13. FEMALE GENITAL DEVELOPMENT:

***Early urogenital development:** (4-8 weeks)*

The *urorectal septum* (URS) divides the cloaca into the dorsal anorectal canal and the ventral primitive urogenital sinus (UGS) and the cloacal plate into the anal plate and urogenital plate. The *lower border of the sinus/Müllerian tubercle* divides the primitive urogenital sinus into the vesicourethral canal and the definitive urogenital sinus or vestibule. The vesicourethral canal forms the allantois, the bladder and the urethra. The urethra differentiates into the proximal glandular urethra and distal membranous urethra. The sinus/Müllerian tubercle contains the lower end of the vagina and distal ends of the mesonephric (Gartner's) ducts. The sinus/ Müllerian tubercle tilts dorsally and lies posterior to the membranous urethra. The sinus/Müllerian tubercle forms a subtle projection in the roof of the vestibule, posterior to the (urethral meatus) of the membranous urethra. When the *urogenital plate disintegrates*, the *vestibular/labial folds* surround the *urogenital groove* or elliptical *opening of the vestibule*. The inner surfaces (ectoderm) of the vestibular/labial folds join the mucosa (endoderm) of the urogenital groove at *Hart's line.*

***Female genital development** (8-12 weeks):*

The *urogenital fold* (ectoderm) surrounds the elliptical *urogenital groove* (endoderm), which will form the perineal and phallic parts of the *vestibule*.
The *urogenital fold (*vestibular/labial fold) will form the labia minora that surround the elliptical vestibule.
The distal ends of the folds of the *labia minora* of 'frenulum' of the glans clitoris, unite to form the *anterior commissure* of the labia minora.

In the perineum:
The *bulbs of the vestibule,* develop lateral to the walls of vestibule and join in the midline, posterior to the curved posterior wall of the vestibule. Tiny ducts develop from the lateral walls of the vestibule, run between the lateral walls of the vestibule and upper borders of the vestibular bulb, and proliferate to form small oval compound alveolar vestibular/Bartholin's glands embedded in the posterior ends of the vestibular bulbs, adjacent to the curved posterior wall of the vestibule.
Epithelium (ectoderm) of the *labial folds (labia majora)*, joins the lateral borders of the outer surfaces of the vestibular/labial folds. Epithelium on the inner surfaces of the vestibular/labial urethral folds meets the mucosa of the vestibule/urethra (endoderm).

Development of the clitoris:
The *genital swelling* grows slightly forward of the perineum of the embryo to form the phallus/ clitoris. The genital swelling consists of the *genital tubercle* (mesoderm) covered by epithelium or *genital fold* (ectoderm). The genital swelling is the anlage of the clitoris.
The genital tubercle consists mainly of the bicavernosal body of the clitoris.
The perineal part of the urogenital groove/vestibule extends to the ventral aspect of the bicavernosal body of the clitoris to form the *phallic part of the urogenital groove/vestibule*.

The anterior/distal ends of the bulbs of the vestibule, fuse dorsally and form a narrow dorsal plate (pars intermedia), adherent to the ventral surface of the bicavernosal body and the roof of the anterior section of the vestibule.

The *perineal segments* of the *vestibular/labial folds* form the *labia minora* under the posterior and middle sections of the vestibule, proximal to the suspensory ligament of the clitoris.
The *posterior ends* of the labia minora unite to form the *fourchette* of the labia minora.
Distal to the suspensory ligament of the clitoris, the *phallic segments* of the *vestibular/labial folds* form the labia minora under the anterior section of the vestibule.
Just distal to the suspensory ligament of the clitoris, the labia minora assume the term the 'frenulum' of the clitoris.
Just distal to the conical end of the bicavernosal body, the labia minora, unite to form the *anterior commissure of the labia minora.*
The *folds of the labia minora* contain a small amount of *mesoderm*.

Epithelium (ectoderm) of the ventral border of the genital fold joins the epithelium of the upper borders of the outer surfaces of the labia minora. The upper borders of the inner surfaces of the labia minora join the mucosa (endoderm) of the ventral border of the perineal and phallic parts of the vestibule, at *Hart's line.*

Formation of the glans clitoris:
The glans (body) clitoris is arbitrarily divided into the roof of the glans and the cap of the glans clitoris. The *glans clitoris* develops from the *dorsal plate* (pars intermedia), *of the vestibule.*

Formation of the roof of the glans clitoris:
The *lateral borders of* pars intermedia generate spongy tissue that flows dorsally, under the genital fold, to envelope the *lateral and dorsal surfaces of the distal end of the bicavernosal body*.

Formation of the dorsal hood:
The dorsal hood forms as forward fold of epithelium and underlying mesoderm (skin) derived from the genital fold. The *origin/base* of the fold develops from the *upper border of the vestibular/labial fold*s, proximal to the ventral border of the roof of the glans clitoris.
The *area proximal to the roof of the glans clitoris*, is the *anlage of the coronal sulcus*, in male development.

At the proximal end of the roof of the glans clitoris, the genital fold, grows distally to form the dorsal hood of the clitoris. The *ventral borders* of the dorsal hood of the glans join a *tiny segment of the vestibular folds*, *proximal to the lower border of the roof* of the glans clitoris.

Formation of the cap of the glans clitoris:
The *distal end* of the dorsal plate generates spongy tissue that flow under the genital fold and molds over the conical end of the bicavernosal body, to form the crescentic *cap of the glans* clitoris.

At the level of the ventral border of the roof of the glans clitoris, the *genital fold* of the roof of the glans clitoris, joins the upper borders of the epithelium of the outer surfaces of the labia minora.
The *upper borders* of the epithelium (ectoderm) of the inner surfaces of the labia minora, meet the mucosa (endoderm) of the (anterior section of the) vestibule, at *Hart's line*.

The pointed ventral border of the cap of the glans clitoris is *immediately ventral to the conical tip* of the cap of the glans clitoris. At this point, the *genital fold* (ectoderm) of the cap of the glans clitoris, joins the upper border of the *outer surface of the anterior commissure* of the labia minora.

The upper border of epithelium (ectoderm) of the inner surfaces of the *anterior commissure* of the labia minora, meets the mucosa (endoderm) of the (anterior section of the) vestibule, at *Hart's line.*

The *ventral border of roof of the glans clitoris* (mesoderm) is in contact with the small amount of *mesoderm in the folds* labia minora/frenulum.
Mesoderm at the ventral pointed end of the *cap of the glans clitoris* is in contact with the small amount of *mesoderm* in the fold of the *anterior commissure* of the labia minora/frenulum.

Key point: In the development the labia and dorsal commissure of the labia of the glans penis, in the male, we will remember that epithelium and mesoderm of the *anterior commissure* at the distal ends of the urogenital folds (vestibular/urethral folds) *attaches to the epithelium and mesoderm of the pointed ventral end of the crescentic cap of the glans*.

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From https://anatomydevelopment.com/#undefined
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