12. DEVELOPMENT OF THE MALE EXTERNAL GENITALIA:

Terminology:
Embryonic folds are derived from ectoderm. An embryonic fold usually overlies an embryonic swelling, tubercle or plate.

INDIFFERENT STAGE OF DEVELOPMENT OF THE EXTERNAL GENITALIA:
Vertically oriented cloacal fold surrounds the cloacal groove and the cloacal membrane. The cloacal membrane consists of an external layer of ectoderm and internal layer of endoderm, with no intervening mesoderm.

Downwards growth of the sagittal urorectal septum divides the cloaca into the rectum, and the primitive urogenital sinus.

Medial growth of the perineal plates divides the cloacal folds into a circular anal fold and circumferential urogenital fold, compressed from side to side.

The anal fold surrounds the anal pit and anal membrane. When the anal membrane disintegrates, rectal mucosa (endoderm) and anal epidermis (ectoderm) meet at the pectinate line.

The urogenital fold surrounds the urogenital groove and the urogenital membrane. The urogenital membrane disintegrates and (endoderm) of the definitive urogenital sinus and epidermis (ectoderm) of the external genitalia meet at Hart’s line.

The perineal plates meet the fused bilaminar cloacal folds. The fused cloacal folds between the perineal plates form the anogenital raphe.

The genital fold is a broad fold shaped like a horseshoe. The genital tubercle emerges from the pelvis and joins the anterior arch of the genital fold. The lateral limbs of the genital fold join the pelvic part of the urogenital folds. The fold of the genital tubercle joins the phallic part of the urogenital folds.

Genital tubercle:
The genital tubercle is a cylindrical body of mesoderm covered by ectoderm. It emerges from the embryo, under the anterior arch of the genital fold.

The genital tubercle contains forward extensions of: the corpora cavernosa, dorsal plate of corpus spongiosum. The phallic part of the urogenital sinus and the urogenital folds are ventral to the corpora cavernosa and dorsal plate of the corpus spongiosum.

The forwards extensions of the urogenital folds, surrounding the urogenital groove and.
The urogenital folds surround the urogenital sinus and extend the tip of the dorsal plate under the bicavernosal body of the corpora cavernosa.
The epithelium (ectoderm) of the ventrolateral edges of the fold of the genital tubercle is continuous with the urogenital folds, and the epithelium (ectoderm) of the urogenital fold is continuous with the mucosa (endoderm) of the definitive urogenital sinus.

DIFFERENTIATION OF MALE EXTERNAL GENITALIA:

Genital tubercle is the anlage of the shaft of the penis.  
Genital folds are termed scrotal folds and are destined to form the scrotum.  
Urogenital folds between the scrotal folds are destined to form the scrotal raphe.  
Urogenital folds under genital tubercle are termed urethral/vestibular folds.  
Urogenital groove under genital tubercle is termed urethral/vestibular groove.  
Urethral/vestibular folds surround the urethral/vestibular groove and urogenital membrane.  
Urethral/vestibular folds are joined posteriorly at the posterior commissure (future posterior end of the scrotal raphe).  
Urogenital sinus/vestibule lies above the level of the urethral folds.  
Genital tubercle is the anlage of the shaft of the penis.  
The dorsal plate of corpus spongiosum is destined lie in roof of fossa navicularis.  
Distal end of the dorsal plate of corpus spongiosum is destined to develop the glans penis.  
Glans penis (and wings of the glans penis) covers the conical ends of bicavernosal body of the penis, and encloses the dorsal plate of corpus spongiosum, and mucosa of fossa navicularis.  
In the shaft of the penis the urogenital sinus/vestibule is destined to form penile urethra and fossa navicularis.  
Proximally, ventral fusion of the vestibular swellings will form the bulbar segment of the corpus spongiosum, surrounding the bulbar urethra/vestibule.

Urogenital folds:

Urogenital folds are called urethral/vestibular folds.  
Urethral/vestibular folds fuse in the midline to form the scrotal raphe, penile raphe, raphe of the prepuce, and the frenum.  
At the anterior border of the frenum the urethral/vestibular folds, remain unfused and will form the labia of the glans and labial commissure.  
The labial commissure will be found in the dorsal angle of the external urethral meatus.  
The inner surfaces of the labia and labial commissure will form the glanular urethra.  
Mucosa (endoderm) of the fossa navicularis joins the epithelium (ectoderm) on the inner aspect of the glanular urethra at Hart’s line.