DEVELOPMENT OF FEMALE GENITAL SYSTEMS

Objectives:

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

Done by:

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Embryology 437

- Important
- Extra
- Notes

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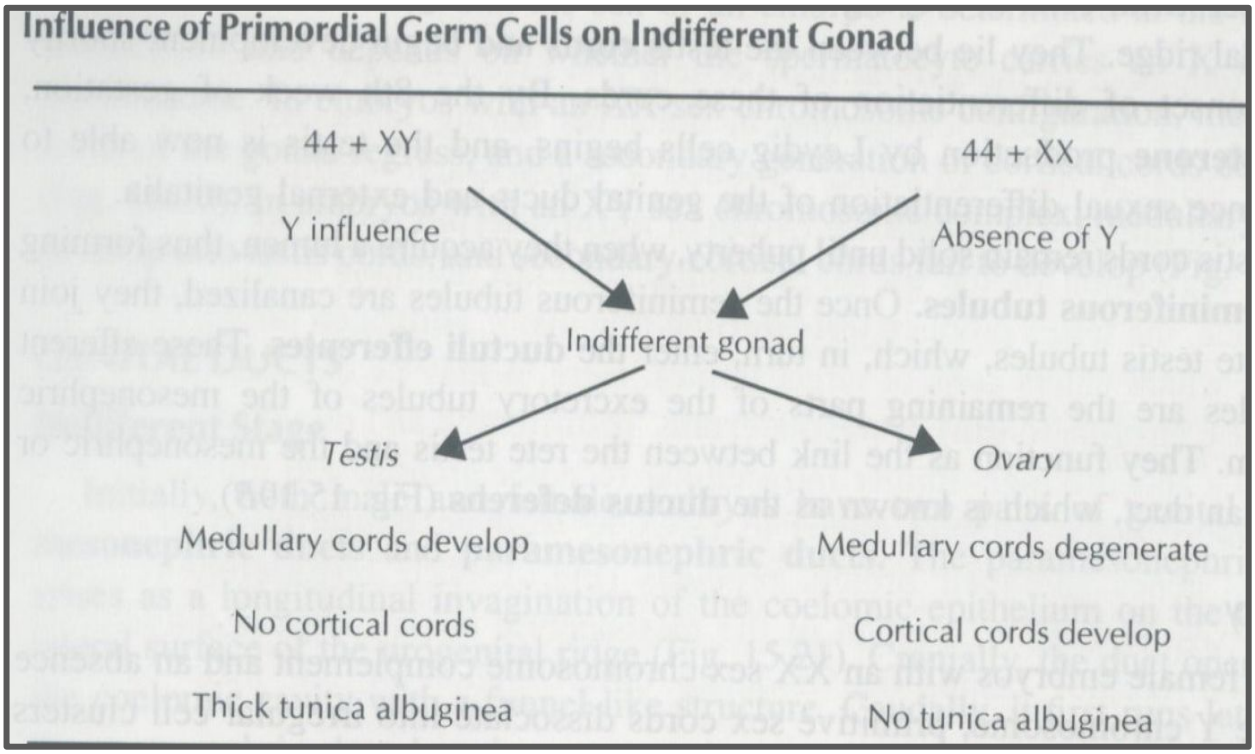
Development of Genital System

- Y chromosome
- Testis-determining factor (TDF) gene
- TDF = Male
- No TDF = Female

Gonads

- Sex of the embryo is determined genetically at the time of fertilization
- Gonads do not acquire male or female morphological characteristics until the **7th week** of development



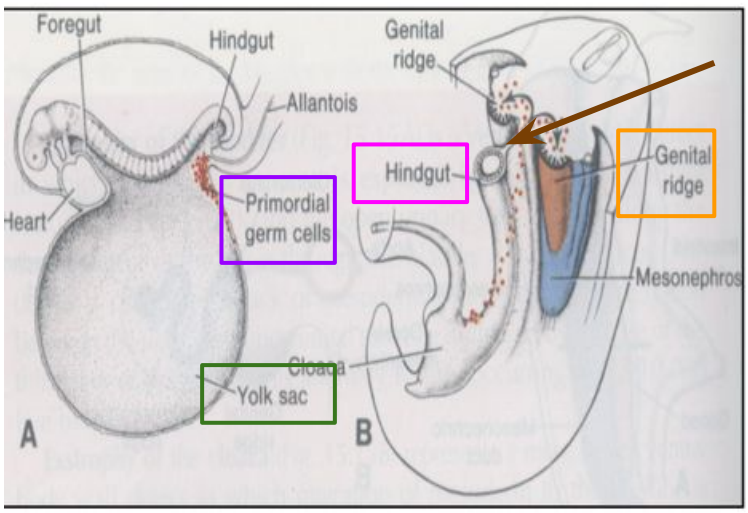
(Cortical وقت الفيرتلايزيشن حسب الكروموسوم الي داخل من السبيرم (إكس أو واي) يتحدد عندي القوناد اذا هي أوفاري أو تيستس يوضح اذا هي اوفاري او تستس بالإسبوع **السابع** (وقت تكون الـ **Cords**

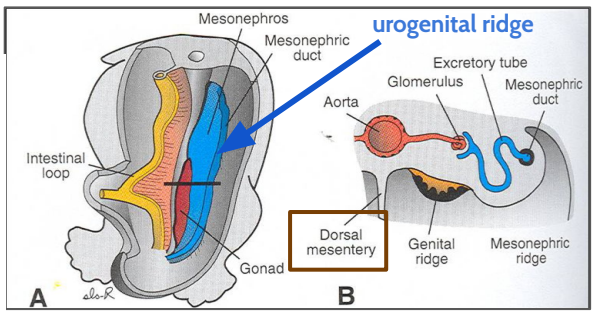
1. Development of Gonad

- Genital system are developed from two longitudinal ridges of mesoderm (intermediate mesoderm) which run down the entire length of the dorsal body wall
- These ridges are called urogenital ridges
- The medial region of this ridge differentiates into the genital ridge where the gonads develop.
- The gonads (gonadal ridge) begin to develop during the 5th week in the genital ridge
- First the gonads are undifferentiated and have a cortex and a medulla
- In embryos with an XX chromosome complex, the cortex normally differentiates into an ovary, and the medulla regresses
- In embryos with an XY complex, the medulla differentiates into a testis and the cortex regresses (no medulla: Female , no cortex: Male) لازم وحدة منهم تختفي يا الكورتكس يا الميدلا

- Large primitive cells, called primordial sex cells formed in the yolk sac during the 4th week
- They migrate along the dorsal mesentery of the hindgut to the genital ridges where they become incorporated into the developing gonads

- Germ Cells arrives at 5th week & invades the genital ridge in the 6th week
- During arrival of Germ cells, the epithelium of the genital ridge proliferates, and epithelial cells penetrate the underlying mesenchyme
- Forming an irregular shaped cord primitive sex cord “indifferent gonad”





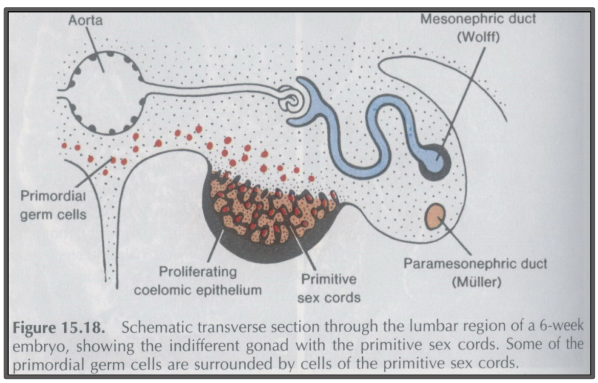


Figure 15.18. Schematic transverse section through the lumbar region of a 6-week embryo, showing the indifferent gonad with the primitive sex cords. Some of the primordial germ cells are surrounded by cells of the primitive sex cords.

1. Development of Gonad... Explanation

طيب أول شيء القوناد تمر بمرحلتين أثناء التكون :
١- indifferent gonad
وتكون من البداية إلى الإسبوع السابع
٢- different gonad
وهنا يوضح إذا هي أوفاري أو تستس بعد الإسبوع السابع

تمام حلو .. طيب خلال المرحلة الأولى الميزوديرم راح تتقسم إلى ثلاث أقسام
١- pronephros
٢- mesonephros
٣- metaphors

من الميزونيفروز راح يتكون عندي الـ " **جينتال ريدج** " وهذا الجنيتال ريدج راح يعطي الكابسول والكونكتف تيشو للقوناد
يعني لو سألوكم إيش الأورجن للجينتال ريدج تقولوا الميزوديرم ..

طيب للحين ما خلصنا، الآن من الإندوديرم راح يتكون لنا حاجة نسميها يوك ساك، طيب من هذا اليوك ساك بتتكون خلايا نسميها **"بيريموديال جيرم سلز"** هذي الخلايا بتهاجر من مكانها وبتروح للجينتال ريدج الي كان متكون من الميزوديرم
يعني لو سألوكم البيريموديال جيرم سلز من وين تكونت؟ تقولون من الإندوديرم

لما توصل الجيرم سلز هذي خلايا الإبيثيليم الموجود حول الجينتال ريدج بتبدأ تتكاثر وتدخل على جوا ويسوي لي السكس كورد تمام؟ بعد كذا هذي السكس كورد راح تتبدل بأوعية دموية ولما يجي الإسبوع السابع خلايا الإبيثيليم مره ثانية راح تتكاثر وتدخل على جوا وتسوي لي حاجة إسمها ال الكورتكال كورد وهذي الكورتكال كورد في الشهر الرابع بتنفصل إلى خلايا صغيرة وتلتف حول الجيرم سلز

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 proliferates
- In **7th week** they give rise to 2nd generation of cords called **"cortical cords"**

- The cortical cords penetrate the underlying mesenchyme
- In **4th month** these cords split into isolated cell clusters which surrounding one or more primitive germ cells, (GC).
- GC will develop into oogonia and the surrounding epithelial cells form the follicular cells

شرحنا هذه المعلومات بالسلايد السابق

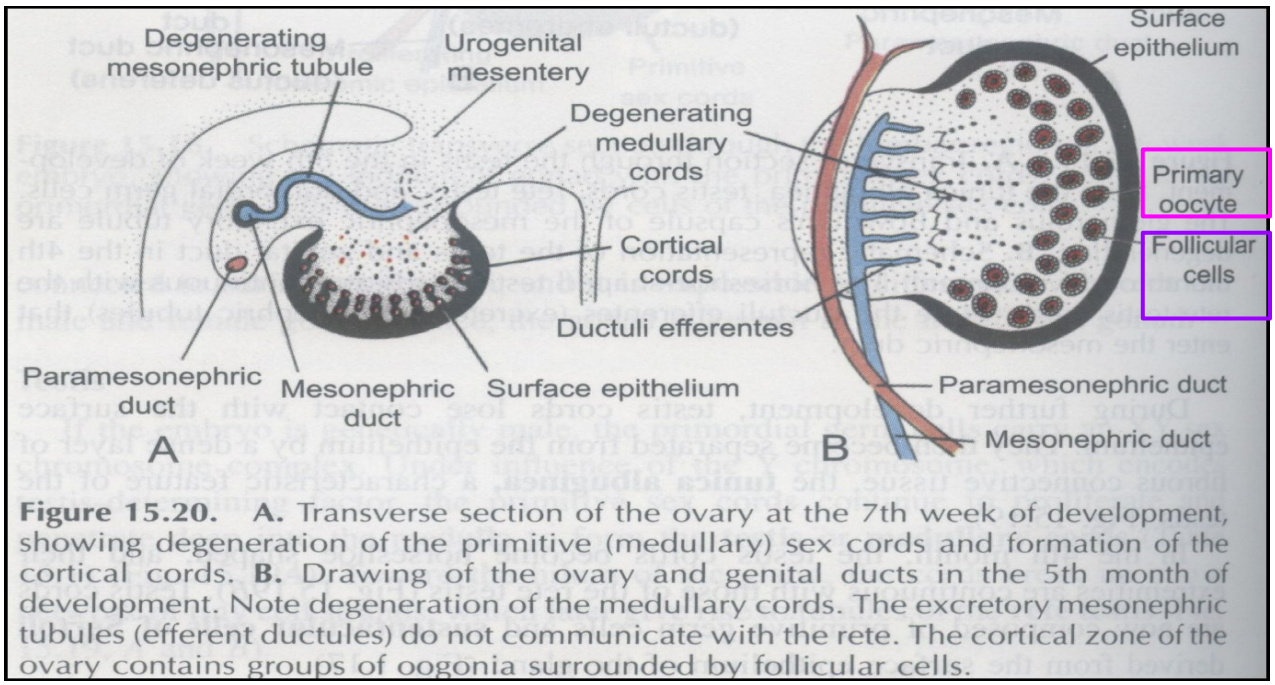


Figure 15.20. **A.** Transverse section of the ovary at the 7th week of development, showing degeneration of the primitive (medullary) sex cords and formation of the cortical cords. **B.** Drawing of the ovary and genital ducts in the 5th month of development. Note degeneration of the medullary cords. The excretory mesonephric tubules (efferent ductules) do not communicate with the rete. The cortical zone of the ovary contains groups of oogonia surrounded by follicular cells.

Genital Ducts

شوفوا الفيديو إلى دقيقة 5:50 علشان تفهمون زين

Two pairs of genital ducts develop in both sexes:	
1.Mesonephric (Wolffian) ducts	2. Paramesonephric Mullerian) ducts

➢ **In female embryos, mesonephric ducts regress while the paramesonephric ducts develop into:**

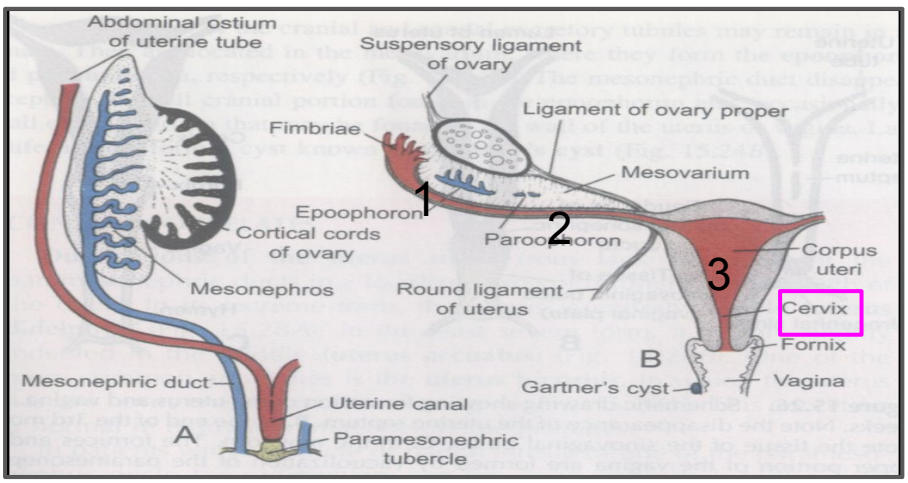
1. Uterus
2. Uterine tubes
3. Upper vagina

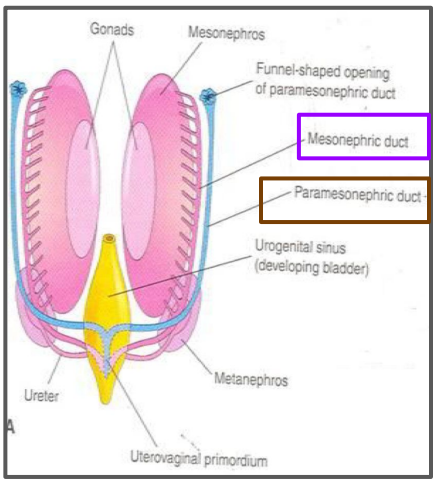
➢ **Paramesonephric ducts** develop into the main genital ducts of the female
➢ Initially, 3 parts can be recognized in each duct:

1. A vertical cranial portion which opens into abdominal cavity
2. A horizontal part that crosses anterior to the **mesonephric duct**
3. A caudal vertical part that fuses with its partner from the opposite side

➢ (1 & 2) develop into the **uterine tubes**
➢ The fused parts (3) give rise to body and **cervix** of the uterus and upper vagina
➢ Mesenchyme will form the **myometrium & perimetrium** of the uterus

➢ Myometrium: العضلات اللي تغطي اليوتيروس
➢ Perimetrium: is the outer serosa layer of the uterus equivalent to peritoneum.





Vagina

شوفوا الفيديوز علشان تفهمون زين

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

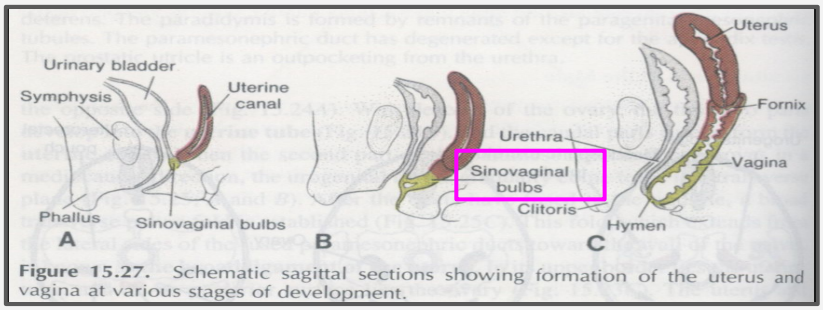


Figure 15.27. Schematic sagittal sections showing formation of the uterus and vagina at various stages of development.

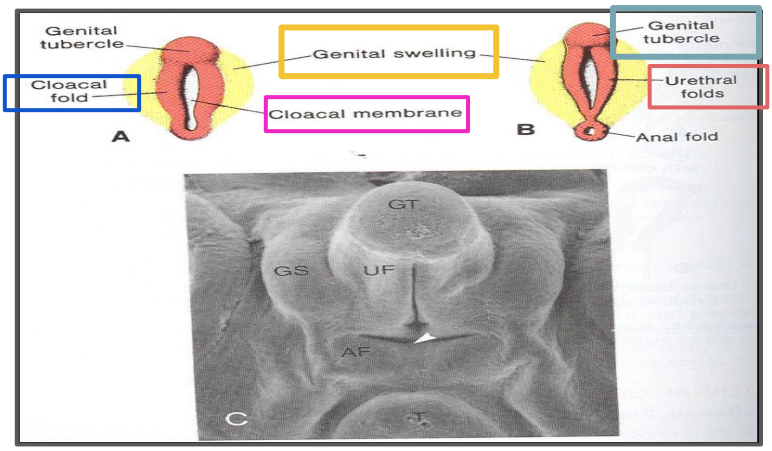
External Genitalia

- By the **3rd week**, mesenchymal cells migrate around the **cloacal membrane** to form a pair of **cloacal folds**
- Cranial to the cloacal membrane the folds unite to form the **genital tubercle, (GT)**
- Caudally the folds are subdivided into **urethral folds anteriorly, (UF) and anal folds posteriorly, (AF)**

❖ **Development of Female External Genitalia**

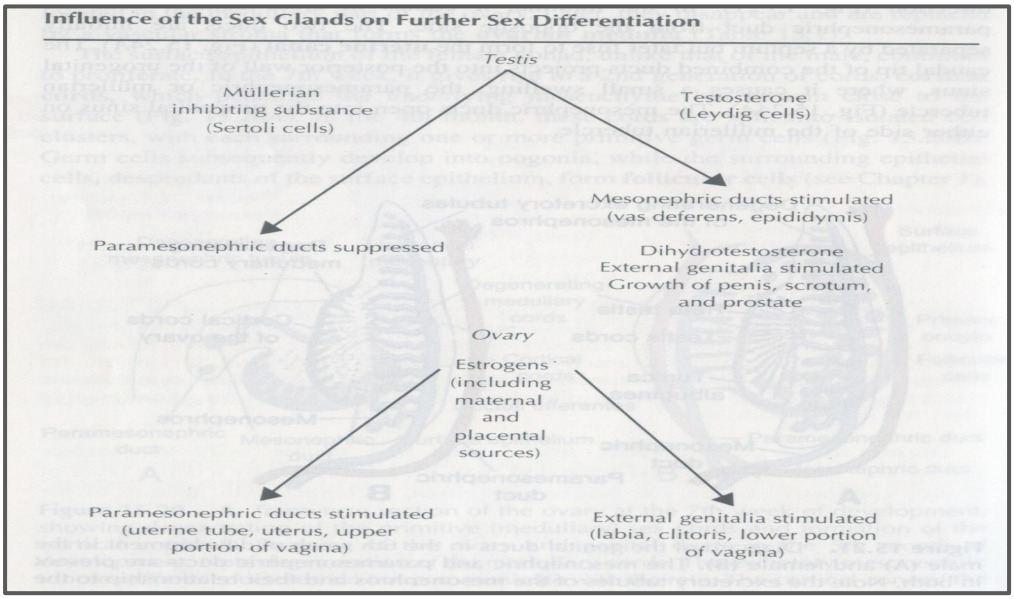
- Proliferation of Mesenchyme at the cranial end and sides of the cloacal membrane, will forms:

1.	Genital Tubercle (GT)
2.	Urogenital Folds or Urethral Folds (UF)
3.	Labioscrotal swellings or Genital Swellings (GS)



2. Feminization of External Genitalia

- Estrogen produced by both placenta and fetal ovaries has a role in feminization of the external genitalia
- **Genital Tubercle** proliferates to form the **primordial Phalls** which elongates slightly to form the **Clitoris**
- **Urethral Folds** do not fuse and form the **Labia Minora**
- **Labioscrotal Folds** form the **Labia Majora** , they fuse to form posterior and anterior Labial Commissures



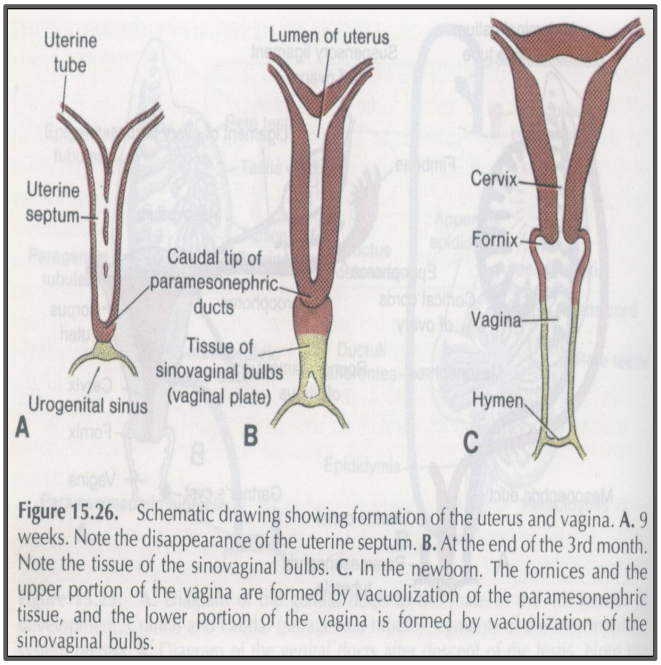
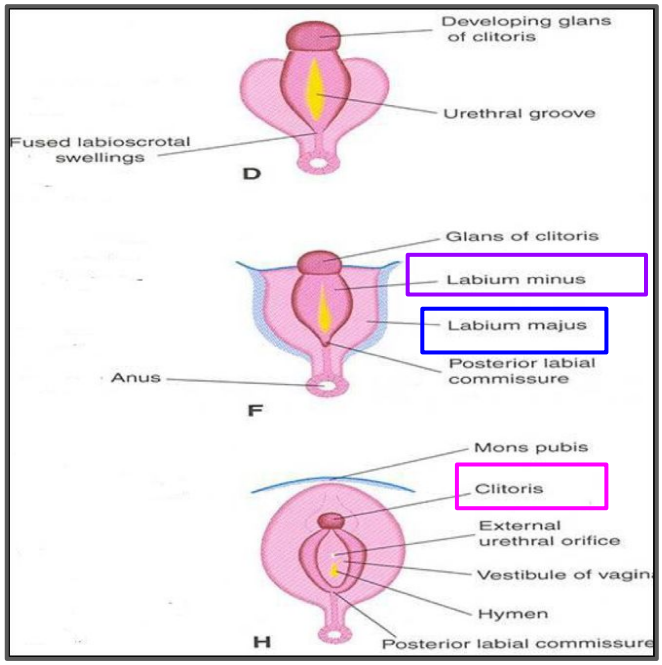


Figure 15.26. Schematic drawing showing formation of the uterus and vagina. **A.** 9 weeks. Note the disappearance of the uterine septum. **B.** At the end of the 3rd month. Note the tissue of the sinovaginal bulbs. **C.** In the newborn. The fornices and the upper portion of the vagina are formed by vacuolization of the paramesonephric tissue, and the lower portion of the vagina is formed by vacuolization of the sinovaginal bulbs.



Congenital Anomalies

Various types of anomalies can result due to:
1. Arrest of development of the uterovaginal primordium during the 8th week.
2. Incomplete development of the paramesonephric ducts
3. Incomplete fusion of the paramesonephric ducts.
4. Incomplete of the canalization
5. Failure of parts of one or both paramesonephric ducts to develop

➢ **Remnants of the mesonephric (wolffian) ducts may persist in the anterolateral wall of vagina or adjacent to the uterus within the broad ligament or mesosalpinx**

Cervical Atresia		
It may be combined with incomplete development of the upper vagina or lower uterus		
Vaginal Anomalies		
Atresia (Partial or complete) Atresia: absence or abnormal narrowing of an opening.	Double vagina	**Transversely septate vagina:** results from faulty canalization of the fused mullerian ducts

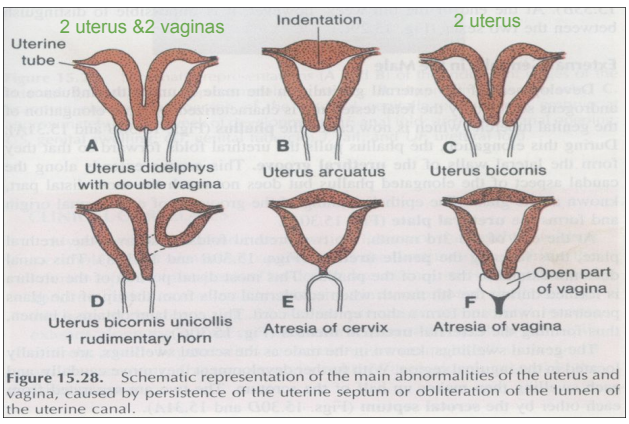
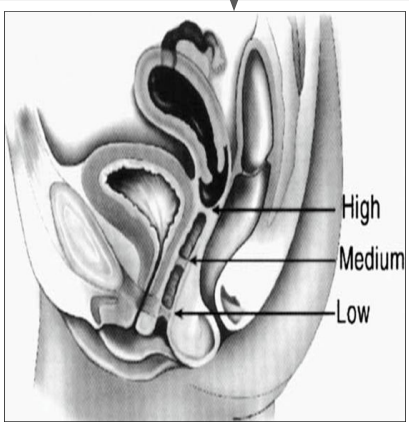


Figure 15.28. Schematic representation of the main abnormalities of the uterus and vagina, caused by persistence of the uterine septum or obliteration of the lumen of the uterine canal.



Summary

Mullerian ducts (Paramesonephric Ducts)	Female internal genital Organs upper Vagina , Cervix, Uterus & uterine Tubes
Genital Tubercle	Primordial Phalls clitoris
Urethral Folds	Labia Minora
Labioscrotal Folds	Labia Majora
SinoVaginal Bulbs	Vaginal Plate
intermediate mesoderm	Genital (Gonadal) Ridge
Primitive Germ Cell	Oogonium
surface epithelium (Sex Cord)	Follicular Cells
Vaginal Plate	The lining of the entire vagina

Date	**4th** week	Primordial sex cells formed in the yolk sac
	5th week	Gonad begin to develop
	5th week	Germ Cells arrives to the genital ridges
	6th week	Germ cells invades the genital ridge
	7th week	Surface epithelium of the female gonad proliferates and they give rise to **cortical cords**
	3rd week	mesenchymal cells migrate around the cloacal membrane to form a pair of cloacal folds
	4th month	Cortical cords split into isolated cell clusters

MCQ's

1. primordial sex cells formed in the yolk sac during		2. morphological characteristics of gonad are acquired at:	
A.	4th week	A.	5th week
B.	5th week	B.	7th week
C.	6th week	C.	4th week
D.	7th week	D.	6th week
3. what is the origin of ovaries ?		4. The labia minora arise embryologically from which of the following structures	
A.	endoderm	A.	Phallus
B.	intermediate mesoderm	B.	Labioscrotal swellings
C.	mesoderm	C.	Sinovaginal bulbs
D.	ectoderm	D.	Urogenital folds
5. faulty canalization of the fused mlleian ducts lead to:		6.Phallus elongated to form which one of the following ?	
A.	cervical atresia	A.	labia minora
B.	transversely septate vagina	B.	labia majora
C.	double vagina	C.	clitoris

Q	1	2	3	4	5	6
Answers	A	B	B	D	B	C