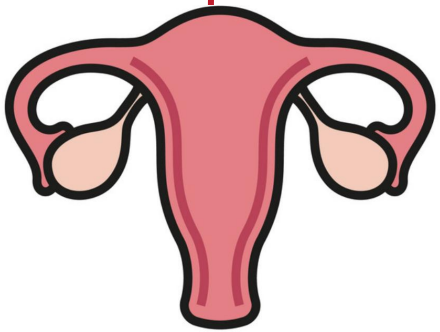

Development of Female Genital System

Reproductive block-Anatomy-Lecture

Editing file
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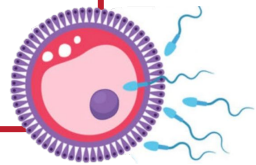

Color index:

- Girls' slides
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- Main content
- Extra
- Important
- Drs' notes

MED439

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MED 439

Revised & Approved
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Reviewed by Razan AlRabah & Walaa AlOtaibi

Objectives

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

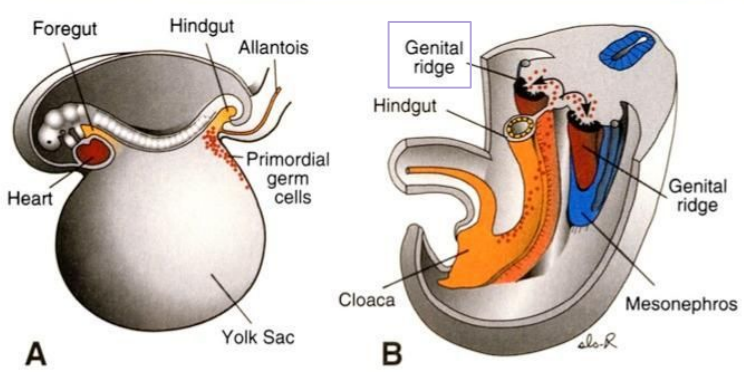
- Describe the development of gonads (indifferent & different).
- Describe the development of the female gonad (ovary) and the internal genital organs (uterus, uterine tubes and vagina).
- Describe the development of the external genitalia.
- List the main congenital anomalies of female genital system.

Development Of Genital System

- Sex of the embryo is determined genetically at the time of fertilization.
- Gonads do not acquire male or female morphological characteristics until 7th week of development.
  - if The Y chromosome exist, it will express a gene called Testis-determining factor (TDF) gene = Male
  - No Y chromosome = No TDF = Female.
- Sex depends on the chromosomes that carried to the ovum.

Beginning of development

1. Genital system are developed from 2 longitudinal ridges of mesoderm which run down the entire length of the dorsal body wall.
2. These ridges are called **urogenital ridges**.
3. The medial region of this ridge differentiates into the genital ridge where the gonads develop (lateral gives bladder)
4. The gonads begin to develop during the 5th week in the genital ridge, and they are **first undifferentiated** (we don't know if it will become testis or ovary yet) and have only a cortex and a medulla



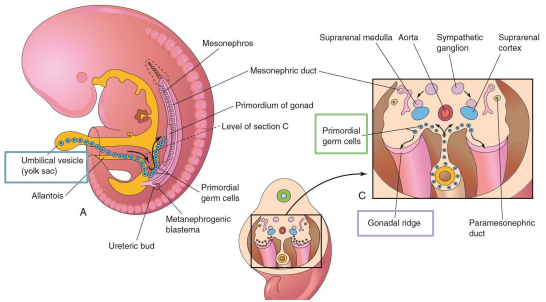
Development Of Undifferentiated Gonads

- During the 4th week Large primitive cells, called primordial sex cells (they are stem cells), form in the yolk sac.
- They migrate along the dorsal mesentery of the hindgut to the genital ridges where they become incorporated into the developing gonads

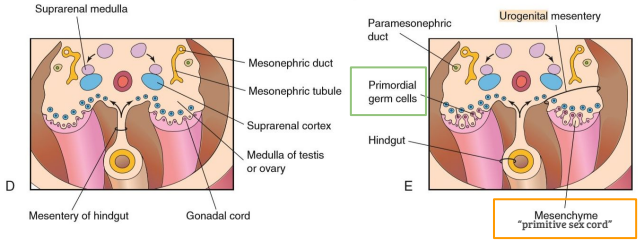
- Germ Cells arrive to the genital ridge at 5th week.
- They invade the genital ridge in the 6th week.

- During arrival of Primordial Germ cells, the epithelium of the genital ridge proliferates, and epithelial cells penetrate the underlying mesenchyme
- Forming irregular shaped cord primitive sex cord "indifferent gonad" (still unknown if male or female)

4th week



5th & 6th week



in embryos

Males

In embryos with an XY complex, the medulla differentiates into a testis and the cortex regresses.

Females

In embryos with an XX chromosome complex, the cortex differentiates into an ovary, and the medulla regresses.

Development Of Ovary

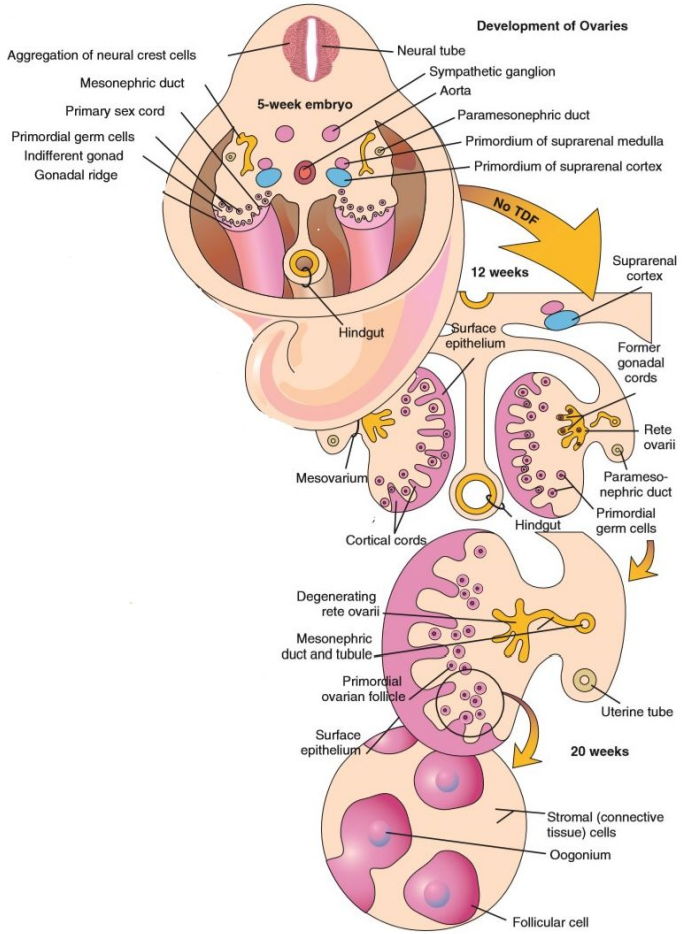
- Primitive sex cords dissociate into irregular cell cluster.
- Later they will disappear and are replaced by vascular stroma forming ovarian medulla.
- Surface epithelium of the female gonad proliferate.

7th week

- In 7th week give rise to **2nd generation** of cords, called cortical cords (because we are talking about the ovary we said CORTICAL cords)
- Penetrate the underlying mesenchyme (the same thing will happen again as we said before, but this time the penetration will only happen in the cortex)

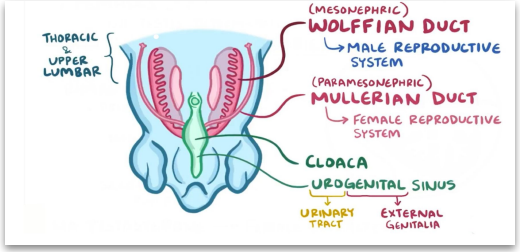
4th month

- In 4th month these cortical cords split into isolated cell clusters which surrounding one or more primitive germ cells.
- Germ cell will develop into oogonia and surrounding epithelial cells form follicular cells. (it's like a hot dog, the cover is follicular cell and the middle is oogonia)



Development Of Genital Ducts

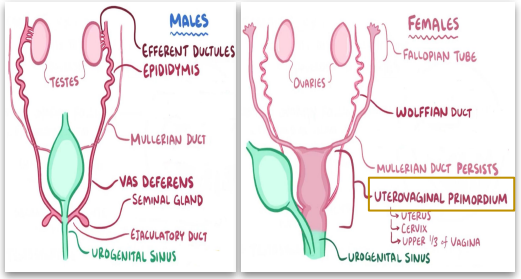
- Two pairs of genital ducts develop in both sexes:
  1. Mesonephric (Wolffian) Ducts
     Male cord , remember M = male
     In case of female, this cord will regress
  2. Paramesonephric (Mullerian) Ducts.
     Female cord , remember para = female
     In case of male, this cord will regress



In Males

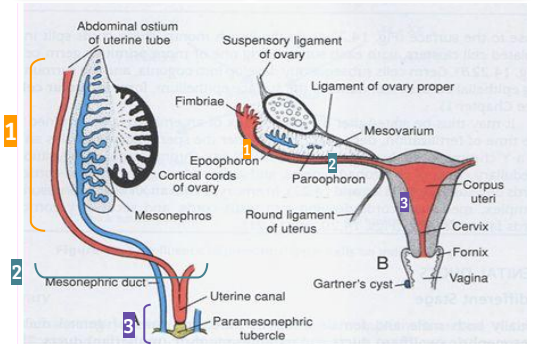
Boys' slide only

- Mesonephric duct system remains to form efferent ductules, epididymis, vas deferens and ejaculatory duct, The seminal vesicle develops as a diverticulum from the developing vas
- Paramesonephric ducts regress (males have mullerian inhibiting substance which inhibit formation of mullerIan ducts)



In Females

- Mesonephric ducts regress
- **Paramesonephric ducts** develop into the main genital ducts of the female:
- uterine tubes, uterus, and upper vagina
- Initially, in **Paramesonephric ducts** development 3 parts can be recognized in each duct:
  1. A cranial vertical portion opens into abdominal cavity
  2. A horizontal part that crosses Anterior to the mesonephric duct
     - both develop into the uterine tube
  3. A caudal vertical part that fuses with its partner from the opposite side
     - Fuse to form uterine canal
     - The Fused parts give rise to the body and cervix of the uterus and upper one third of vagina forming **Uterovaginal primordium**
     - Mesenchyme will form muscular coat of the uterus myometrium & perimetrium



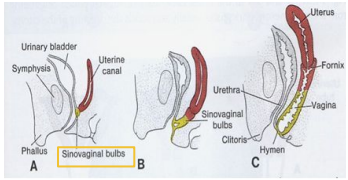
Development Of Vagina and External genitalia

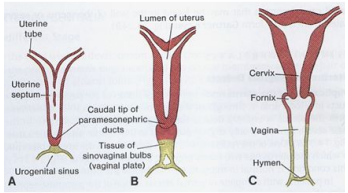
Vagina

upper one third → Mesodermal origin (fused caudal vertica Paramesonephric ducts)

Lower two third → Ectodermal origin

- After solid tip of **paramesonephric ducts** reaches the urogenital sinus, 2 solid evagination (sinovaginal bulbs) grow out and proliferate to form vaginal plate which is form the lower two third of Vagina
- By 5th week outgrowth is entirely canalized

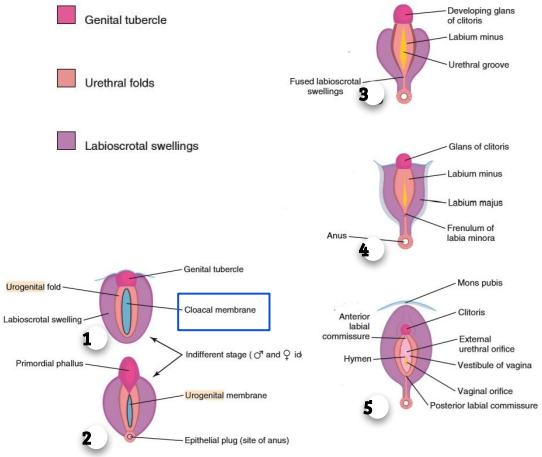




External genitalia

- in the 3rd week, mesenchyme cells originated from primitive streak migrate around the cloacal membrane to form a pair of cloacal folds.

1. **Cranial** to cloacal membrane the folds unite to form the genital tubercle, then The genital tubercle proliferates to form the primordial Phalls which elongates slightly to form **clitoris**
2. **Caudally** the folds are subdivided into **urethral folds** anterior & **anal folds** posterior
3. **another pair of elevation**, genital swelling (Labioscrotal swellings) become visible on each side of the urethral folds (Labioscrotal Folds) these will form **labia majora** they fuse to form posterior and anterior Labial Commissures.
4. **Urethral folds do not fuse** and form **labia minora**
5. **Urogenital groove** is open and forms the **vestibule**

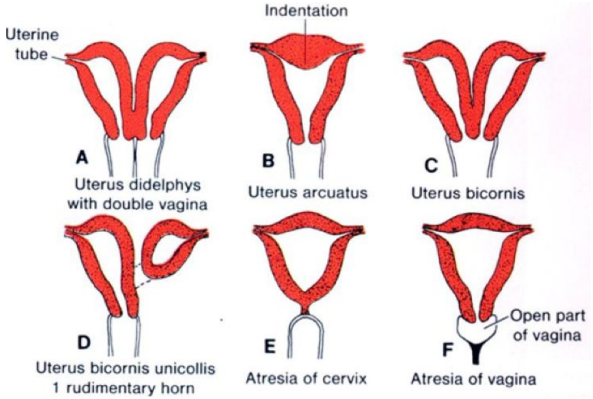


★ Estrogens produced by both placenta and fetal ovaries has a role in feminization of the external genitalia (genitalia needs hormones)

Congenital Anomalies

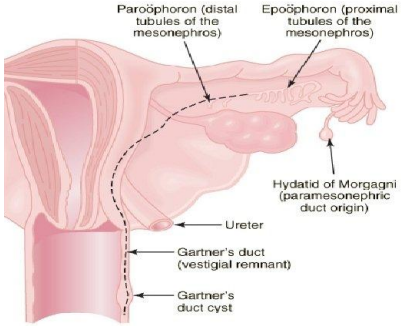
Various types of anomalies can result due to:

1. Arrest of development of the uterovaginal (paramesonephric) primordium during the 8th week.
2. Incomplete development of the paramesonephric ducts.
3. Incomplete fusion of the paramesonephric ducts.
4. Failure of parts of one or both paramesonephric ducts to develop.
5. Incomplete canalization at the 5th week.



Some of common anomalies :

- **Cervical Atresia**: It may be combined with incomplete development of the upper vagina or lower uterus.(because they are from the same source of formation)
- **Vaginal Anomalies:**
  - Atresia (Partial or complete).
  - Double vagina.
  - Transversely septate vagina: Results from faulty canalization of the fused müllerian ducts.
- Remnants of mesonephric (wolffian) ducts may persist in the anterolateral wall of vagina or adjacent to the uterus within the broad ligament or mesosalpinx.



Summary: Timeline

Time of fertilization

- Sex of the embryo is determined **genetically**

3rd week

- Mesenchyme cells originated from primitive streak migrate around the cloacal membrane to form a pair of cloacal folds.

4th week

- Large primitive cells, called primordial sex cells, form in the yolk sac and migrate along the dorsal mesentery

5th week

- Gonads start to develop
- Germ Cells arriving
- The epithelium of the genital ridge proliferates, and penetrate the underlying mesenchyme
- Vagina outgrowth is entirely canalized

6th week

- Germ Cells invading the genital ridge

7th week

- Gonads acquire male or female morphological characteristics
- Surface epithelium rise to 2nd generation of cortical cords and cointine of Penetrating the underlying mesenchyme

16th week (4th month)

- Cortical cords split into isolated cell clusters which surrounding one or more primitive germ cells.

Answers: [Q1:B] [Q2:D] [Q3:A] [Q4:C] [Q5:C] [Q6:A] [Q7:B] [Q8:A]

QUIZ

Q1: Estrogens stimulate development of the .....

A. Genital System

B. external genitalia of the female

C. Ovary

D. Gonads

Q2: which of these event happened in 7th week of development

A. Germ Cells invading the genital ridge

B. Surface epithelium rise to 3rd generation of cortical cords

C. Mesenchyme cells originated from primitive streak and migrate

D. Gonads acquire male or female morphological characteristics

Q3: which of these form the lower two third of Vagina

A. sinovaginal bulbs

B. caudal vertical part of Paramesonephric ducts

C. A horizontal part of Paramesonephric ducts

D. Urogenital groove

Q4: In embryos with an XX chromosome

A. cortex differentiates into a Genital System, and the medulla regresses

B. cortex regresses, and the medulla differentiates into an ovary

C. cortex differentiates into an ovary, and the medulla regresses

D. cortex regresses, and the medulla differentiates into a Genital System

Q5: Germ Cells invading the genital ridge happen in

A. 5th week

B. 4th week

C. 6th week

D. 7th week

Q6: Cranial part to cloacal membrane form

A. clitoris

B. labia majora

C. labia minora

D. vestibule

Q7: Cortical cords split into isolated cell clusters in which week

A. 6th week

B. 16th week

C. 10th week

D. 7th week

Q8: in development Of Genital Ducts in males which of the following is correct

A. Wolffian duct system remains and Mullerian ducts regress

B. both Wolffian duct system and Mullerian ducts remains

C. Wolffian duct system regress and Mullerian ducts remains

D. both Wolffian duct system and Mullerian ducts regress

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