

Development of female genital tract

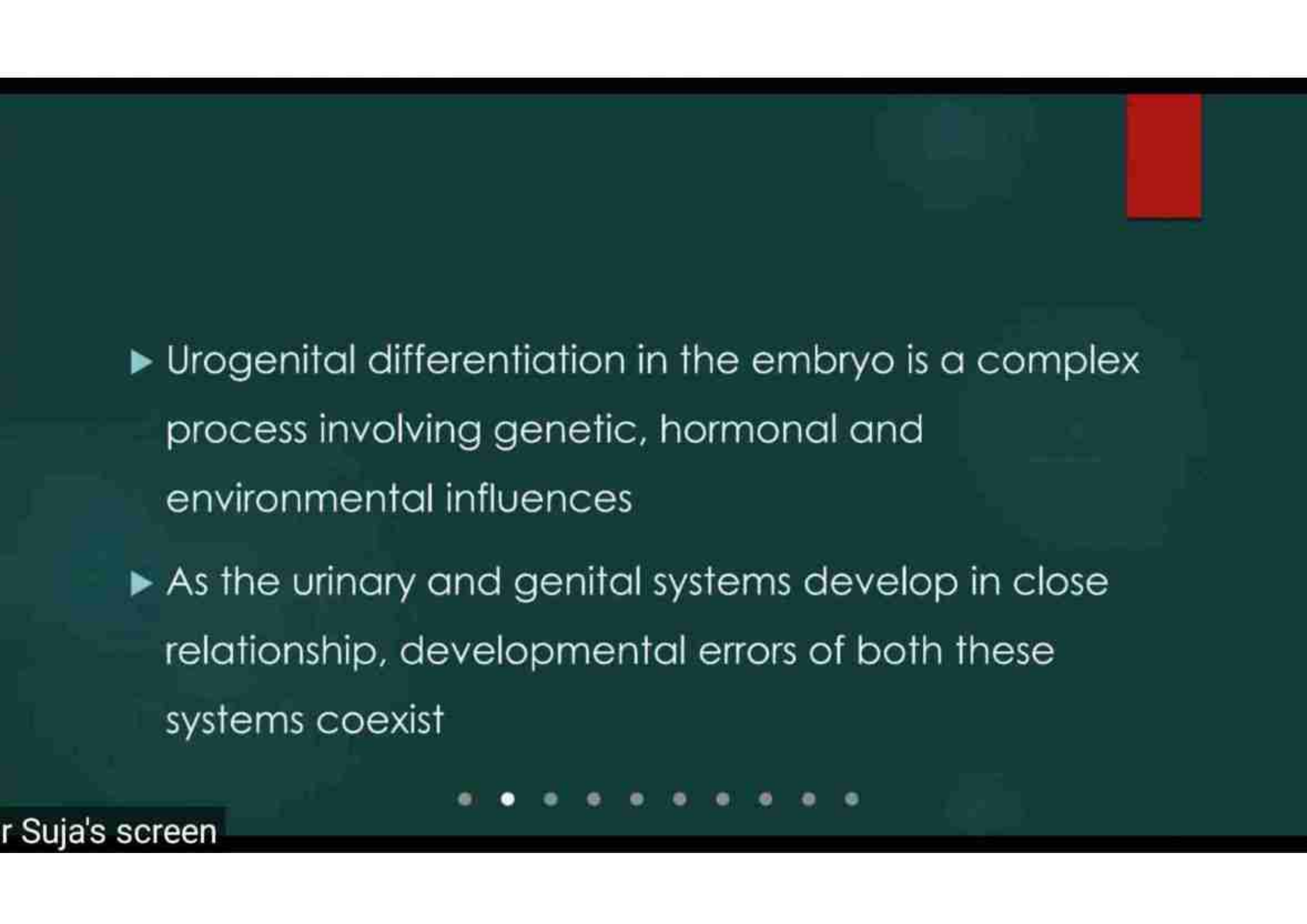
DR SUJA MARY MANI





- ▶ Urogenital differentiation in the embryo is a complex process involving genetic, hormonal and environmental influences
- ▶ As the urinary and genital systems develop in close relationship, developmental errors of both these systems coexist



- 
- ▶ Urogenital differentiation in the embryo is a complex process involving genetic, hormonal and environmental influences
 - ▶ As the urinary and genital systems develop in close relationship, developmental errors of both these systems coexist

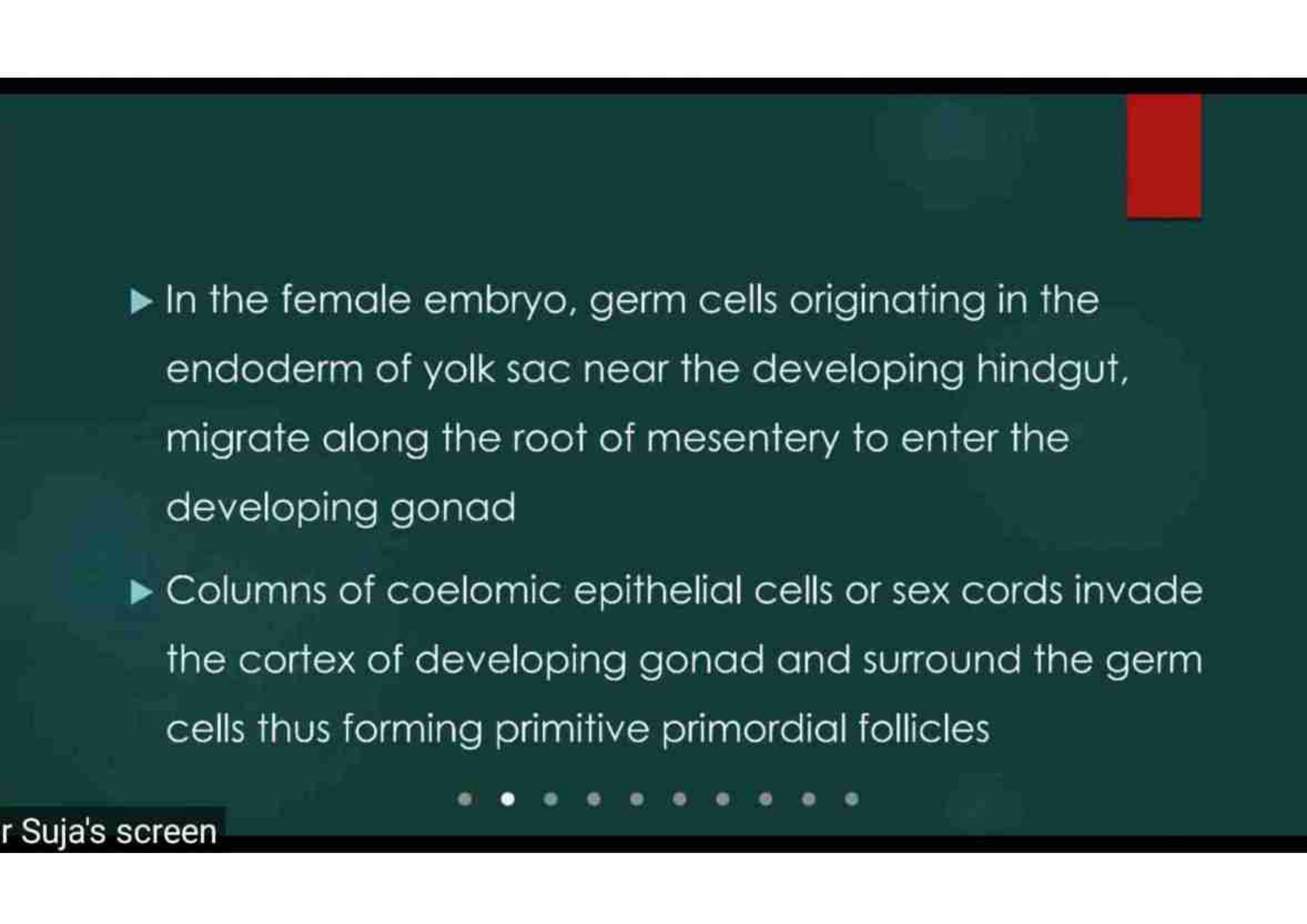


Gonad

- ▶ The chromosomal sex of the fertilized ovum determines the development of embryonic gonad into an ovary or testes
- ▶ This further plays a role in differentiation and development of internal and external genital organs



- 
- ▶ Around the 6th week of intrauterine life, a genital ridge appears
 - ▶ It consists of proliferation and thickening of the coelomic epithelium overlying the mesenchymal tissue on either side of dorsal mesenteric root near the developing kidney

- 
- ▶ In the female embryo, germ cells originating in the endoderm of yolk sac near the developing hindgut, migrate along the root of mesentery to enter the developing gonad
 - ▶ Columns of coelomic epithelial cells or sex cords invade the cortex of developing gonad and surround the germ cells thus forming primitive primordial follicles

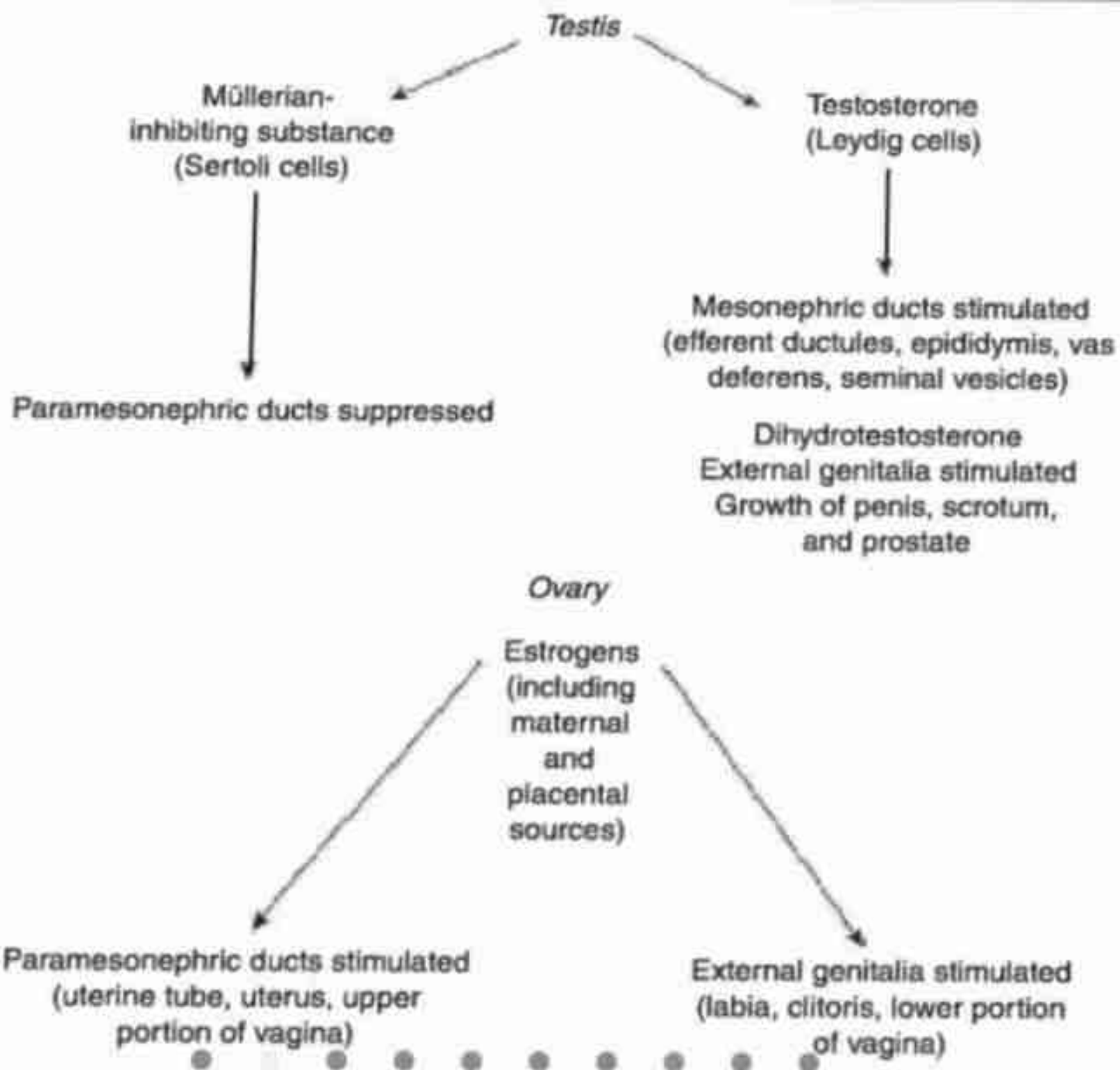


- 
- ▶ The follicles proliferate to reach 7 million in number at 7 th month of fetal life
 - ▶ As gonadal stroma proliferates, some of these follicles degenerate so that ovaries at birth have 2 million follicles
 - ▶ Of these, 300 – 400 follicles will ever ovulate

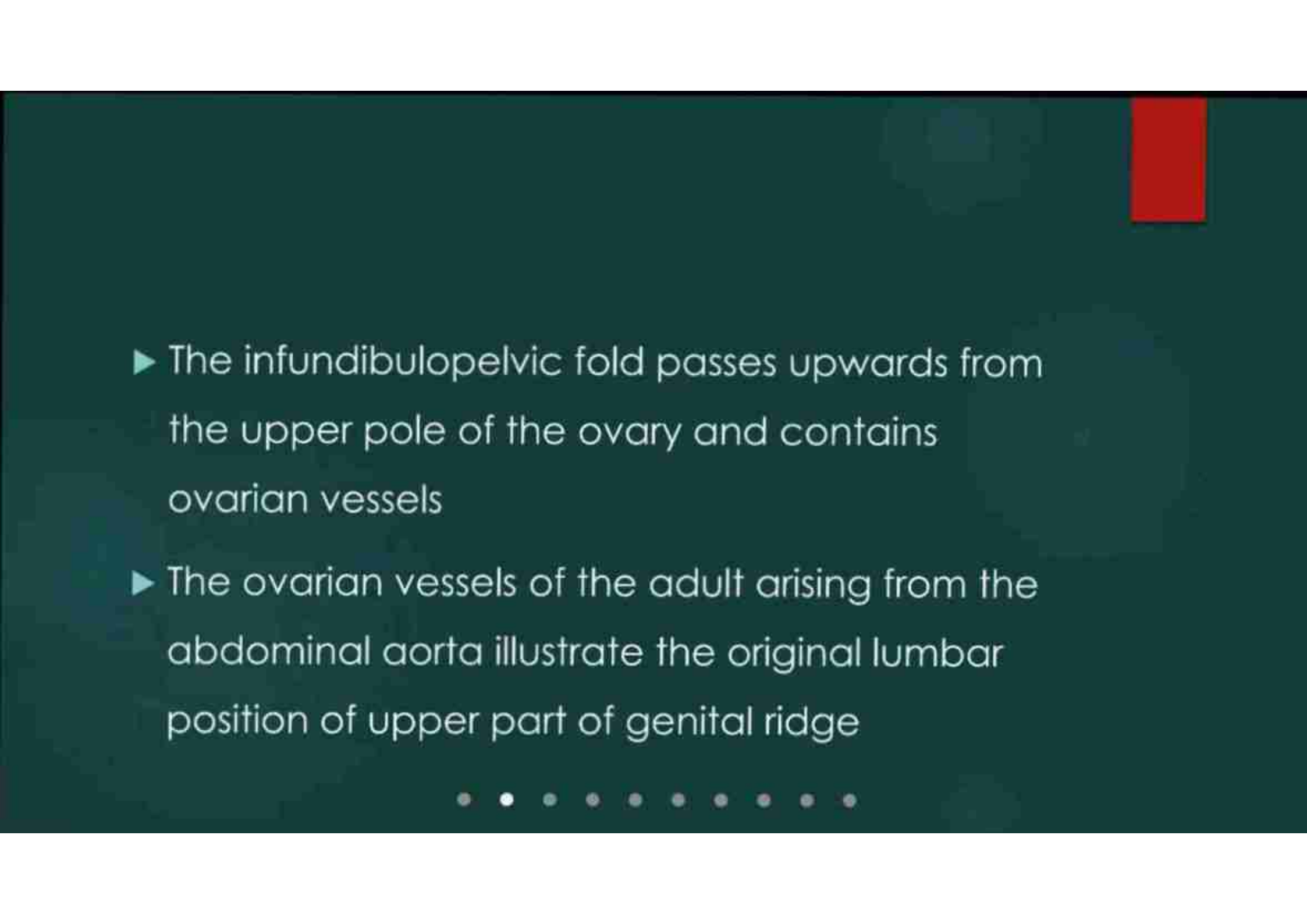


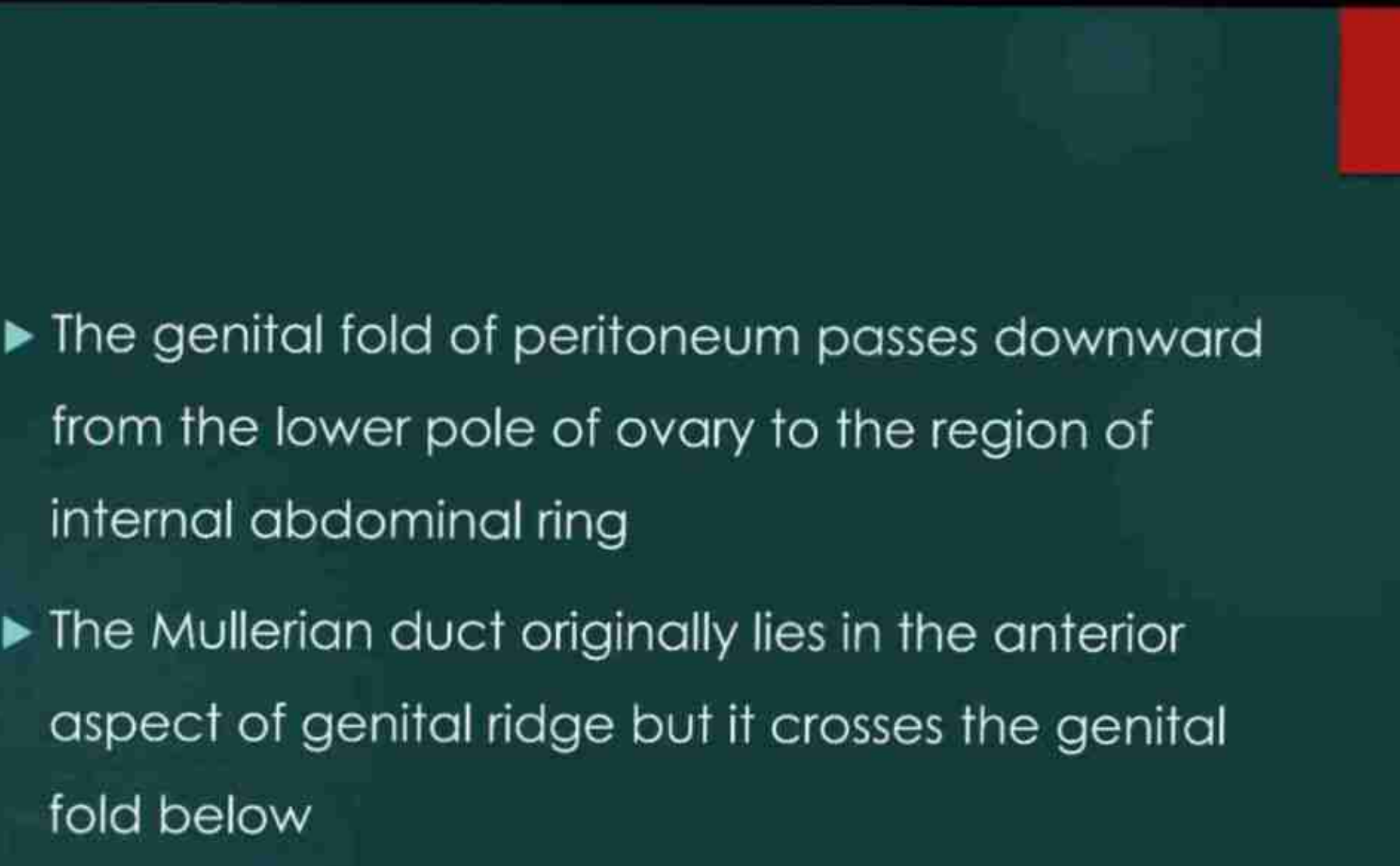
- 
- ▶ The developing gonad of female embryo assumes histologically recognizable characteristics by 10 th week
 - ▶ The role of oestrogen derived from primitive ovary is of less importance in the development of Mullerian ducts and suppression of Wolffian structures as compared to androgen

- 
- ▶ The basic sex pattern is female in all embryos
 - ▶ It is the androgen of testicular origin in male embryos which causes the male elements to grow
 - ▶ Its absence in female permits development along female line



- 
- ▶ The genital ridge extends from pronephric region above to the sacral region below
 - ▶ In the earliest form it is represented by an elongated vertical prominence
 - ▶ Very soon, it develops a mesentery of its own, the mesoovarium by which it is attached to the intermediate cell mass

- 
- ▶ The infundibulopelvic fold passes upwards from the upper pole of the ovary and contains ovarian vessels
 - ▶ The ovarian vessels of the adult arising from the abdominal aorta illustrate the original lumbar position of upper part of genital ridge

- 
- 
- ▶ The genital fold of peritoneum passes downward from the lower pole of ovary to the region of internal abdominal ring
 - ▶ The Mullerian duct originally lies in the anterior aspect of genital ridge but it crosses the genital fold below

- 
- ▶ As the Mullerian duct crosses the genital fold, the two structures fuse
 - ▶ After muscle tissues have developed around the Mullerian duct, it passes into the tissues of genital fold



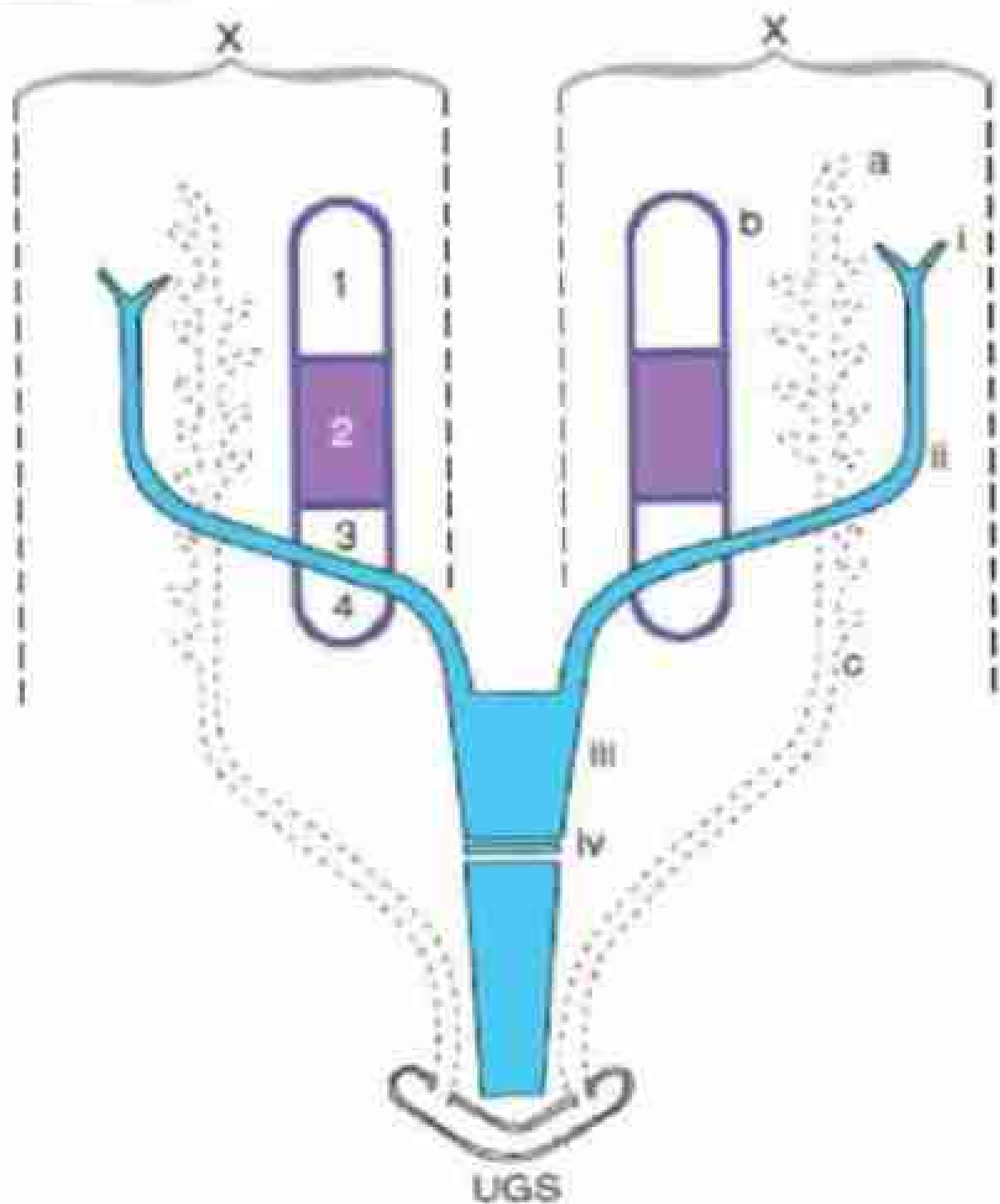
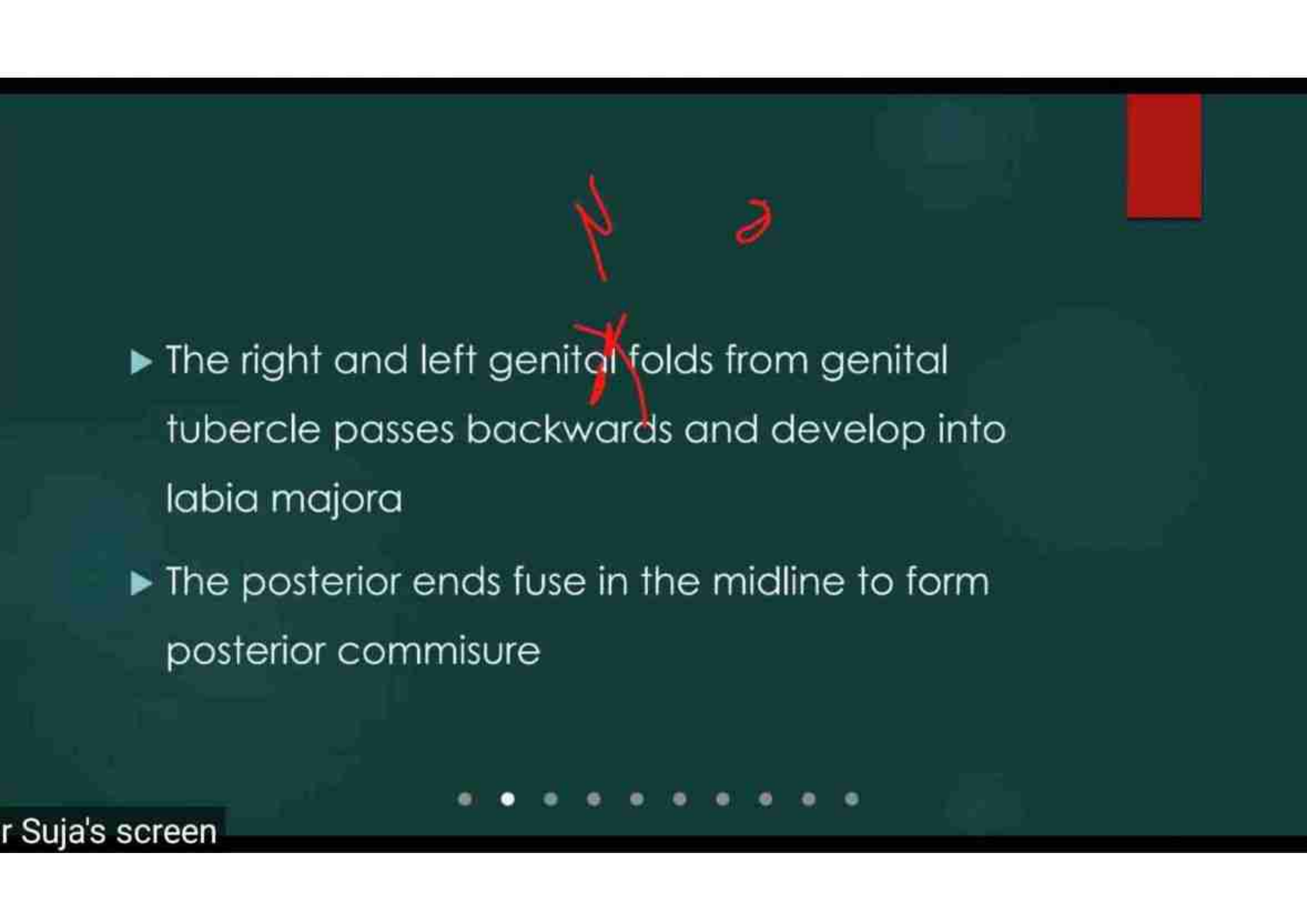


Figure 9.1 Diagram of urogenital system: X—Intermediate cell mass—shaded areas is the genital ridge. (1) Infundibulopelvic ligament, (2) ovary, (3) ovarian ligament, (4) round ligament. Dotted outline is Wolffian duct (Gartner's duct). (a) Pronephros, (b) epoophoron, (c) mesonephros. Solid block is Müllerian ducts. (i) Fimbria, (ii) fallopian tube, (iii) uterus, (iv) upper three-fourth of the vagina. UGS—urogenital sinus.

- 
- ▶ The right and left genital folds from genital tubercle passes backwards and develop into labia majora
 - ▶ The posterior ends fuse in the midline to form posterior commissure

- 
- ▶ The ovary descends from its original lumbar position so that at term it lies at the level of pelvic brim with its long axis directed vertically

MULLERIAN DUCTS

- ▶ In the 7th week of intrauterine life of developing embryo an invagination of coelomic epithelium occurs close to the primitive gonad in the upper lateral part of intermediate cell mass, ventral to Wolffian duct
- ▶ This is called the paramesonephric duct or Mullerian duct



- 
- ▶ As the two Mullerian ducts, one on either side develop and grow caudally they approach each other in the midline after crossing the Wolffian ducts (mesonephric ducts)
 - ▶ The two ducts fuse in the midline

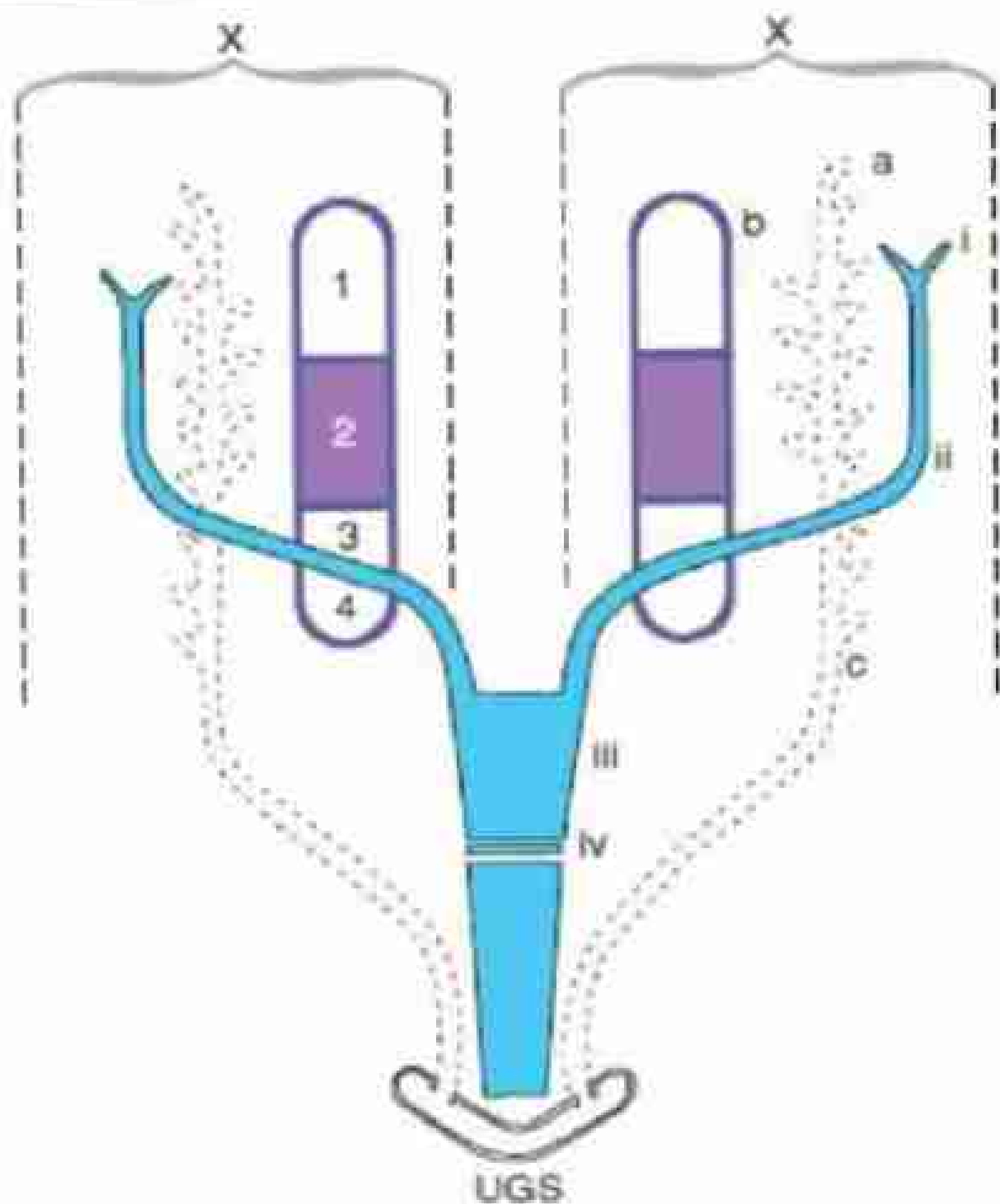


Figure 9.1 Diagram of urogenital system: X—intermediate cell mass—shaded areas is the genital ridge. (1) Infundibulopelvic ligament, (2) ovary, (3) ovarian ligament, (4) round ligament. Dotted outline is Wolffian duct (Gartner's duct). (a) Pronephros, (b) epoophoron, (c) mesonephros. Solid block is Müllerian ducts. (i) Fimbria, (ii) fallopian tube, (iii) uterus, (iv) upper three-fourth of the vagina. UGS—urogenital sinus.

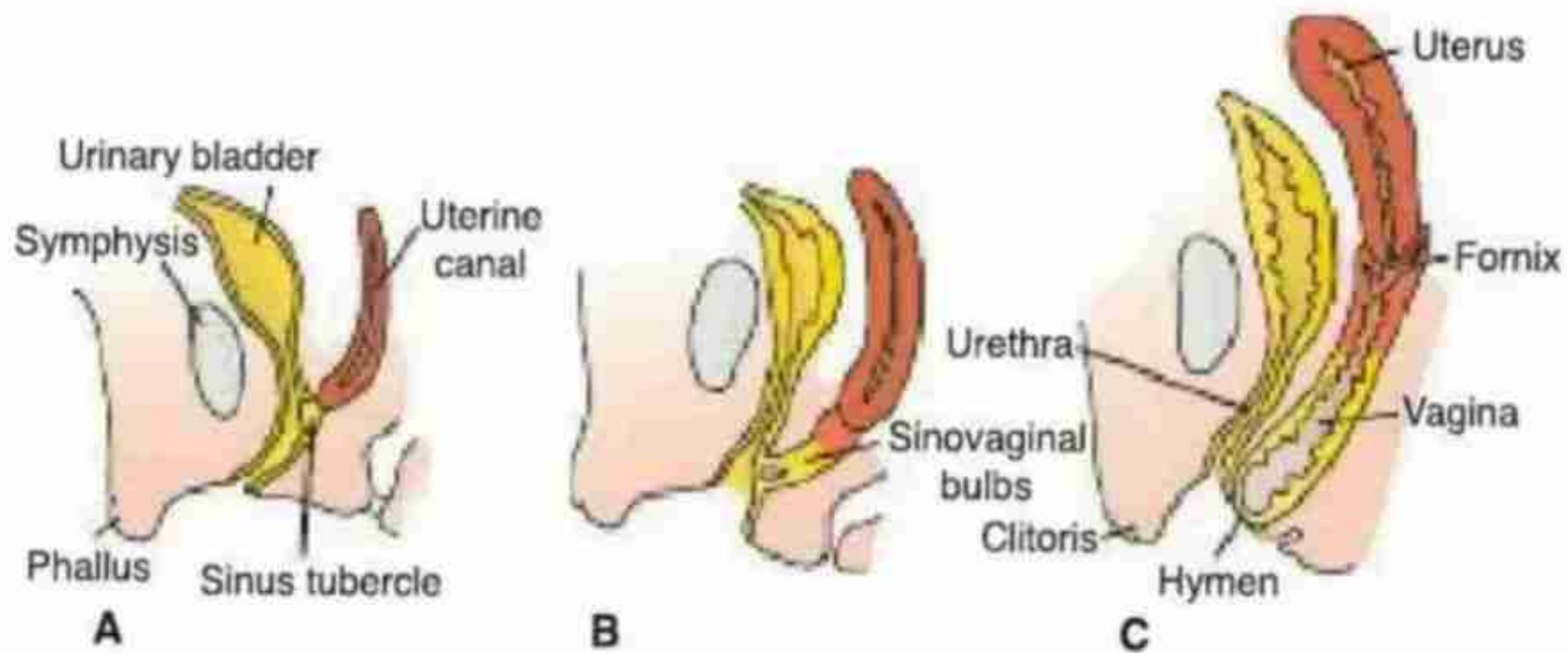


FIGURE 16.30 Sagittal sections showing formation of the uterus and vagina at various stages of development. **A.** 9 weeks. **B.** End of third month. **C.** Newborn.

- 
- ▶ The cranial free parts of the paramesonephric ducts develop into fallopian tubes
 - ▶ The middle fused portion gives rise to uterus and cervix
 - ▶ Caudal fused portion forms upper $\frac{3}{4}$ of vagina

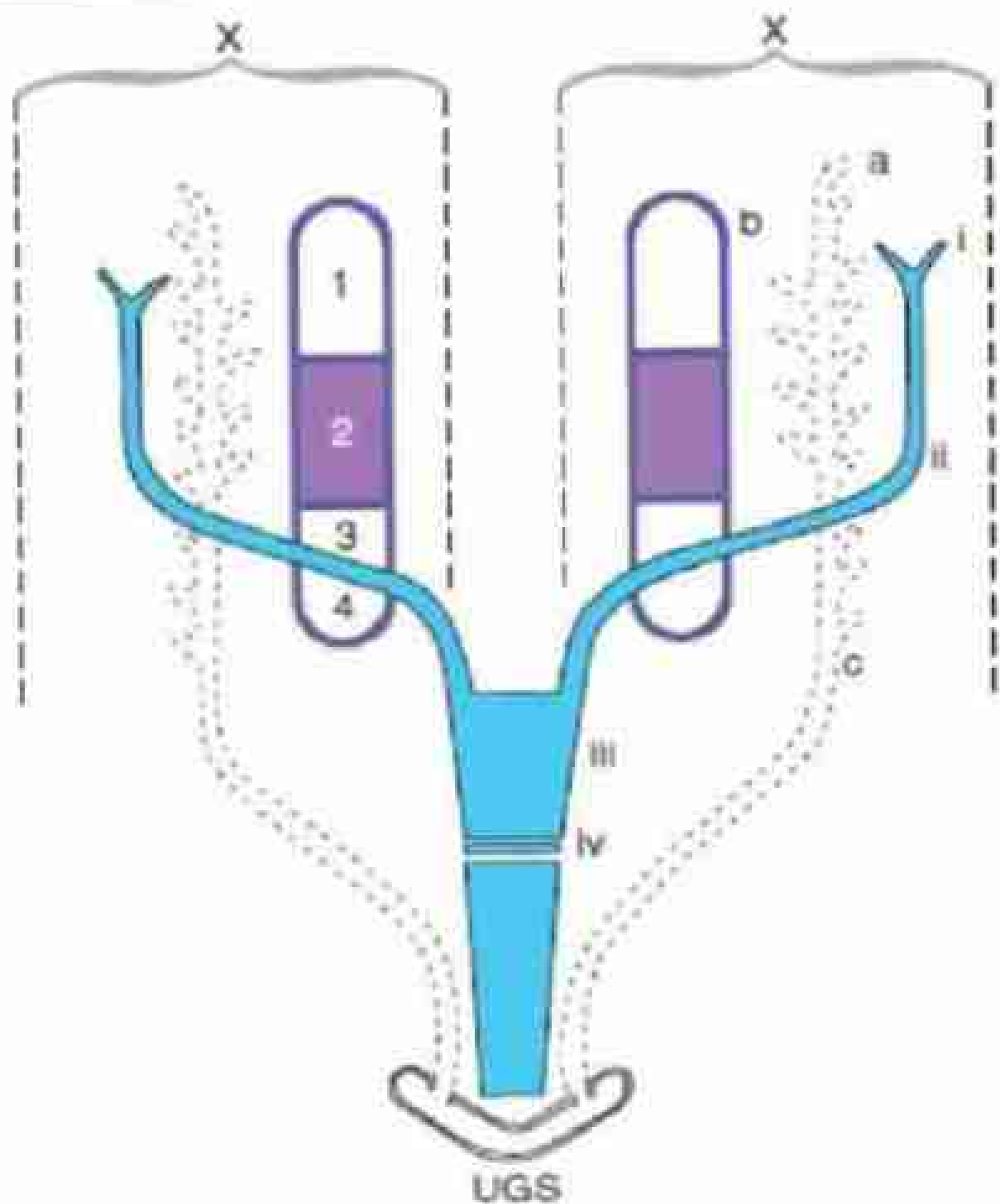


Figure 9.1 Diagram of urogenital system: X—Intermediate cell mass—shaded areas is the genital ridge. (1) Infundibulopelvic ligament, (2) ovary, (3) ovarian ligament, (4) round ligament. Dotted outline is Wolffian duct (Gartner's duct). (a) Pronephros, (b) epoophoron, (c) mesonephros. Solid block is Müllerian ducts. (i) Fimbria, (ii) fallopian tube, (iii) uterus, (iv) upper three-fourth of the vagina. UGS—urogenital sinus.

- 
- ▶ Initially when the two Mullerian ducts fuse, the intervening septa is present
 - ▶ Later it disappears so that the uterovaginal canal appears as a single continuous canal

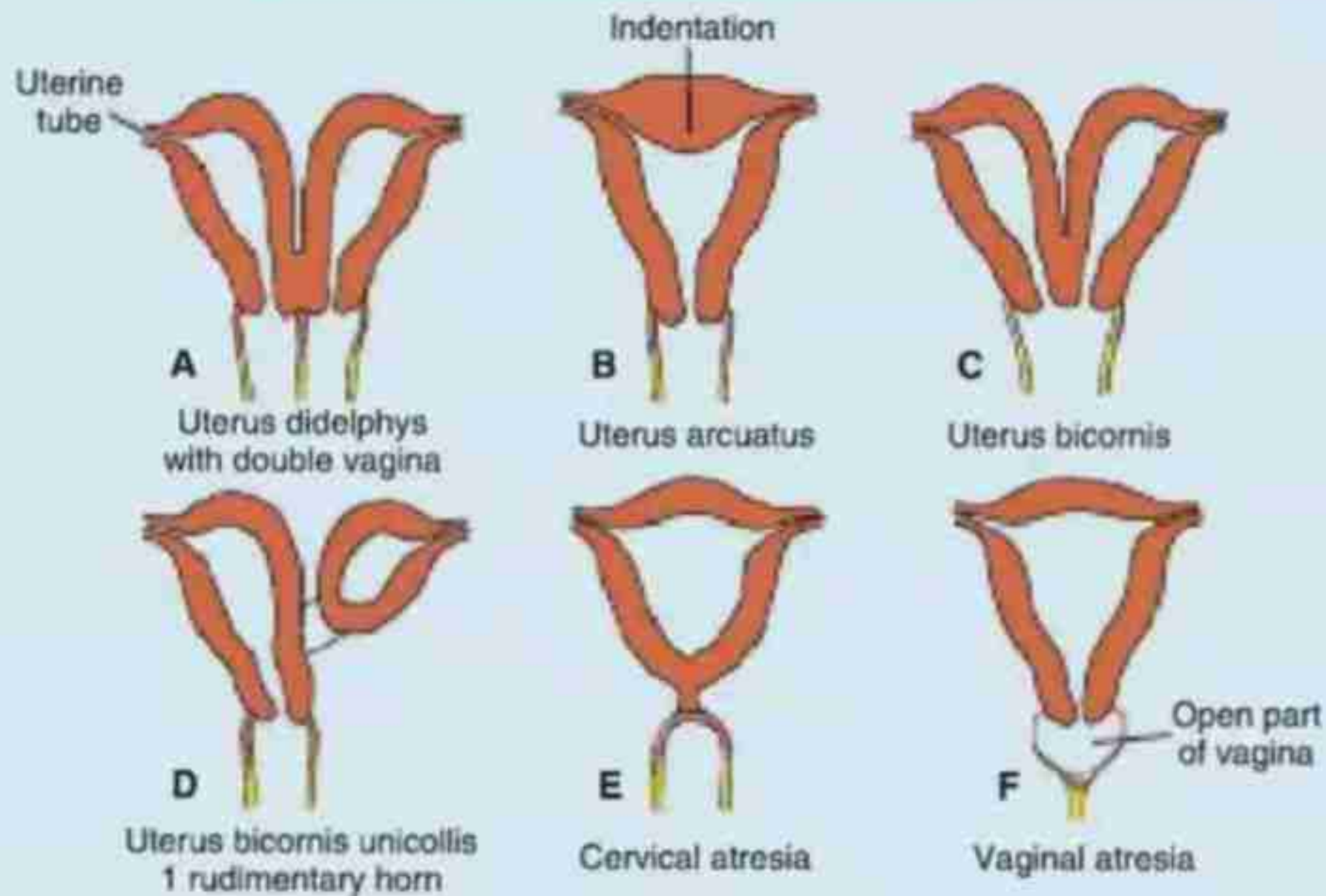
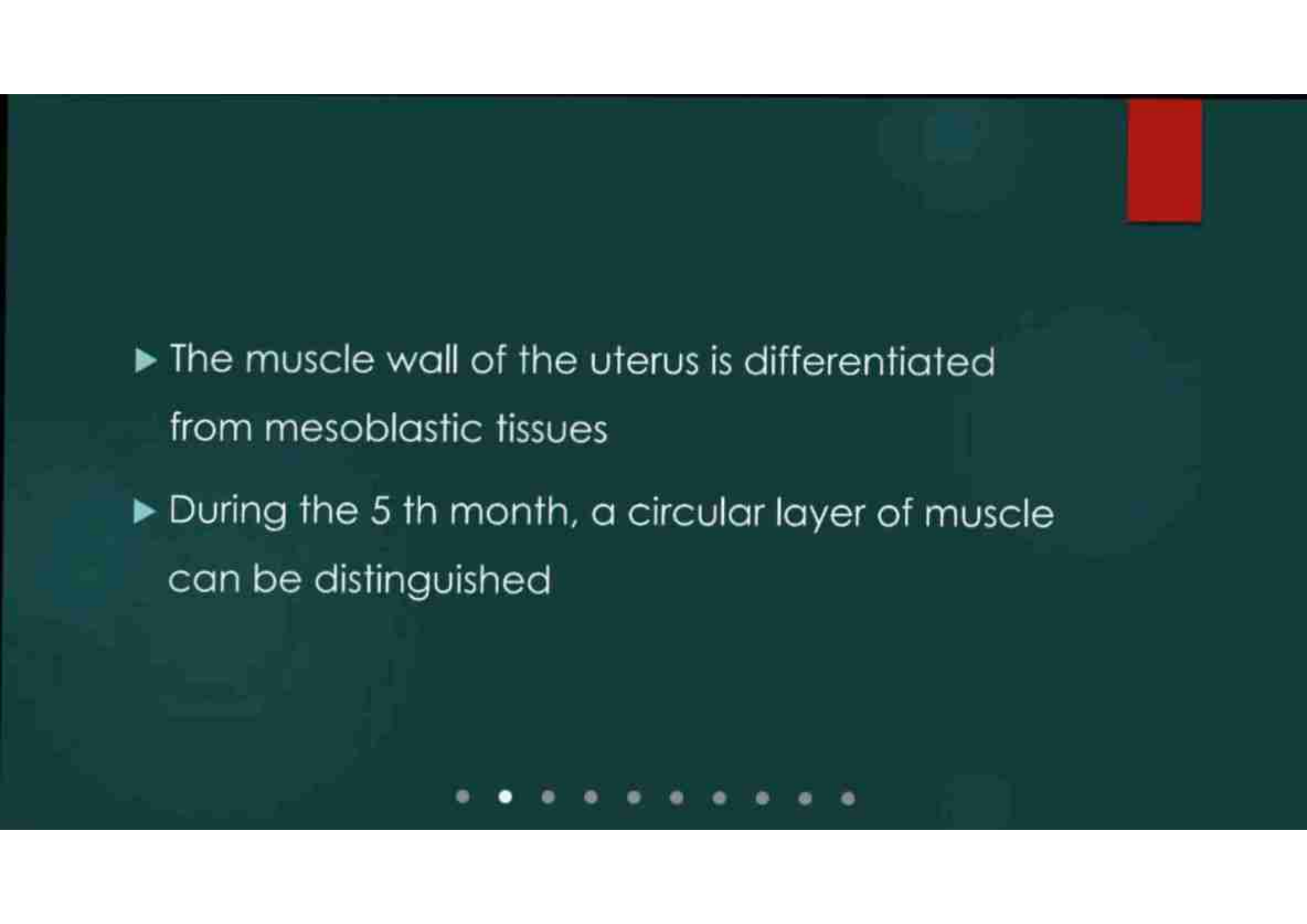
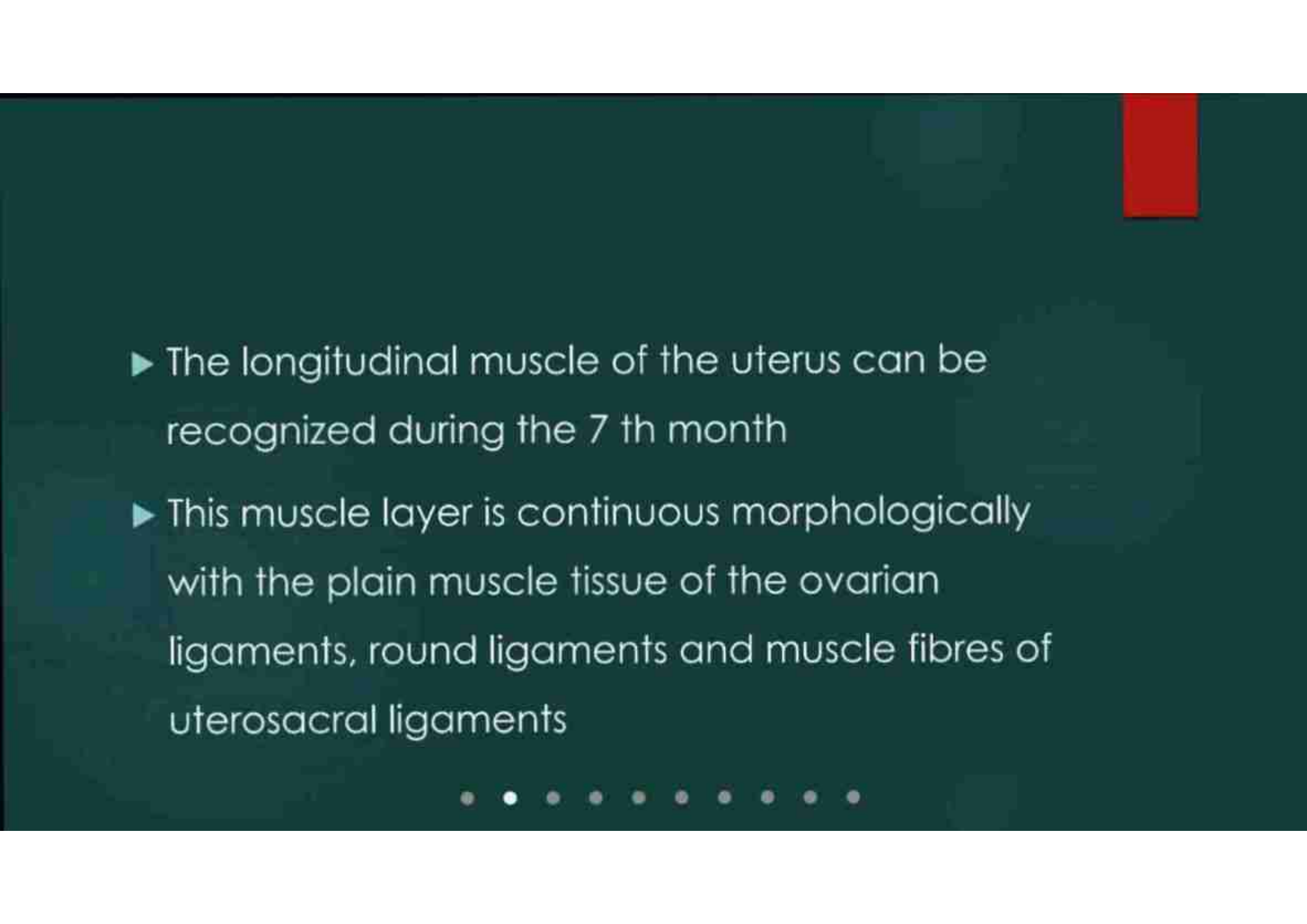


FIGURE 16.31 Main abnormalities of the uterus and vagina caused by persistence of the uterine septum or obliteration of the lumen of the uterine canal.

- 
- 
- ▶ The muscle wall of the uterus is differentiated from mesoblastic tissues
 - ▶ During the 5 th month, a circular layer of muscle can be distinguished

- 
- ▶ The longitudinal muscle of the uterus can be recognized during the 7th month
 - ▶ This muscle layer is continuous morphologically with the plain muscle tissue of the ovarian ligaments, round ligaments and muscle fibres of uterosacral ligaments

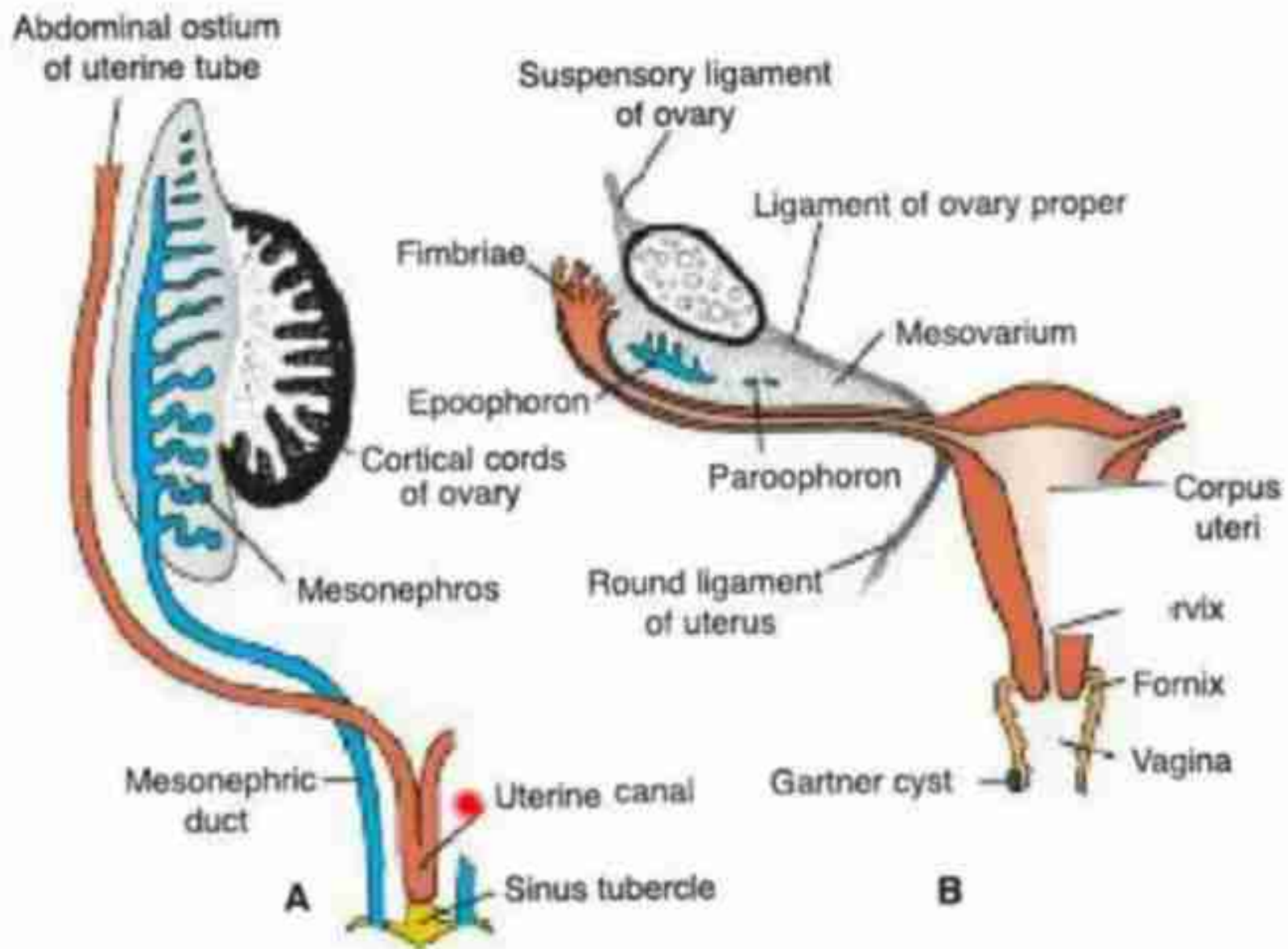


FIGURE 16.24 A. Genital ducts in the female at the end of the second month. Note the paramesonephric (müllerian) tubercle and formation of the uterine canal. **B.** Genital ducts after descent of the ovary. The only parts remaining from the mesonephric system are the epoophoron, paroophoron, and Gartner cyst. Note the suspensory ligament of the ovary, ligament of the ovary proper, and round ligament of the uterus.

- 
- ▶ The primitive cloaca is divided by the formation of urorectal septum into a ventral part, the urogenital sinus and the dorsal part, the rectum
 - ▶ The urorectal septum develops into the perineal body

- 
- ▶ The urorectal septum initially consists of 2 folds which project on each side and then fuse caudally
 - ▶ The primitive cloaca is closed by the cloacal membrane which can be recognized very early in the development of embryo

- 
- ▶ The urorectal septum grows towards the cloacal membrane and fuses with it
 - ▶ It divides cloacal membrane into ventral urogenital membrane related urogenital sinus and dorsal anal membrane related to rectum



- ▶ The upper $\frac{3}{4}$ of vagina develops from Mullerian duct and is represented at its lower end by the solid Mullerian tubercle which later gets canalized
- ▶ The lower $\frac{1}{4}$ of vagina developed from sinovaginal bulbs of urogenital sinus which also becomes canalised



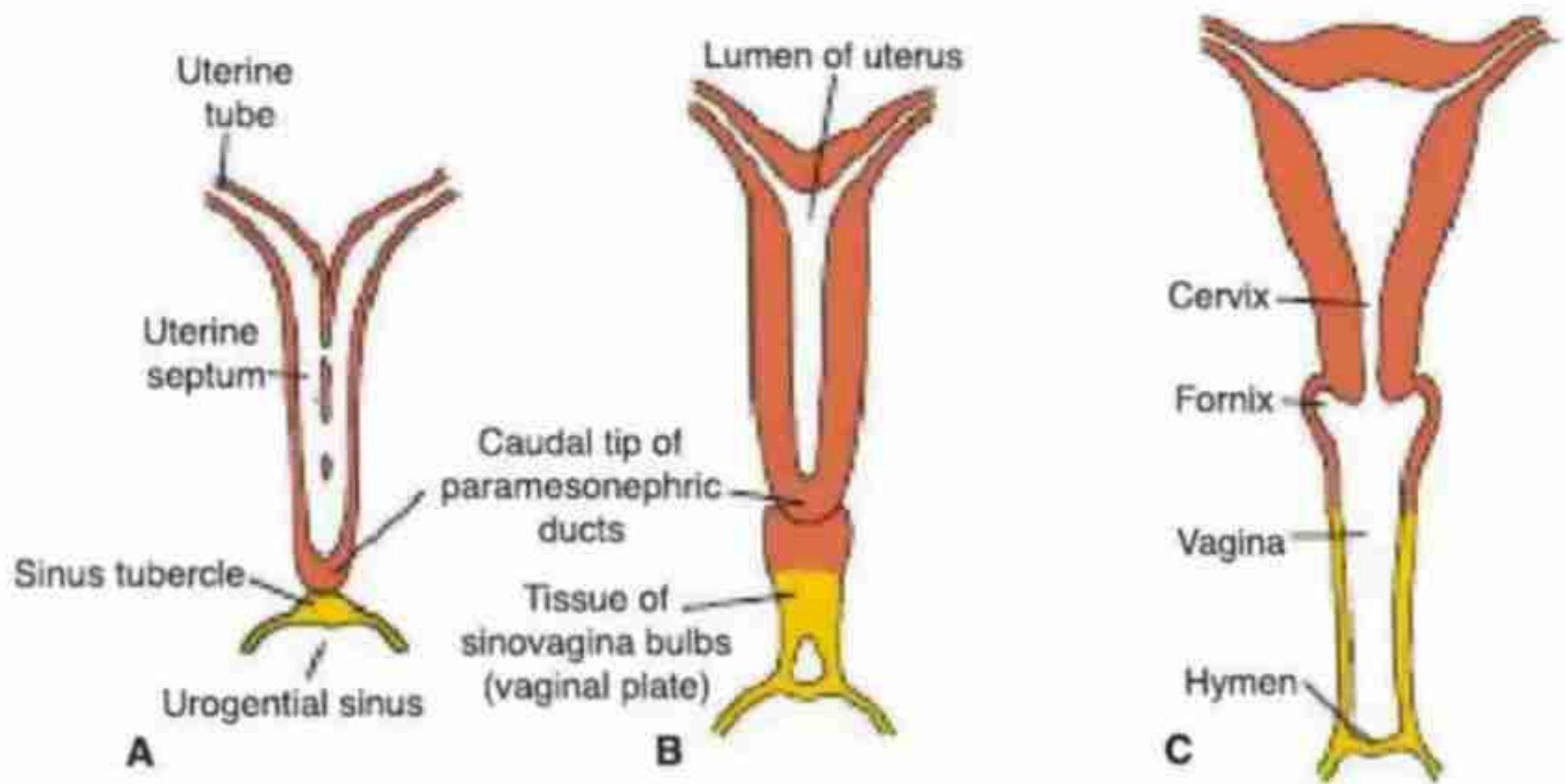


FIGURE 16.29 Formation of the uterus and vagina. **A.** 9 weeks. Note the disappearance of the uterine septum. **B.** At the end of the third month. Note the tissue of the sinovaginal bulbs. **C.** Newborn. The fornices and the upper portion of the vagina are formed by vacuolization of the paramesonephric tissue, and the lower portion of the vagina is formed by vacuolization of the sinovaginal bulbs.

- 
- ▶ The epithelium of vagina and portiovaginalis of cervix, since it is stratified, is derived from an upgrowth of epithelium of urogenital sinus
 - ▶ This is comparable with stratified epithelium of anal canal

- 
- ▶ The urogenital membrane becomes elongated in craniocaudal direction
 - ▶ The mesoderm on either side of it is soon heaped up to form 2 longitudinal elevations called primitive urethral folds

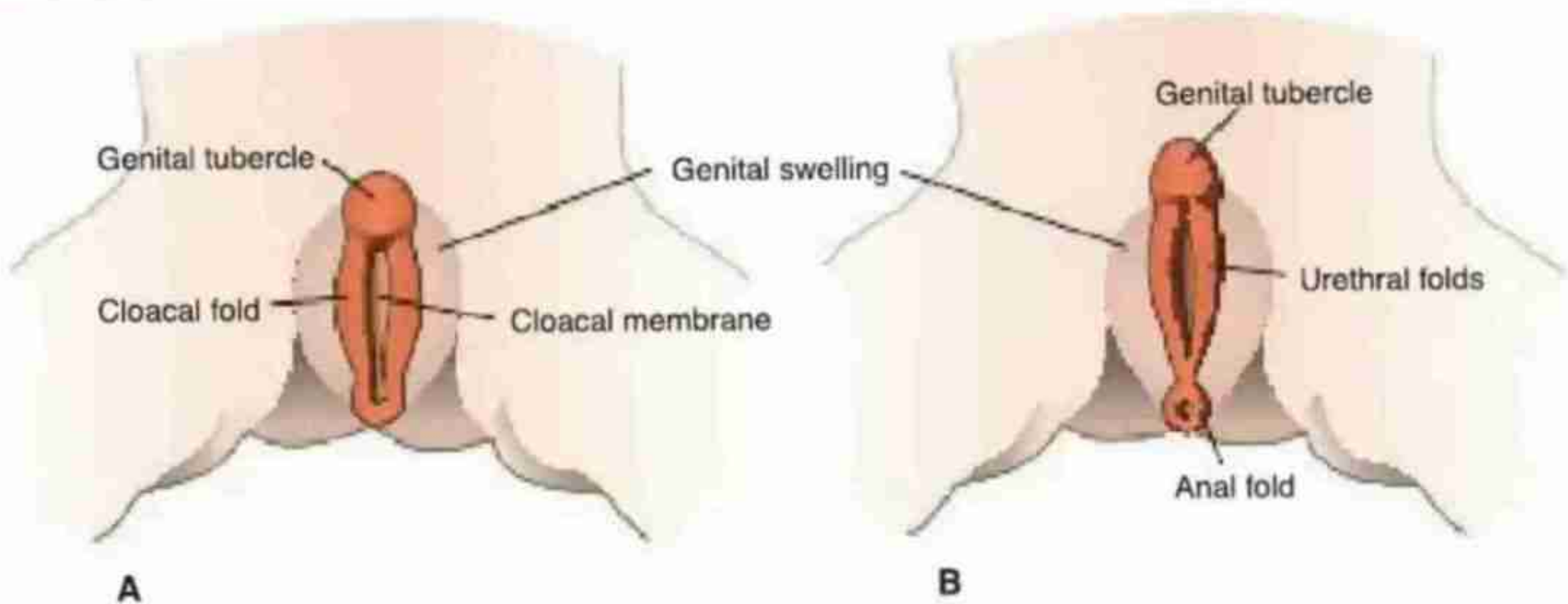


FIGURE 16.32 Indifferent stages of the external genitalia. **A.** Approximately 4 weeks. **B.** Approximately 6 weeks.

- 
- ▶ The right and left genital folds from genital tubercle passes backwards and develop into labia majora
 - ▶ The posterior ends fuse in the midline to form posterior commissure

- 
- ▶ The urogenital membrane breaks down so that continuity is established between urogenital sinus (which forms vestibule) and exterior
 - ▶ The primitive urethral folds form labia minora by 6 th week
 - ▶ It is lined on the outside by ectoderm and inside by endoderm



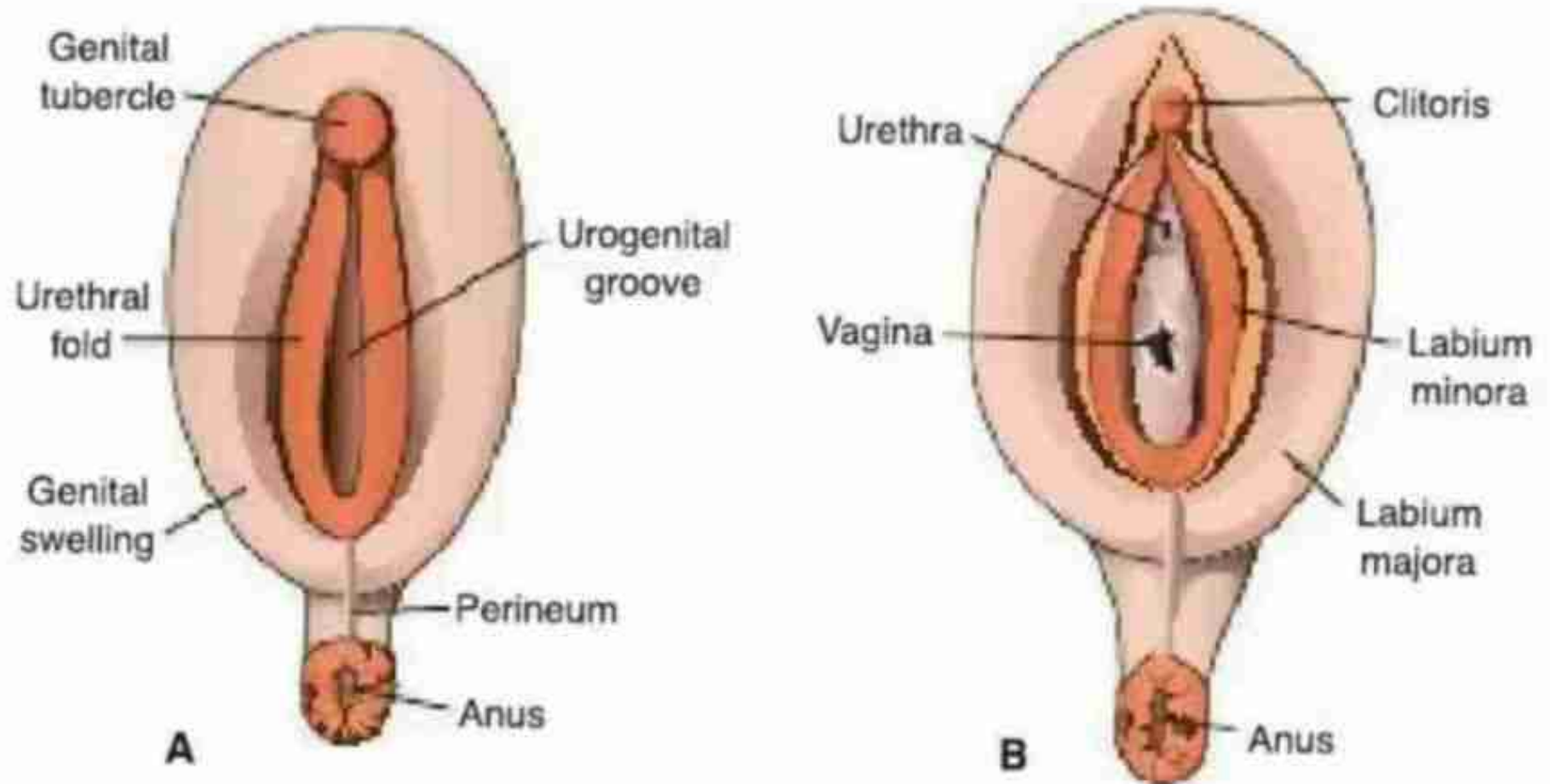


FIGURE 16.35 Development of the external genitalia in the female at 5 months **[A]** and in the newborn **[B]**

- ▶ The vestibule and urethra are derived from anterior part of urogenital sinus
- ▶ The Bartholin's glands and Skene's paraurethral glands are developed from downgrowths of urogenital sinus

- 
- ▶ The female may retain some remnants of the cranial and caudal excretory tubules in the mesoovarium where they form epoophoron and paroophoron respectively.
 - ▶ Later in life, it may form Gartner's cyst



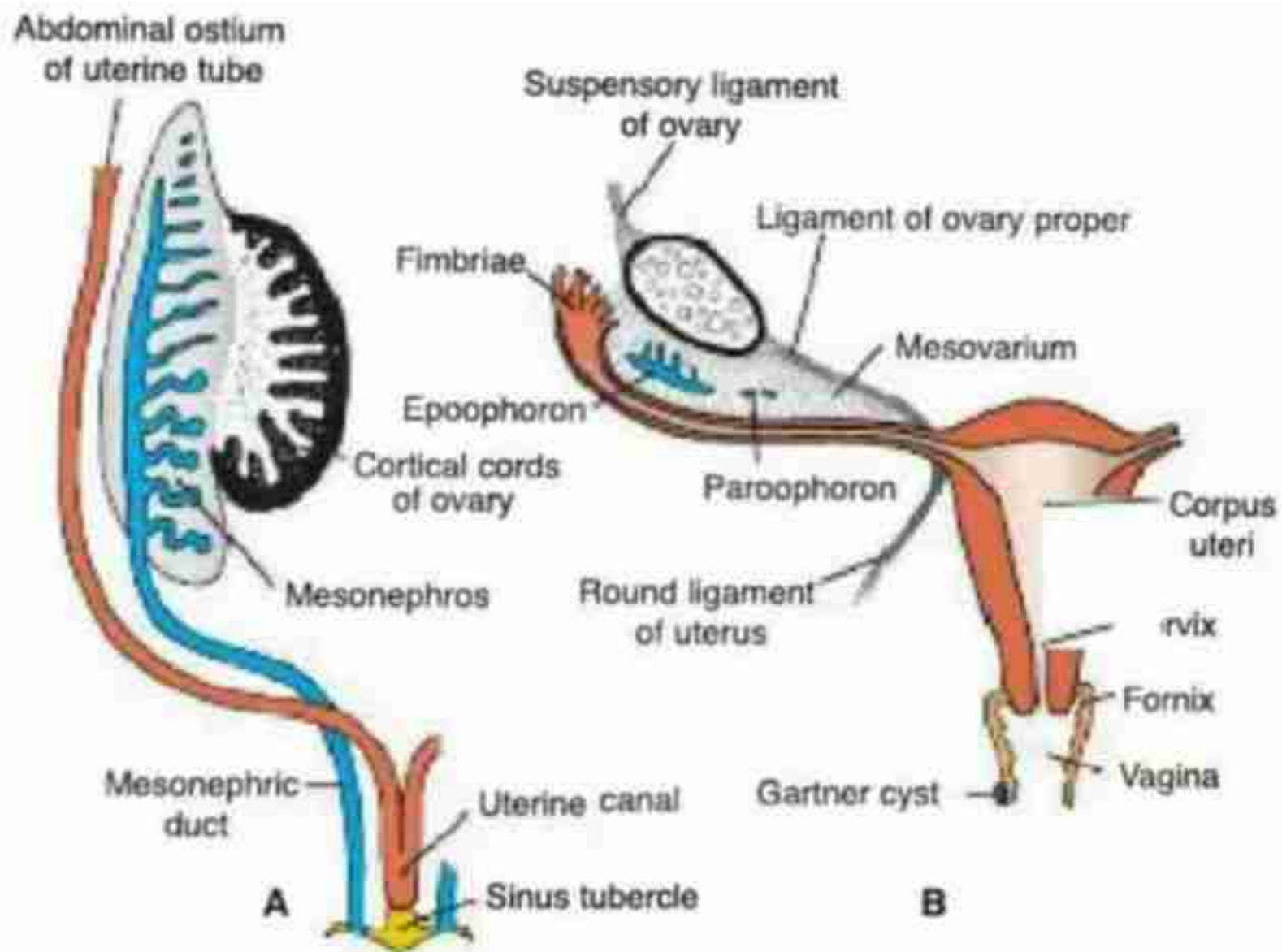


FIGURE 16.24 A. Genital ducts in the female at the end of the second month. Note the paramesonephric [müllerian] tubercle and formation of the uterine canal. **B.** Genital ducts after descent of the ovary. The only parts remaining from the mesonephric system are the epoophoron, paroophoron, and Gartner cyst. Note the suspensory ligament of the ovary, ligament of the ovary proper, and round ligament of the uterus.