DEVELOPMENT
OF
MALE GENITAL SYSTEM

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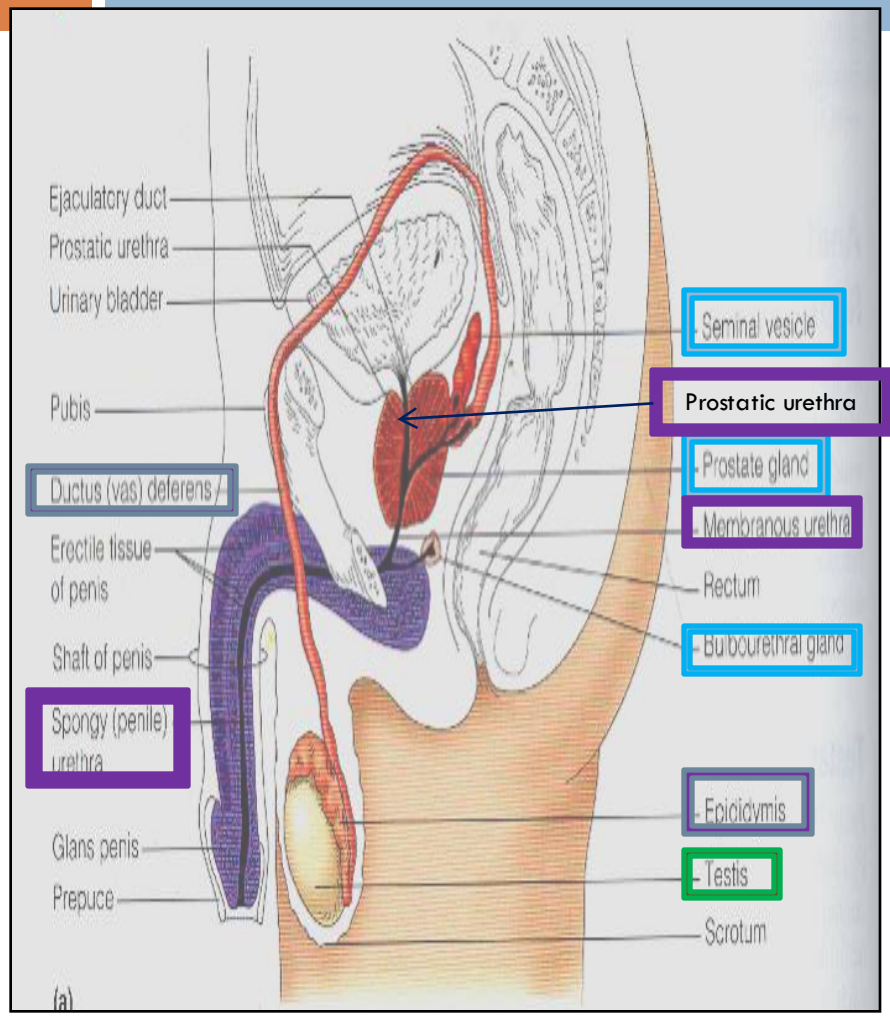
OBJECTIVES

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

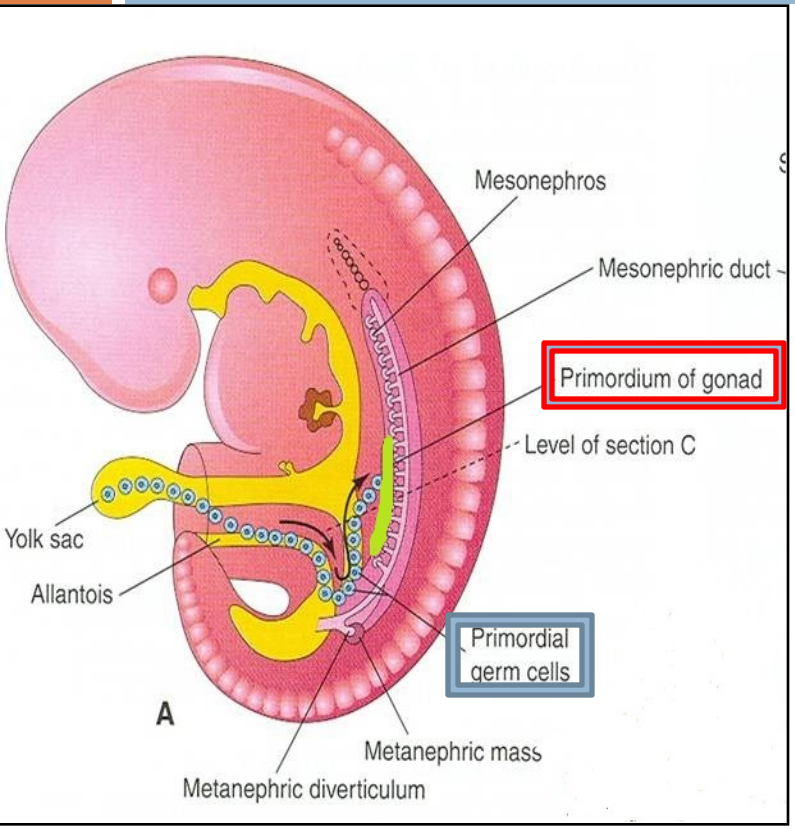
- **List the causes of differentiation of genitalia into the male type.**
- **Describe the origin of each part of the male internal & external genitalia.**
- **List the causes & describe the events of descent of testis.**
- **List the common anomalies of male genital system & describe the causes of each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

MALE GENITAL SYSTEM



- Gonad :
- Testis.
- Genital Ducts:
- Epididymis.
- Vas deferens.
- Urethra.
- Genital Glands:
- Seminale vesicle.
- Prostate.
- Bulbourethral Glands.

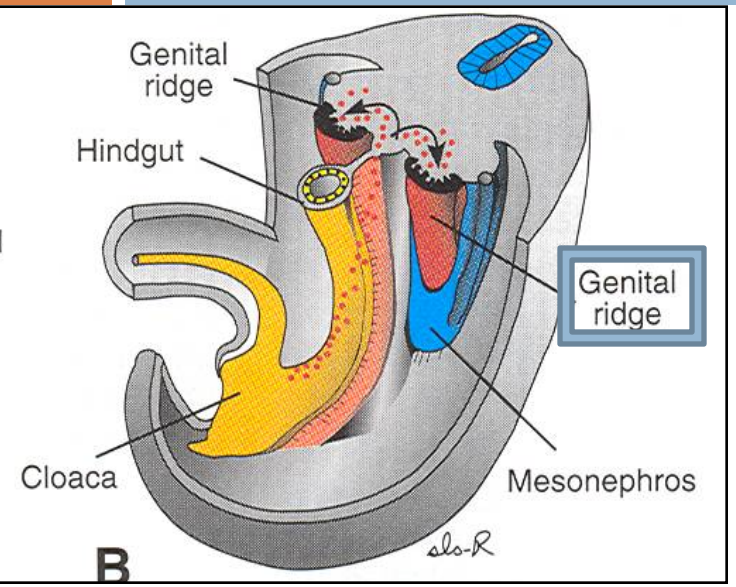
DEVELOPMENT OF GONADS

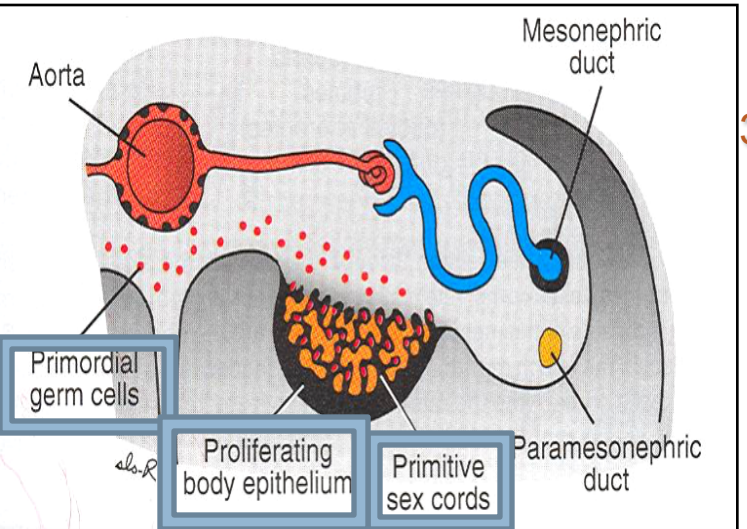


- During 5th week: gonadal development occurs.
- Until 7th week: gonads are similar in both sexes
- Gonads are derived from ***3 sources:***

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

INDIFFERENT GONADS





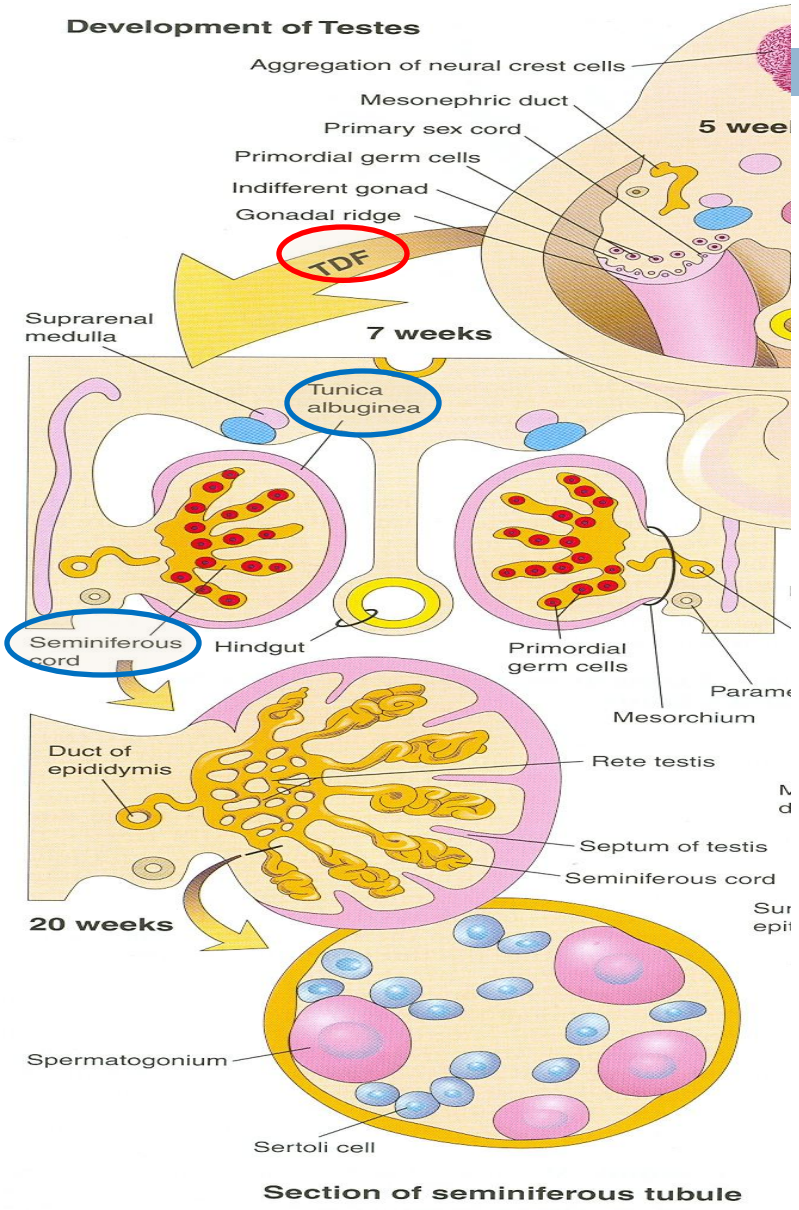
- **Gonadal ridge:** a bulge on the medial side of mesonephros produced by:
  1. *Proliferation of* ***mesothelium*** **(cortex)**
  2. *Proliferation of* ***mesenchyme*** **(medulla)**
- **Gonadal (primary sex) cords:**

The proliferating **mesothelial cells** fuse and penetrate the underlying mesenchyme to form **primitive gonadal cords.**

3. **Primordial germ cells:**

endodermal cells of the yolk sac migrate along dorsal mesentery of hindgut to gonadal ridges & become incorporated into gonadal cords.

DEVELOPMENT OF TESTIS

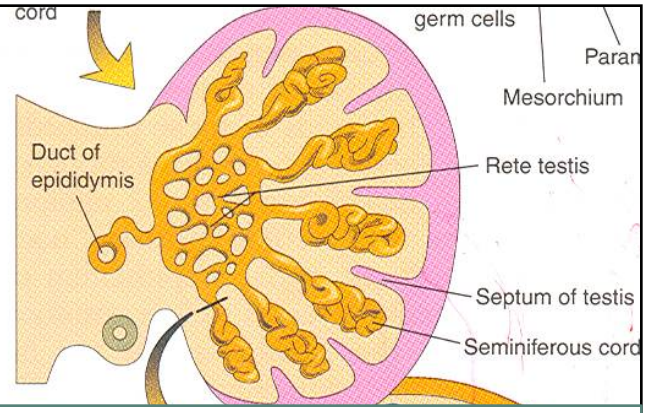


The Y chromosome has a **testis-determining factor (TDF)** that differentiates gonad into testis.

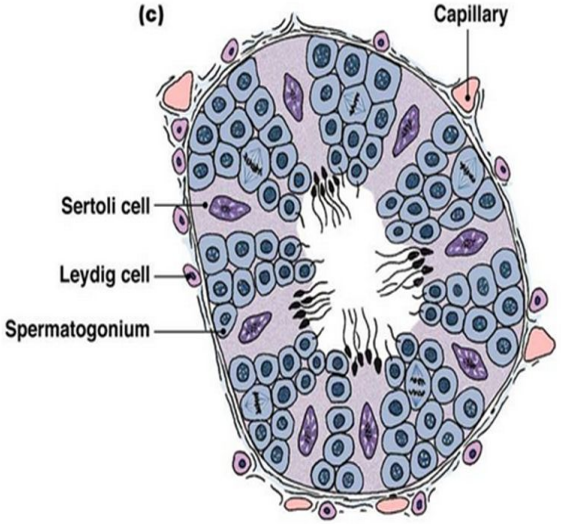
At 7th week:

- **Regression of cortex & differentiation of medulla into testis… How ?**
- **Gonadal cords condense & extend into medulla (Medullary cords) 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



The Seminiferous Tubule



- 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 MALE GENITAL DUCTS

Leydig's cells

↓ secretes

Testosterone (8th week)

↓

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

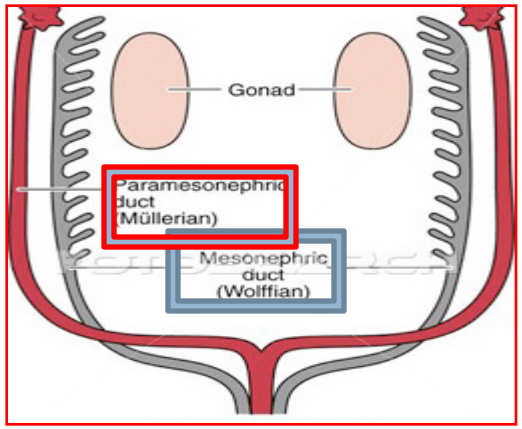
Sertoli cells

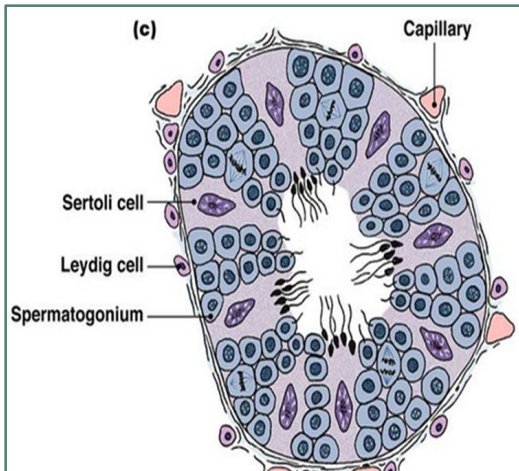
↓ secretes

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

↓

Suppression of development of paramesonephric (Müllerian) duct

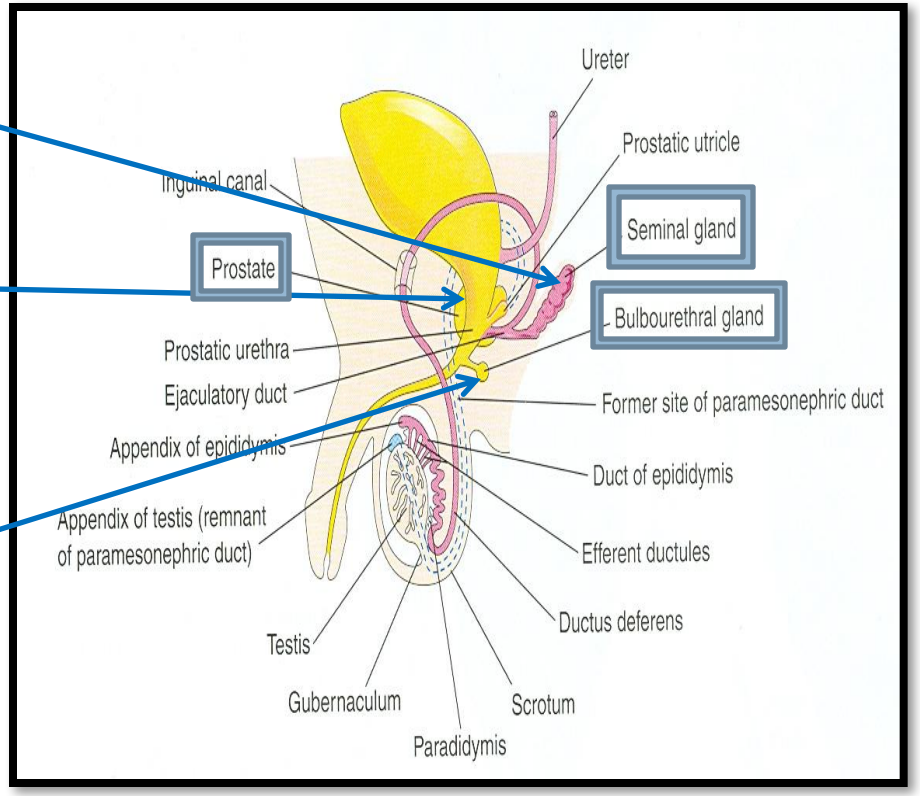




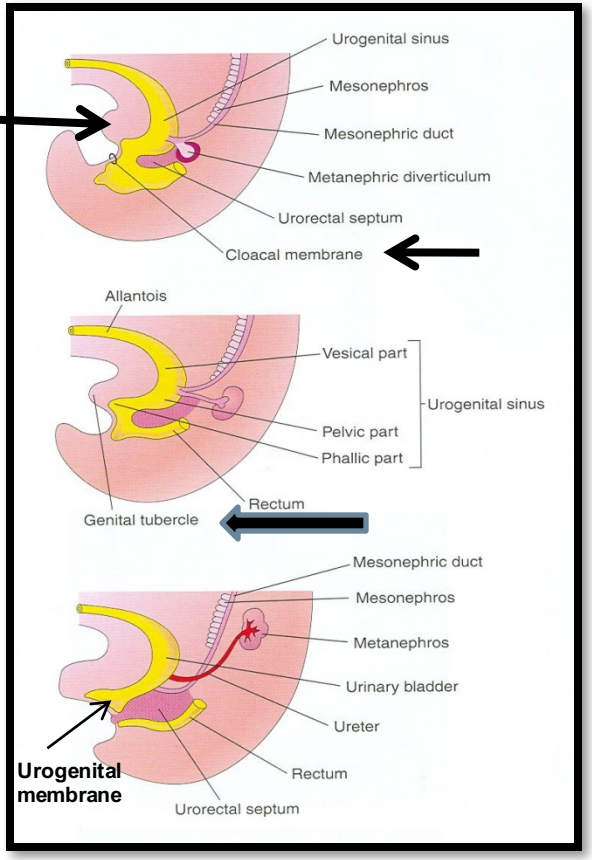
DEVELOPMENT OF MALE GENITAL GLANDS

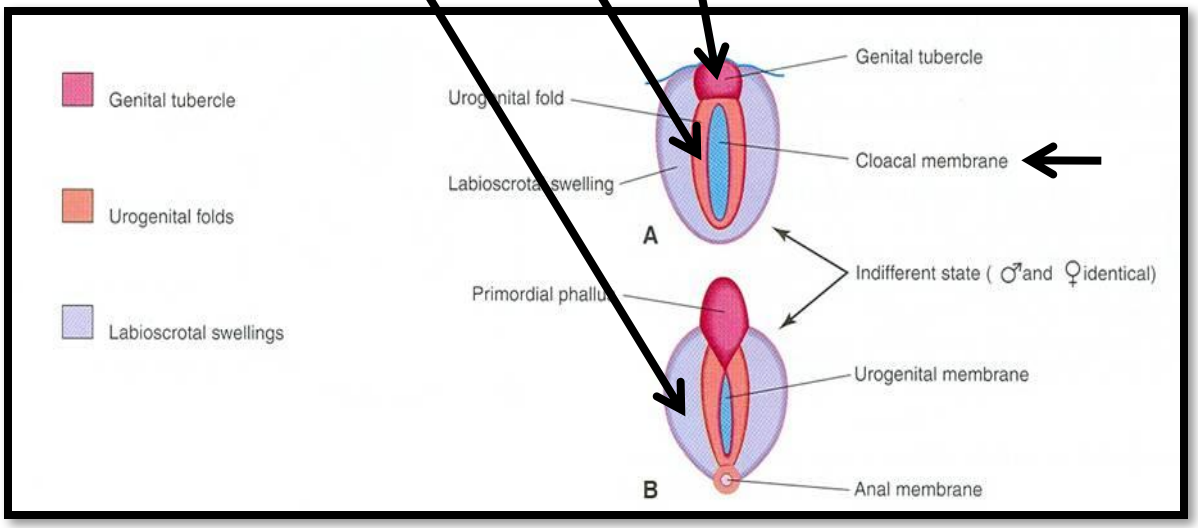
1. **SEMINAL GLAND:** mesodermal outgrowth from mesonephric duct.
2. **PROSTATE GLAND:** endodermal outgrowth from prostatic urethra.
3. **BULBOURETHRAL GLAND:** endodermal outgrowth from spongy urethra.

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



- **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



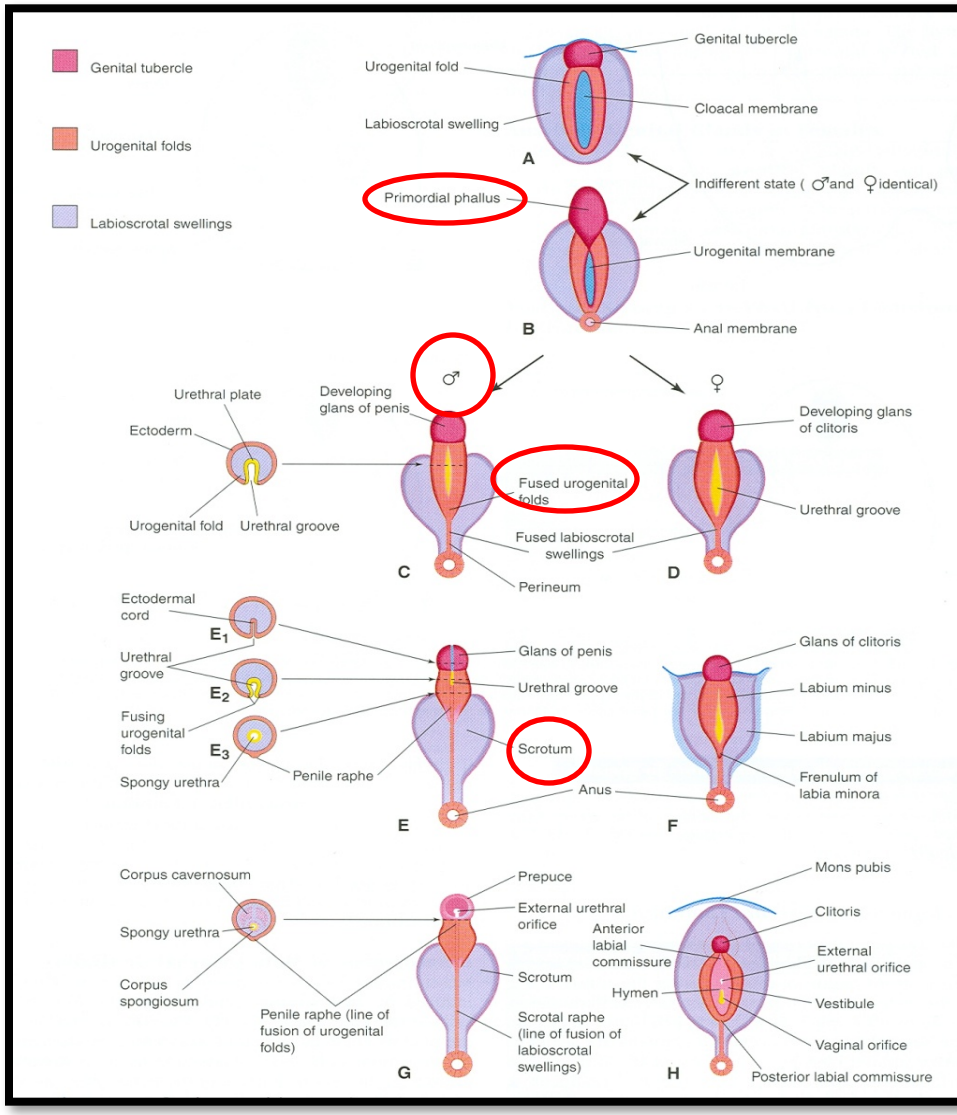


INDIFFERENT STAGE OF EXTERNAL GENITALIA (from 4th to 7th week)

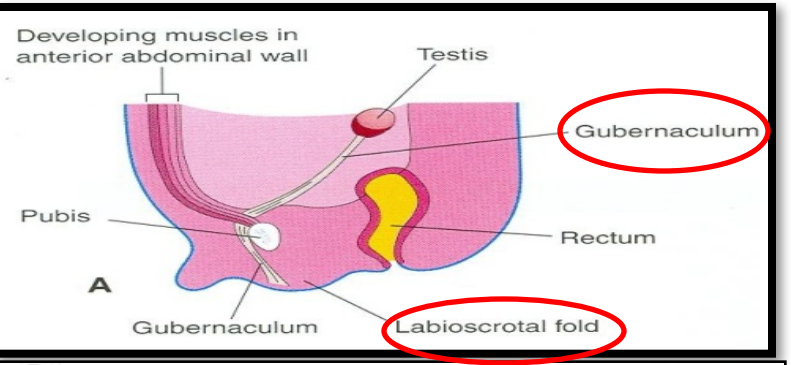
DEVELOPMENT OF MALE EXTERNAL GENITALIA
(stimulated by testosterone)

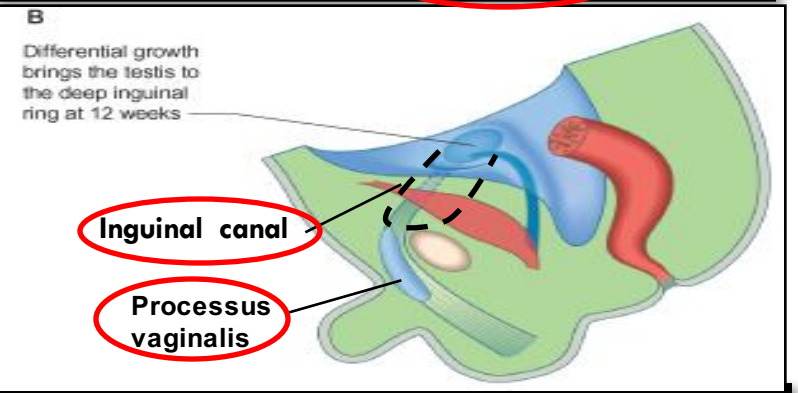
- Begins at 9th week
- Complete differentiation at 12th week:

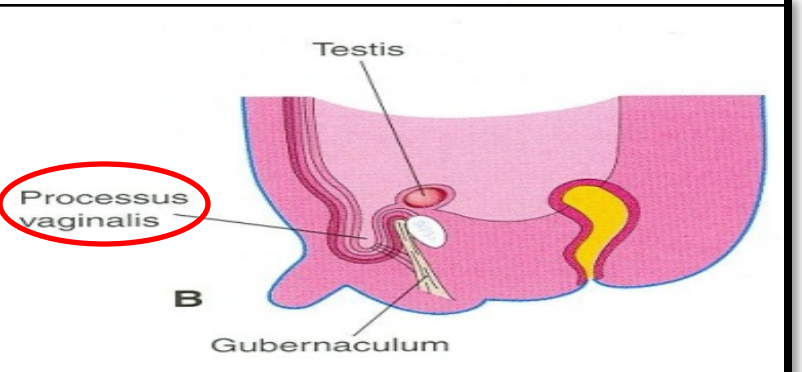
1. The phallus enlarges to form the penis
2. The urogenital folds fuse to form the spongy (penile) urethra
3. The labioscrotal folds (swellings) fuse to form the scrotum



DESCENT OF TESTIS

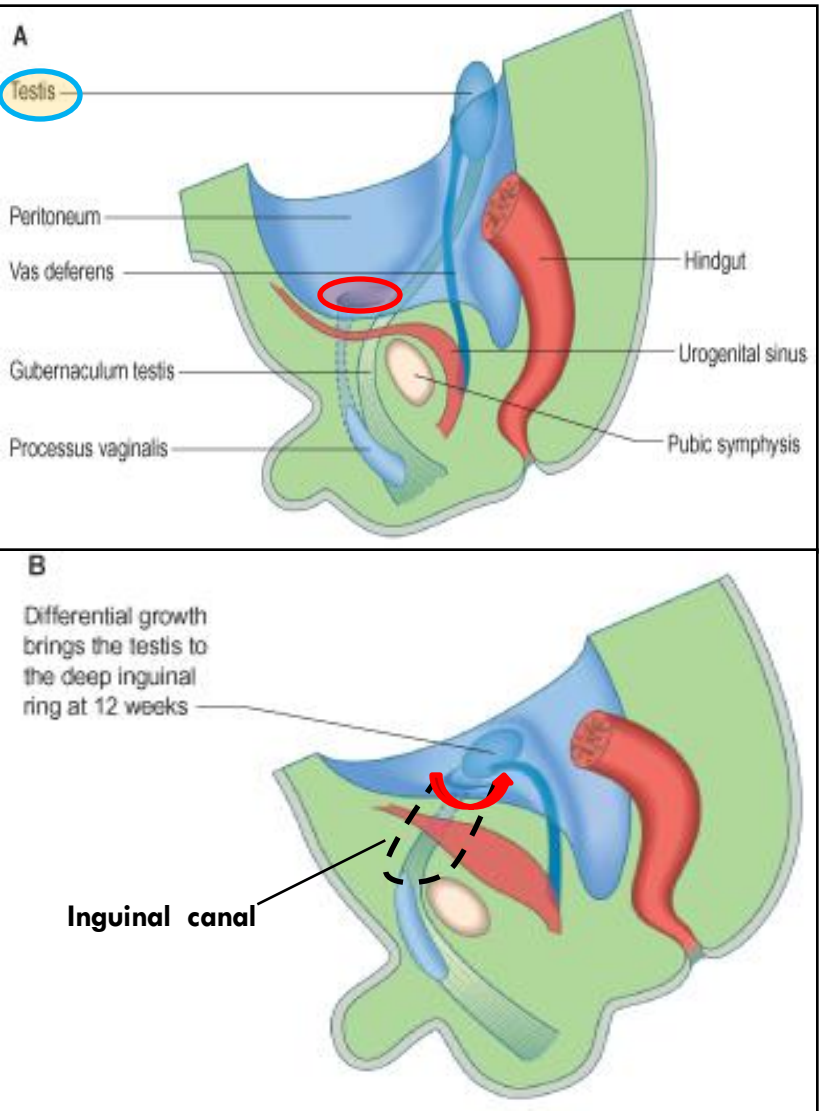






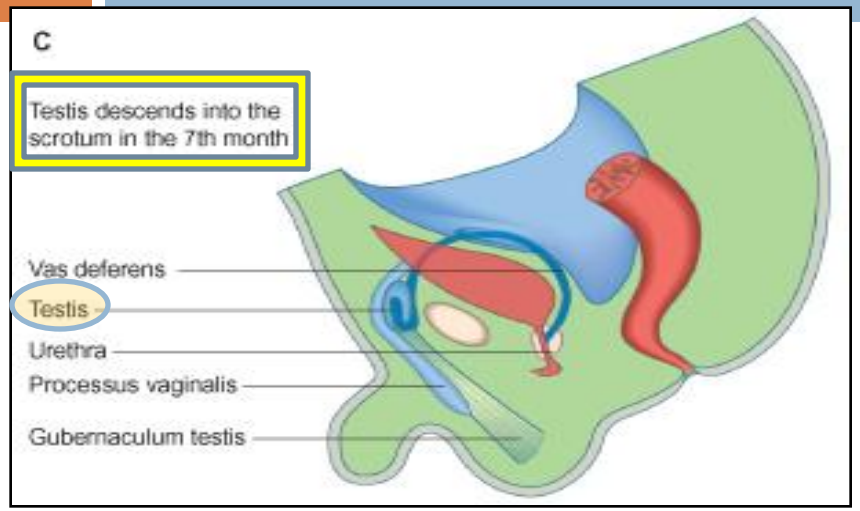
- **Gubernaculum:** a mesenchymal band extending from inferior pole of gonad to labioscrotal fold.
- **Inguinal canal:** a pathway formed by gubernaculum through layers of anterior abdominal wall.
- **Processus vaginalis:** a peritoneal fold passing through inguinal canal before testis, to facilitate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

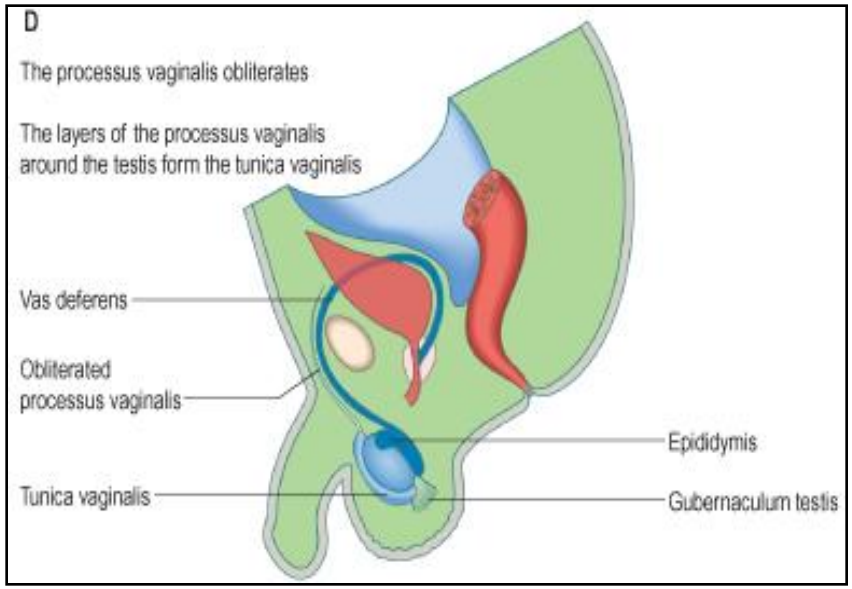
INTERNAL DESCENT OF TESTIS



- **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

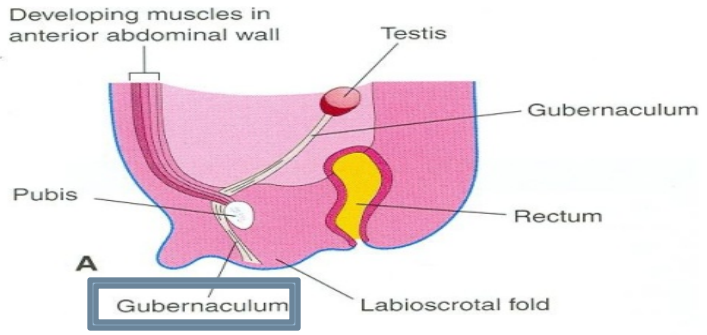


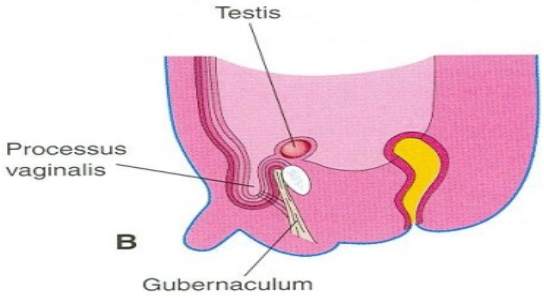


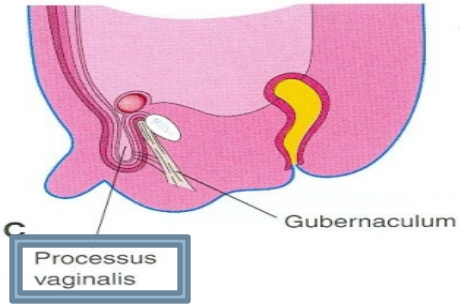
- **Definition:** Descent of testis from deep inguinal ring, through inguinal canal, to scrotum
- **Time:** Begins in 7th month and *takes 2 to 3 days*
- **Causes:**

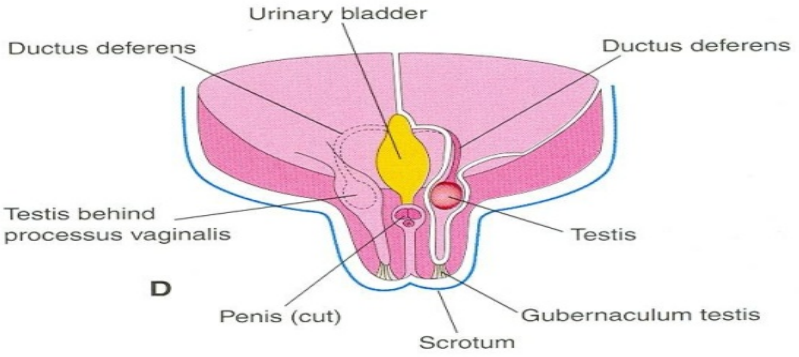
1. Controlled by androgens.
2. Guided by gubernaculum.
3. Facilitated by processus vaginalis.
4. Helped by increased intra-abdominal pressure resulting from growth of abdominal viscera.

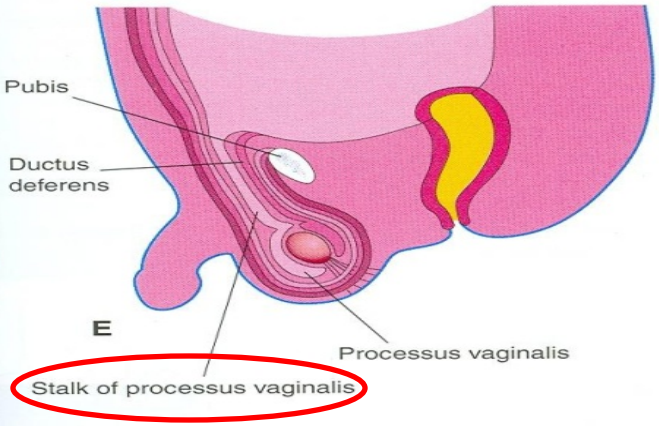
DESCENT OF TESTIS

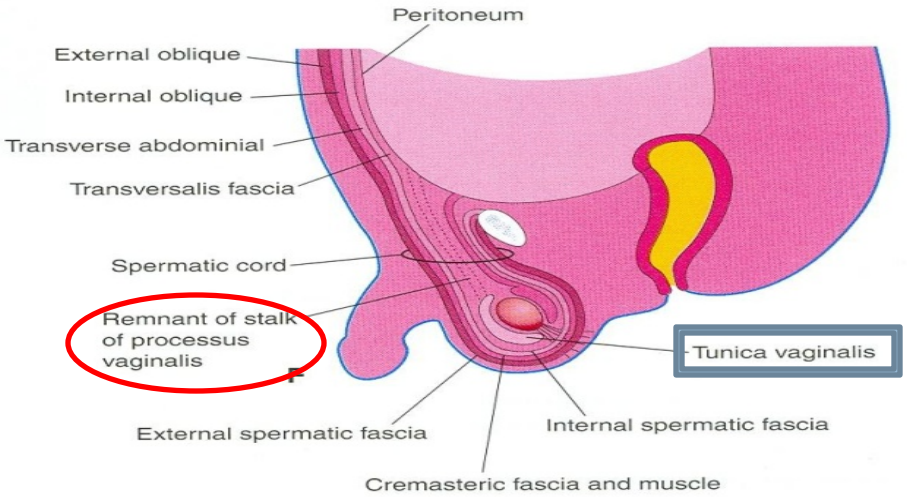


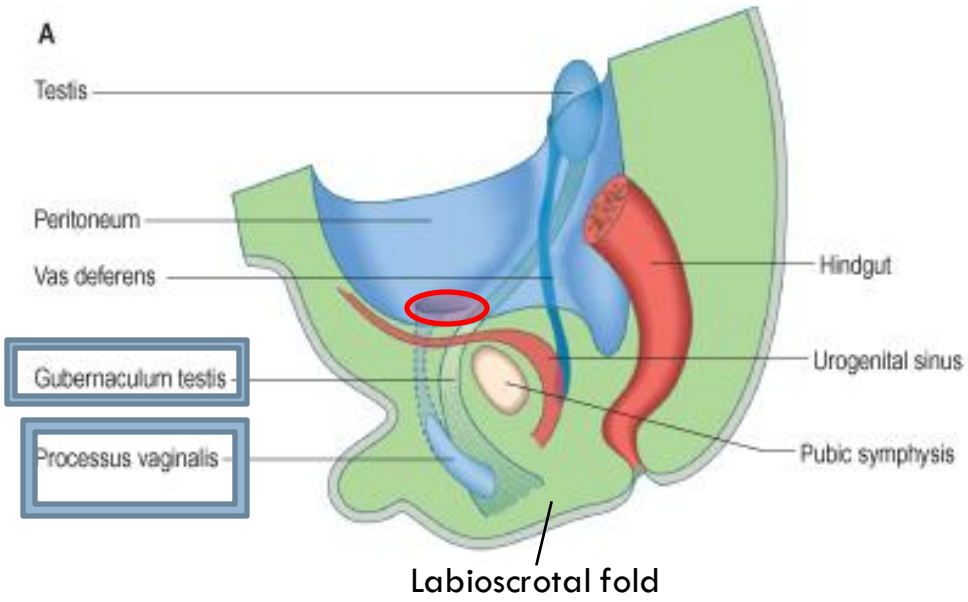


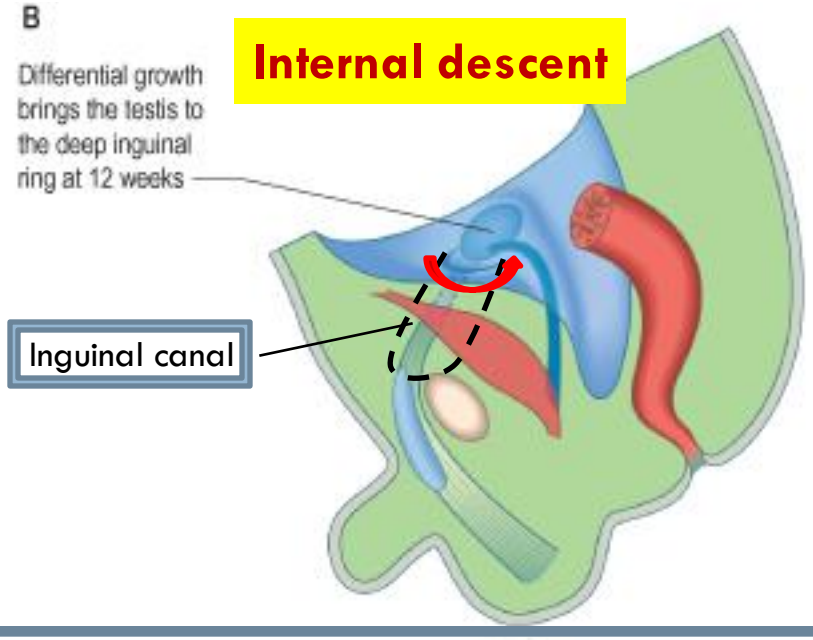


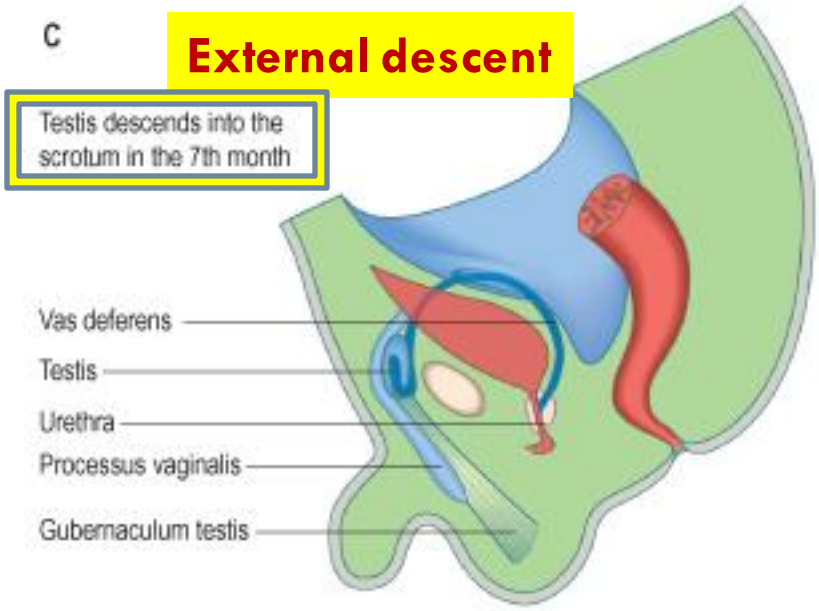


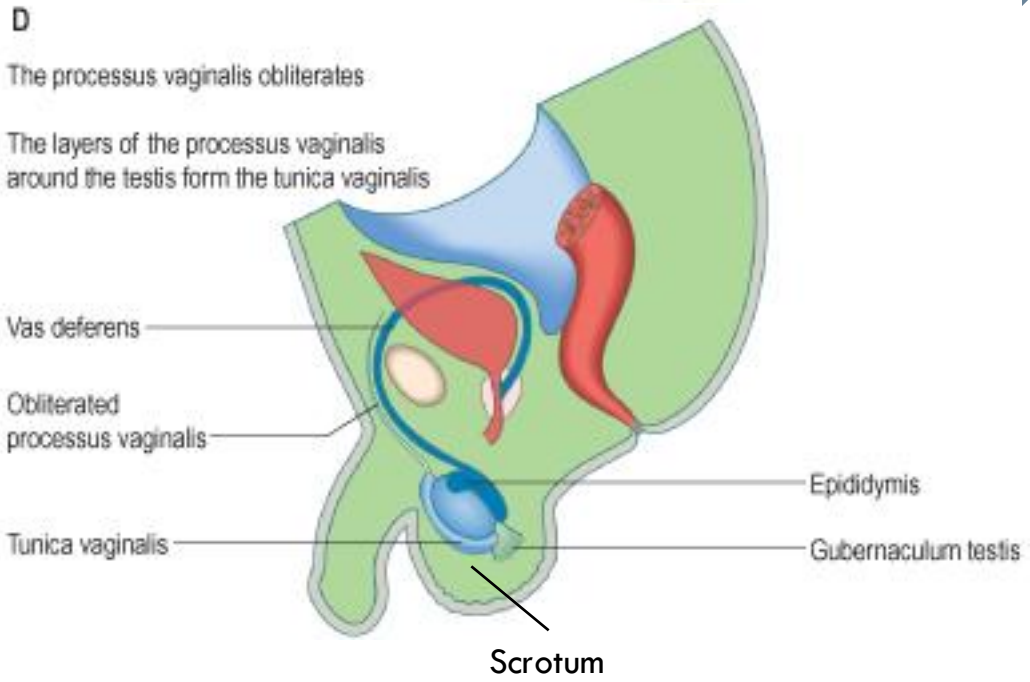





A
Testis
Peritoneum
Vas deferens
Gubernaculum testis
Processus vaginalis
Hindgut
Urogenital sinus
Pubic symphysis
Labioscrotal fold


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

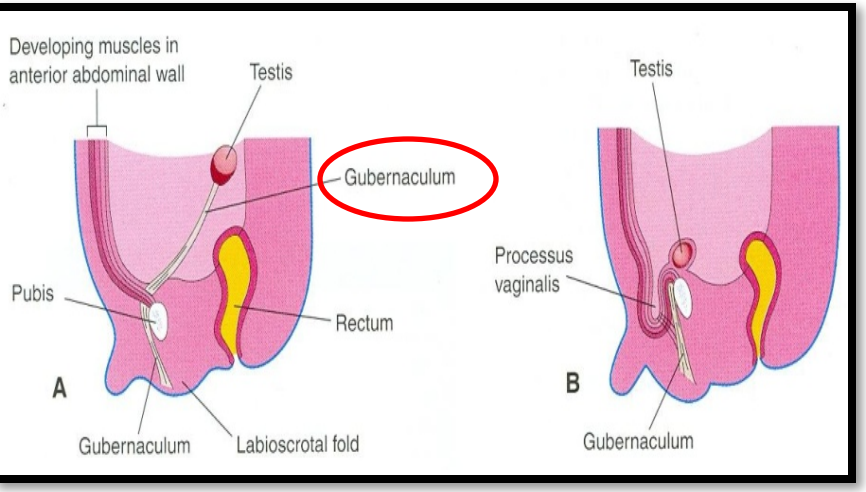

C
External descent
Testis descends into the scrotum in the 7th month
Vas deferens
Testis
Urethra
Processus vaginalis
Gubernaculum testis

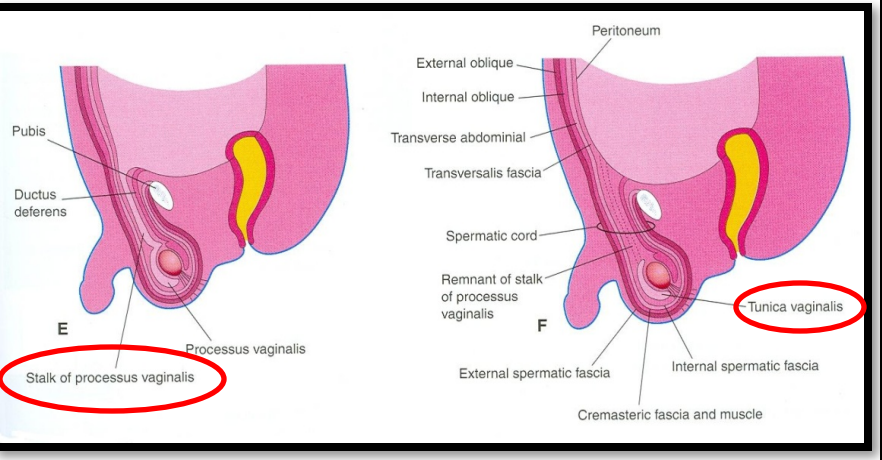

D
The processus vaginalis obliterates
The layers of the processus vaginalis around the testis form the tunica vaginalis
Vas deferens
Obliterated processus vaginalis
Tunica vaginalis
Epididymis
Gubernaculum testis
Scrotum

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





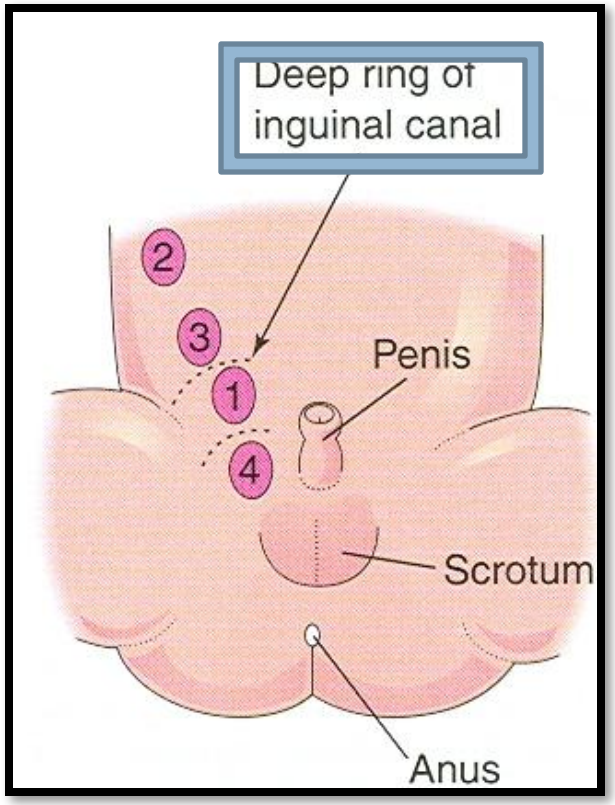
Complete descent of testis is associated by:

- **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"

CRYPTORCHIDISM
(UNDESCENDED TESTIS)

- **Incidence:** is 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%).

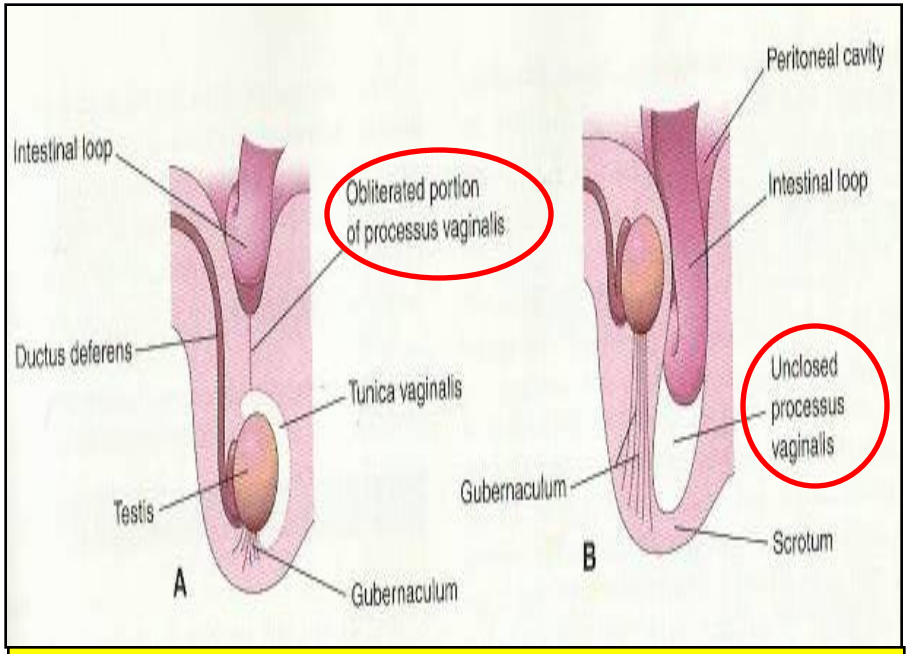


CONGENITAL INGUINAL HERNIA

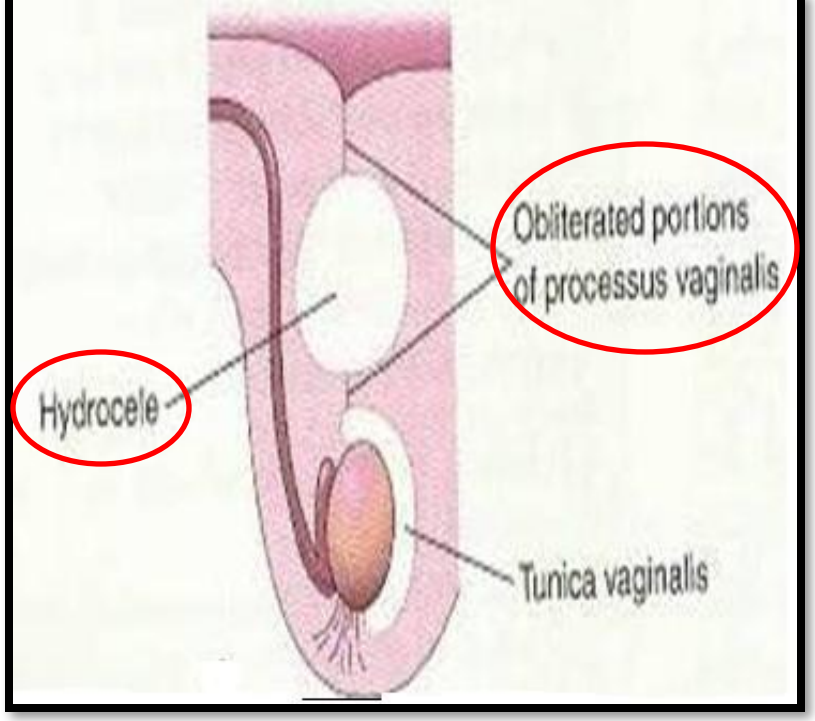
- **Definition:** Herniation of a loop of intestine through a non-obliterated processus vaginalis.

  A: incomplete
  B: complete (in scrotum)

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

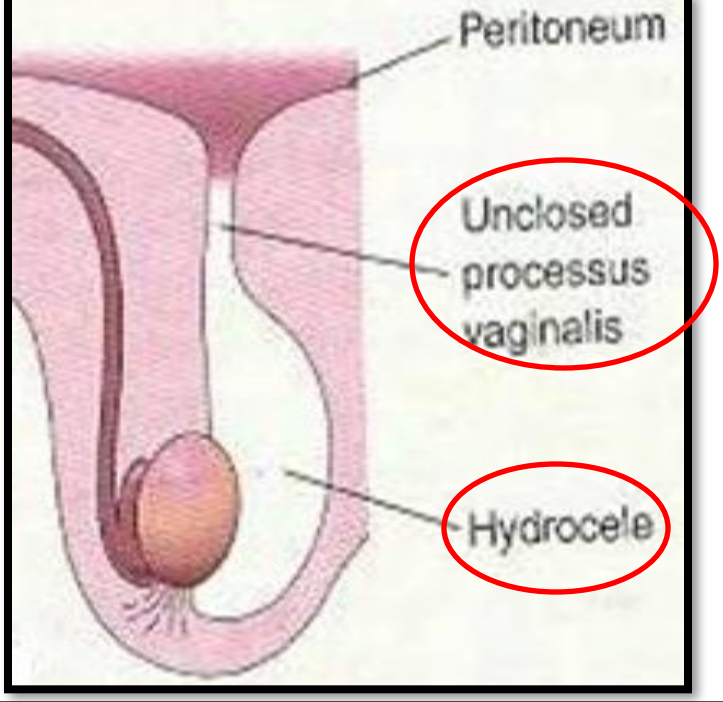


Failure of closure of processus vaginalis



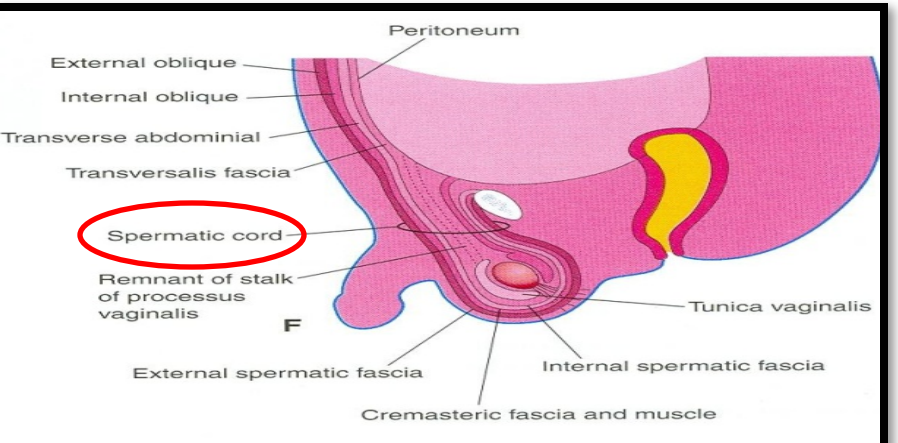
HYDROCELE OF SPERMATIC CORD

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



THANK YOU