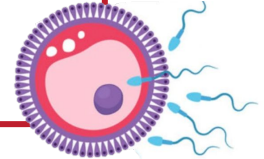


Development of the male reproductive organs

Reproductive block-Embryology-Lecture 3

[Editing file](#)
[Summary file](#)



Color index:

- Girls' slides
- Boys' slides
- Main content
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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.

Useful Links:

- [Teach me anatomy](#)
- [Amboss](#)

Male genital system

1

Gonad :

1. Testis.

2

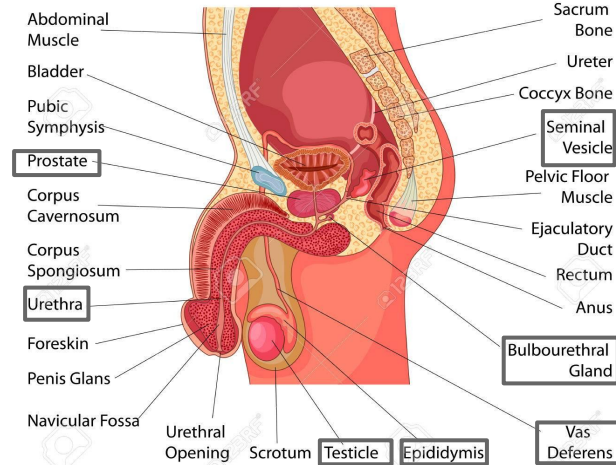
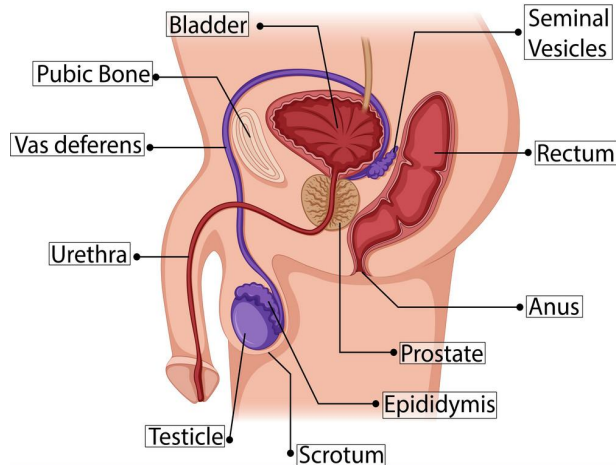
Genital Ducts:

1. Epididymis.
2. Vas deferens.
3. Urethra.

3

Genital Glands:

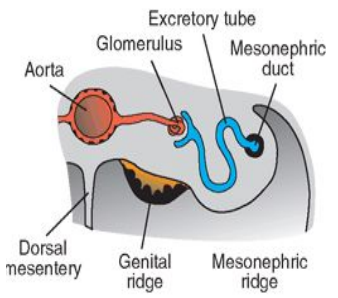
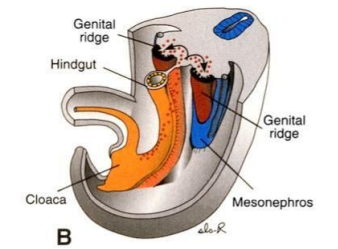
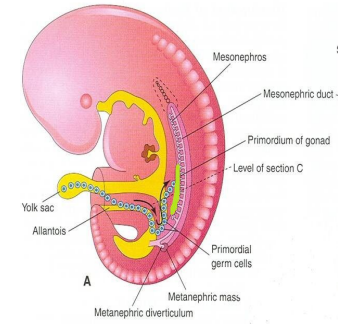
1. Seminal vesicle.
2. Prostate.
3. Bulbourethral Glands.



Development of Gonads

Gonads are derived from **3 sources**:

- 1) Primordial germ cells
- 2) Underlying mesenchyme
- 3) Mesothelium (Mesodermal epithelium lining the coelomic cavity)
 - During 5th week gonadal development occurs.
 - Until 7th week gonads are similar in both sexes and called **INDIFFERENT GONADS**



Indifferent Gonads

Gonadal ridge
 Gonadal ridge is made up of two kind of ridges,
 1- Mesothelial → Mesodermal origin
 2- Primordial germ cells → Endodermal origin

A bulge on the medial side of mesonephros produced by

Proliferation of mesothelium (cortex)

Proliferation of mesenchyme (medulla)

Gonadal (primary sex) cords

The proliferating mesothelial cells fuse and penetrate the underlying mesenchyme to form primitive gonadal 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 Testis

The genetic sex determined at fertilization and the presence of Y chromosome represent the male phenotype and it has a testis-determining factor (TDF) that differentiates primitive (indifferent) gonad into testis and also differentiates germ cell

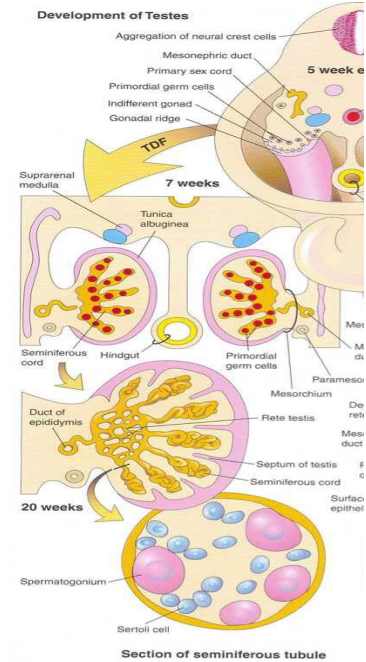
At 7th week

1. Regression of cortex & differentiation of medulla (of primitive gonad) into testis.
“Medulla is the important part in males because it gives rise to the testis”
2. The characteristic feature is the development of a thick fibrous capsule (tunica albuginea) that separates the enlarging testis from mesonephros.
3. Gonadal cords condense & extend into all the medulla (Medullary cords) to form Seminiferous cords.
4. Seminiferous cords develop into → Seminiferous tubules.
5. Seminiferous tubules remain solid until puberty and its walls are composed of:
 - A) Sertoli cells → derived from surface epithelium of testis (mesothelial cells)
 - B) Spermatogonia → derived from primordial germ cells (endodermal in origin).

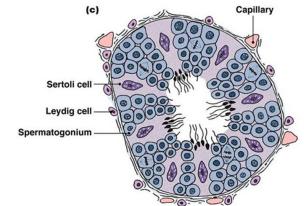
At 8th week

Mesenchyme surrounding seminiferous cords mesothelial cells gives rise to interstitial cells (of Leydig) secreting testosterone.

“So now, we have 3 kinds of cells: 1) Spermatogonium 2) Sertoli cells 3) Leydig cells”

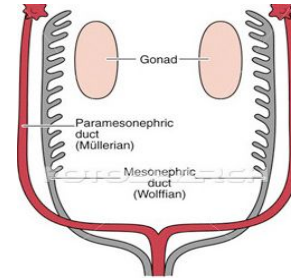
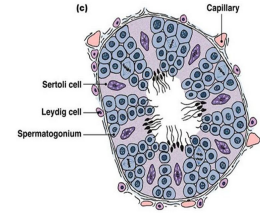


The Seminiferous Tubule

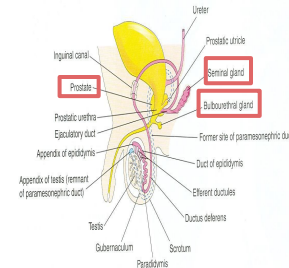


Development of internal genitalia

| 1) Ducts | | |
|-----------------|---|---|
| Cell | Leydig cells | Sertoli cells |
| Secretes | Testosterone (8th week) | Müllerian inhibiting substance (Anti- Müllerian hormone) (7th week) |
| Function | <ol style="list-style-type: none"> Masculine differentiation of mesonephric duct : epididymis, vas deferens, seminal glands, ejaculatory duct. Masculine differentiation of external genitalia "In female the mesonephric duct will turn into ureter only" | <p>Suppression of development of paramesonephric (Müllerian) duct</p> <p>Also it gives support</p> <p>"Paramesonephric duct is the main duct in female that give rise to their reproductive organs, that's why it needs to be suppressed"</p> |



| 2) Glands | |
|----------------------|--|
| Glands | "Seminal gland is the only genital gland to develop from mesonephric duct" |
| Seminal | Mesodermal outgrowth from mesonephric duct |
| Prostate | Endodermal outgrowth from prostatic urethra. |
| Bulbourethral | Endodermal outgrowth from spongy urethra |

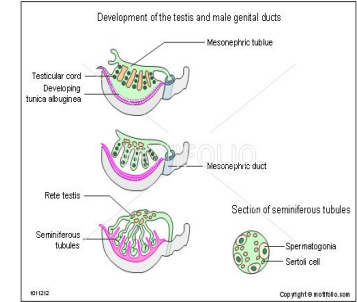
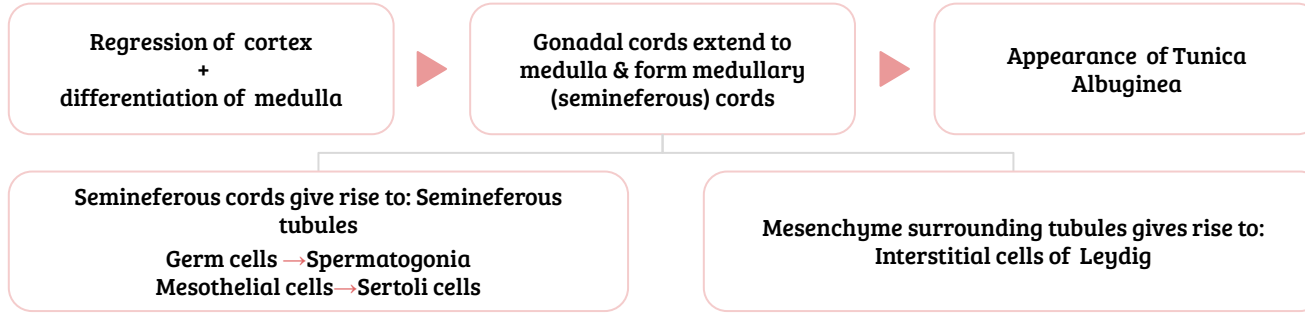


► Stroma & Smooth muscles in prostate and bulbourethral glands are derived from surrounding **mesenchyme**. (Mesoderm)



Summary from male slides

1) Testis



2) Internal genitalia

| Mesodermal structures | | Endodermal structures | |
|--|---|----------------------------|--|
| Testis | from medulla of genital ridge | Spermatogonia | from primordial germ cells of yolk sac |
| Seminiferous tubules | from medullary cords of ridge | | |
| Sertoli cells | from mesothelial cells of ridge | Prostate gland | from prostatic urethra |
| Leydig cells | from mesenchyme surrounding the tubules | | |
| Epididymis, vas deferens, seminal gland, ejaculatory duct | from mesonephric duct | Bulbourethral gland | from spongy urethra |

Development of external genitalia

Indifferent Stage

(from 4th to 7th week)

Genital tubercle

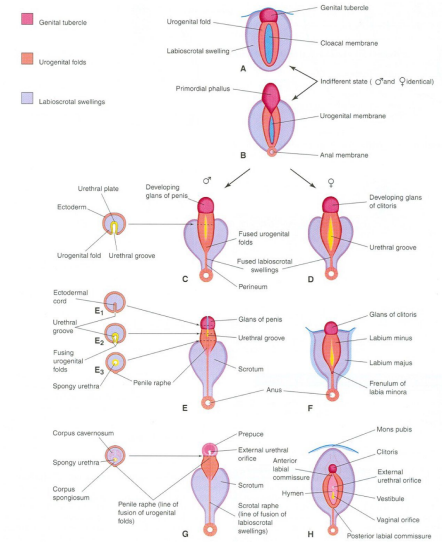
Produced from mesenchyme at the cranial end of cloacal membrane. It elongates to form a primordial phallus.
 "When the genital tubercle enlarge it's called phallus"

Urogenital folds

Develop on each side of cloacal membrane

Labioscrotal swellings

Develop on each side of urogenital folds

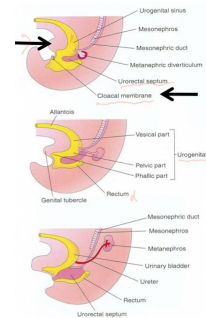


Different Stage

- 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

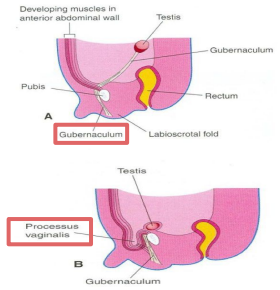


"The yellow tube is the hind gut , its last part enlarge and gives us CLOACA, then the cloaca will close, and gets separated from the middle by URORECTAL SEPTUM. the urorectal septum divides the cloaca into two parts , ventral and dorsal parts. the dorsal part will give rise to the anorectal canal, and the ventral part will give rise to urogenital sinus (which contains urinary bladder and urethra). Just above the cloaca, a small protrusion will happen which is called Genital tubercle."

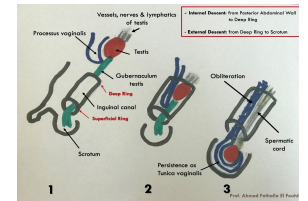


Descent of testis

- **The testes are initially located on the posterior abdominal wall, to descend it needs 3 things:**
 1. **Gubernaculum:** a mesenchymal band extending from inferior pole of gonad to labioscrotal fold.
 2. **Inguinal canal:** a pathway formed by gubernaculum through layers of anterior abdominal wall.
 3. **Processus vaginalis:** a peritoneal fold passing through inguinal canal before testis, to facilitate its descent
- **Descent of testis occurs in 2 steps:**



| Types | 1. Internal | 2. External |
|-------------------|--|---|
| Definition | Descent of testis from posterior abdominal wall to deep inguinal ring. | Descent of testis from deep inguinal ring, through inguinal canal, to scrotum |
| Time | During 12th week | Begins in 7th month and takes 2 to 3 days |
| Causes | A relative movement (حركة نسبية) resulting from elongation of cranial part of abdomen away from its caudal part (future pelvic Inguinal canal cavity). | <ol style="list-style-type: none"> 1. Controlled by androgens. (Testosterone) 2. Guided by gubernaculum. 3. Facilitated by processus vaginalis. 4. Helped by increased intra-abdominal pressure resulting from growth of abdominal viscera. |
| Pictures | <p>A</p> <p>Testis Peritoneum Vas deferens Gubernaculum testis Processus vaginalis</p> <p>Rectum Labioscrotal fold Pubic symphysis</p> | <p>C</p> <p>Testis descends into the scrotum in the 7th month</p> <p>Vas deferens Testis Urethra Processus vaginalis Gubernaculum testis</p> <p>D</p> <p>The processus vaginalis obliterates The layers of the processus vaginalis around the testis form the tunica vaginalis</p> <p>Vas deferens Obliterated processus vaginalis Tunica vaginalis</p> <p>Epididymis Gubernaculum testis</p> |



💡 "The internal descent begin at the 12th week, first the testes (in case of male) gets attached to the Green tube (Gubernaculum) زبي الزحليقة , and before it goes down it gets preceded by Processus vaginalis , and when it goes down it takes its vascular innervation and nerves with it. First it goes through the inguinal ligament and it pierces the deep ring and it's fascia then it pierces the superficial ring and it's fascia. ... so when it finally settles down in the scrotum it will be covered by these 2 fascia and the processus vaginalis, total of three covering"

External Descent of Testis

1. More than 97% of full-term newborn 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.

★ Complete descent of testis is associated by:

1

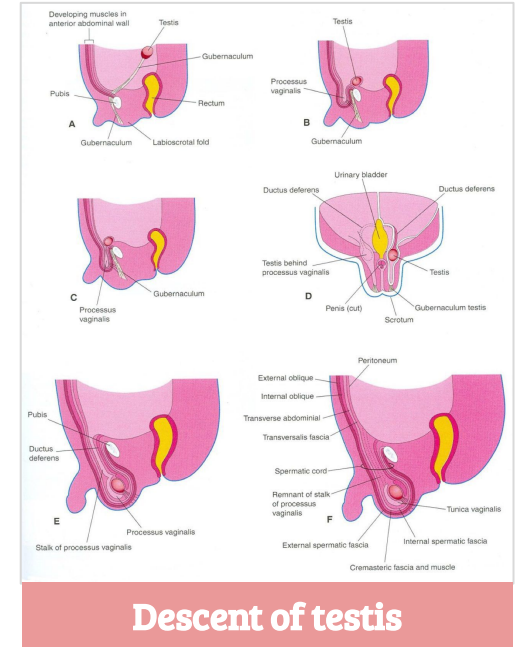
Degeneration of gubernaculum. **“to prevent herniation”**

2

Obliteration of stalk of processus vaginalis.

3

Persistence of part of processus vaginalis surrounding the testis in the scrotum to form **“tunica vaginalis”**

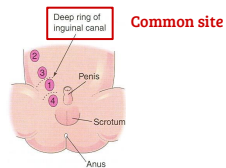


Congenital Deformities

Cryptorchidism Undescended testis

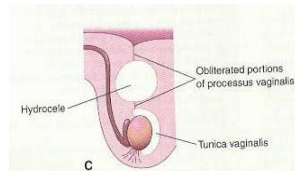
- **Incidence:** is up to 30% of premature & 3-4% of full term males
- **Cause:** deficiency of androgens.
- **Common sites:** cryptorchid testes may be in the abdominal cavity or anywhere along the usual path of descent of the testis, but they are usually in the inguinal canal. look at the figure.
- **Complications:**
 1. Sterility, if bilateral.
 2. Testicular cancer (20-44%).

“The numbers are based on prevalence”



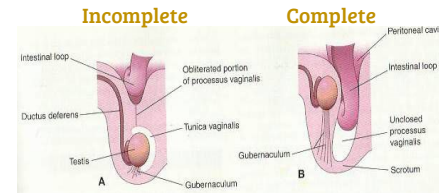
Hydrocele of spermatic cord

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



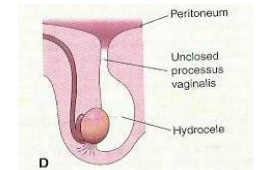
Congenital inguinal hernia

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



Hydrocele of testis

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



Dates to Remember

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

QUIZ

Q1: Which one of the following is considered indifferent gonad?

- A. Gonadal ridge
- B. Gonadal cord
- C. Primordial germ cells
- D. All of above

Q2: Interstitial cells (of Leydig) secreting testosterone. happen...?

- A. During 5th week
- B. During 6th week
- C. At 7th week
- D. By 8th week

Q3: Mesodermal outgrowth from spongy urethra is:

- A. Seminal gland
- B. Prostate gland
- C. Bulbourethral gland
- D. Non of above

Q4: Complete descent of testis is associated by:

- A. Formation of gubernaculum
- B. Obliteration of stalk of processus vaginalis
- C. Degradation of tunica vaginalis
- D. All of above

Q5: Deficiency of androgens cause?

- A. Inguinal hernia
- B. Cryptorchidism
- C. Hydrocele of spermatic cord
- D. Hydrocele Of Testis

Q6: Accumulation of fluid in tunica vaginalis cause:

- A. Inguinal hernia
- B. Cryptorchidism
- C. Hydrocele of spermatic cord
- D. Hydrocele Of Testis

Q7: The processus vaginalis remains in open communication with the peritoneal cavity cause:

- A. Inguinal hernia
- B. Cryptorchidism
- C. Hydrocele of spermatic cord
- D. Hydrocele Of Testis

Q8: Accumulation of fluid in spermatic cord cause:

- A. Inguinal hernia
- B. Cryptorchidism
- C. Hydrocele of spermatic cord
- D. Hydrocele Of Testis



QUIZ - from Boys' Slides

Q1: Which one of the following structure is a derivative of male urethra?

- A. Seminal gland
- B. Prostate gland
- C. Vas deferens
- D. Ejaculatory duct

Q2: Which one of the following cells are responsible for masculine differentiation of external genitalia?

- A. Sertoli cells
- B. Leydig's cells
- C. Mesothelial cells
- D. Primordial germ cells

Q3: At which one of the following age periods gonads begin to differentiate into testes?

- A. At 5th week
- B. At 7th week
- C. At 8th week
- D. At 9th week



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