Development of male genital system

EMBRYOLOGY EDIT

The development of the reproductive system (Male&Female)

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LECTURE OBJECTIVES:

- 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.

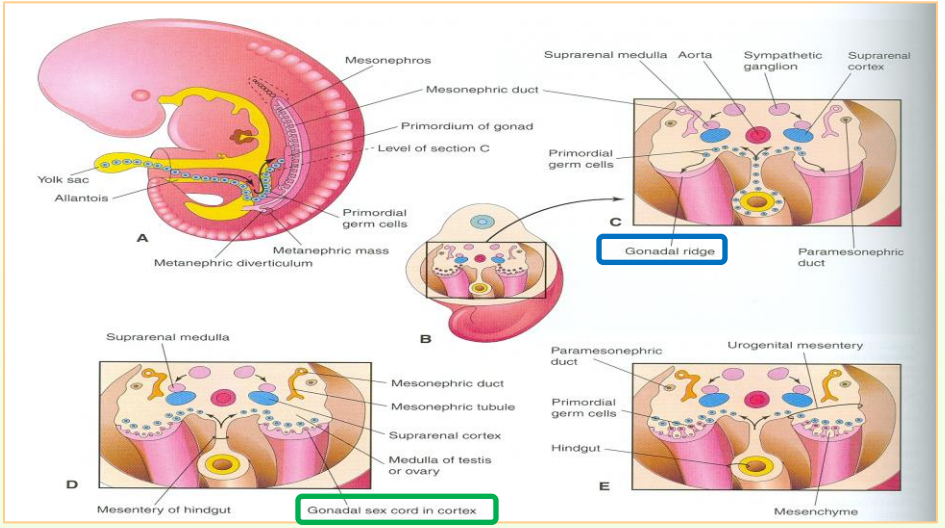
#Development of gonads

- ✓ The gonad of both male and female **have the same origin** (until 7th week).
- ✓ **During 5th week** gonadal development occurs.
- ✓ **Until 7th week** gonads are similar in both sexes.
- ✓ The unified precursor of male and female gonads is a group of **three** types of cells:

1) **Mesothelium** (mesodermal epithelium lining the coelomic cavity).

2) **Underlying mesenchyme**, Which is the mesodermal cells covering the mesothelial cells.

3) **Primordial germ cells:** endodermal cells of the yolk sac migrate through the dorsal mesentery of hindgut to **gonadal ridges** and become incorporated into **gonadal cords.**



- ✓ **Gonadal ridge:** a bulge on the medial side of mesonephros produced by proliferation in both of:
  - **Mesothelium** forming the **cortex**.
  - **Mesenchyme** forming the **medulla**.
- ✓ When gonadal ridge is formed, the mesothelial cells fuse and form **Sex (Gonadal) cords**.

#Development of Testis

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

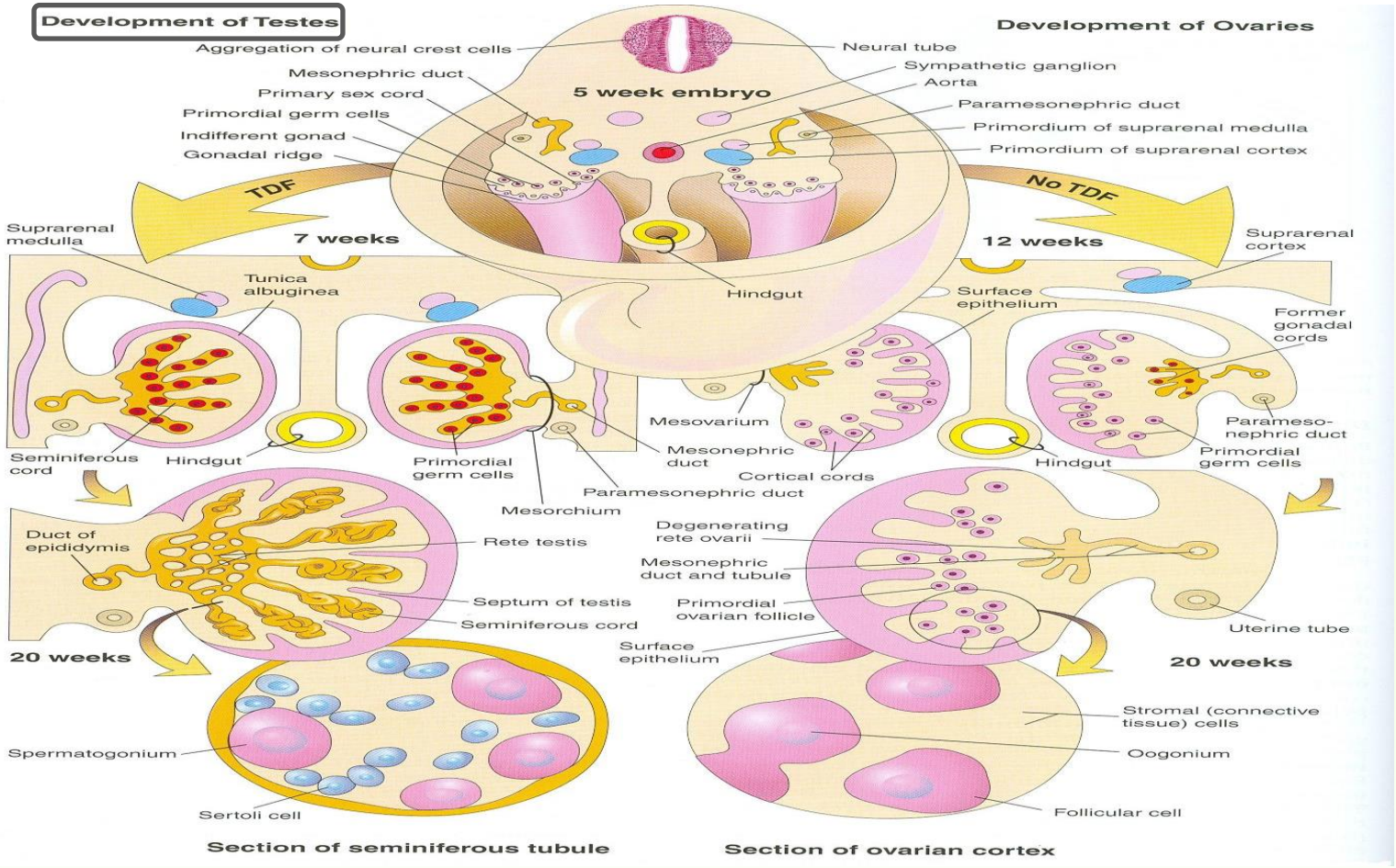
✓ At the 7th week, (TDF) causes the following:

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

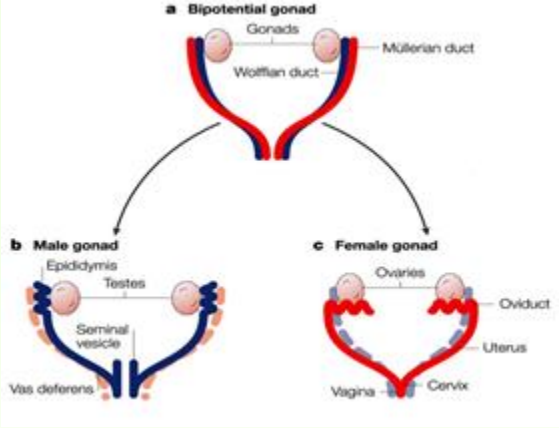
  1) **Sertoli cells:** derived from surface epithelium of testis **(mesothelial cells).**

  2) **Spermatogonia:** derived from **primordial germ cells**.

- By **8th** week, **mesenchyme** surrounding seminiferous cords gives rise to **interstitial cells (of Leydig)** secreting testosterone.


Development of Testes
Development of Ovaries
Aggregation of neural crest cells
Neural tube
Mesonephric duct
Primary sex cord
Primordial germ cells
Indifferent gonad
Gonadal ridge
5 week embryo
Sympathetic ganglion
Aorta
Paramesonephric duct
Primordium of suprarenal medulla
Primordium of suprarenal cortex
TDF
No TDF
7 weeks
12 weeks
Suprarenal medulla
Tunica albuginea
Hindgut
Suprarenal cortex
Surface epithelium
Former gonadal cords
Seminiferous cord
Hindgut
Primordial germ cells
Mesonephric duct
Paramesonephric duct
Mesorchium
Mesovarium
Cortical cords
Hindgut
Paramesonephric duct
Primordial germ cells
Duct of epididymis
Rete testis
Septum of testis
Seminiferous cord
20 weeks
Degenerating rete ovarii
Mesonephric duct and tubule
Primordial ovarian follicle
Surface epithelium
Uterine tube
20 weeks
Spermatogonium
Sertoli cell
Stromal (connective tissue) cells
Oogonium
Follicular cell
Section of seminiferous tubule
Section of ovarian cortex

#Development of male genital ducts

Leydig's cells	Sertoli cells
✓ The developed Lydig cells start to secrete testosterone by the 8th week. ✓ Stimulate mesonephric duct to form the ductal system that composed of : 1) Epididymis 2) Vas deferens 3) Seminal glands, 4) Ejaculatory duct. ✓ Masculine differentiation of external genitalia.	Sertoli cells secrete **(Anti-Müllerian hormone)** which suppress the development of paramesonephric (Müllerian) duct 

#Development of male genital glands

✓ Their origin is completely different from the gonads.

1. Seminal Gland

- **Mesodermal outgrowth from mesonephric duct.**

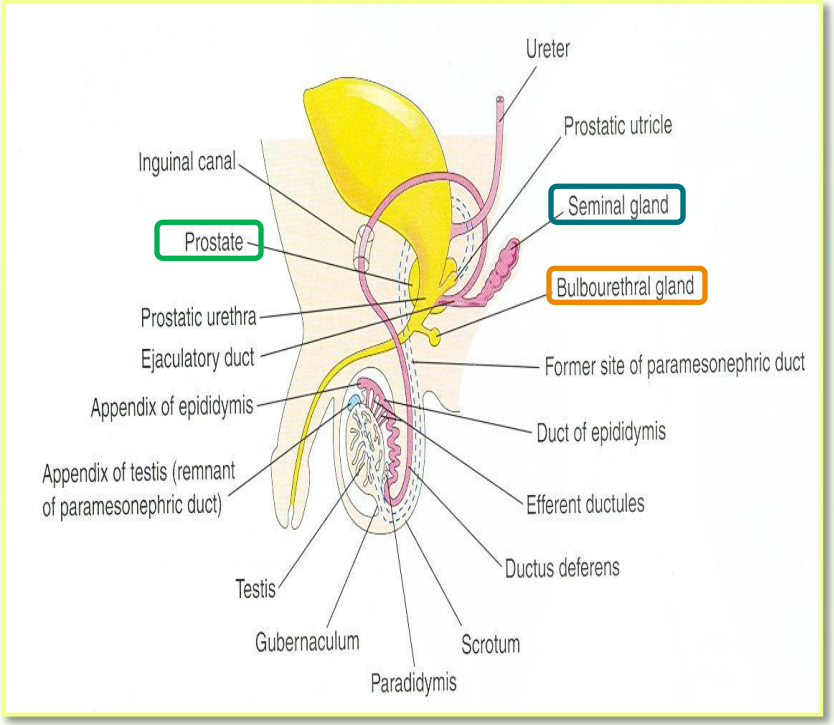
2. Prostate Gland

- **Endodermal outgrowth from prostatic urethra.**

3. Bulbourethral Gland

- **Endodermal outgrowth from spongy urethra.**

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



➢ **Indifferent stage of external genitalia (from 4th to 7th week)**

✓ **Genital tubercle:** produced from mesenchyme at the cranial end of cloacal membrane. It elongates to form a primordial phallus.

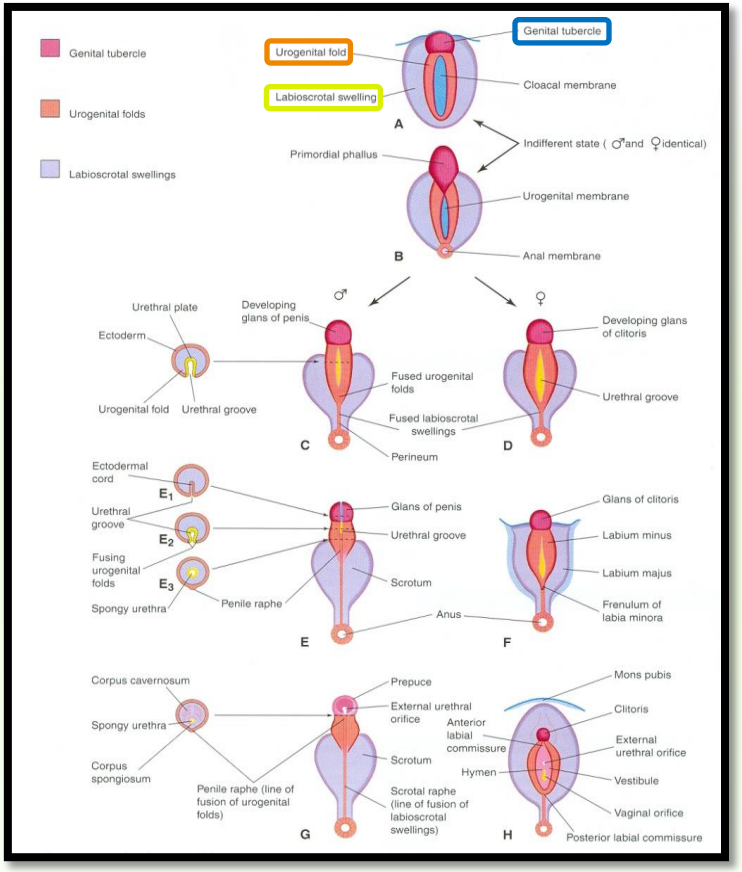
✓ **Urogenital folds:** develop on each side of **cloacal membrane**

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

➢ **Development of male external genital**

✓ 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.**

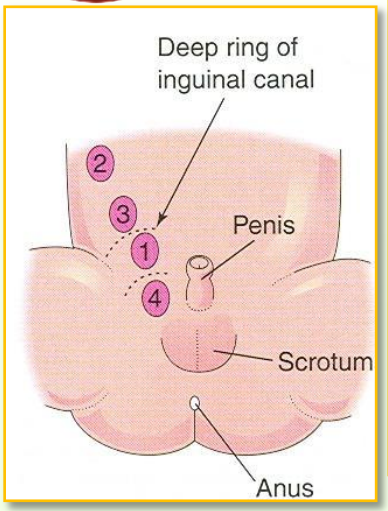


#Descent of Testis

New terms:
- Gubernaculum: a mesenchymal band extending from inferior pole of gonad (testis) 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	External descent of testis
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.
Cause	A relative movement resulting from elongation of cranial part of abdomen away from its caudal part (future pelvic cavity).	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.
Note that		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 Complete descent of testis is associated by: 1. Degeneration of gubernaculum. 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 anomalies



➢ **Chryptorchidism** (undescended testis)

✓ **Incidence:** in up to 30% of premature & 3-4% of full term males.

✓ **Cause:** deficiency of **androgens**.

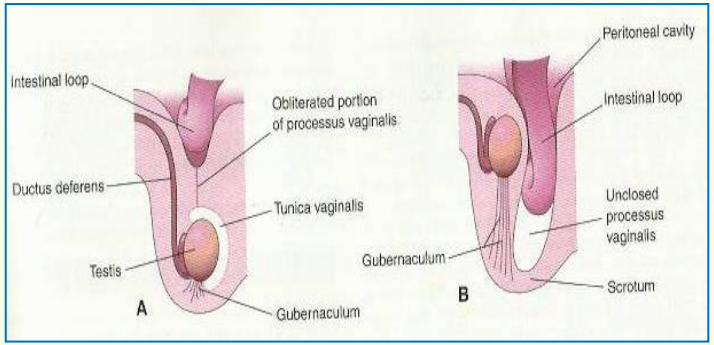
✓ **Common sites:** 1.deep ring of inguinal canal(most common) 2,3,4 (look at the figure).

✓ **Complications:**
1.Sterility, if bilateral
2.Testicular cancer (20-44%)

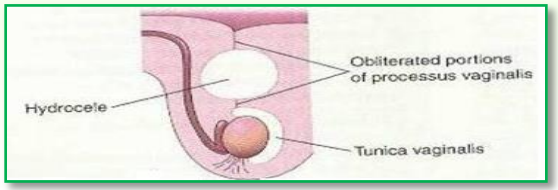
➢ **Congenital inguinal hernia**

✓ **Definition:** Herniation of a loop of intestine through a non-obliterated processus vaginalis either:
A) incomplete B) complete (in scrotum)

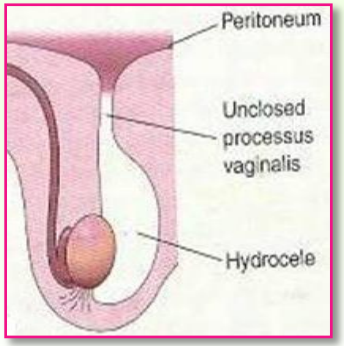
✓ **Cause:** The processus vaginalis does not obliterate and remains in open communication with the peritoneal cavity.



➢ **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



1. Sertoli cells function in fetal life is:

a) Masculine differentiation of external genitalia.
b) Formation of epididymis
c) Ejaculatory duct.
d) Secretion of (anti-müllerian hormone).

2. Which of the following gonads is mesodermal outgrowth:

a) Prostate gland.
b) Seminal gland.
c) Bulbourethral Gland bourethral.
d) a&c.

3. Which of the following derived from primordial germ cells?

a) Sertoli.
b) Spermatogonia.
c) Leydig's cells.
d) Seminiferous cords.

4. Which of the following is the characteristic feature of the testicular development ?

a) Rete testis.
b) Seminiferous cords.
c) Tunica albuginea.
d) Testis- determining factor (TDF).

5. 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.

6. In the development of male external genital, The urogenital folds fuse to form:

a) Urethra.
b) Penis.
c) Scrotum.
d) Phallus.

7. Which of the follow statements is related to Chryptorchidism:

a) Accumulation of fluid in tunica vaginalis.
b) Accumulation of fluid in spermatic cord.
c) Caused by deficiency in androgens.
d) The processus vaginalis does not obliterate.

8. Which structure gives rise the seminal gland ?

a) Genital tubercle.
b) Mesonephric duct.
c) Paramesonephric duct.
d) Urogenital sinus.

9. Which structure gives rise the prostate ?

a) Spongy urethra.
b) Prostatic urethra.
c) Phallus.
d) Mesonephric duct.

10. The common site of the Cryptorchidism is:

a) Superficial inguinal ring.
b) Deep inguinal ring.
c) Peritoneal cavity.
d) Pelvis.

1. (d)
2. (b)
3. (b)
4. (c)
5. (b)
6. (a)
7. (c)
8. (b)
9. (b)
10. (b)

MCQs

Done by:

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Thank you for checking our team
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