

DEVELOPMENT OF MALE GENITAL SYSTEMS



Embryology
436



﴿ إِنَّا خَلَقْنَا الْإِنْسَانَ مِنْ
نُطْفَةٍ أَمْشَاجٍ نَبْتَلِيهِ فَجَعَلْنَاهُ
سَمِيعًا بَصِيرًا ﴾



- Important
- Dr. notes
- Explanation

- We recommend you to study anatomy of male lecture

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.

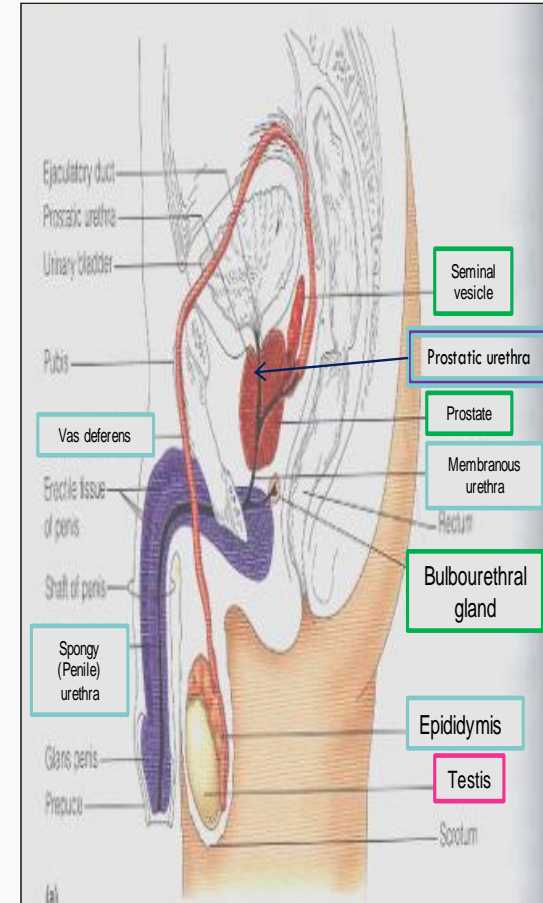
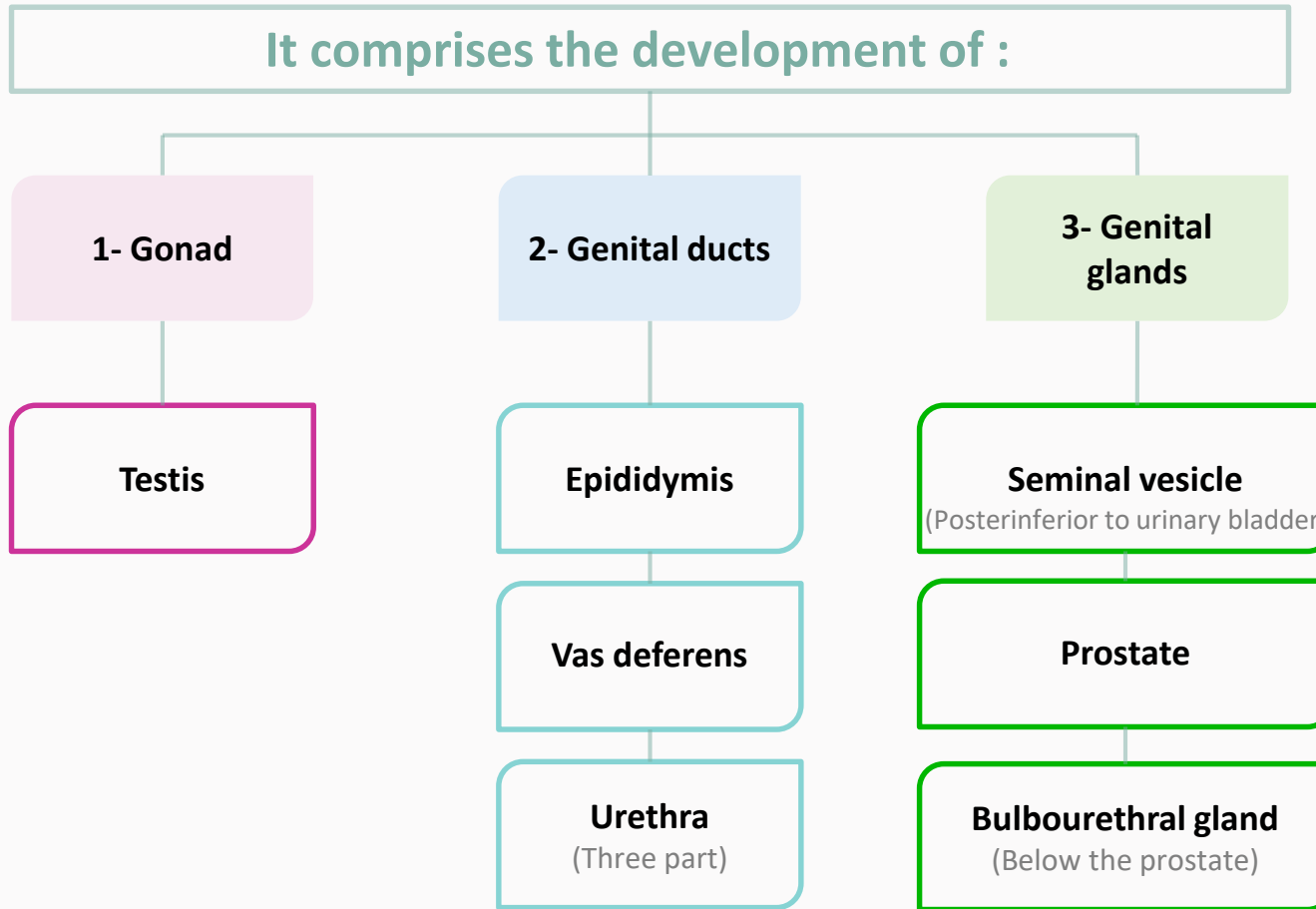
فهم هذي المحاضرة معتمد على المحاضرة الاولى (female) فضروري تدرسوا
المحاضرة الاولى قبل



Useful video

MALE GENITAL SYSTEM

- (عشان تعرفوا بالضبط هذي السلايد لازم تدرسوا قبل الاناتومي)



1-Development of gonads

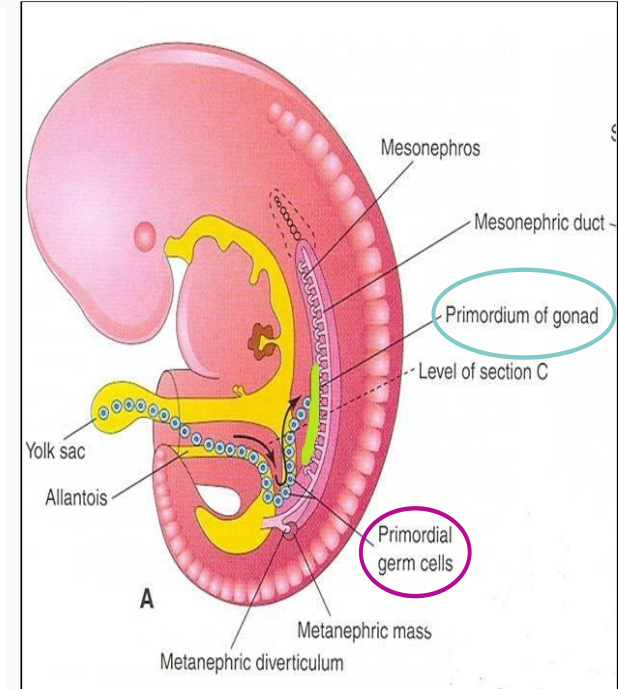
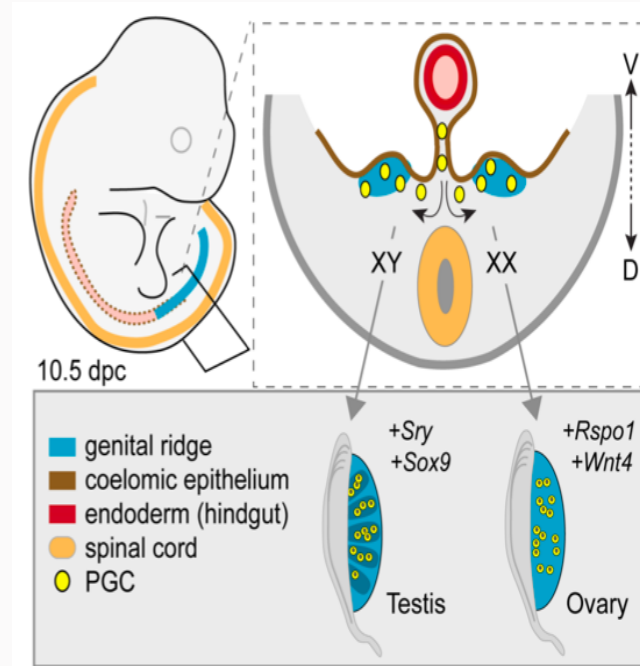
- Gonadal development starts at the 5th week until (بداية) the 7th week of gestation. However, during this period (5th to 7th week of gestation) the gonads are undifferentiated between both sexes.

❖ 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).
* (في شيء في الجنين قبل ما يتميز نوعه ذكر أو أنثى اسمه Coelomic Cavity هذا ال cavity
حيطيه طبقة من ال epithelium ويعطينا ال mesothelium)
- 2. Underlying mesenchyme** (Mesoderm).
- 3. Primordial germ cells.** Endodermal in origin Coming from yolk sac.



❖ شرح السلايد:

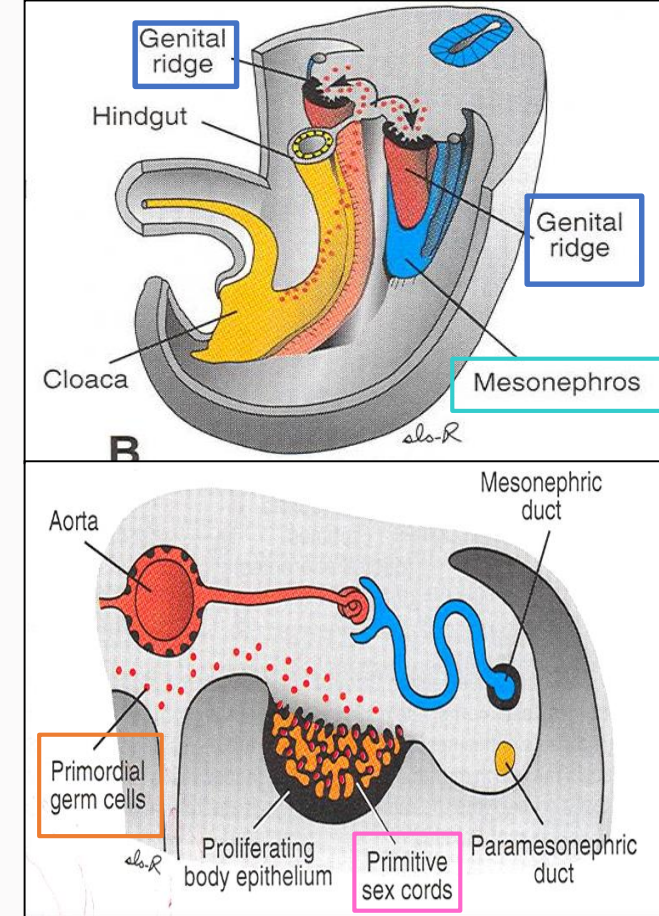
- The **mesenchyme** lies below the **mesothelium** and those two will form the **gonadal rigid** on the medial side of the mesonephric mass.
- The urogenital system will rise from the **mesonephric mass**.
- Finally the primordial germ cells will inter and join the gonadal rigid.

INDIFFERENT GONADS

Undifferentiated gonads (during 5th and 7th week of gestation)

❖ Gonad is derived from three sources :

Gonadal ridge	A bulge on the medial side of <u>mesonephros</u> 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 *. <small>*So it's formed after the fusion of proliferating epithelium "cortex" في الصورة الثانية with mesenchyme.</small>
Primordial germ cells	Endodermal cells of the yolk sac migrate along dorsal mesentery of hindgut to gonadal ridges and become incorporated into gonadal cords.



❖ شرح السلايد:

أولاً. احنا عارفين من المحاضرة الماضية عندي: من برا ميزوثيليم (كورتكس) ومن جوا مازينكايم (ميدلا) هذول الطبقتين مع بعض يتكاثروا ويعطوني القونادال ريديج.

ثانياً. الميزوثيليم يتكاثر اكثر ويندمج اكثر مع الميزينكايم ويكون البريماتف (البرايمري) قونادال كورد
ثالثاً. البريميديل جيرم سلز الي تجي من اليوك ساك (هيندقت) تروح تهاجر وتمشي في معبر اسمه دورسال ميزنتري وبعدين تروح للقونادال ريديج وتدخل جوا البريماتف كورد

❖ شرح الصورة:

الصورتين هذي نفس الشيء ولكن وحده بالطول كأنها Sagittal section والثانية بالعرض كأنها transverse section ، في الصورة الأولى نشوف ال gonadal of genital rigid كامل إلي لونه أحمر، أما الصورة الثانية نشوف من الداخل إلي هو عبارة عن ال البرتقالي والأسود ويمثلوا ال primitive cord.

DEVELOPMENT OF TESTIS

This slide is important

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

At 7th week:

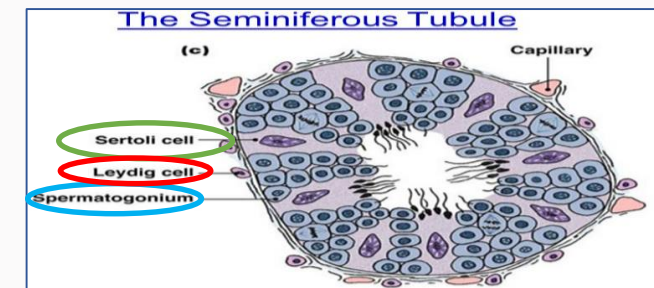
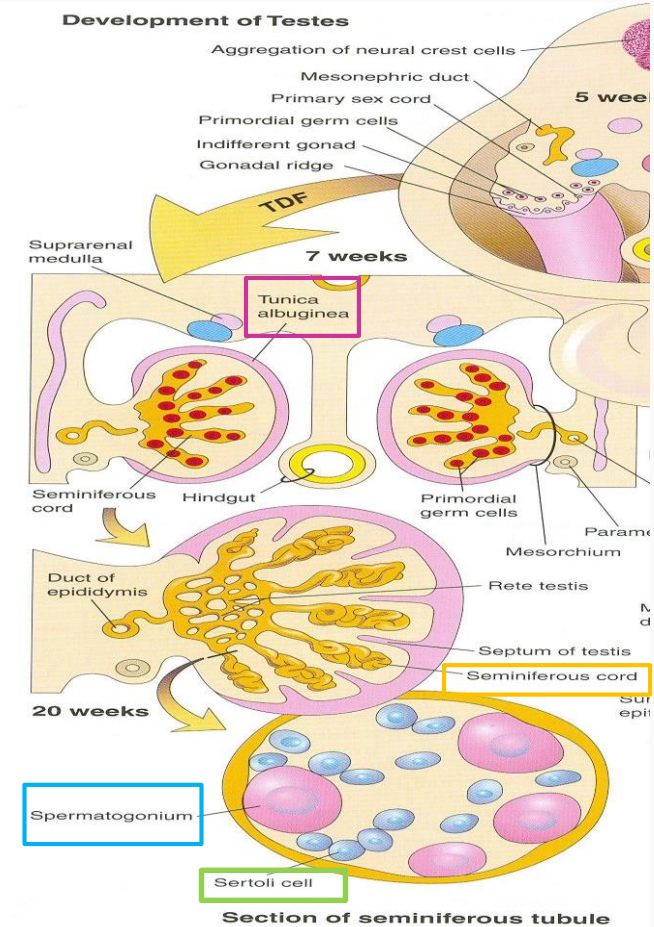
- Regression of cortex & **differentiation of medulla into testis**.*
- Gonadal cords condense & **extend into medulla (Medullary cords) to form Seminiferous cords**.
- **The characteristic feature (مهم)** is the development of a thick fibrous capsule (tunica albuginea) that separates the enlarging testis from mesonephros.

*Regression of cortex leads to development of capsule which is tunica albuginea and the primary sex cords condense and penetrate all over the medulla then it will be called medullary cords to form seminiferous cords.

- **Seminiferous cords develop into: Semineferous tubules**
- Semineferous tubules remain **solid** until **puberty**.

Seminiferous walls are composed of:

1. Sertoli cells: derived from surface epithelium of testis (**mesothelial cells**).
 2. Spermatogonia: **derived from primordial germ cells**. (Spermatogonia is endodermal in origin coming from the yolk sac)
- By **eighth week**, mesenchyme surrounding semineferous cords from outside gives rise to **interstitial cells (of Leydig)** secreting **testosterone**.



❖ شرح السلايد :

بعد بداية الأسبوع السابع يظهر عندي الفاكتر الي يحدد ان نوع الجنين ذكر

احنا اتفقنا في الميل يصير اضمحلال للكورتكس وتبقى الميلا

- طيب الكورتكس اذا اضمحل يتكون مكانه كابسول الي هو التونيكا البوجينيا وتذكر في الفيمل كان thin في الميل رح يكون thick

- الميلا حيصير لها تغيرات اخر شي تصير ميلاري كورد وثم يتحول الي سيمينفرس كورد وليس تببول

بعدين يتحول السيمينفرس كورد الي تببول ويكون solid حتى البلوغ

2-DEVELOPMENT OF MALE GENITAL DUCTS

This slide is important

Leydig's cells
إذا عدتوا حروف (Leydig's) مع الفاصلة تطلع ٨ يعني تفرز تيستستيرون في الأسبوع الثامن

secretes

Testosterone (8th week)

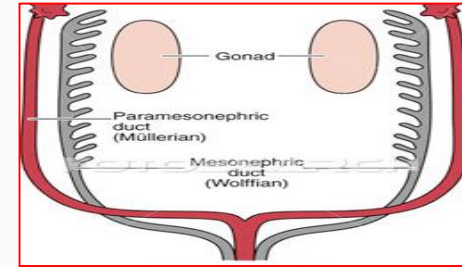
It will do two action

1-Masculine "male" differentiation of **mesonephric duct** : 1-epididymis, 2-vas deferens, 3-ejaculatory duct
4-**seminal glands**

(انتبهوا ان السمينال قلاند هي القلاندة الوحيدة اللي تطلع من الميزونفرك دكت)

2-Masculine differentiation of **external genitalia**.

❖ شرح السلايد:
-so the leydig cells in 8th week responsible for the masculine differentiation of these ducts and these ducts are called mesonephric duct in two sides.



Sertoli cells
Sertoli cells = Seven week

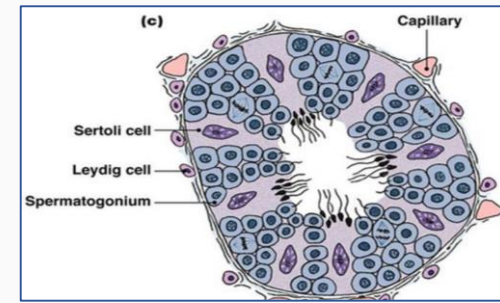
secretes

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

action

Suppression of development of paramesonephric (Müllerian) ducts in females.

❖ شرح السلايد:
- Sertoli cells in 7th week secretes **anti mullerian hormone** which will suppress the paramesonephric duct which is the origin of female duct.



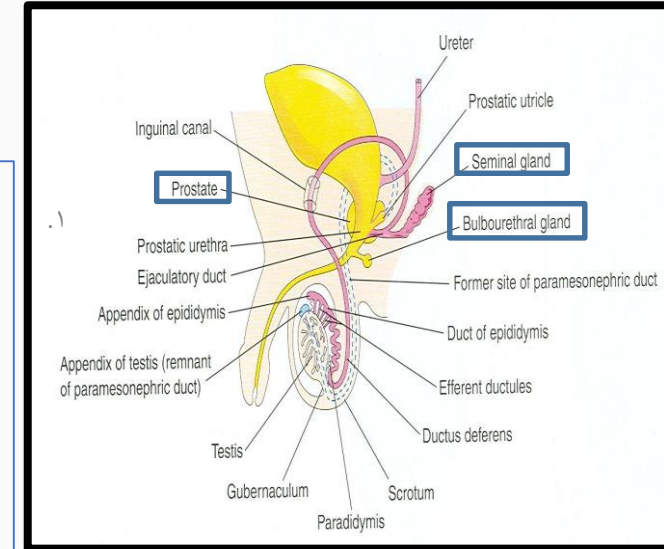
3-DEVELOPMENT OF MALE GENITAL GLANDS

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

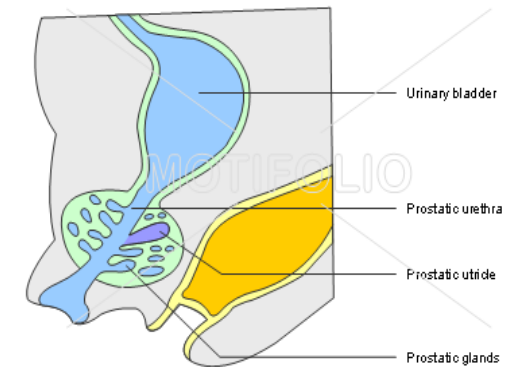
قولنا انها القلانن الوحيدة الي تطلع من الميزونفرك

عشان نسهل الحفظ كل قلانن طالعه من اللي حولها البروستات قلانن طالعه من البروستات يورثها وهكذا

❖ **Stroma & Smooth muscles** Of prostatic and bulbourethral glands are derived from surrounding mesenchyme

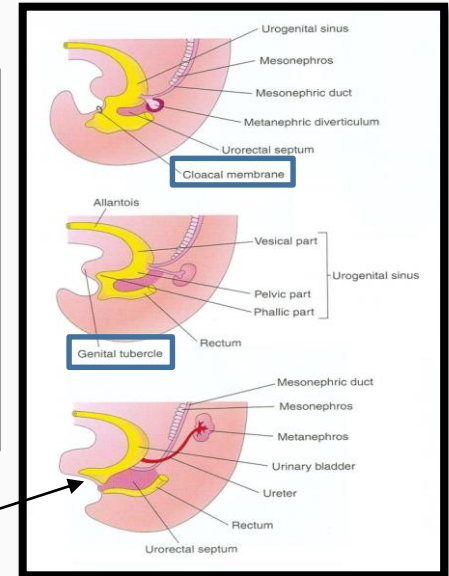


Development of the accessory glands of the male genital system – 12 weeks



- 1- Genital tubercle:** produced from mesenchyme at the cranial end “above” of cloacal membrane. It elongates to form a **primordial phallus** Which later will give the penis.
- 2- Urogenital folds:** develop on each side of cloacal (later will convert to urogenital) membrane.
- 3- Labioscrotal swellings:** develop on each side of urogenital folds Which later will give the scrotum.

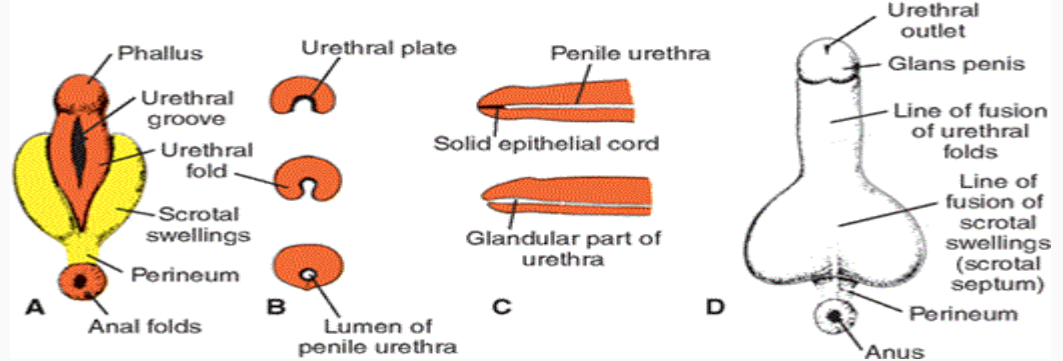
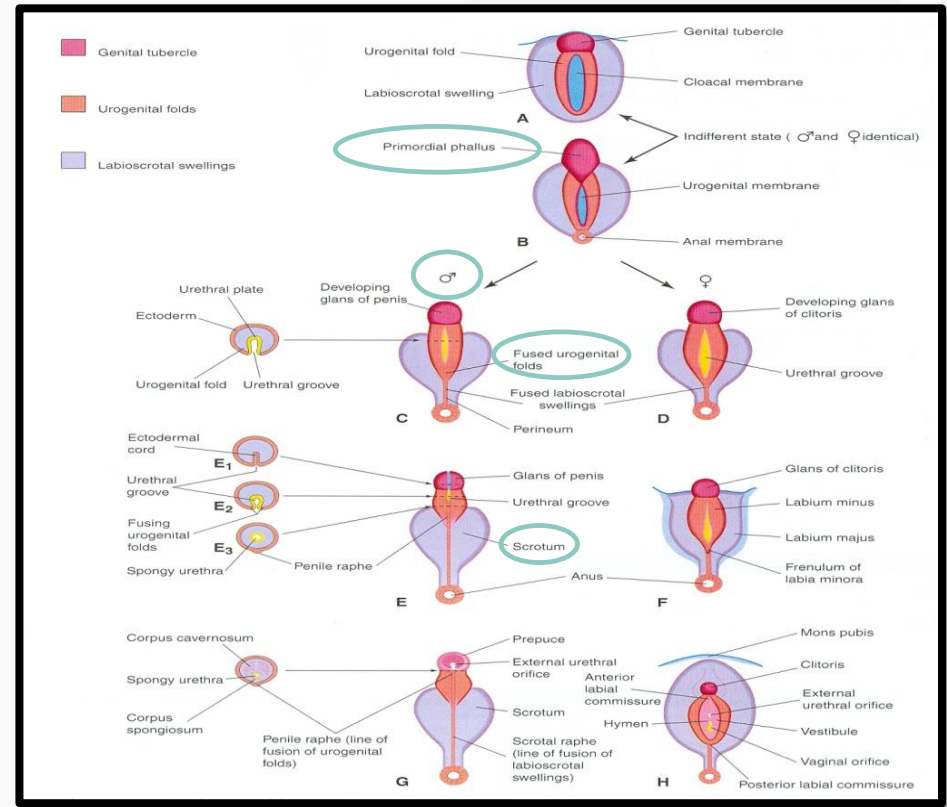
-INDIFFERENT STAGE OF EXTERNAL GENITALIA
 (from 4th to 7th week)
 يعني الى هذا المرحلة الفيميل والميل نفس الشيء



Urogenital membrane



- 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 (yellow color in the middle)** (When it fuses it forms a canal in the middle which is the penile urethra)
 - 3. The labioscrotal folds** (swellings) fuse to form **the scrotum**





❖ DESCENT OF TESTIS “The changes occur during descending of testes”:

- **Gubernaculum:** a mesenchymal band extending from inferior pole of gonad “**testes**” to labioscrotal fold “**scrotum**” .

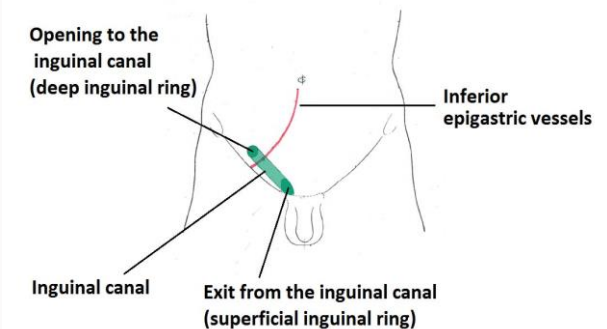
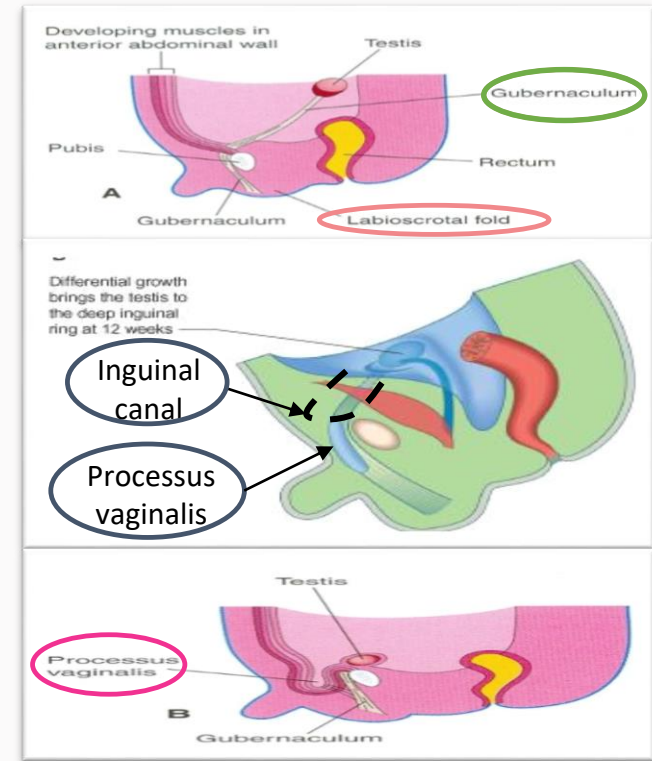
اول ماتتكون التيستس تكون في posterior abdominal wall عندنا زي حبل متصل مع التيستس الى السكروتم عشان بعدين هذا الحبل يرجع التيستس لمكانها الطبيعي (السكروتم)
- الحبل = gubernaculum

- **Inguinal canal:** a pathway formed by gubernaculum through layers of anterior abdominal wall.


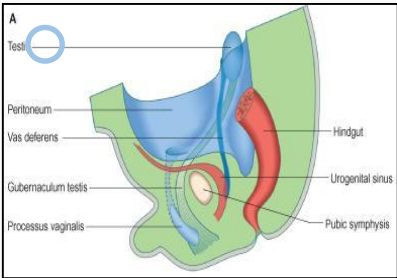
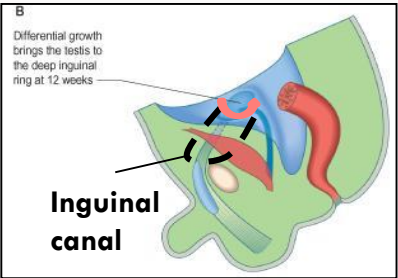
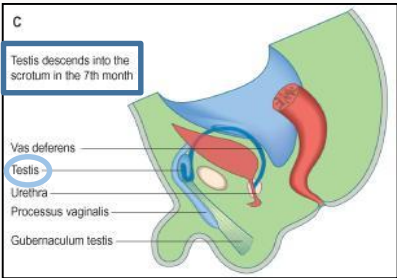
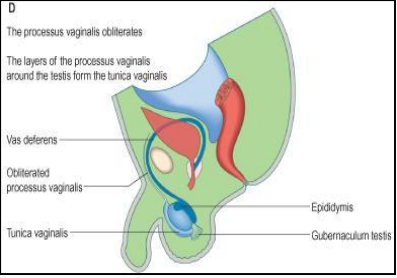
gubernaculum يخترق المسلز ويكون لي Canal وهي زي معبر تمر من خلاله التيستس

- **Processus vaginalis:** a **peritoneal fold passing through inguinal canal before testis, to facilitate its descent.**

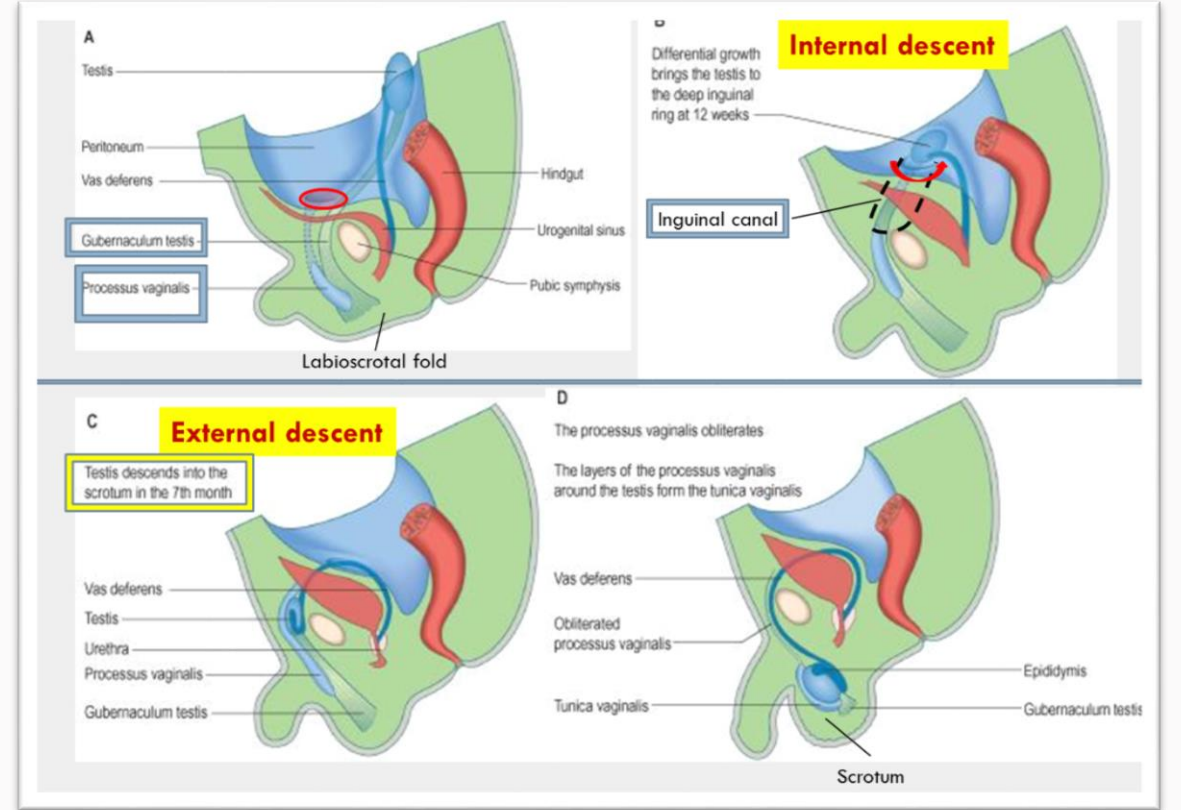
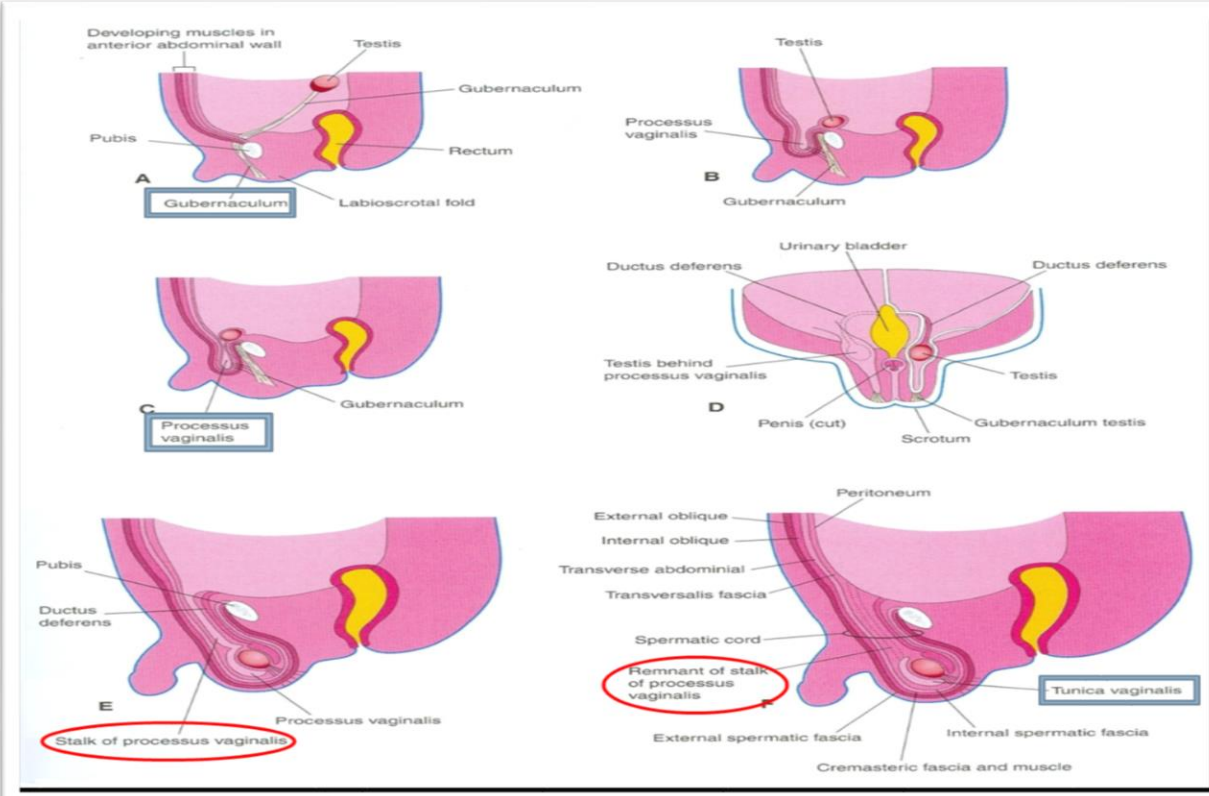
هذا البروتينيال فولد تدخل داخل الكنال قبل التيستس عشان تسهل نزول التيستس بعدين وتزحلق اسهل 😊



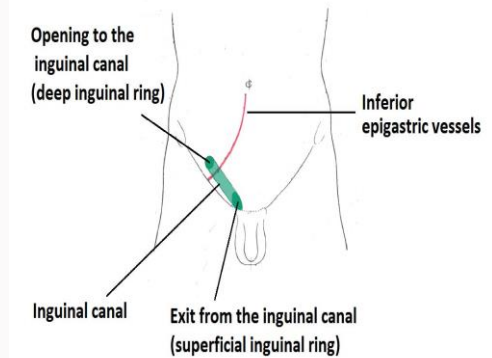
INTERNAL & EXTERNAL DESCENT OF TESTIS **Important**

	INTERNAL DESCENT OF TESTIS	External DESCENT OF TESTIS Important
Definition	Descent of testis from posterior abdominal wall to deep inguinal ring . By Gubernaculum .	Descent of testis from deep inguinal ring , through inguinal canal, to scrotum .
Time	During 12th week	Begins in the 7th month and it takes 2 to 3 days . يبدأ في الشهر السابع وتأخذ من يومين إلى ثلاثة عشان توصل للسكريتكم
Cause	 Useful video a relative movement resulting from elongation of cranial part of abdomen away from its caudal part (future pelvic cavity).	<ol style="list-style-type: none"> Controlled by androgens. Testosterone hormone Guided by gubernaculum. Facilitated by processus vaginalis 😊 الزحليقه . Helped by increased intra-abdominal pressure resulting from the growth of abdominal viscera.
Explanation	  <p>❖ شرح السلايد : الجزء العلوي من الأبدومينال يرتفع لرفع اسرع وينزل الجزء السفلي (اللي راح يكون لي البيلفس) فهذي العملية تعمل على إنزال التيستس من الأبدومينال إلى ال deep inguinal</p>	  <p>❖ شرح السلايد: كل هذي العوامل ال تسهل نزولها من ال deep inguinal إلى ال scrotum</p>

Explanations (هذي السلايد فيها صور توضيحية للسلايدن السابقة)



❖ شرح السلايد: (السلايدن السابقة باختصار)
 باختصار التيسيس هذا ملك لازم يكون عنده حراس يدلوه على الطريق الملك هذا (موجود ف الابدومنال وول ويغا يروح بيته الي هو السكروتم) عندي حبل او مرشد يدل الملك لبيته الي هو gubernaculum وهذا المرشد يروح يسويلي كانال عشان يمر الملك بسلام .
 لكن قبل مايمر الملك جوا الكانال يستنى برا عند باب الكانال هذا الباب اسمه deep inguinal ring كل هذي المرحلة نسميها (INTERNAL DESCENT OF TESTIS) -وبعدين تجي الprocess vaginalis تسويلي دبل تشيك قبل الملك يدخل وتتأكد ان الكانال امنة كل شي تمام وتسهلي عبور ونزول الملك عشان يوصل لبيته بسرعه ف يدخل الملك من الdeep inguinal ring داخل الكانال ثم من الكانال يروح بيته (السكروتم) هذي المرحلة نسميها (External DESCENT OF TESTIS).



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.**

❖ شرح السلايد :

1- لنورمال:

النزول الطبيعي إنّه كل two testes descend in the scrotum ١- تكون نازلة عند اغلب مواليد حديثي الولادة

٢- حالات نادرة التيسس تنزل بعد الولادة ب ٣ شهور

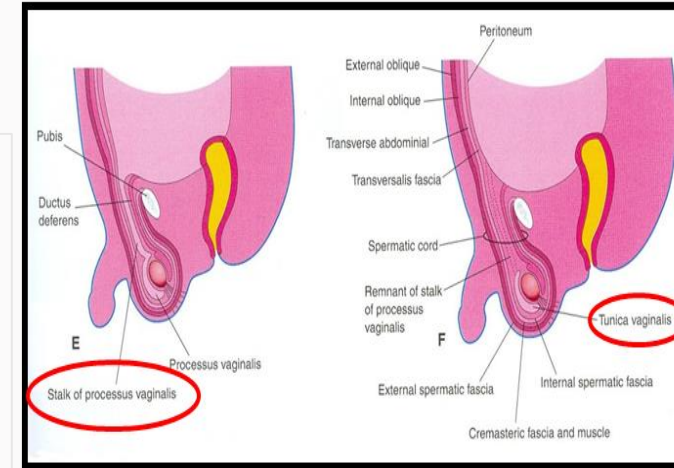
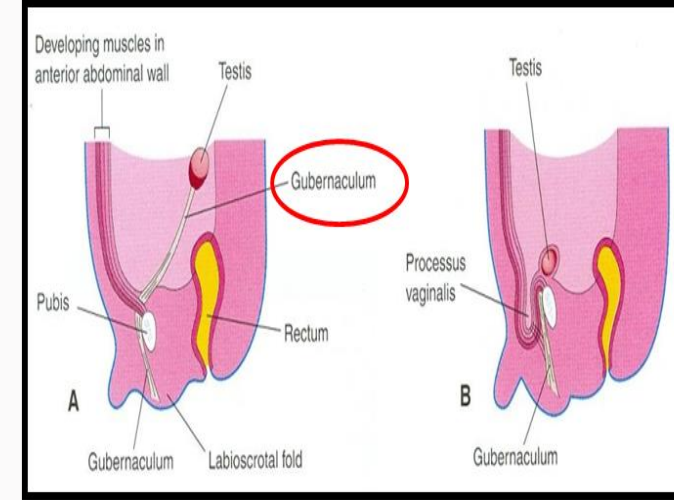
3- الابنورمال:

ماتنزل بعد سنة من الولادة ويتكون عندي انوملي ونسميها التيسس المعلقة أو المختفية.

Complete descent of testis is associated by: Important !!

- إيش التغيرات الطبيعية إليّ تصير بعد ما يتم نزول التيسس؟

- **Degeneration of gubernaculum.** (يختفي الحبل الي مرتبط مع التيسس بعد ما نزلها)
- **Obliteration** (يقفل) of **stalk of processus vaginalis.**
- **Persistence** of part of processus vaginalis **surrounding the testis in the scrotum to form "tunica vaginalis"**
ال stalk يتقفل ويختفي بينما جزء يبقى ويحيط بالسكروتم إلي هو tunica vaginalis





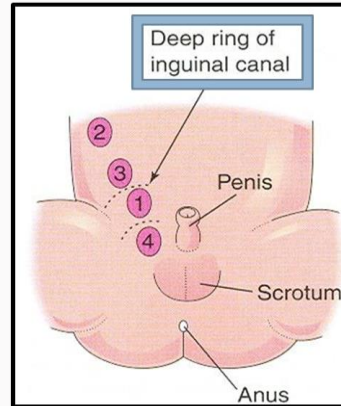
Very useful video
from 10:02 to the end

Congenital Anomalies

Cryptorchidism (undescended testis)

الخصية المعلقة أو المعلقة

- ❖ **Incidence:** is up to 30% of premature & 3-4% of full term males
- ❖ **Cause:** deficiency of androgens.
- ❖ **Common sites:** look to figure:
 1. Deep ring of inguinal canal
 2. Upper part of abdomen
 3. Lower part of abdomen
 4. Pelvis
- ❖ **Complications:**
 1. Sterility (عقم), **if bilateral.**
 2. Testicular cancer (20-44%).



Congenital inguinal hernia

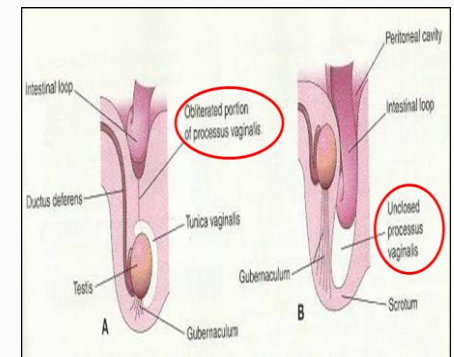
Hydrocele of spermatic cord

Hydrocele of testis

- ❖ **Definition:** Herniation of a **loop of intestine** through a non-obiterated processus vaginalis.
- 1. **incomplete** (Part of stalk open)
- 2. **complete (in scrotum)** (All stalk open)
- ❖ **Cause:** The **processus vaginalis does not obliterate** & remains in open communication with the peritoneal cavity.

❖ شرح السلايد :

الهرنياشن هو لمن يكون ال stalk مفتوح سواء جزء منه أو كامل بالتالي جزء من ال intestine يطيح او يدخل داخله



Failure of closure of processus vaginalis

Congenital Anomalies

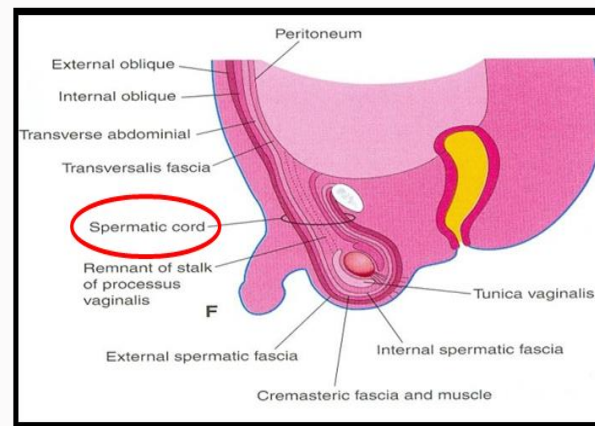
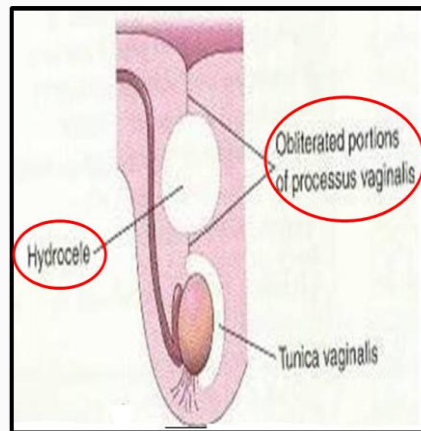
**Cryptorchidism
(undescended
testis)**

**Congenital inguinal
hernia**

**Hydrocele of
spermatic cord**

**Hydrocele of
testis**

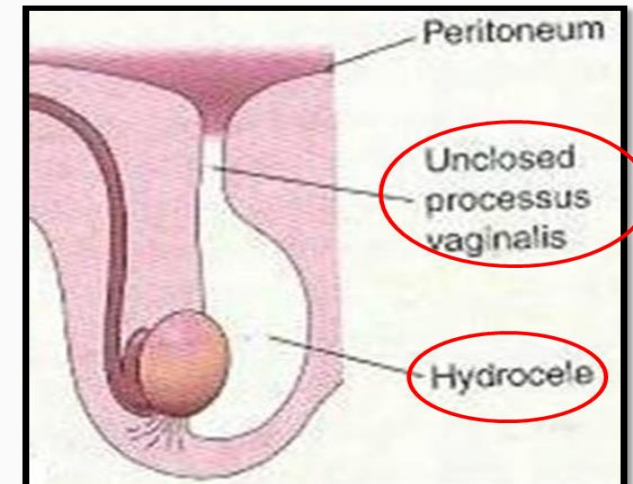
Accumulation of fluid in **spermatic cord** due to a **non-obliterated portion of stalk** of processus_vaginalis.



❖ شرح السلايد:

يصير تراكم للسوائل في السبيرماتك كورد (فوق التيس) نتيجة ان جزء من الستالك ماتقفل

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



❖ شرح السلايد:

من اسمها تراكم سوائل حول التيس (في السكروتكم) نتيجة ان الستالك كامل ماتقفل

Summary

DATE	EVENT
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
Penis	Genital tubercle- > enlargement of phallus
Spongy (penile) urethra	fusion of urogenital folds
Scrotum	fusion of The labioscrotal folds

MCQ's

1. During Which week gonadal development occurs :

A- 5th week B- 4th week C- 6th week

2. The Y chromosome has a gene that code for :

A- testes-determining Factor (TDF) B- Progesterone C- androgens

3. Which cells is responsible for Suppression of development of paramesonephric duct :

A- endodermal cells B- Sertoli cells C-Leydig's cells

4. Which cell is responsible for Masculine differentiation of mesonephric duct :

A- endodermal cells B- Sertoli cells C-Leydig's cells

5. Cryptorchidism is caused by deficiency of :

A- Aldosterone B- Androgens C- FSH

6. Failure of closure of processus vaginalis can cause :

A- Hydrocele of spermatic cord B- Hydrocele of testis C- CONGENITAL INGUINAL HERNIA D- All of them

7. Which one of the following structure is a derivative of male urethra:

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

8. 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

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

References



- Dr.slides (male and female).
- Embryology team 435 .

USEFUL VIDEOS



<https://www.youtube.com/watch?v=EO6kRLtTZW0&t=625s>
<https://www.youtube.com/watch?v=MureNA-RSZM&t=349s>



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