

Development of male genital systems

Reproductive block

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.

Resources :

- ★ 435 embryology (males & females) lectures.
- ★ BRS embryology Book.
- ★ The Developing Human Clinically Oriented Embryology book.

Color Index :

- ★ EXTRA
- ★ Important
- ★ Day, Week, Month

Team members :

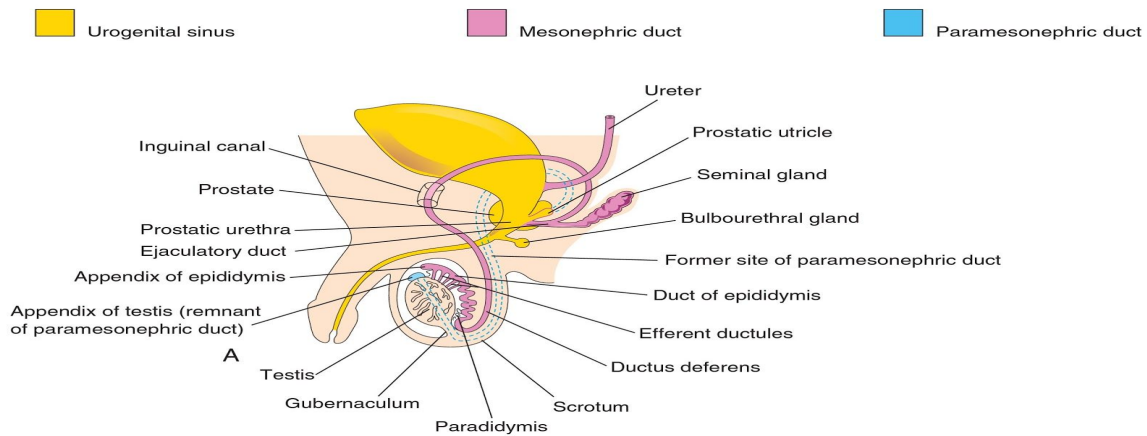
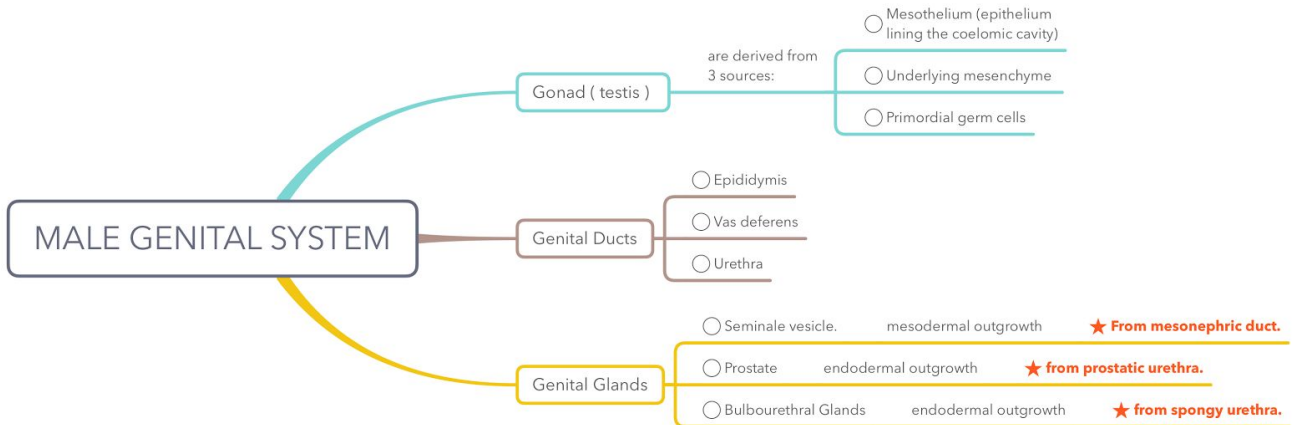
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Helpful video

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INTRODUCTION



DEVELOPMENT OF GONADS

★ During **5th week** gonadal development occurs. Until **7th week** gonads are similar in both sexes

❖ **INDIFFERENT GONADS:** same as in female

Gonadal ridge: a bulge on the medial side of mesonephros produced by:

Proliferation of mesothelium (cortex)

because we here still in the indifferent stage, so both medulla and cortex proliferate, but if we reach the 7th week and start the differentiate stage, only the Medulla will differentiate while the cortex regress.

Proliferation of mesenchyme (medulla)

Gonadal (primary sex) cords: The proliferating mesothelial cells fuse and penetrate the underlying mesenchyme to form 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 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**.

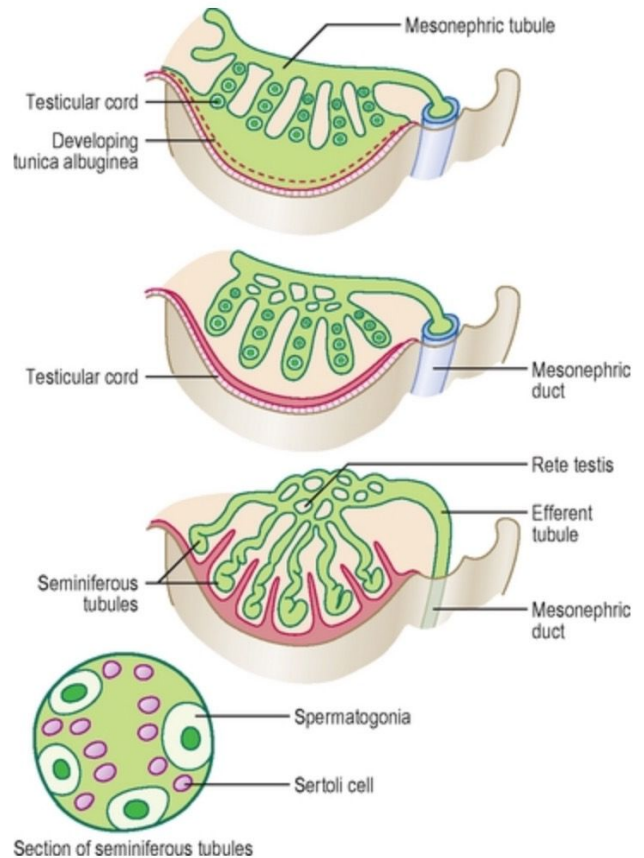
The characteristic feature is the development of a thick fibrous capsule (**tunica albuginea**) that separates the enlarging testis from mesonephros. The development of the dense tunica albuginea is the characteristic feature of testicular development.

Seminiferous cords develop into:
Seminiferous tubules

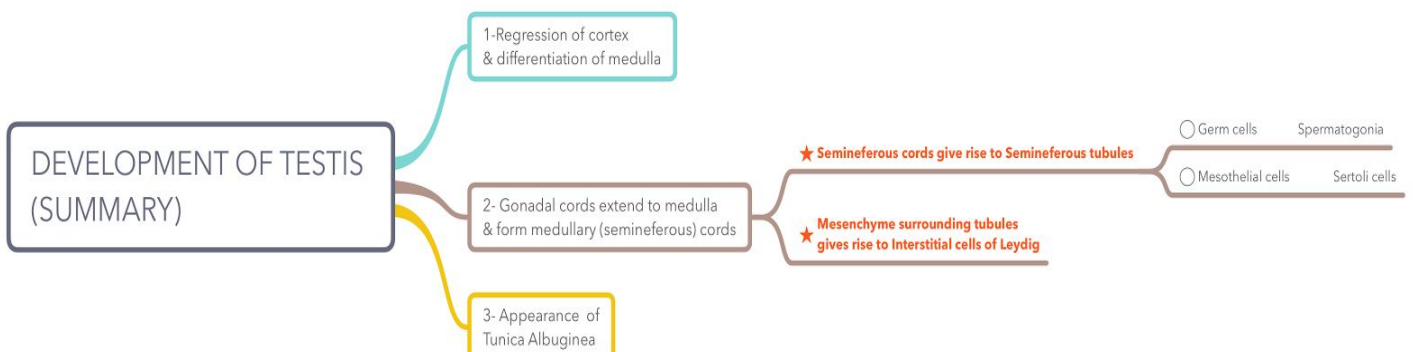
Seminiferous tubules remain solid until **puberty**.

Its walls are composed of:

1. **Sertoli cells**, derived from surface epithelium of testis (**mesothelial cells**).
2. **Spermatogonia**: derived from **primordial germ cells** (endodermal cells of the yolk sac)



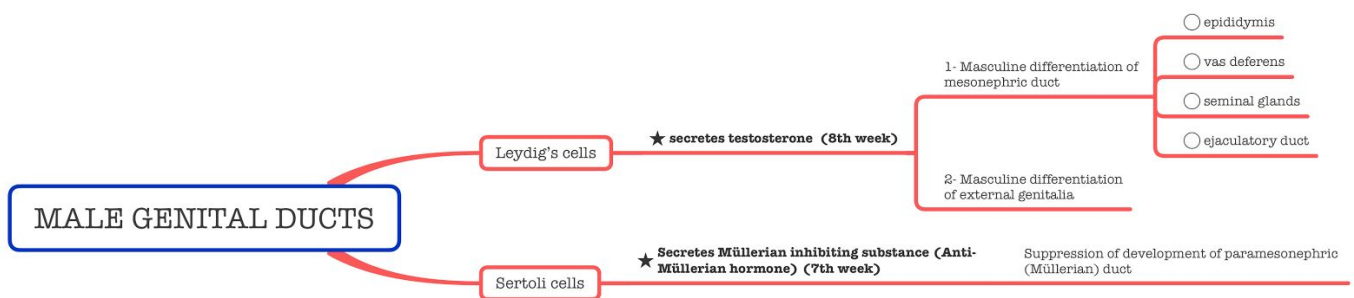
- ★ By **eighth week**, mesenchyme surrounding seminiferous cords gives rise to **interstitial cells** (of **Leydig**) secreting testosterone.



❖ **DEVELOPMENT OF MALE GENITAL DUCTS:** look at first picture in this lecture

Leydig's cells	Sertoli cells
Secretes Testosterone 8th week	Secretes Müllerian inhibiting substance (Anti-Müllerian hormone) 7th week

In the female, due to the absence of Leydig cells (No testosterone) and the absence of Sertoli cells (No mullerian inhibiting substance) this leads to the developing of mullerian duct (paramesonephric duct) that gives arise to the female genital ducts.



❖ **DEVELOPMENT OF MALE GENITAL GLANDS:**

1-SEMINAL GLAND	2-PROSTATE GLAND	3-BULBOURETHRAL GLAND
mesodermal outgrowth from mesonephric duct .	endodermal outgrowth from prostatic urethra .	endodermal outgrowth from spongy urethra .
Stroma & Smooth muscles in PROSTATE & BULBOURETHRAL glands are derived from surrounding mesenchyme		

❖ EXTERNAL GENITALIA:

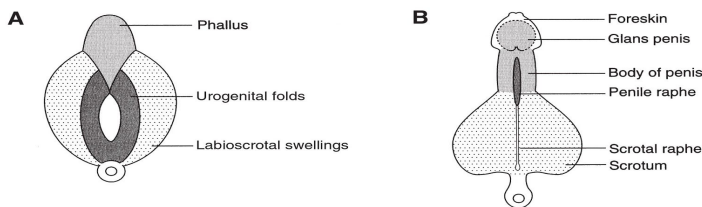
1. INDIFFERENT STAGE OF EXTERNAL GENITALIA (same as female)

from 4th to 7th week.

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

What is cloaca? It is the lower dilated end of the hind-gut, the posterior part is a continuation of the GI system forming the anal canal, while the anterior part is connected with both urinary and genital system by the urogenital sinus.

2. DEVELOPMENT OF MALE EXTERNAL GENITALIA



★ stimulated by **testosterone**

★ Begins at **9th week**

★ Complete differentiation at **12th week** So before this time, the external genitalia of the fetus will not be shown at the ultrasound .

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

★ DESCENT OF TESTIS: هذي الثلاثة لازم تكون موجودة عشان تتم العملية



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.

1- gubernaculum: عبارة عن فايبرس باند وهي نازلة كأنها تشكل لها طريق بإنها تريح طبقات الانتيرير ابدومينال وول الي بتواجهها في طريقها بتأخذهم معها وتنزل فيها Inguinal canal وبالتالي تشكل قناة نسميها. وأيضا دوره مهم في توجيه حركة نزول التستس للأسفل.
 2- testosterone: يحفز عملية نزول التستس ووظيفته مهمة لدرجة في حالة عدم نزول التستس عند طفل حديث ولادة أول شي نجرّب نعطيّه التستسترون في حال ما استجاب نتدخل جراحياً.
 3- processus vaginalis: الآن يحصل شيء مهم، التستس بياخذ جزء من البيروتينيم وينزله معاه الي بيكون له مهمة جداً لأنها بتعتبر له زي المنحدر تسهل عملية نزول التستس يعني عملية النزول تبدأ من الشهر السابع تصير ما تاخذ بالكثير 3 أيام إلا والتستس نزلت.

❖ INTERNAL DESCENT OF TESTIS

تحدث في الذكر والأنثى نتيجة لكير أعضاء الإندومين ما تلقى لها مكان في الأول فيصير لها هيرنيشيين ليرا بعدين تنفرد الأندومين وتزيد مساحتها فيصير لأعضائها الي برزت مكان ترجع تدخل لجوا وتضغط على التستس تنزل تحت

- **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

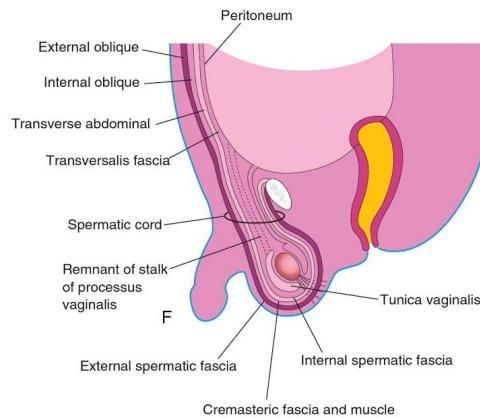
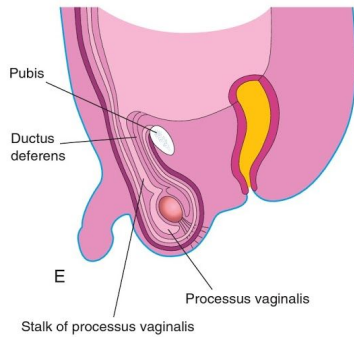
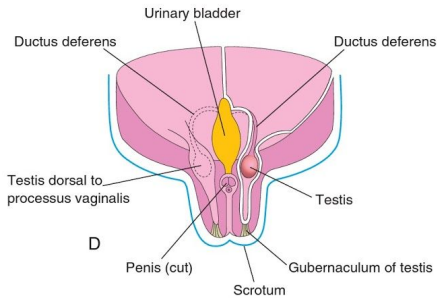
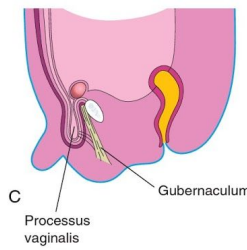
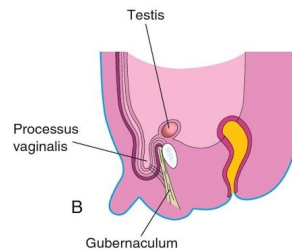
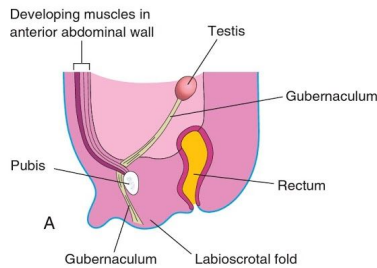
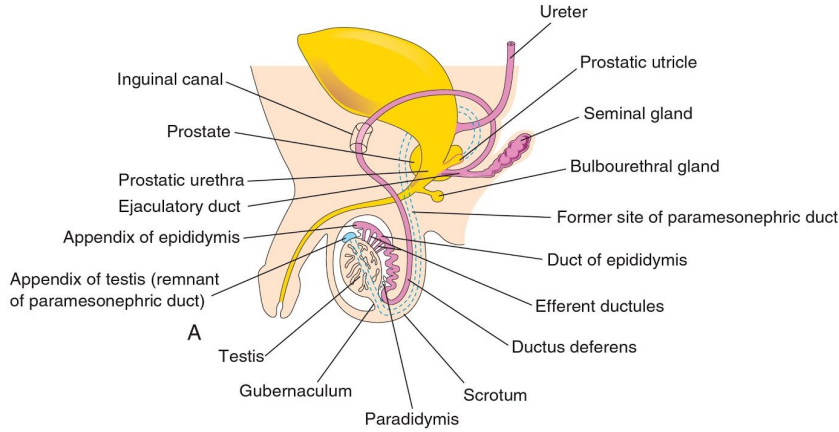
- **Definition:** Descent of testis from deep inguinal ring, through inguinal canal, to scrotum.
- **Time:** Begins in 7th month and takes 2 to 3 days.
- **Causes:**
 - 1- Controlled by androgens.
 - 2- Guided by gubernaculum.
 - 3- Facilitated by processus vaginalis.
 - 4- Helped by increased intra-abdominal pressure resulting from growth of abdominal viscera.
- 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:

عشان كذا بعض الخدج الي ينولدون قبل الشهر السابع تكون الخصية فوق مانزلت

Cont. EXTERNAL DESCENT OF TESTIS

- 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"

مصير البروسيس فاجينالس جزء منها يفضل محيط بالتستس يكون لها التونيكاجاينالس بينما الجزء الي فوق الي هو المتالك هذا يتنقل عشان ما يؤدي لطريق للبريتيم ويسبب هرنيا .



1- CRYPTORCHIDISM (UNDESCENDED TESTIS)

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

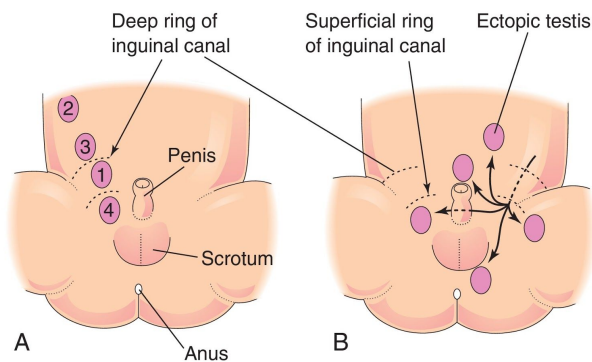


FIGURE 12-48 Possible sites of cryptorchid and ectopic testes. **A**, Positions of cryptorchid testes, numbered in order of frequency. **B**, Usual locations of ectopic testes.

2- CONGENITAL INGUINAL HERNIA Pic. A&B

- **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).

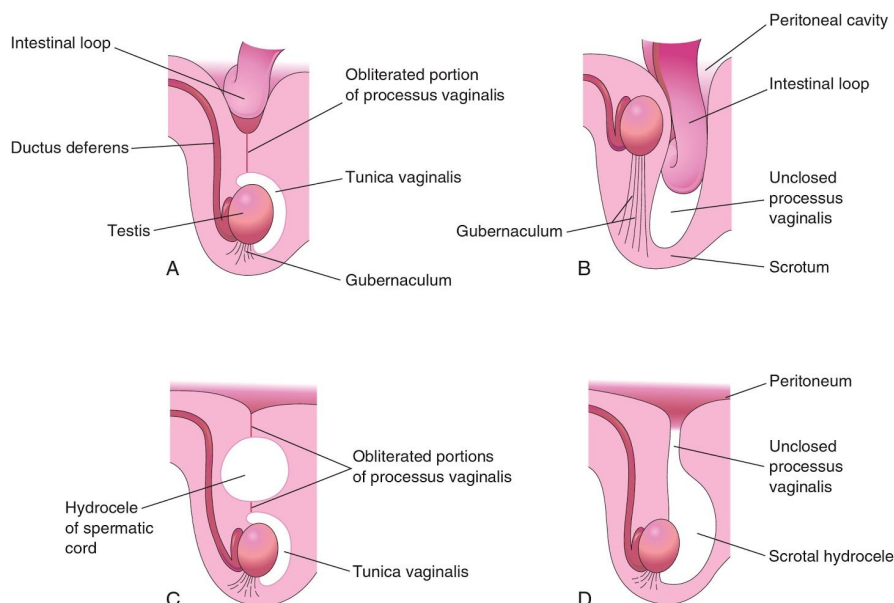
Congenital inguinal hernia and hydrocele result from persistence of the processus vaginalis. Failure of the urethral folds to fuse in males results in various types of hypospadias.

3- HYDROCELE OF SPERMATIC CORD: Pic.C

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

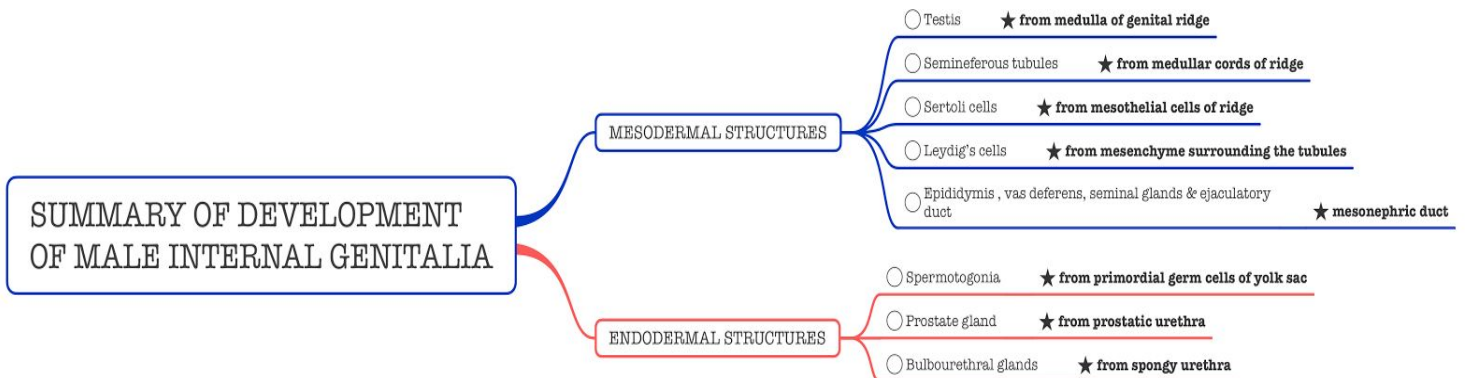
4- HYDROCELE OF TESTIS: Pic.D

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



summary

5th week	development of gonads
7th week	<ul style="list-style-type: none"> ★ Regression of cortex & differentiation of medulla into testis ★ Sertoli cells secretes Anti- Müllerian hormone ★ gonads are similar in both sexes
8th week	interstitial cells (of Leydig) secreting testosterone.
4th to 7th week	INDIFFERENT STAGE OF EXTERNAL GENITALIA
9th week	Begins of development of male external genitalia
12th week	<ul style="list-style-type: none"> ★ Complete differentiation male external genitalia ★ Internal descent of testis
7th month	external descent of testis
first 3 months after birth	most undescended testes descend into scrotum.
after 1 year.	No spontaneous descent of testis occur



penis	Genital tubercle > enlargement of phallus
spongy (penile) urethra	fusion of urogenital folds
scrotum	fusion of The labioscrotal folds

MCQ's

- 1.The Y chromosome carries a gene on its short arm that codes for
 - A. testosterone
 - B. MIF
 - C. testes-determining factor (TDF)
 - D. progesterone
- 2.What is the most common site of cryptorchidism ?
 - A. Superficial inguinal ring.
 - B. Deep inguinal ring.
 - C. Peritoneal cavity.
 - D. Pelvis.
- 3.which one of the following cells is responsible for masculine differentiation of external genitalia ?
 - A. Sertoli cells.
 - B. Primordial cells.
 - C. leyden's cells
 - D. Mesothelium cells
- 4..... is due to deficiency of androgens
 - A. CAH
 - B. CRYPTORCHIDISM
 - C. HYDROCELE OF TESTIS
 - D. UNDESCENDED TESTIS
- 5.....are due to Failure of closure of processus vaginalis
 - A. HYDROCELE OF SPERMATIC CORD
 - B. HYDROCELE OF TESTIS
 - C. CONGENITAL INGUINAL HERNIA
 - D. all of them
- 6.In HYDROCELE OF SPERMATIC CORD Accumulation of fluid in..... and in HYDROCELE OF TESTIS Accumulation of fluid in.....
 - A. tunica vaginalis , scrotum
 - B. scrotum . tunica vaginalis
 - C. spermatic cord . tunica vaginalis
 - D. scrotum , spermatic cord
7. spontaneous descent can occurs after the age of 1 year.
 - A. True
 - B. False
- 8.EXTERNAL DESCENT OF TESTIS > Descent of testis from posterior abdominal wall to deep inguinal ring.
 - A. True
 - B. False
- 9.Complete descent of testis is associated by Degeneration of gubernaculum & Obliteration of stalk of processus vaginalis.
 - A. True
 - B. False

1	2	3	4	5	6	7	8	9
C	B	C	B&D	D	C	B	B	A