

INTRODUCTION

H ypospadias is congenital abnormality occurring in 1 of 300 live birth and recent studies suggest an increase of the incidence with considerable variation in different countries (*Barbogli et al., 2006*).

Treatment of failed hypospadias can be challenging because of significant scarring and paucity of genital skin; thus, leaving the surgeon with less than ideal material with which to reconstruct the patient (*Al-Sayyed et al., 2007*).

Commonly operative failures result from wound infection, urine extravasation, hematoma, ischemia, and necrosis of flap and graft or from errors in design, technique and postoperative care during primary repair (*Barbogli et al., 2006*).

Early complications of hypospadias repair including bleeding, hematoma, and urinary retention. Late complications include meatal stenosis, urethra-cutaneous fistula, urethral diverticula, recurrent chordee and urethral stricture (*Snyder et al., 2004*).

Presentation and patient dissatisfaction may be wide ranging and may be related to urinary dysfunction, sexual

dysfunction, and/or inadequate cosmetic appearance (**Manzoni, 2006**).

Initial examination of these patients usually guide our decision of which salvage technique could be used. However, the final decision is usually made intraoperatively after taking into consideration the amount and location of scarring, the availability and quality of penile skin and the quality of the urethral plate (**Al-Sayyed et al., 2007**).

Meatus location and wound closure will further influence decision making (**Manzoni, 2006**).

The general principles of repair included minimal use of cautery, avoidance of tension on repair, use of well vascularized tissue, closure in as many layers as possible, single stage repair with epithelial inversion, use of loupe magnification but not the operating microscope, and identification and relief of any obstruction before fistula or diverticulum repair (**Snyder et al., 2004**).

Success was defined by having a functional urethra without fistula, stricture, or residual chordee and having a cosmetically acceptable glandular meatus after completion of all secondary procedures (**Barbogli et al., 2006**).

If the urethral plate is present and wide enough, we elect for Tubularized Incised Plate (TIP) urethra-plasty. Using this technique, we have had satisfactory results comparable with previously mentioned series.

If the urthral plate is not suitable for TIP or if it is absent and there is enough penile skin, we perform an Onlay Island Flap (OIF).

If there is grossly scarred urethral plate contributing to chordee it should be excised and replaced by buccal mucosa graft for 2-stage repair as advocated by bracka (*Al-Sayyed et al., 2007*).

It is widely believed that skin flap, even these developed from previously operated skin , have more reliable vascularity than free grafts that are placed on a scarred bed. Onlay flaps have better outcomes than tubes or flip flap (*Manzoni, 2006*).

Once more two important messages. First, surgical repair of hypospadias should be done by an experienced specialist, whether a pediatric urologist/ surgeon, an adult reconstructive urologist, or a plastic surgeon. This is not surgery for the occasional operator. Second, adult studies such as this show the true long term complications or dissatisfaction rate may be significantly higher than expected.

Early discharge of young patients after apparently successful hypospadias repair may be just convenient way to sweep problems under the carpet. We should therefore maintain an active long term follow up policy both for patients welfare and for our education (*Manzoni, 2006*).

AIM OF THE WORK

The ultimate aim of this work is to evaluate and determine the suitable modalities of redo hypospadias repair.

EMBRYOLOGY OF THE MALE EXTERNAL GENITALIA AND PENIS

The embryological development of the male urinary system remains a subject of much controversy. As a result the pathogenesis of congenital anomalies such as hypospadias which are presented to the reconstructive surgeon remains poorly understood (*Hynes et al I., 2004*).

The sacral mesodermal streams directed by the notochord in the 3-6 weeks old (fertilization age) embryo mould and integrate the organs of the external genitalia within a very confined space, bounded in front by the body stalk, behind by the tail bud and laterally by the lower limb buds. The sagittally oriented cloacal membrane lies deep on the bottom of this "box" (*Stephens et al., 2005*).

The embryonic disc, at first consists only of ectoderm and endoderm. The primitive; streak is a central area at the caudal midline of the embryonic disc, from this area, the third layer (mesoderm) arises. The cloacal membrane is an area in which the ectoderm and the endoderm remain fused without mesodermal ingrowth and is located in the midline just caudal to primitive streak (*Baskin, 2002*).

Between weeks four and five of fetal life, the cloaca is separated from the amniotic cavity by the cloacal membrane (*Krishan et al., 2006*).

The cloaca is divided into the urogenital sinus and the hindgut by the urorectal septum, which descends in a rostral-to-caudal fashion (Fig. 1) (*Levin et al., 2007*).

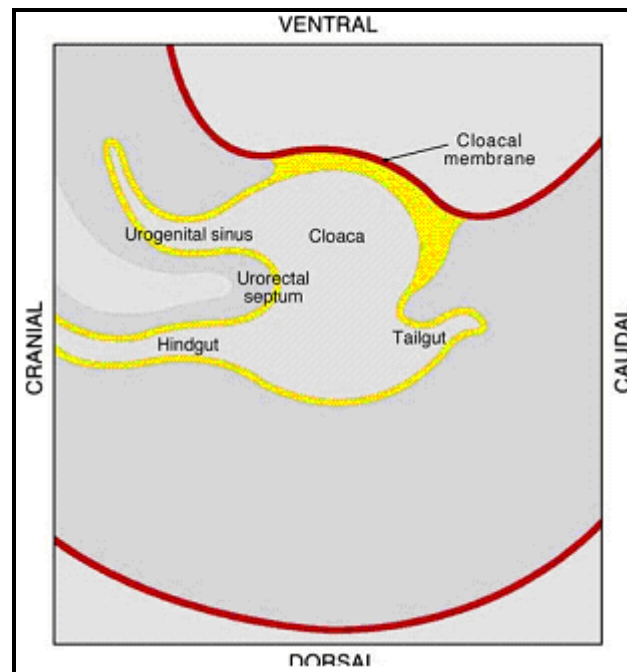


Fig. (1): Embryologic development of the male genitourinary tract. The cloaca is divided into the urogenital sinus and the hindgut by the urorectal septum (*Levin et al., 2007*).

The urorectal septum is derived from the progressive median union of the longitudinal folds on the lateral walls of the cloaca .when progressive fusion of these folds reaches the

level of the cloacal folds, the later unite in a similar fashion to form the perineal rudiment (*Hynes et al I., 2004*).

The urogenital sinus is the precursor of the bladder and posterior urethra. The cloacal membrane subsequently undergoes disruption such that the hindgut and phallic cloaca open separately to the exterior (Fig. 2) (*Levin et al., 2007*).

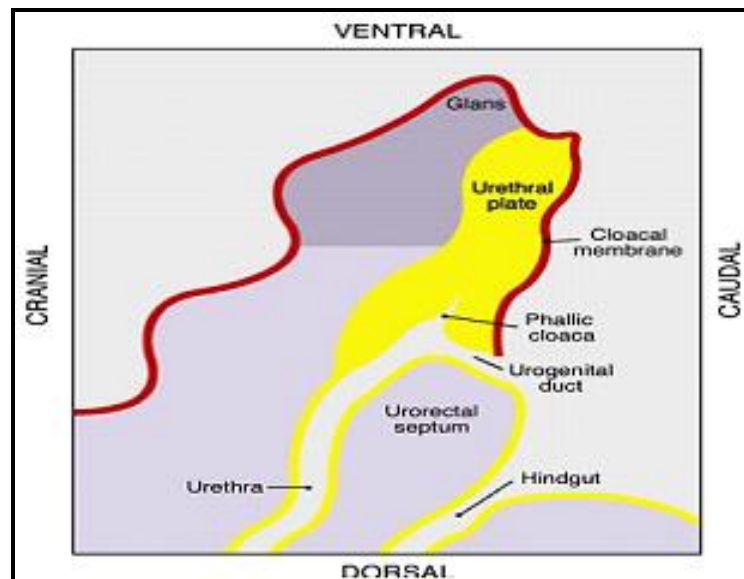


Fig. (2): The urorectal septum continues to descend and the cloacal membrane undergoes disruption. The hindgut and the phallic cloaca now open separately to the exterior (*Levin et al., 2007*).

Initially the cloacal membrane and memberanous cloaca extend to the base of the umbilicus (body stalk). With development of the genital tubercle and growth of thr rostral mesoderm of the genital tubercle (RMGT). They are displaced

from this level and progressively from the rostral and distal aspect of the genital tubercle (*Hynes et al II., 2004*).

Proliferation of rostral mesoderm of the genital tubercle displaces the cloaca so that it lies on the caudal aspect of the developing glans (Fig. 3) (*Levin et al., 2007*).

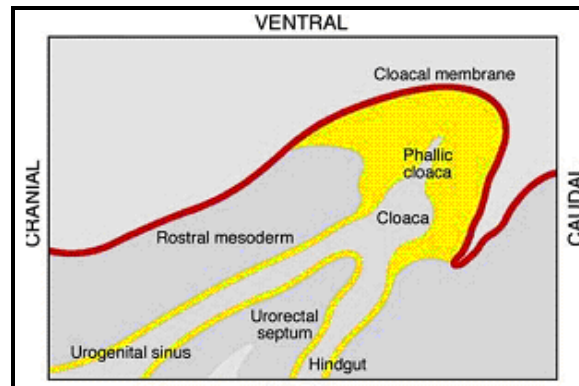


Fig. (3): The cloaca extends distally through developing genital tubercle. Proliferation of rostral mesoderm of the genital tubercle displaces the cloaca so that it lies on the caudal aspect of the developing glans (*Levin et al., 2007*).

Progressive distoproximal apposition of the walls of the phallic cloaca result in the formation of a solid plate of endodermal plate, the urthral plate (*Hynes et al II., 2004*).

Portion of cloacal membrane also contribute to the urethral plate (Fig. 4) (*Levin et al., 2007*).

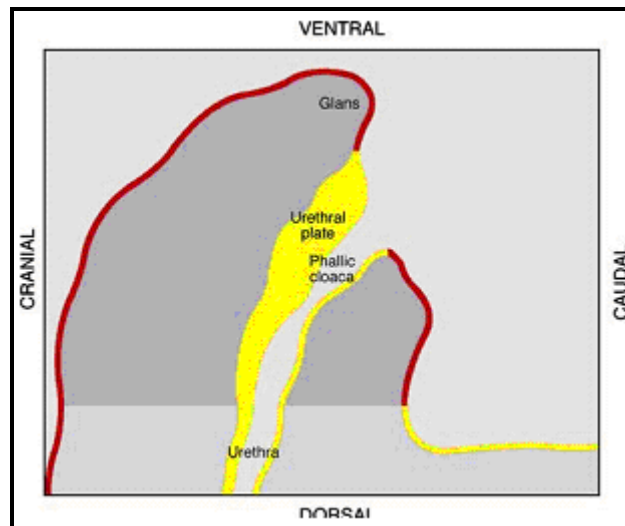


Fig. (4): Median cleavage of the urethral plate occurs. The urethral plate forms the deep and lateral walls of the proximal urethra. The phallic cloaca opens to the exterior at the base of the glans (*Levin et al., 2007*).

The phallic cloaca and the urethral plate are the precursors of the urethra of the penile shaft and the proximal two thirds of the glander urethra (*Hynes et al II., 2004*).

The distal urethra at the glans penis is formed from fusion of the distal folds that arise from the apical part of the glans distal to the cloaca and subsequent urethral plate. It is lined by ectoderm (*Levin et al., 2007*).

In order for the mesoderm of the caudal extremities of the preputial folds to become continuous across the midline, fusion of the urethral folds must progress normally at least as far as the base of the glans. In proximal types of hypospadias

the caudal extremities of the preputial folds cannot fuse and hooded prepuce is formed (*Hynes et al III., 2004*).

The phallus:

The phallus develops from the sacral outflow of mesoderm from two sources .the central glans and urethral plate form from the urogenital sinus mesoderm deep to the cloacal membrane.

The phallus has an outer covering of mesoderm forming external to the membrane. This external mesoderm forms the outer genital folds, the penile wrap around the central shaft, the penile raphe, the corpora cavernosa and the mons pubis. When the cloacal membrane disintegrates the roof of the urogenital sinus becomes exposed and the union of the sinus with skin form the inner genital folds (*Stephen et al., 2005*).

ANATOMY OF THE PENIS AND MALE URETHRA

The structure of the penis:

1- The root:

The root of the penis consists of three masses of erectile tissue in the urogenital triangle, namely the two crura and the bulb, firmly attached to the pubic arch and the perineal membrane respectively (*Healy et al., 2008*).

Each penile crus (Fig. 5) starts behind as blunt, elongated but rounded process, attached firmly to the everted edge of the ischiopubic ramus and covered by ischiocavernosus.

Anteriorly it converges towards its fellow and is slightly elongated posterior to this. Near the inferior symphyseal border the two crura come together and continue as corpora cavernosa of the body of the penis. The bulb of the penis lies between the crura and is firmly connected to the inferior aspect of the perineal membrane, from which it receives a fibrous covering. The bulb narrows anteriorly into the corpus spongiosum. Its convex superficial surface is covered by bulbospongiosus. Its flattened deep surface is pierced above its centre by the

urethra, which traverses it to reach the corpus spongiosum (*Healy et al., 2008*).

2- The body:

The body of the penis contains three elongated erectile masses. The erectile masses are the right and left corpora cavernosa and the median corpus spongiosum, which are continuation of the crura and bulb of the penis respectively (*Healy et al., 2008*).

Corpora cavernosa:

The corpora cavernosa of the penis form the most of the body. They share common fibrous envelope and are separated by median fibrous septum (*Healy et al., 2008*).

They are enclosed in a strong fibrous tunica albuginea, consisting of superficial and deep strata. The superficial fibres are longitudinal, and form a single tube around both corpora. The deep fibres are circularly oriented and surround each corpus separately, joining together as median septum of the penis. The median septum is thick and complete proximally so the corporal bodies can be separated proximally for 5-7cm. Distally it consists of a pectiniform (comb like) series of bands and is called the pectiniform septum which is complete and allows cross circulation of blood between the two corpora (Fig. 6) (*Healy et al., 2008*).

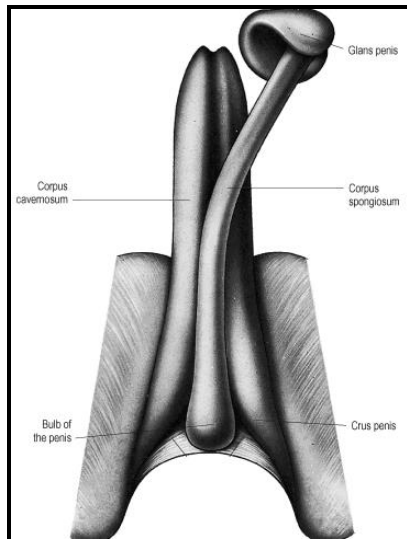


Fig. (5): Ventral aspect of the constituent erectile mass of the penis in erect position (*Healy et al., 2008*).

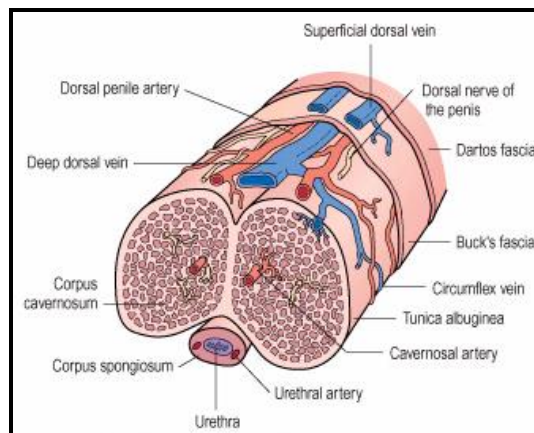


Fig. (6): Transverse section of the penis (*Healy et al., 2008*).

Corpus spongiosum:

The corpus spongiosum lies in the ventral groove between the corpora cavernosa, and is traversed by the centrally placed urethra. Its distal end is expanded into conical glans, which is folded dorsally and proximally to cover the end of the corpora cavernosa and ends in a prominent ridge, the corona. The corona passes laterally and then curves distally to meet in a V ventrally and anterior to the frenulum, a fold of skin just proximal to the external urethral meatus (*Quartery, 2006*).

Skin of the penis:

The skin of the penis is thin, darkish in colour, and without any fat tissue beneath it. It is loosely connected to the penile shaft, which allow for easy movement over the shaft (*Yachia, 2007*).

The distal penile skin leaves the surface of the penis at the level of the corona, and fold upon itself to form the preputium which covers the glans. The inner surface of the preputium approaches the character of a mucous membrane. This membrane passes backwards at the ventral part of the preputium and create the frenulum, a longitudinal fold attached to the urethral meatus (*Yachia, 2007*).