Congenital Malformations of female genital organs

Embryology Related to Development in Males and Females;

The sexual differentiation depends on sex determining region (SRY region) present on short arm of Y-chromosome.

If Y-chromosome is present → gonads which are initially bipotential develop into testes (7 weeks)

If SRY region is absent, i.e. Y chromosome is absent → gonads develop into ovaries

Development of External Genital Organs in Females;

The external genital organs start developing almost simultaneously with the development of the internal genital organs. The site of origin is from the urogenital sinus.

Clitoris is developed from the genital tubercle.

Labia minora are developed from the genital folds.

Labia majora are developed from the genital swellings.

The Bartholin’s glands are developed as outgrowths from the caudal part of the urogenital sinus and correspond to the bulbourethral glands of male
The vestibule develops from inferior portion of the pelvic part and whole of the phallic part of the urogenital sinus.

Female genital development is complete by 11 weeks.

Development of Internal Genital Organs;

The major part of the female genital tract develops from the Mullerian ducts.

Development of Mullerian ducts/paramesonephric ducts in females

In the 5th-6th week of intrauterine life of the embryo, Mullerian ducts develop as an invagination of intermediate cell mass. Two Mullerian ducts develop, one on either side and grow caudally. They approach each other in the midline after crossing the Wolffian duct and fuse. Fusion begins by 7–8 weeks and is completed by 12 weeks.

The cervix can be differentiated from corpus by 10th week. Fusion proceeds in below upwards direction. Initially when the two Mullerian ducts fuse, an intervening septum is present but later by 5th month of intrauterine life, it also disappears.

Development of Vagina;

Vagina develops from two sources: Mainly from the Mullerian duct (forms upper 3/5th part) Partly from the urogenital sinus
(forms lower 1/5th part) which together form a solid vaginal plate. Canalization of the solid vaginal plate occurs at 20 weeks. If this canalization fails to occur it leads to – transverse vaginal septum. The mucous membrane of vagina is derived from endoderm of urogenital sinus and muscles from mesoderm of mullerian duct.

Development of Ovary ;

Ovaries are formed because of absence of y chromosome. For proper development of ovaries-presence of two X chromosomes is required. This is the reason why- in Turner’s syndrome (45X0) ovaries are not developed properly-called as streak gonads. WNT-4 is the ovary determining gene. The ovary is developed from the genital ridge. Genital ridge appears at 5 weeks of POG. The cortex and the covering epithelium are developed from the coelomic epithelium and the medulla from the mesenchyme. The germ cells are ectodermal in origin and migrate to the yolk sac (at 2 weeks) and to the genital ridge (3 weeks). The estimated number at birth is about 2 million. The ovaries descend during seventh to ninth months, and at birth, they are situated at the pelvic brim.
Notes;

Mullerian Ducts Form

• Both the fallopian tubes
• Uterus
• Cervix
• Upper part of vagina

Ovaries are not formed by Mullerian duct hence in Mullerian agenesis – ovaries/ovulation is normal.
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<td>a. <strong>Uterus bicornis unicolli</strong></td>
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WHO classification of Mullerian anomalies:

Class I Mullerian agenesis (MRKH syndrome)

Class II Unicornuate uterus

Class III Didelphys uterus

Class IV Bicornuate uterus

Class V Septate uterus

Class VI Arcuate uterus

Class VII DES related abnormalities/T shaped uterus

Diagnosis:

HSG: Hysterosalpingogram (HSG) is mainly preferred in uterine anomalies but it cannot distinguish between a septate and bicornuate uterus. This is because in order to distinguish between the two, uterine fundus should be visible.

IOC: MRI followed by 3 dimension USG

Gold Standard — Laparoscopy

Management of Bicornuate or Septate Uterus: Presence of uterine malformation per se is not an indication of surgical correction. Unification operation is indicated in otherwise unexplained cases of infertility or if it has lead to ≥ 3 abortions. Options Include: For bicornuate uterus: (and if needed for Didelphys uterus) Unification surgery (done either
hysteroscopically or by abdominal route - Strassman metroplasty). For septate uterus: Earlier: Jones/Tompkins metroplasty was done. Nowadays: Hysteroscopic resection of septa is being done after inducing endometrial atrophy by administering GnRH analogue for 2 months. Main complications: Uterus perforation and fluid overload.

Transverse Vaginal Septum;

If there is a disorder in fusion of downgrowing Mullerian duct and upgrowing derivative of urogenital sinus, results in transverse vaginal septum which causes imperforate vagina (or vaginal agenesis). 46% septa are located in upper part. 40% septa are located in middle part. 14% septa are located in lower part. Transverse vaginal septum can present either in:

Neonatal Age-group; The placental transfer of estrogen results in stimulating the glands of the endocervix which results in formation of mucocolpos, and can present as: Abdominal tumour. Can compress the ureter resulting in hydroureter followed by hydronephrosis. Can compress the rectum resulting in obstipation/intestinal obstruction.

At Puberty; Patient can present with primary amenorrhea (actually called as cryptomenorrhea as uterus menstruates normally but blood does not come out due to outflow tract
obstruction). Secondary sexual characteristics are normal. Due to cryptomenorrhoea, blood gradually collects and distends first the vagina (hematocolpos) then cervix, uterus (hematocervix and hematometra) and finally the tube (hematosalpinx). All these present as pelvic/abdominal tumor. The abdominal tumor can irritate the bladder followed by compression of internal urinary meatus leading to complete retention of urine (This occurs 3–4 years after the onset of hidden menstruation and therefore, patient is generally aged 15–18 years). Patient may complain of monthly cyclic pain (backache/lower abdomen pain).

Management; In case of septa in lower and middle part of vagina- surgical removal of septa vaginally followed by reanastomosis. In case of upper septa, abdominal surgery is required.

Mullerian Agenesis;

is the complete failure in the development of the mullerian ducts, resulting in absence of the fallopian tubes, uterus, and most of vagina (as 2/3rd of vagina is formed by Mullerian duct). Karyotype = 46 XX. Phenotype = Female. Associated Abnormalities: Renal anomalies (M/C Renal agenesis followed by horse-shoe shaped kidney). Skeletal abnormalities (most common - scoliosis). Cardiac anomalies. When mullerian
agenesis is associated with Renal anomalies and skeletal anomalies-it is called Mayer Rokitansky Kuster Hauser syndrome.

Clinical Features; Patient present between 15–18 years of age with primary amenorrhoea. Secondary sexual characteristics are normal as ovaries are normal (because ovaries do not develop from mullerian duct but from genital ridge, so ovulation is also normal) i.e. breast, pubic hair and axillary hair all are normal.

P/V = Vagina is felt like a blind pouch and uterus is absent.
“Although in MRKH fallopian tube should be absent, typically a part of the distal tube is present (distal 1/3rd present). Findings are confirmed by USGQ.

Management; Repair of vaginal agenesis is done either by frank dilatation or vaginoplasty. Vaginoplasty should only be performed when the girl is just married or about to be married. Surgical management: Vaginoplasty either by McIndoe reed procedure or Williams vaginoplasty or amnion vaginoplasty. These females are capable of having their biological child because their ovaries are normal hence - oocyte can be picked up and with husband semen, IVF can be done Zygotes are then transferred to surrogate mothers uterus.

Frank Dilatation This non-surgical procedure consists of a woman applying gradual pressure with progressively increasing
dilators over the mullerian pit for 15 minutes twice a day. An indentation is created by the end of 3 to 6 month. Some have satisfactory intercourse, but in many, vaginal size is inadequate and they need a surgical procedure eventually.