Abstract

Background: Hypospadias is one of the most common congenital anomalies of male external genitalia, in which the external urethral meatus exits ventrally any where from the glans to the perineum.There are many surgical modalities for reconstruction but with different rates of success. **Aim:**This study aims to compare the outcome of using dartos flap versus spongioplasty in TIP urethroplasty operation for distal hypospadius as regards operative time, cosmetic outcome and complications rate e.g. fistula, disruption and infection.**Methods:** 30 patients were selected, divided into 2 groups (15 per each), group A underwent TIP repair with dartos flap, while group B underwent TIP repair with spongioplasty. **Results:**Both groups show the same percentage of urethrocutaneous fistula (about 13 %)but in group B 2 patients had complete disruption. We concluded that spongioplasty is not superior to dartos flap in preventing post-operative complications specially urethrocutaneous fistula, with no better cosmetic outcome.

Keywords

Distal hypospadias-TIP repair-2nd layer –dartos flap – spongioplasty.

Introduction

Hypospadias is a condition where the meatus is situated along theunderside of the penis instead of the normal position at its tip. The meatus is most often found near the end of the penis ("distal" position). Hypospadias is the second most common birth defect in males, potentially affecting both urinary and sexual function of the penis. Surgical treatment is necessary, and more than 300 operation techniques have been described for primary hypospadias. The objective of all of procedures is the formation of a functionally normal urethra and a cosmetically acceptable penis***(Snodgrass et al., 2002; Snodgrass,2011).***

Snodgrass described the tubularized incised plate (TIP) hypospadias repair in 1994 as a mean to widen and improve mobilization of the urethral plate when performing a Thiersch-Duplay urethroplasty***(Snodgrass,1994).***

The TIP repair is a reliable method for treating both distal and proximal hypospadias and is suitable for both primary and re-operated cases with accepted low rate of complications ***(Sarhan et al., 2009).***

Significantly better outcome is achieved with distal hypospadias, covering the neourethra by the mobilized corpus spongiosum(spongioplasty) or by a flap***(Sarhan et al., 2009).***

There is little long-term data available for any of the operations of hypospadias in common use today. Throughout the history of hypospadias repair continued evolution of techniques has often resulted in new operations being applied and then discarded before long-term results are determined. Furthermore, most operations are performed in the first year of life, and it is not reasonable to expect data to be available on more than a sampling of these patients after they complete puberty***(Snodgrass,2011).***

Aim of the Work

This study aims to compare the outcome of using dartos flap versus spongioplasty in TIP urethroplasty operation for distal hypospadius as regards operative time, tourniquet time, cosmetic outcome and complications rate e.g. fistula, disruption and infection.

Embryology of the Urethra

Understanding normal human urethral development is the first step in unraveling abnormal urethral development for which the most common abnormality is hypospadias.The development of the human urethra has been a controversial subject in embryology for years. Glenister stated that the penile urethra arises by fusion of the primitive urethral groove and the secondary urethral groove that develops from the urethral plate ***(Glenister,1954).*** In contrast, Van der Putte and Neeteson concluded that the male penile urethra is formed by a movement in ventral direction of the urogenital opening relative to the growing perineum and not by fusion of the genital folds.***(van der Putte and Neeteson,1984).*** Kluth et al. could not find evidence of fusion***(Kluth et al.,2011).***

Recently the optical projection tomography (OPT) confirms a solid urethral plate that canalizes, forming the urethral groove that progressively advances and fuses to form the tubular penile urethra.The process starts proximally at the scrotal folds and progresses along the penile shaft to the glans to form the terminal urethral meatus. There is no evidence of ectodermal intrusion of epidermal cells that meet the solid and/or canalized urethral plate or urethral groove, consistent with the endodermal theory of urethral development ***(Li et al., 2015).***

Optical Projection Tomography (OPT) is a technique for volumetric visualization of transparent or slightly opaque objects on the cellular level up to small organisms. The principle of OPT is similar to computed tomography except for the use of visible light instead of X-rays.

Double zipper ***hypothesis*** of urethral formation where the “opening zipper” facilitates formation of the urethral groove distally through canalization of the urethral plate, and a “closing zipper” follows behind and closes the urethral groove to form the tubular urethra. Midline epithelial proliferation within the urethral plate is a key feature of development of the urethral groove, while apoptosis does not appear to be involved incanalization of the urethral plate***(Li et al., 2015).***

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Indifferent Stage of Penile Development

In the youngest specimen estimated at 6.5 weeks (Figure 1) the urethral plate *was not evident* at the distal tip of the genital tubercle (1A), but was for the most part solid(1B) with evidence of canalization in the penile shaft (1C and D). The urethral meatuswas located at the scrotal folds (1E) with the tubular urethra just proximal (F).

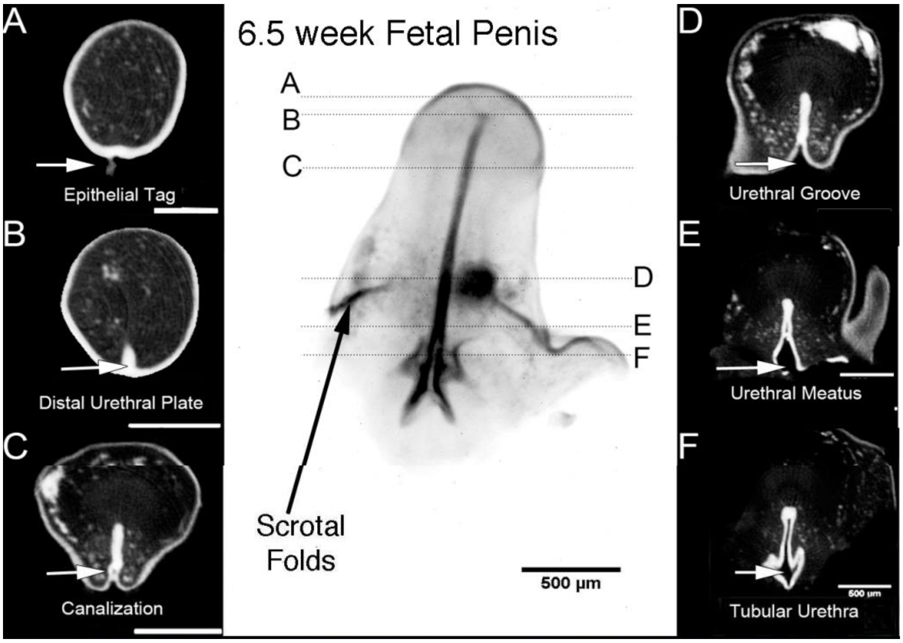

Figure (1): Fetal penis at 6.5 weeks***(Li et al., 2015).***

A similar result was found in the 7.5 week specimen (Figure 2) with absence of the urethral plate in the distal most aspect of the genital tubercle (2A) and proximal canalization of the solid urethral plate (2B, C, D & E, black arrow).

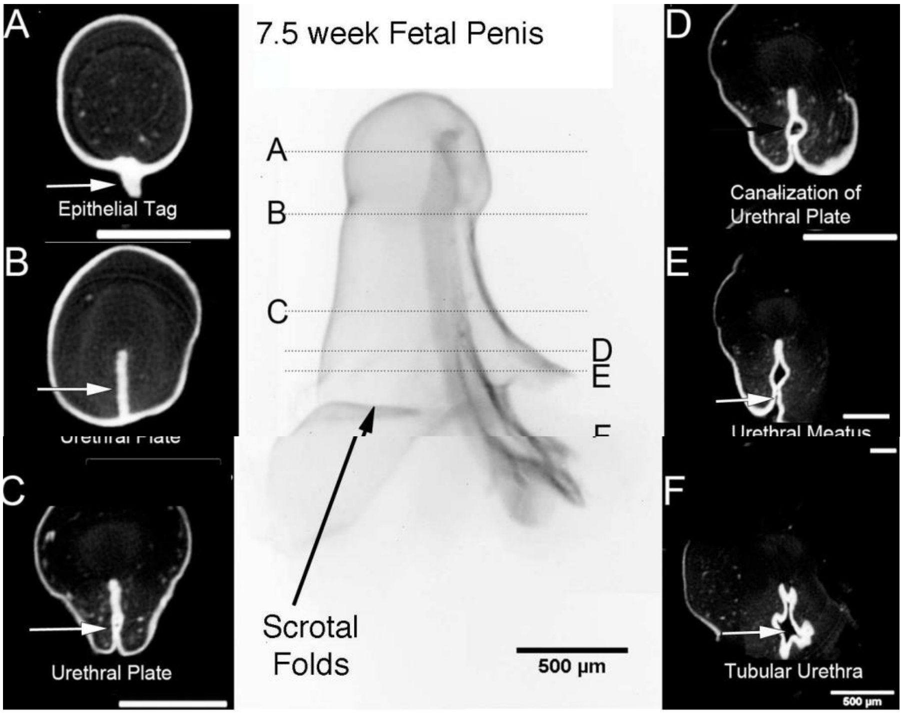

Figure (2): Fetal penis at 7.5 weeks ***(Li et al., 2015)***

Early Stage of Penile Development

The 9.5-week penis exhibited increased growth compared to the two specimens in the indifferent stage (Figure 3). The urethral groove was now well developed extending from the scrotal folds to the proximal aspect of the glans (coronal sulcus) comprising the entire length of the penile shaft. The width of the urethral groove was also quite large compared to the solid urethral plate. The solid urethral plate now located exclusively within the glans exhibited ventral canalization, but remained solid dorsally.

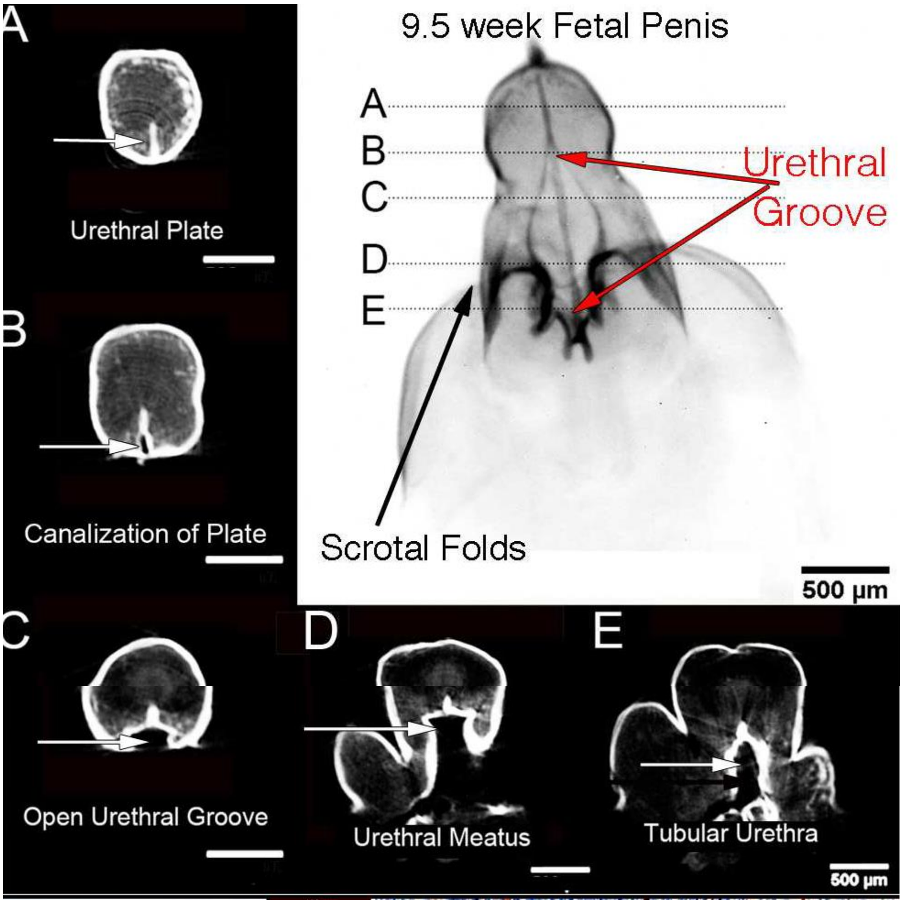

Figure (3): Fetal penis at 9.5 weeks ***(Li Y et al., 2015)***

The notable feature of the 10.5-week penis (Figure 4) is the "distal movement" of the ***wide*** urethral groove, whose proximal boundary was located at midshaft of the penis and whose distal boundary had extended into the glans. Between these two points a broadly opened urethral groove was evident. Proximal closure of the urethral groove created a tubular penile urethra in the penile shaft (Fig. 4E-F).

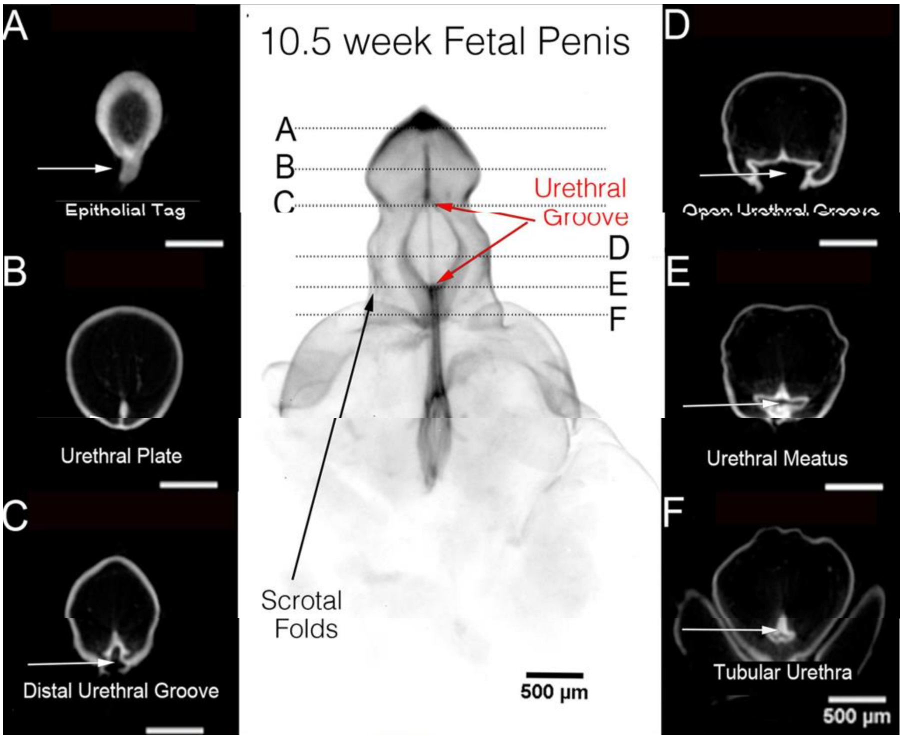

Figure (4): Fetal penis at 10.5 weeks ***(Li et al., 2015)***

Later Stages of Penile Development (12, 13, 15 and 16.5 week specimens)

At 12 weeks the proximal aspect of the urethral groove had fused and advanced further distally along the penile shaft, while the distal aspect of the ***wide*** urethral groove has advanced into the mid glans (Figure 5). The tubular urethra (5E) has advanced to midshaft of the penis. The solid urethral plate has now *evident* in the distal aspect of the glans (5A) with associated canalization of the urethral plate at mid glans (5B).

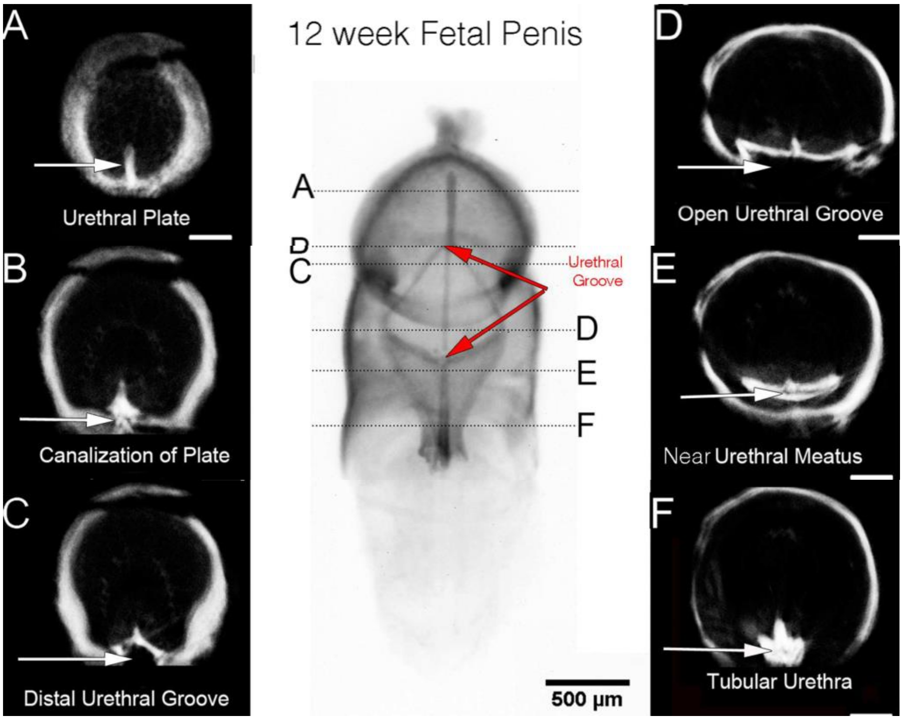

Figure (5): Fetal penis at 12 weeks ***(Li et al., 2015)***

At 13 weeks the urethral groove was shorter in length and entirely within the glans (Figure 6). The epithelial tag was still visible (6A) on the glans. The tubular urethra was completely formed throughout the entire penile shaft.

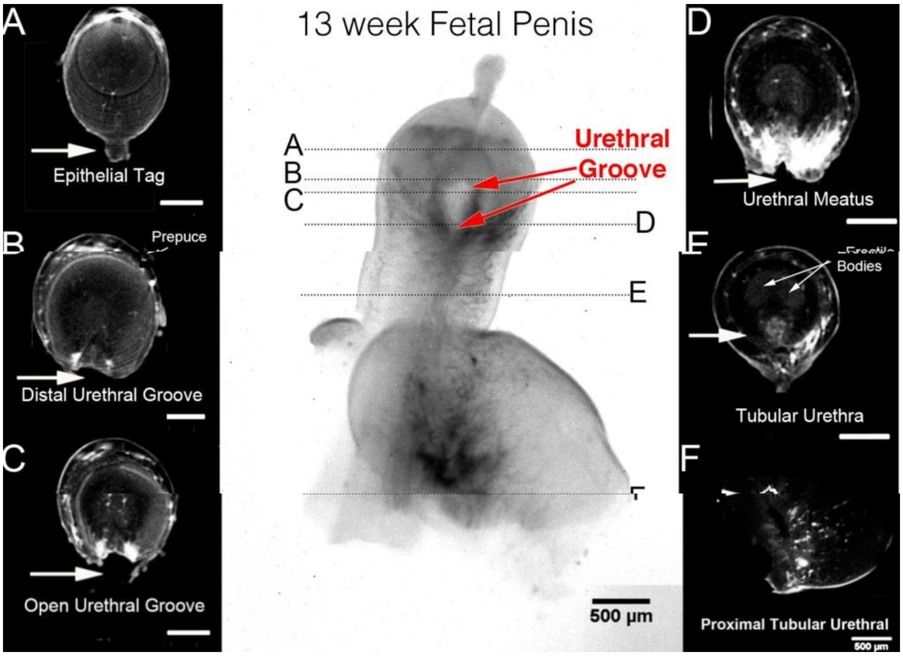

Figure (6): Fetal penis at 13 weeks ***(Li et al., 2015)***

At 15 weeks the penis is almost completely formed (Figure 7). The urethral groove is shorter in length compared to earlier stages of development. The location of the groove is in the distal glans close to the final terminal position of the normal urethral meatus.

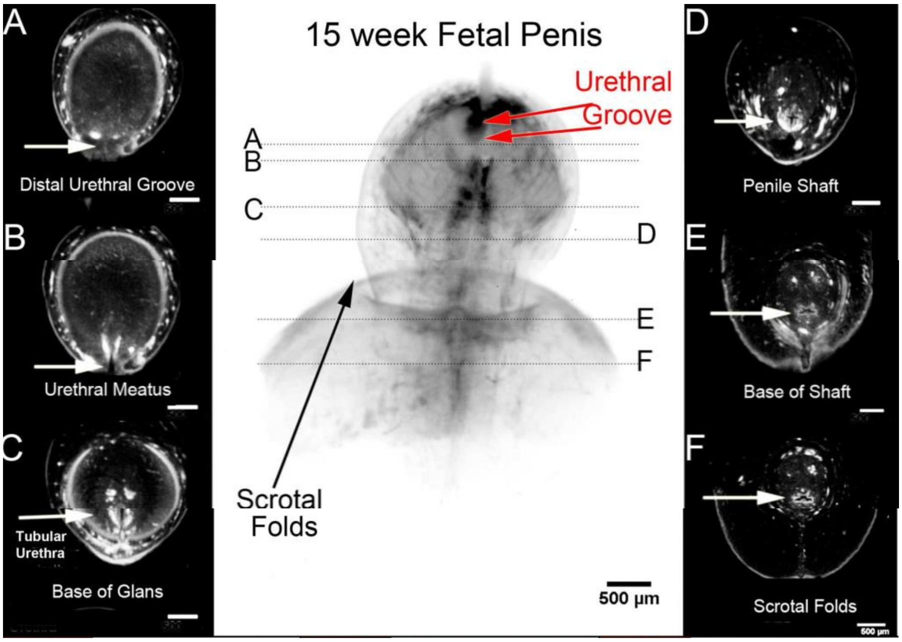

Figure (7): Fetal penis at 15 ***(Li et al., 2015)***

In the 16.5 week specimen (Figure 8) the urethra has reached its normalposition on the glans, the foreskin has fused ventrally and the epithelial tag is no longer present.

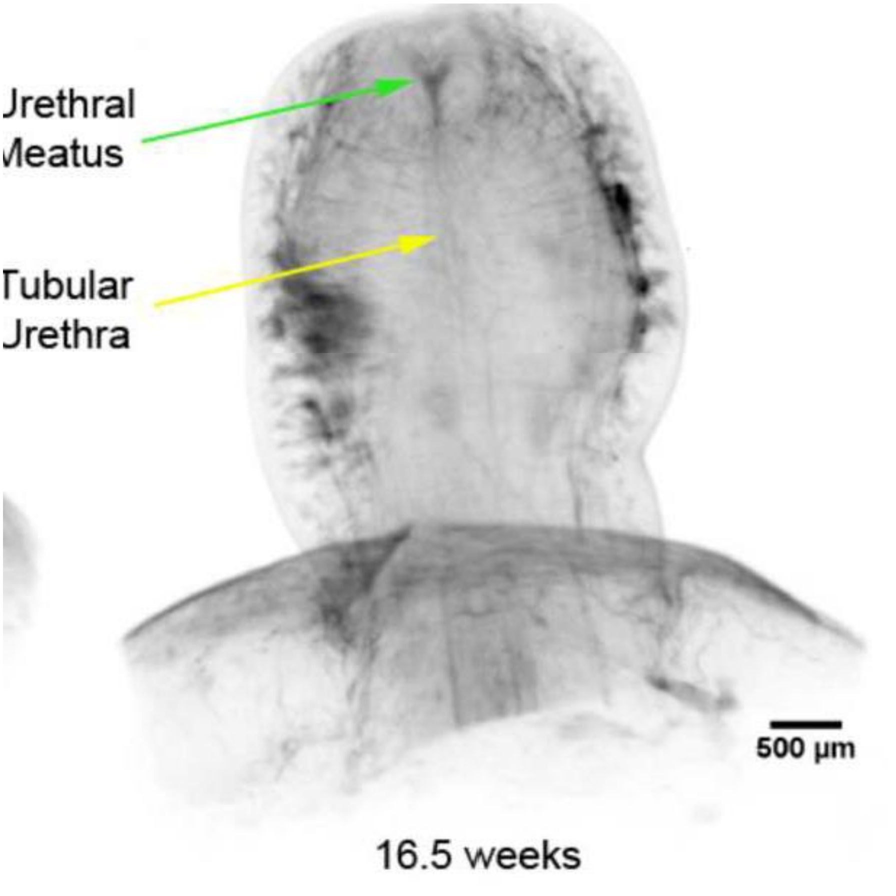

Figure (8): Fetal penis at 16.5 weeks ***(Li et al., 2015)***

In summary there are two mechanisms for further study: (1) The openingzipper that facilitates distal canalization of the solid urethral plate to form the urethral groove, which involves a high rate of epithelial proliferation dorsally within the urethral plate. The process