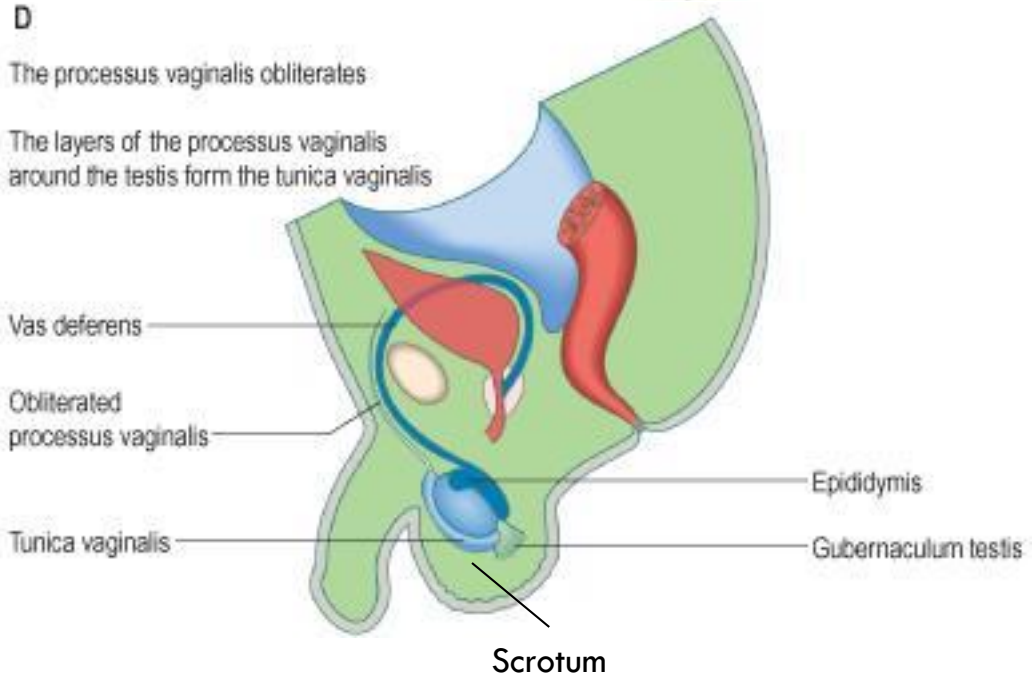
DESCENT OF TESTIS




A
Testis
Peritoneum
Vas deferens
Gubernaculum testis
Processus vaginalis
Hindgut
Urogenital sinus
Pubic symphysis
Labioscrotal fold


B
Internal descent
Differential growth brings the testis to the deep inguinal ring at 12 weeks
Inguinal canal


C
External descent
Testis descends into the scrotum in the 7th month
Vas deferens
Testis
Urethra
Processus vaginalis
Gubernaculum testis


D
The processus vaginalis obliterates
The layers of the processus vaginalis around the testis form the tunica vaginalis
Vas deferens
Obliterated processus vaginalis
Tunica vaginalis
Epididymis
Gubernaculum testis
Scrotum

DESCENT OF TESTIS

- **Gubernaculum:** a mesenchymal band extending from inferior pole of gonad to labioscrotal fold.
- **Inguinal canal:** a pathway formed by gubernaculum through layers of anterior abdominal wall.
- **Processus vaginalis:** a peritoneal fold passing through inguinal canal before testis to facilitate its descent.

INTERNAL DESCENT OF TESTIS

- **Definition:** Descent of testis from posterior abdominal wall to deep inguinal ring.
- **Time:** During **12th week**
- **Cause:** a ***relative movement*** resulting from elongation of cranial part of abdomen away from its caudal part (future pelvic cavity).

EXTERNAL DESCENT OF TESTIS

- **Definition:** Descent of testis from deep inguinal ring, through inguinal canal, to scrotum
- **Time:** Begins in **7th month** and ***takes 2 to 3 days***
- **Causes:**

1. Controlled by **androgens**
2. Guided by **gubernaculum**
3. Facilitated by **processus vaginalis**
4. Helped by **increased intra-abdominal pressure** resulting from growth of abdominal viscera

EXTERNAL DESCENT OF TESTIS

1. More than 97% of full-term new born males have both testes in scrotum.
2. During first 3 months after birth, most undescended testes descend into scrotum.
3. No spontaneous descent occurs after the age of 1 year.

EXTERNAL DESCENT OF TESTIS

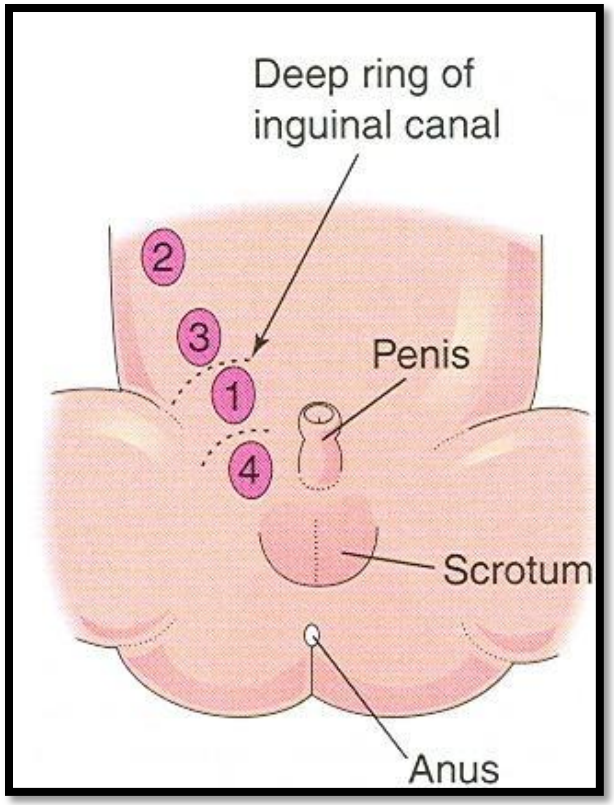
Complete descent of testis is associated by:

- **Degeneration of gubernaculum**
- **Obliteration of stalk of processus vaginalis**
- **Persistence of part of processus vaginalis surrounding the testis in the scrotum to form “tunica vaginalis”**

CHRYPTORCHIDISM
(UNDESCENDED TESTIS)

- **Incidence:** in up to 30% of premature & 3-4% of full term males
- **Cause:** deficiency of androgens
- **Common sites:** look to figure
- **Complications:**

1. Sterility, if bilateral
2. Testicular cancer (20-44%)

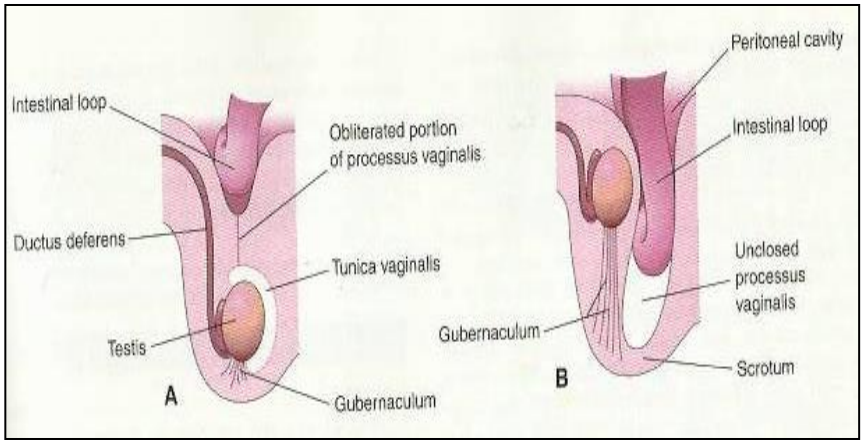


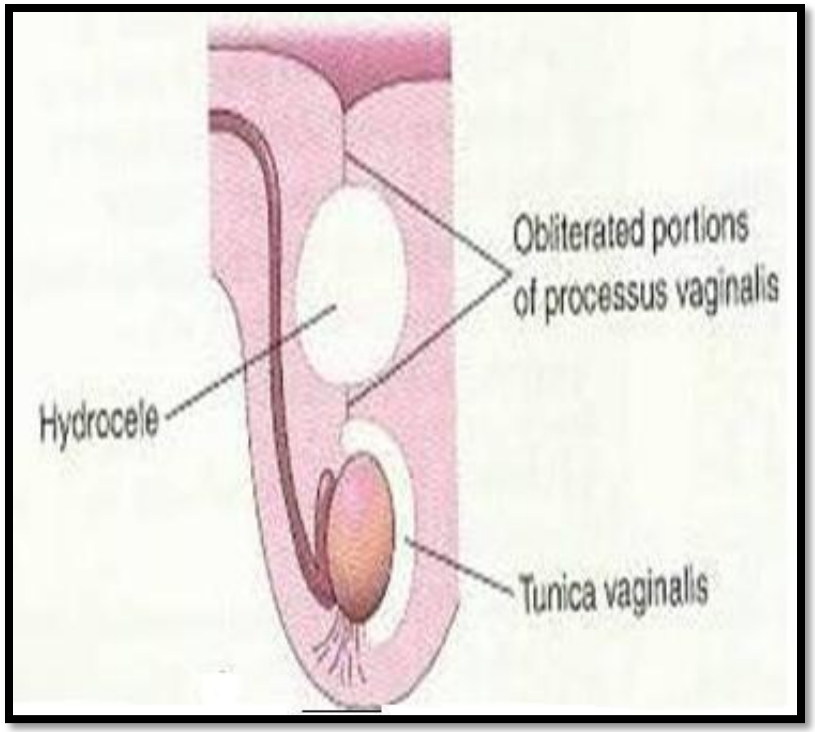
CONGENITAL INGUINAL HERNIA

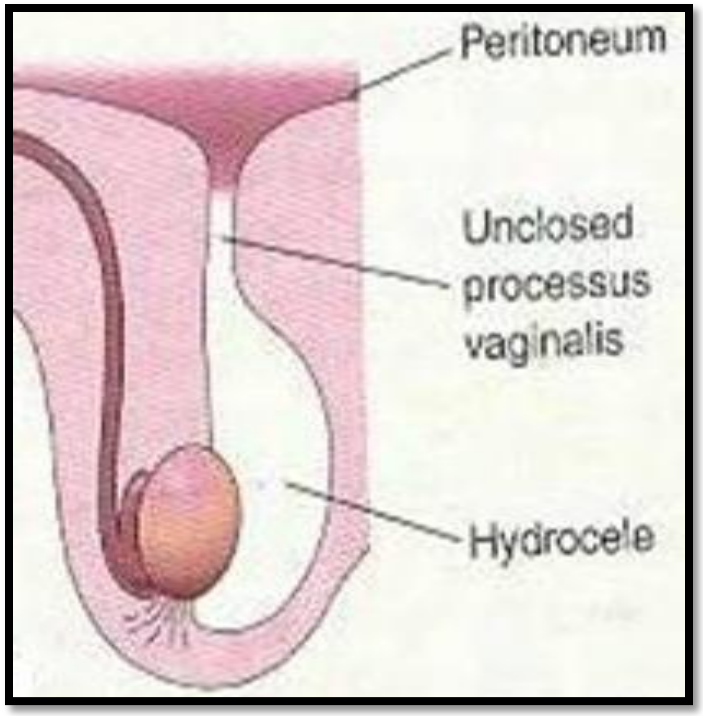
- **Definition:** Herniation of a loop of intestine through a non-obliterated processus vaginalis.

  A: incomplete
  B: complete (in scrotum)

- **Cause:** The processus vaginalis does not obliterate & remains in open communication with the peritoneal cavity.







HYDROCELE OF SPERMATIC CORD

Accumulation of fluid in spermatic cord due to a non-obliterated portion of stalk of processus vaginalis

HYDROCELE OF TESTIS

Accumulation of fluid in tunica vaginalis (in scrotum) due to non-obliteration of the whole stalk of Processus vaginalis

QUESTION 1

- **Which one of the following structure is a derivative of male urethra?**

1. **Seminal gland**
2. **Prostate gland** ⇐
3. **Vas deferens**
4. **Ejaculatory duct**

QUESTION 2

- Which one of the following cells are responsible for masculine differentiation of external genitalia?

1. Sertoli cells
2. Leydig's cells
3. Mesothelial cells
4. Primordial germ cells


They call our language the mother tongue
THANK YOU
because the father seldom gets to speak.