

# DEVELOPMENT OF MALE GENITAL SYSTEM

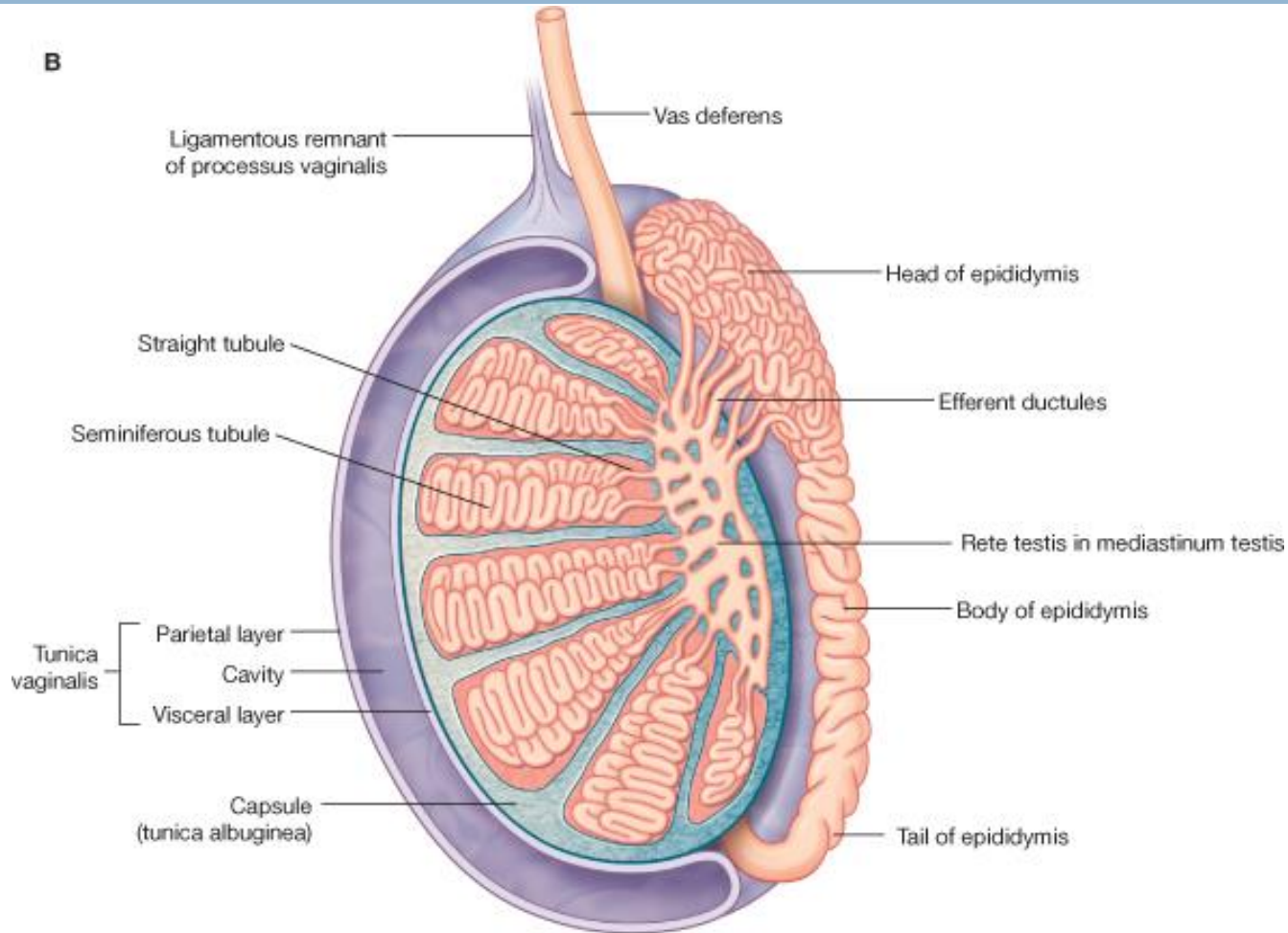
***Prof. Ahmed Fathalla Ibrahim***

# OBJECTIVES

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

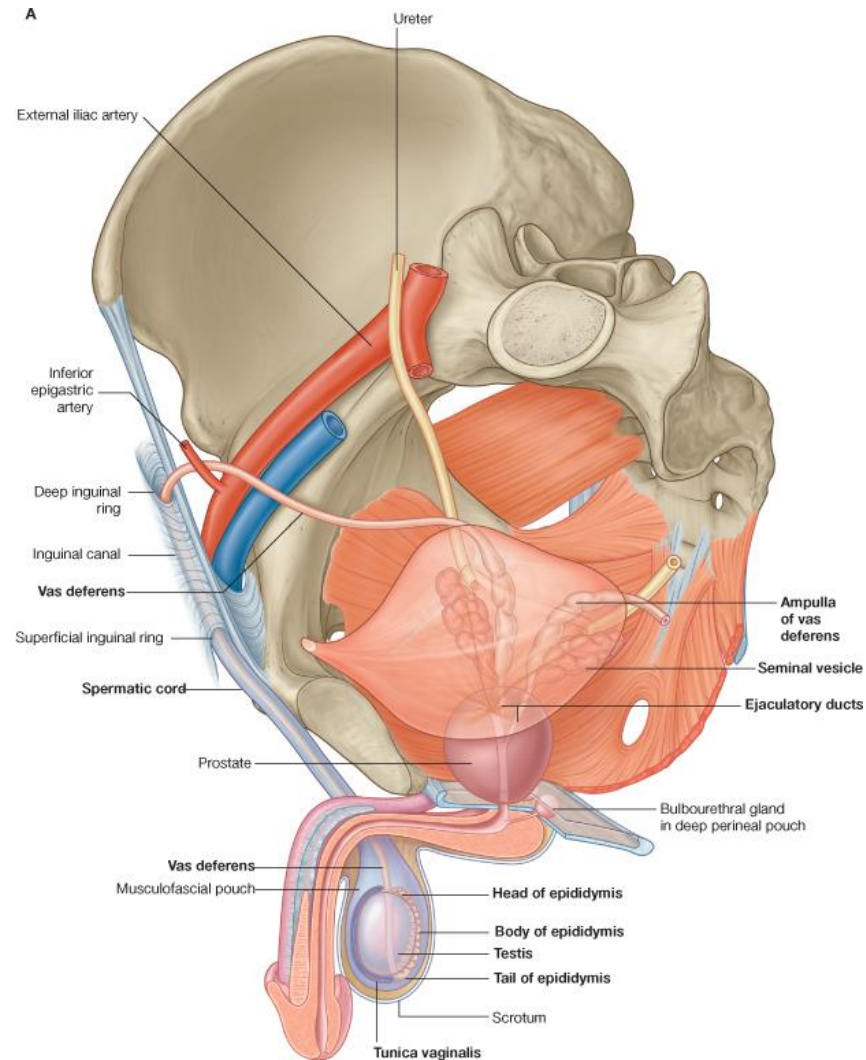
- ❑ **List the causes of differentiation of genitalia into the male type.**
- ❑ **Describe the origin of each part of the male internal & external genitalia.**
- ❑ **List the causes & describe the events of descent of testis.**
- ❑ **List the common anomalies of male genital system & describe the causes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

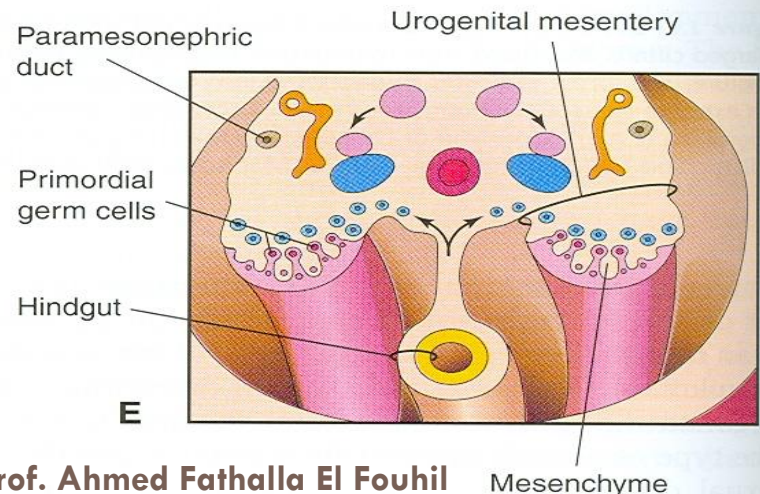
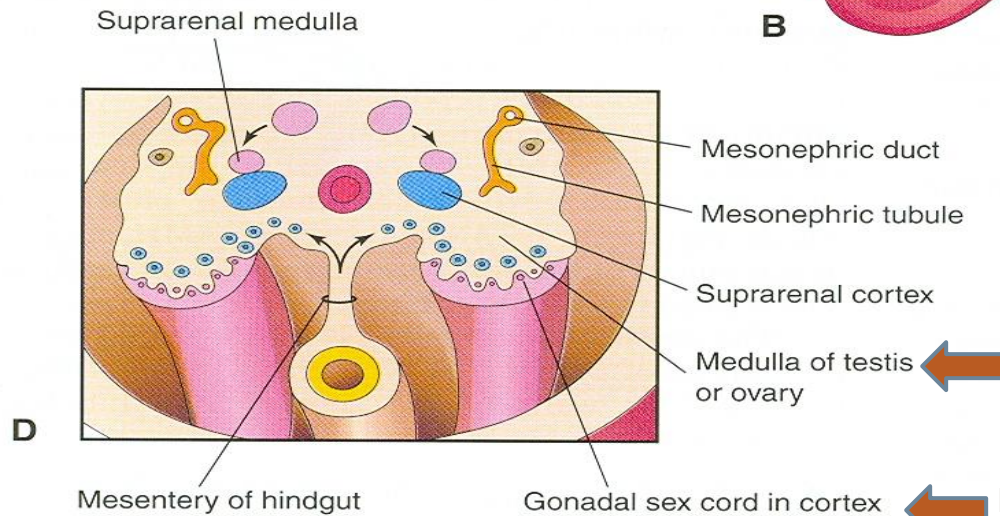
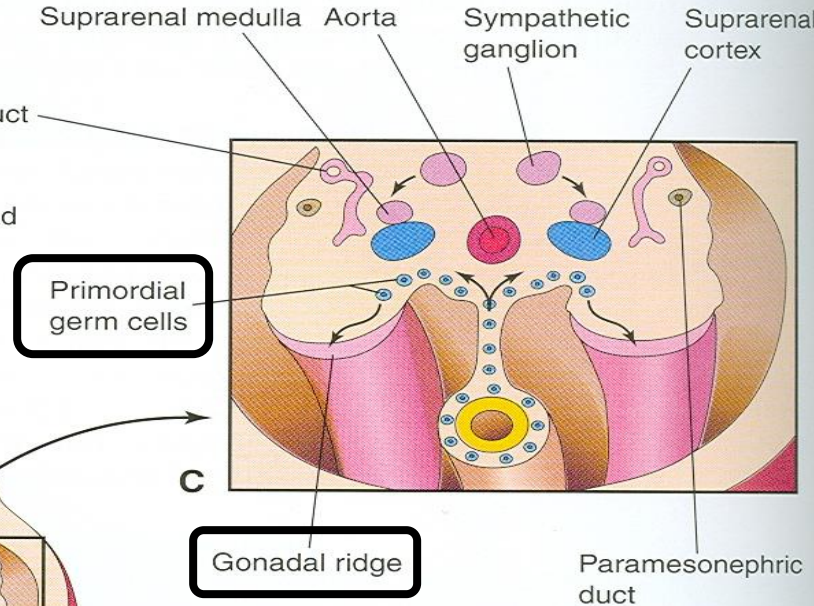
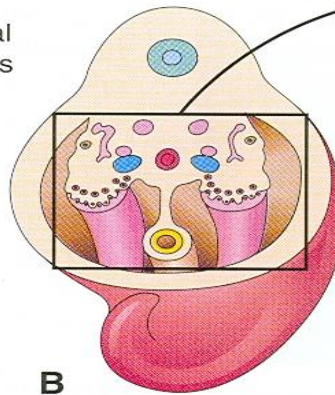
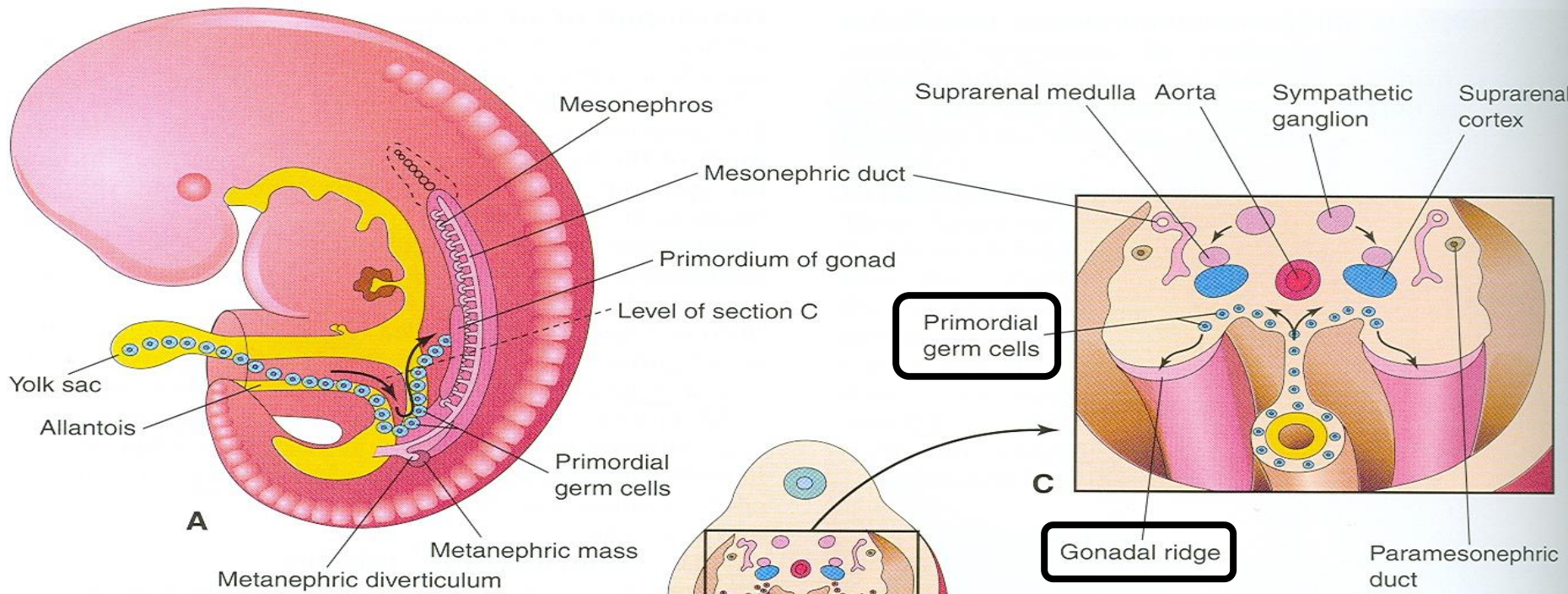
# TESTIS & EPIDIDYMIS



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# MALE GENITAL SYSTEM





Prof. Ahmed Fathalla El Fouhil

# DEVELOPMENT OF GONADS

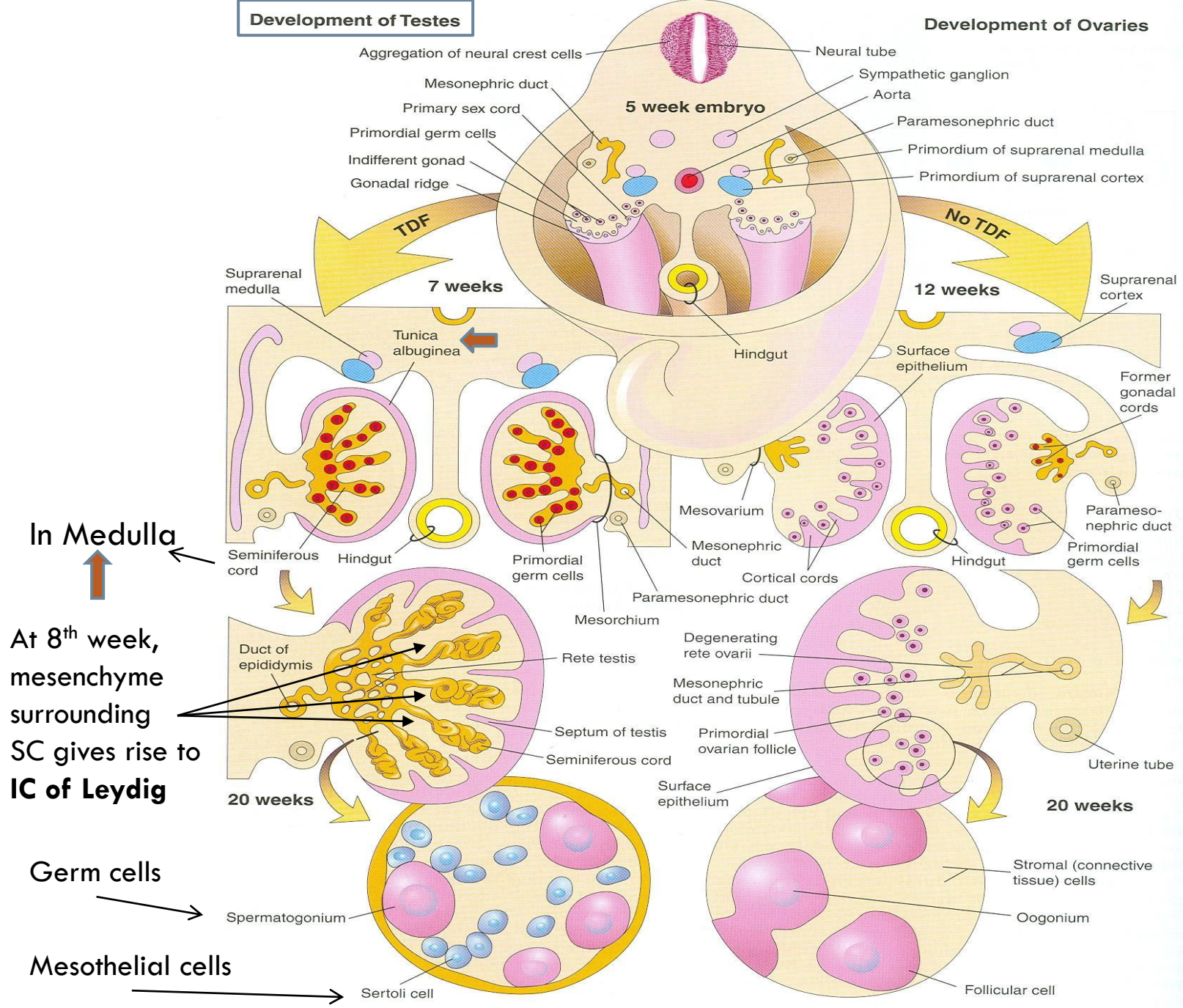
- **During 5<sup>th</sup> week: gonadal development occurs.**
- **Until 7<sup>th</sup> week: gonads are similar in both sexes.**
- **Gonads are derived from 3 sources:**
  1. **Mesothelium (mesodermal epithelium lining the coelomic cavity)**
  2. **Underlying mesenchyme**
  3. **Primordial germ cells**

# 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.

**Development of Testes**

**Development of Ovaries**



Section of seminiferous tubule

Section of ovarian cortex



# DEVELOPMENT OF TESTIS

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

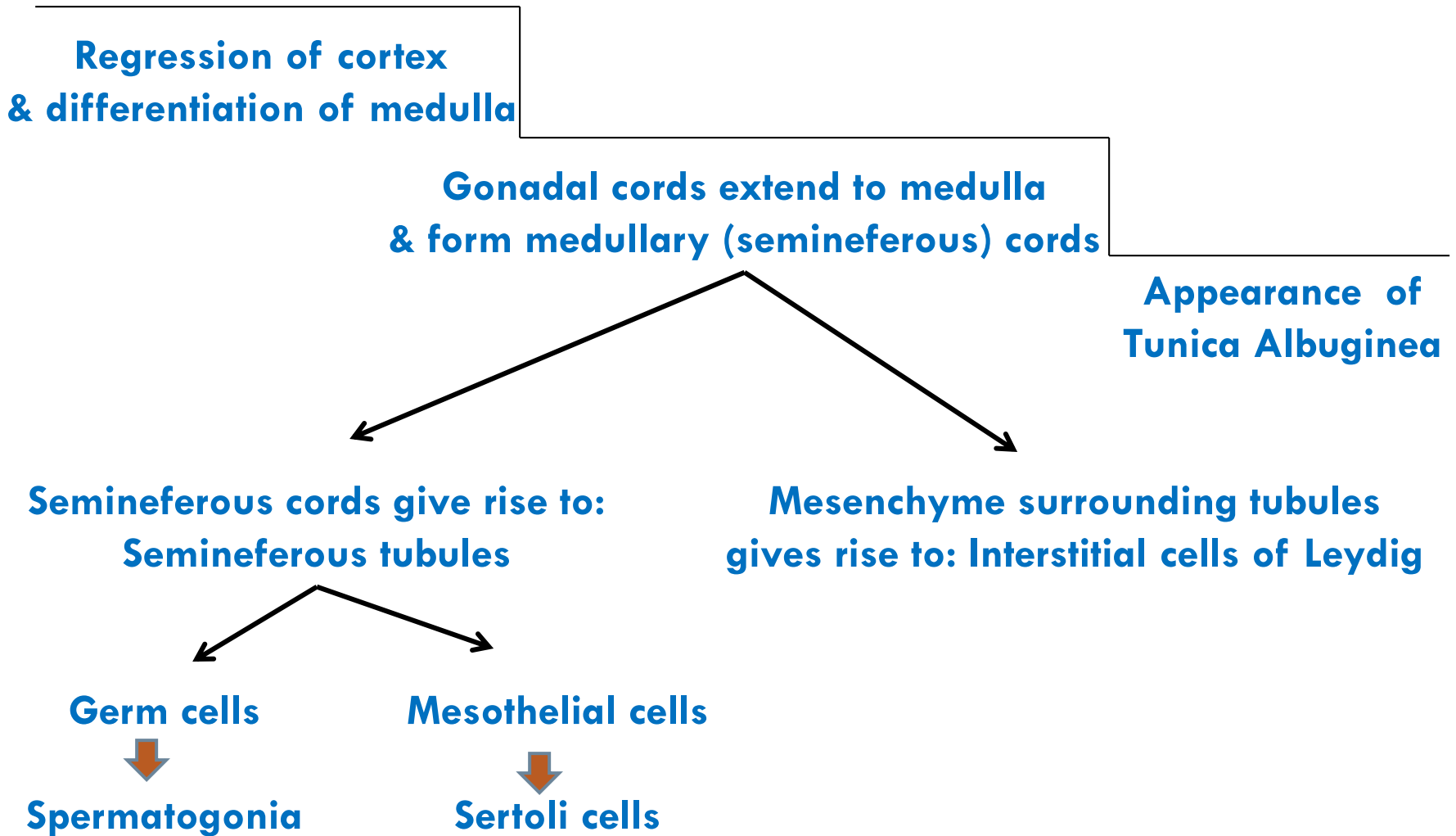
**At 7<sup>th</sup> week:**

- 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 (8<sup>th</sup> 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) (7<sup>th</sup> week)**

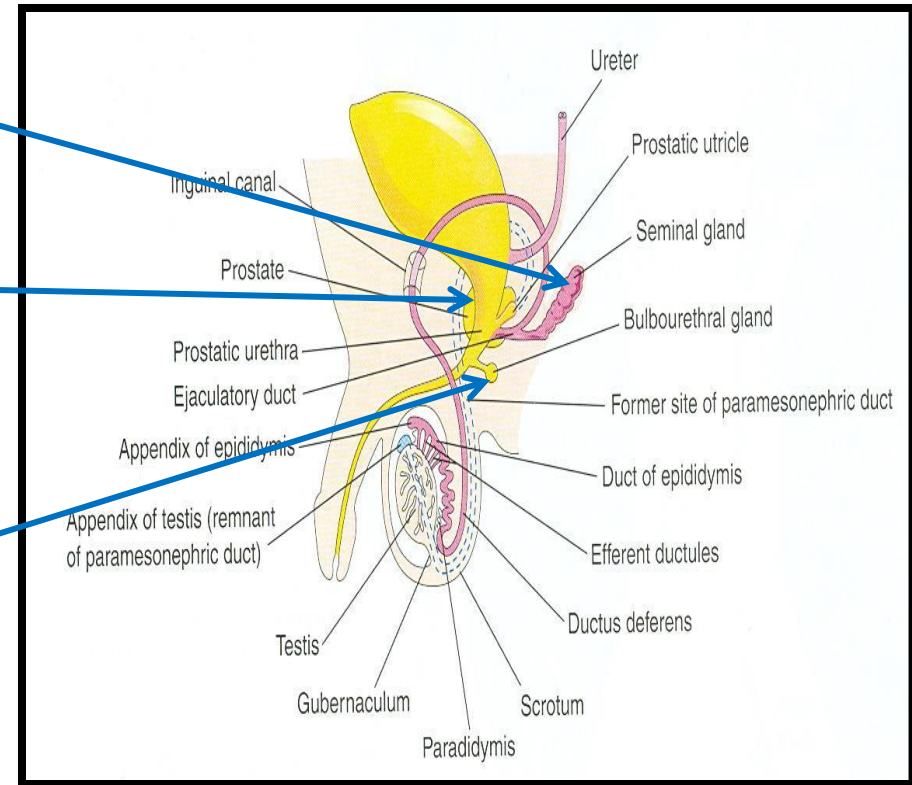


**Suppression of development  
of paramesonephric  
(Müllerian) duct**

# 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

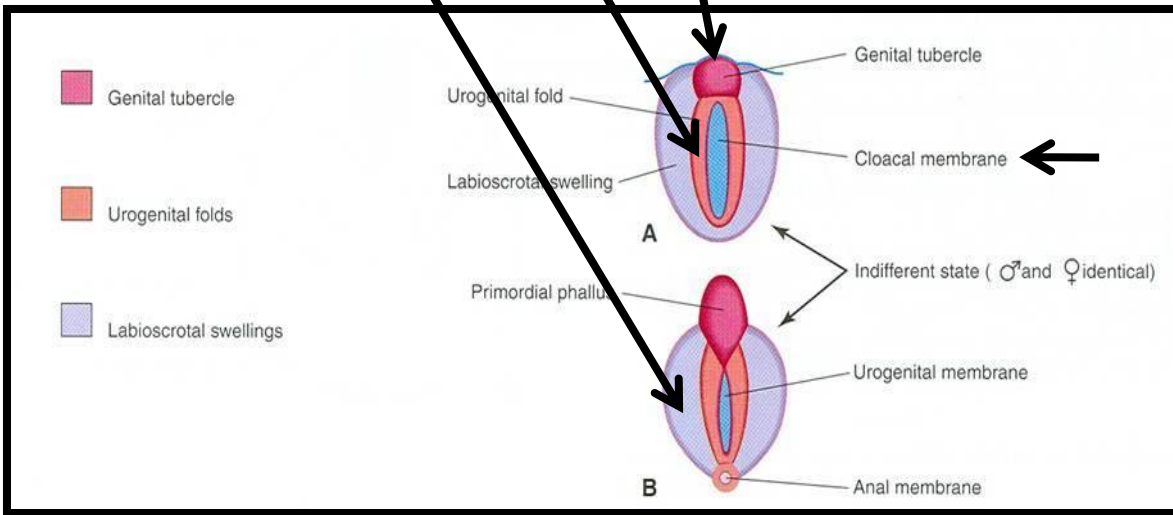
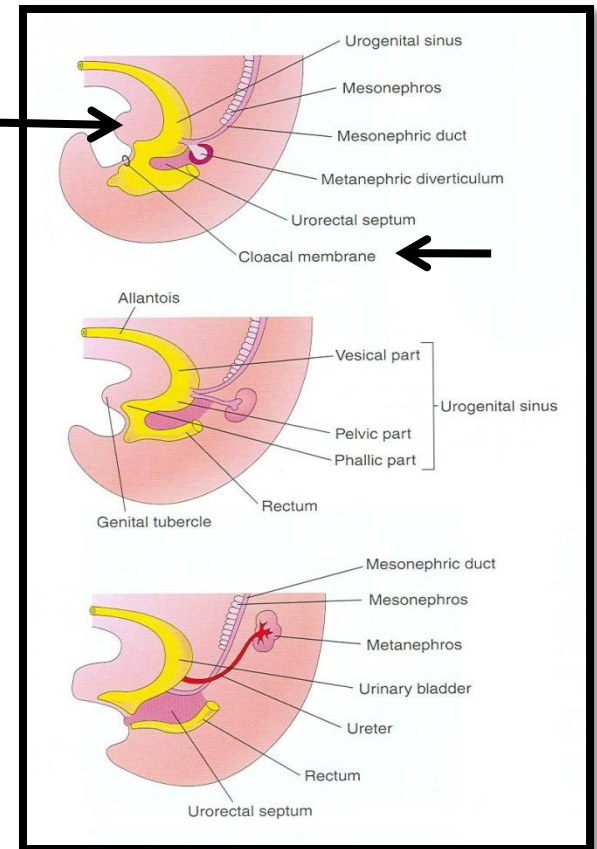
## ENDODERMAL STRUCTURES

1. **Spermatogonia:** 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

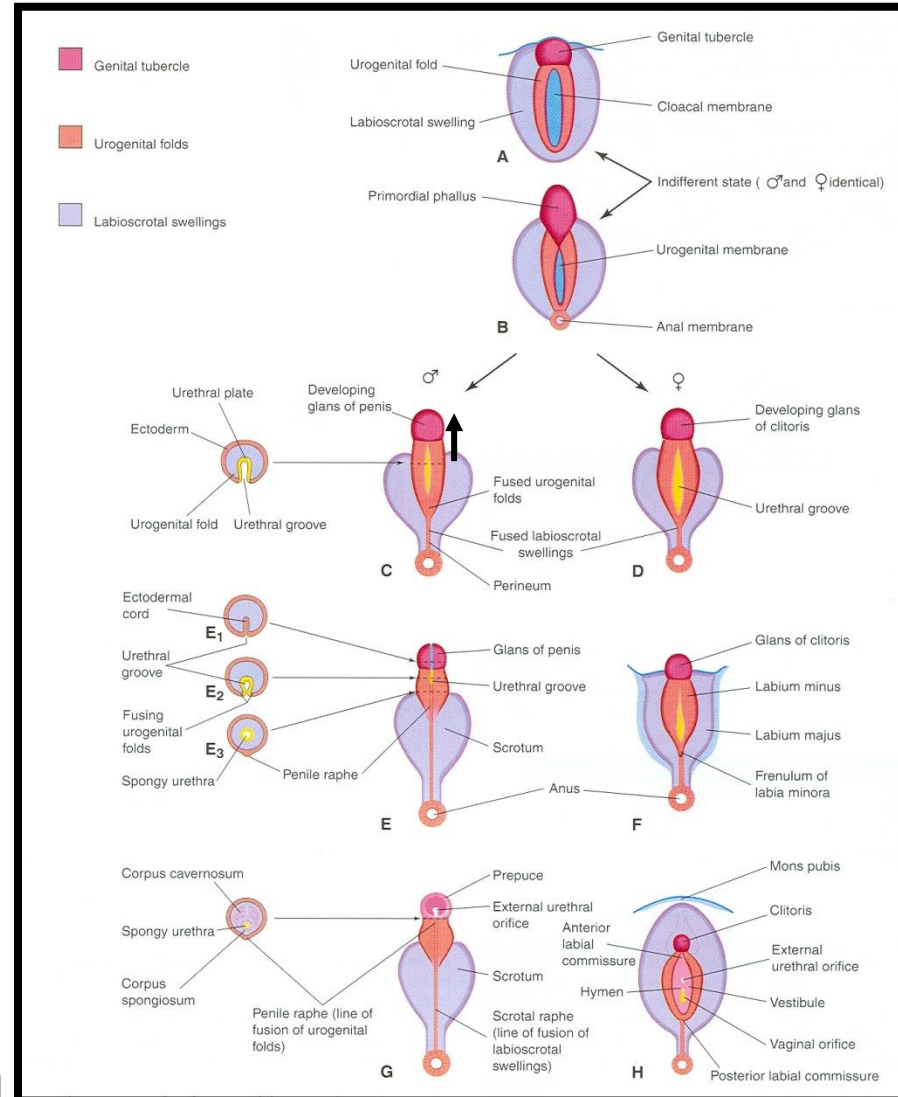
**Labioscrotal swellings:** develop on each side of urogenital folds



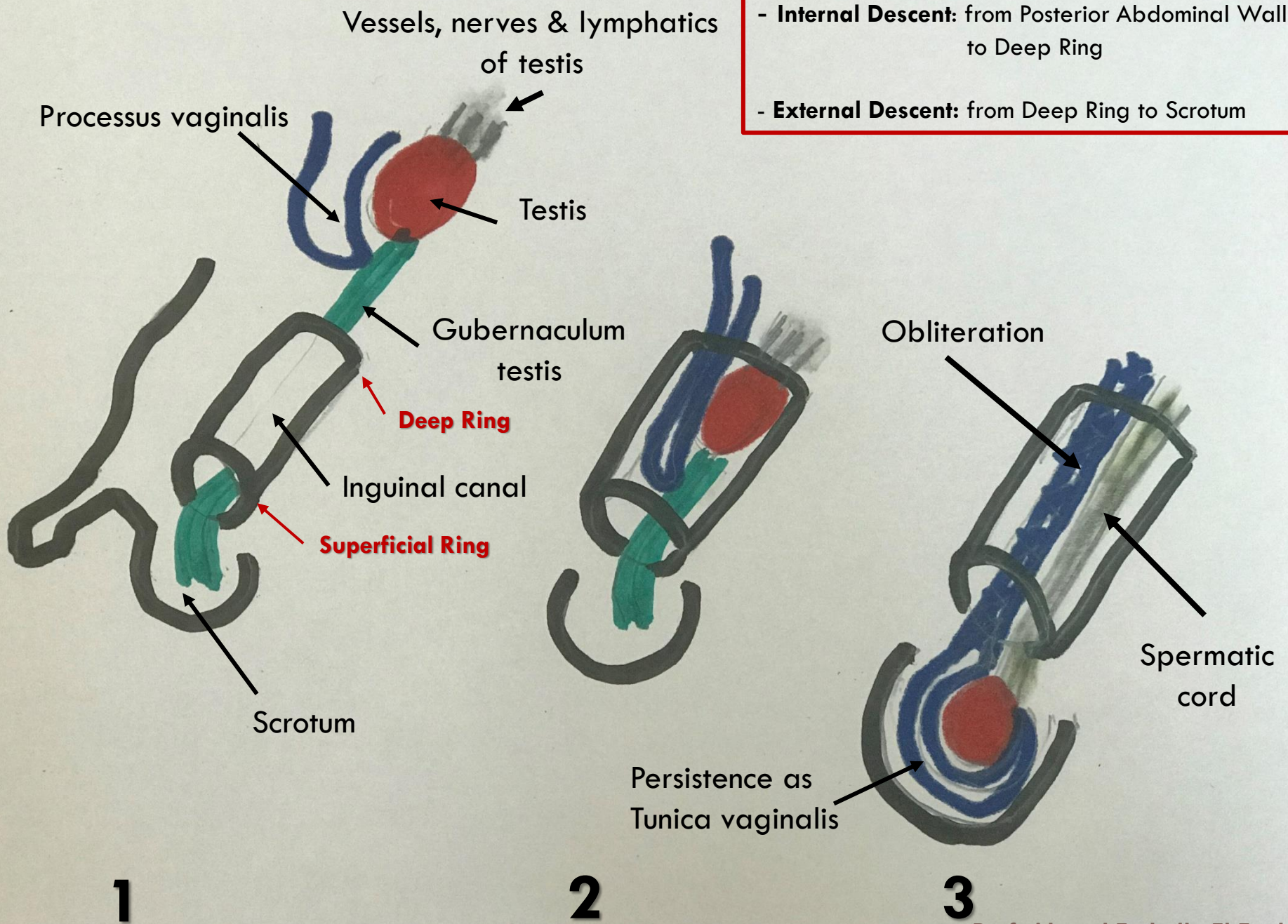
**INDIFFERENT STAGE OF EXTERNAL GENITALIA (from 4<sup>th</sup> to 7<sup>th</sup> week)**

# DEVELOPMENT OF MALE EXTERNAL GENITALIA (stimulated by testosterone)

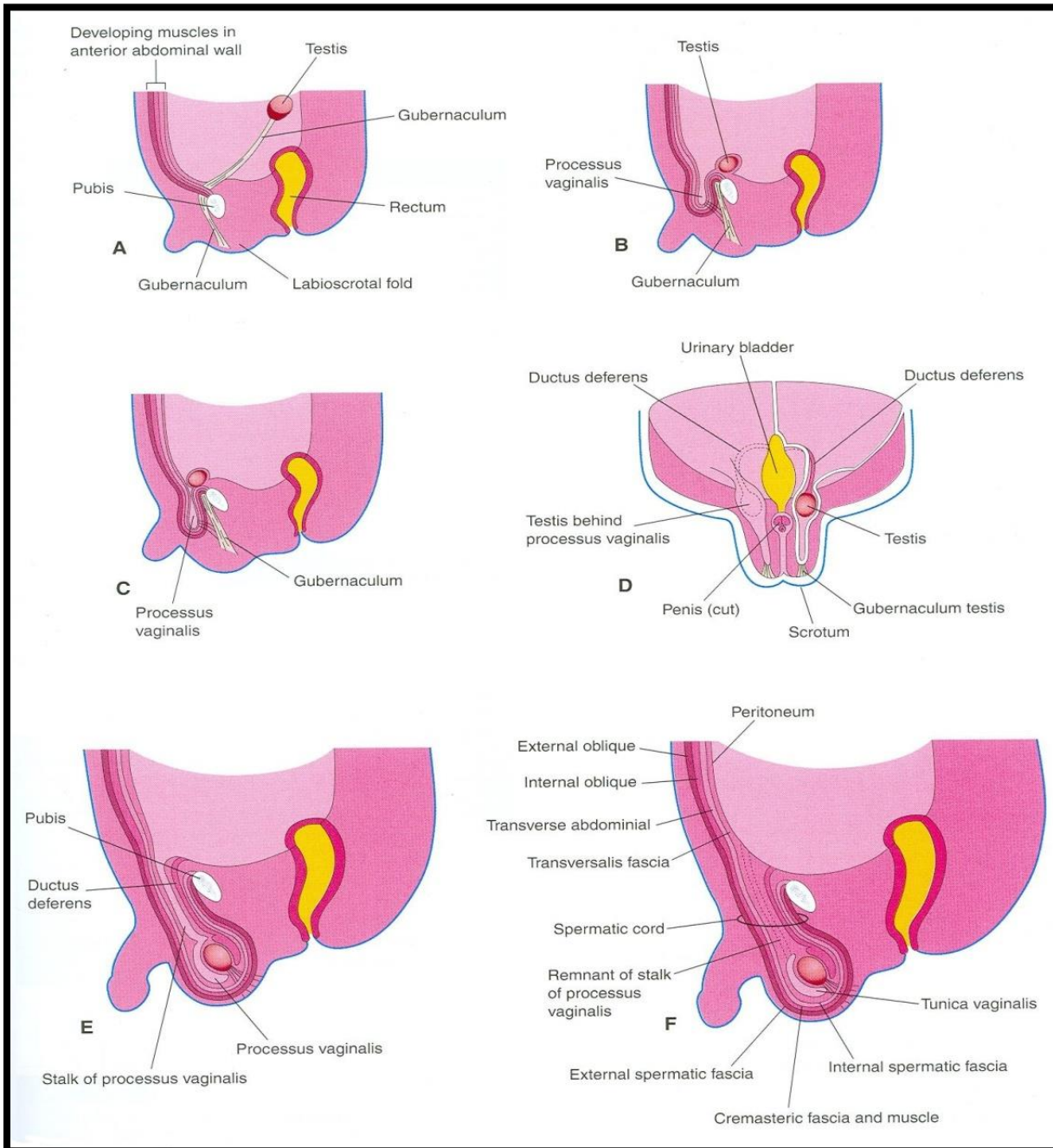
- Begins at 9<sup>th</sup> week
  - Complete differentiation at 12<sup>th</sup> week:
1. The phallus enlarges to form the glans penis & pulls forward the urogenital folds.
  2. The urogenital folds fuse to enclose the spongy (penile) urethra & form the shaft of the penis
  3. The labioscrotal folds (swellings) fuse to form the scrotum

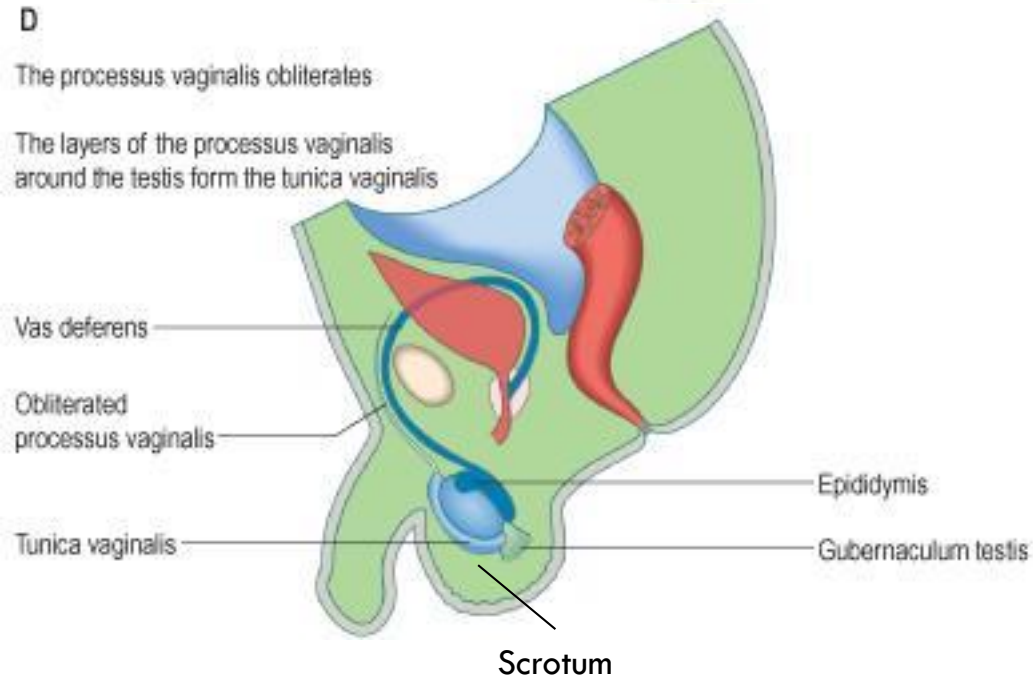
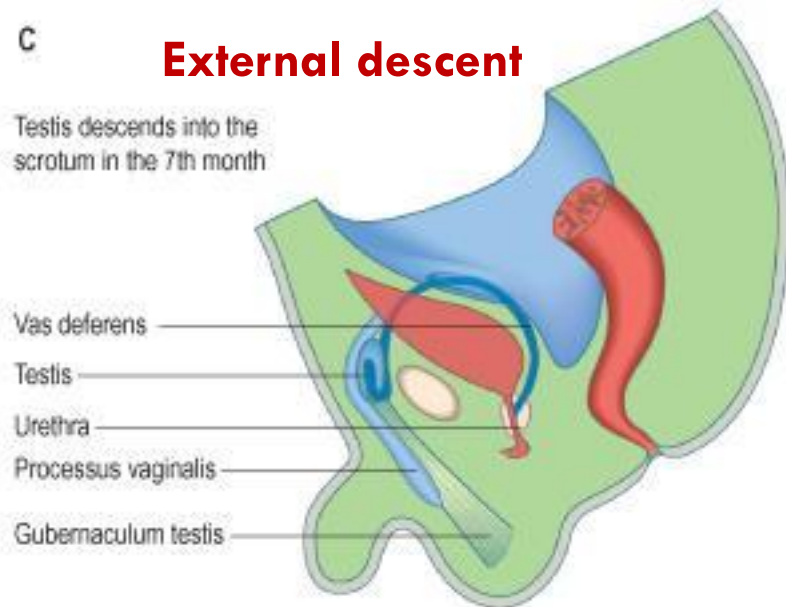
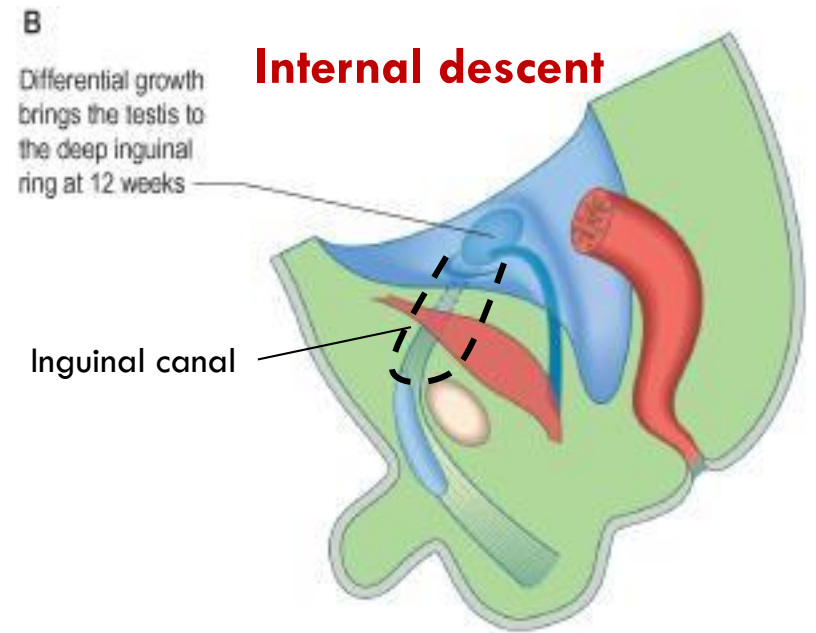
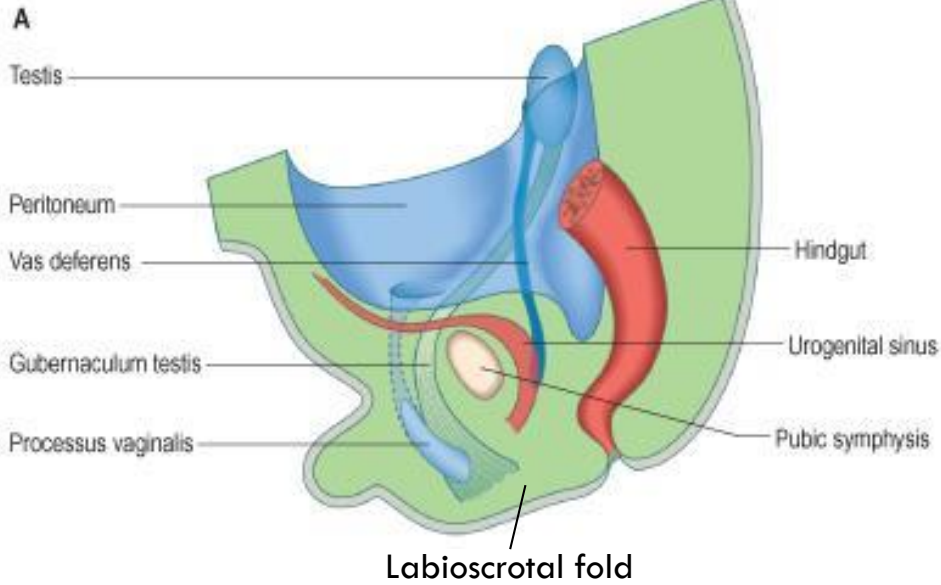






# DESCENT OF TESTIS





# DESCENT OF TESTIS

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

# INTERNAL DESCENT OF TESTIS

- **Definition:** Descent of testis from posterior abdominal wall to deep inguinal ring.
- **Time:** During 12<sup>th</sup> 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 **7<sup>th</sup> 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

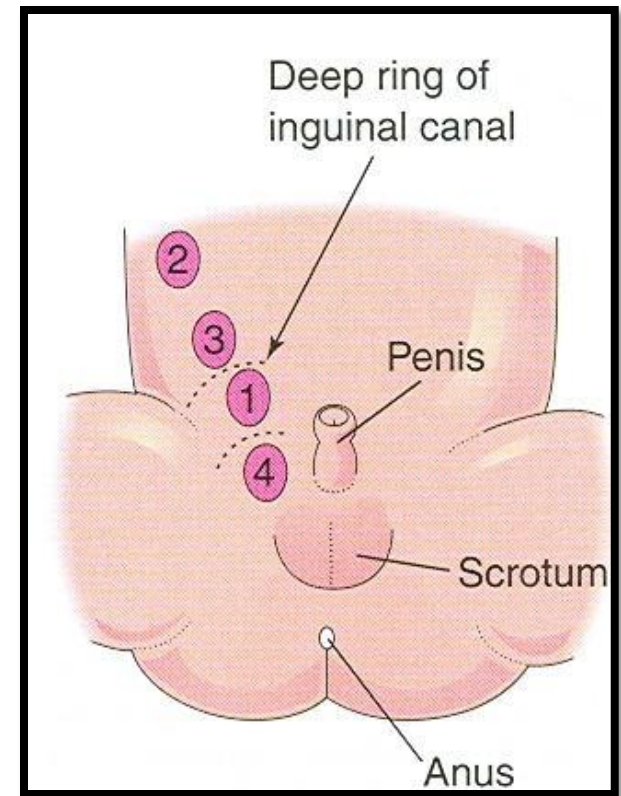
**Complete descent of testis is associated by:**

- ❑ **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”**



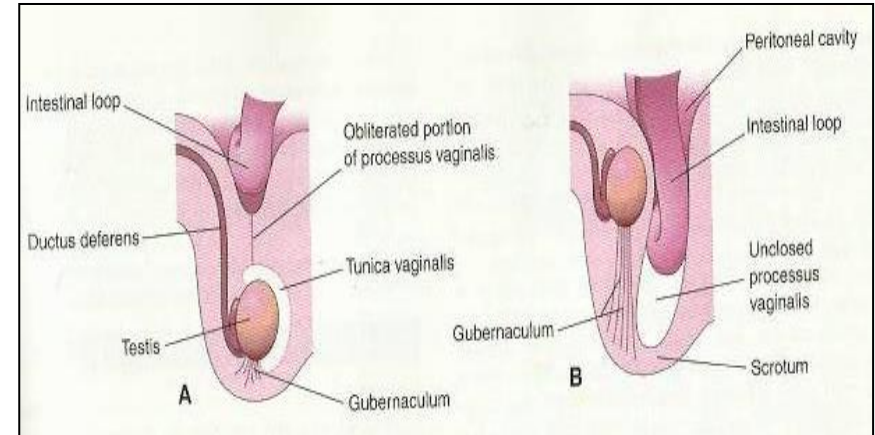
# CRYPTORCHIDISM (UNDESCENDED TESTIS)

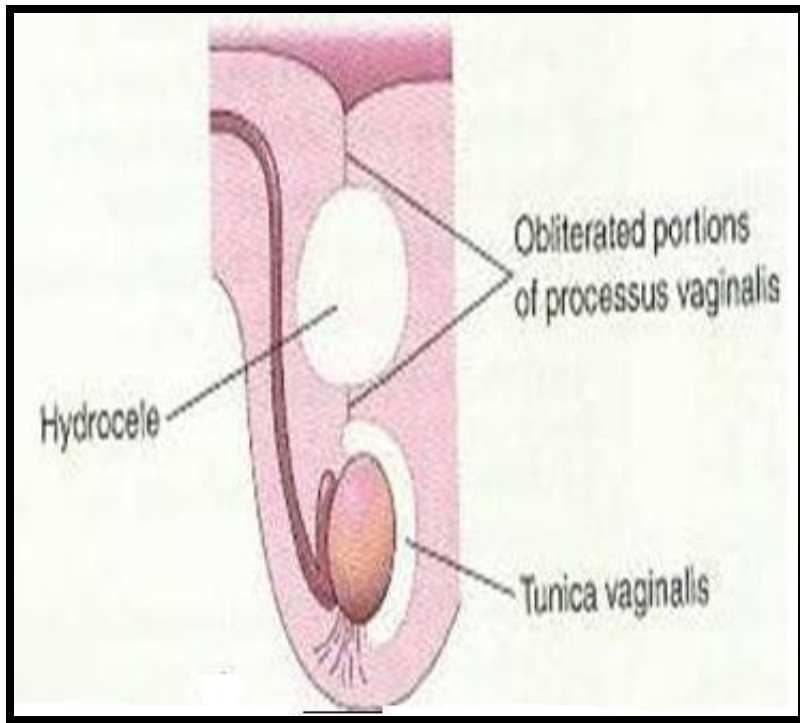
- **Incidence:** in up to 30% of premature & 3-4% of full term males
- **Cause:** deficiency of androgens
- **Common sites:** look to figure
- **Complications:**
  1. Sterility, if bilateral
  2. Testicular cancer (20-44%)



# CONGENITAL INGUINAL HERNIA

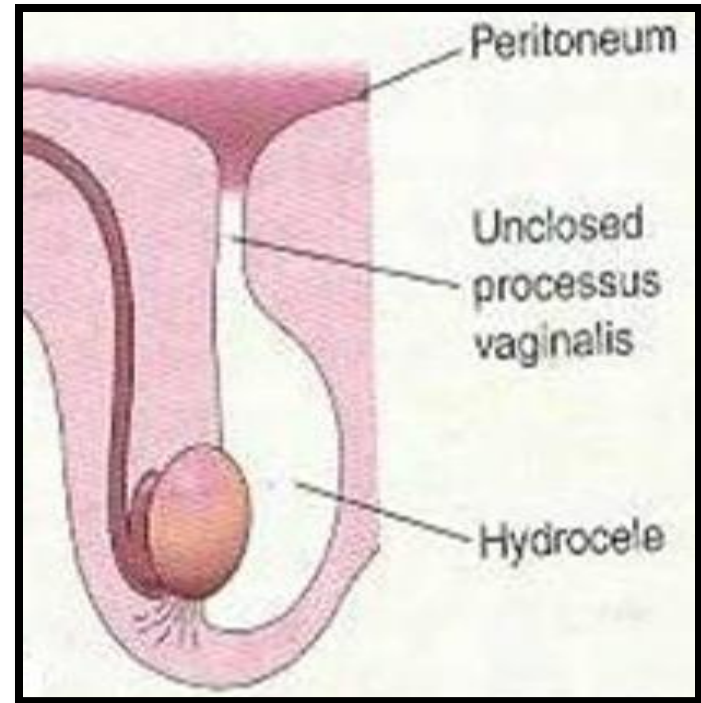
- **Definition:** Herniation of a loop of intestine through a non-obliterated processus vaginalis.  
**A: incomplete**  
**B: complete (in scrotum)**
- **Cause:** The processus vaginalis does not obliterate & remains in open communication with the peritoneal cavity.





### **HYDROCELE OF SPERMATIC CORD**

Accumulation of fluid in spermatic cord due to a non-obiterated 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


# DATES TO REMEMBER

- **At 5<sup>th</sup> week:** Appearance of gonads.
- **At 7<sup>th</sup> week:** Beginning of differentiation of gonads into testes, suppression of paramesonephric (Müllerian) ducts.
- **At 8<sup>th</sup> week:** Leydig's cells secretes testosterone.
- **At 9<sup>th</sup> week:** Beginning of differentiation of male external genitalia.
- **At 12<sup>th</sup> week:** Completion of differentiation of male external genitalia, internal descent of testis.
- **At 7<sup>th</sup> month:** External descent of testis.
- **At puberty:** Canalization of seminiferous tubules.

# 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

# QUESTION 3

- **At which one of the following age periods gonads begin to differentiate into testes?**
  
- 1. **At 5<sup>th</sup> week.**
- 2. **At 7<sup>th</sup> week.** ←
- 3. **At 8<sup>th</sup> week.**
- 4. **At 9<sup>th</sup> week.**

*They call our language the mother tongue*

**THANK YOU**

*because the father seldom gets to speak.*

Prof. Ahmed Fathalla El Fouhil