



Single-Stage Vs Two-Stage Urethroplasty For Hypospadias

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Abstract

Hypospadias is the most frequent congenital external genital deformity in boys, which affects 1/300 live male births worldwide with varying incidence rates in different nations. Hypospadias surgery has been historically characterized by a multitude of techniques available for repair. This study compared single-stage and two-stage urethroplasty with regard to the outcomes and complications. This review was synthesized and obtained from various online databases. Scientific articles were selected based on the inclusion criteria. The result showed that hypospadias is a congenital anatomical abnormality of the male external genitalia and the second most common congenital disorder in males after cryptorchidism, but it is the most common penile congenital malformation. The purpose of surgery in hypospadias is to enhance genital attractiveness, stop splaying of the urine flow, allow the patient to pee while standing, eliminate sexual problems brought on by curvature, and enable semen deposition into the vagina during sexual activity. The choice of operation is frequently influenced by the surgeon's experience. Surgery can be broken down into one- or two-stage operations as well as into operations including tubularization, augmentation, and replacement of the urethral plate. Single-stage urethroplasty can be used for anterior to posterior hypospadias, but two-stage urethroplasty is preference for treating proximal hypospadias with less complication and more desirable aesthetic consequences.

Keywords: Hypospadias, Classification of Hypospadias, Single-Stage, Two-Stage, Urethroplast

Introduction

The most frequent congenital external genital deformity in boys is hypospadias, which affects 1/300 live male births worldwide with varying incidence rates in different nations.¹ These variations may have been the result of a range of factors, including regional, genetic, environmental, and data gathering influences.¹ Excessive dorsal preputial tissue, hypoplastic ventral tissue, ventral urethral opening, and penile curvature are symptoms of hypospadias. Only 10% of cases (scrotum and perineum) occurred posteriorly; distal and coronal/sub-coronal hypospadias types were more frequent.² In order to create an aesthetically straight penis for penetration with meatal displacement for a straight urinary system, current recommendations advocate surgical correction.³

Based on where the urethral meatus is located, hypospadias can be divided into three groups: anterior, middle, and posterior.³ Anterior to posterior hypospadias can be treated with a single-stage urethroplasty. Anger and Duplay employed tubularization for hypospadias repair, utilizing the urethral plate and ventral penile skin to produce the urethral tube. This procedure was developed from a straightforward method for epispadias by Karl Thiersch in the 19th century.⁴

The penile curvature caused by hypospadias has been addressed via dorsal plication and mobilization of the urethral plate. When the urethral plate needs to be transected for optimum release, the native meatus can occasionally fall back to its proximal position. To get superior functional and cosmetic results in this case,

some surgeons favor single-stage urethroplasty while others recommend two-stage of surgery.⁵

Hypospadias surgery has been historically characterized by a multitude of techniques available for repair. Comparing the results of single-stage and two-stage repairs, meanwhile, has only been tried in a small number of investigations. This study compared single-stage and two-stage urethroplasty with regard to the outcomes and complications.

Method

This literature review description was synthesized and obtained from various online databases such as NCBI, Google Scholar, Science Direct, Elsevier, Springer Nature, Wiley Online Library, World Health Organization. The keywords used in the literature searching were Hypospadias, Classifications of Hypospadias, Urethroplasty for Hypospadias, Single-Stage Urethroplasty, and Two-Stage Urethroplasty. Scientific articles were selected based on the following inclusion criteria: (1) The journal can be freely accessed, (2) Publication year of journal is not less than 2012, and (3) Matched with the material discussed in this literature review. All selected literature is analyzed and the material is combined into a logical flow of ideas.

Discussion

Hypospadias

Definition

A congenital anatomical abnormality of the male external genitalia is called hypospadias. It is distinguished by aberrant growth of the ventral foreskin of the penis and the urethral fold, which result in incorrect location of the urethral opening.⁶ The external urethral meatus may be mispositioned to varying degrees and may also have concomitant penile curvature in hypospadias. Recent advances have made it possible for children less than 12 months to undergo a single-stage repair with relatively good outcomes.⁷

Classification

Hypospadias is classified by the location of the abnormal urethral meatus. One of the most commonly used classifications is as follows:⁸

1. Anterior (subcoronal and glandular) – nearly 50% of cases
2. Middle (distal penile, proximal penile, and midshaft) – 20% of cases
3. Posterior (scrotal, penoscrotal, and perineal) – 30% of cases

Such as classification (**Figure. 1**) should help to standardize the description of the different types of hypospadias and associated malformations all over the world.

Figure. 1 Different classifications of hypospadias, according to location of meatus⁴



Etiology

Although the precise cause of hypospadias is unknown, it is thought to be a combination of genetic, hormonal, environmental, and maternal factors.⁹

1. Genetic and familial factors

In the anterior and middle variants of hypospadias, these factors are more prevalent. Close relatives, such as the father and sibling, will develop hypospadias in 7% of cases.¹⁰ It can equally be passed down from the paternal and maternal families, however only 30% of instances have a definite genetic origin.¹⁰ A number of genetic syndromes can be linked to hypospadias, but the most prevalent ones are Smith-Lemli-Opitz syndrome, Denys-Drash syndrome, and WAGR (Wilms tumor, aniridia, genitourinary malformation, mental retardation).⁶

2. Hormonal factors

Hormonal factors, notably the imbalance between androgen and estrogen, are likely to have a significant role in the aberrant development of the urethra and the foreskin as hypospadias is sometimes linked to cryptorchidism and micropenis.¹⁰ It has been observed in boys with hypospadias that interrupted exposure to testosterone throughout fetal life can result in decreased anogenital distance.¹⁰ The prevalence of disorders of sexual development (DSD) is higher in newborns with posterior hypospadias.¹⁰ Male infertility, testicular cancer, hypospadias, and cryptorchidism have all been linked to testicular dysgenesis syndrome (TDS).¹⁰ TDS results from testicular maldevelopment and may be a significant hormonal component causing hypospadias.

3. Environmental factors

A few "environmental-endocrine disruptors" have been linked to animal research on hypospadias.¹⁰ The prospective impact of maternal exposure to hormonally active hazardous air pollutants (HAHAP) on hypospadias was also discovered in a recent human investigation.¹¹

4. Maternal factors

Severe hypospadias is linked to oligohydramnios, premature birth, monochorionic twinning, maternal hypertension, and oligohydramnios.¹⁰ It has been proposed that hypospadias results from insufficient exposure of prenatal testes to human chorionic

gonadotrophin (hCG). No cause-and-effect link, though, has yet been proposed.¹⁰

Epidemiology

Hypospadias is the second most common congenital disorder in males after cryptorchidism, but it is the most common penile congenital malformation. The incidence of hypospadias in the US has been reported to be one out of every 250 males (0,4%) while in Denmark the estimated prevalence is 0,5% to 0,8%. A South American study estimated the global prevalence at 11,3 of 10.000 newborns (less than 0,1%).¹²

Due to methodological limitations, it is challenging to quantify the precise incidence of hypospadias at birth.¹⁰ The prevalence in the United States is around 1 in 200 to 300 live male births, according to the monitoring systems there. In Europe, the frequency was reported to be 18.6 per 10,000 live births. While some research indicated alarm about the rise of hypospadias, other investigations were unable to detect it.¹⁰

Pathophysiology

The external genitalia of men go through two phases of development. Between 8 and 12 weeks of gestation, the initial hormone-independent stage comes into development. The external genitalia are bipotential at this stage and include two labioscrotal swells, two genital folds, and a genital tubercle. The genital tubercle elongates and the urethral plate (UP) develops into a groove near the tip of the genital tubercle during the second phase in the presence of the Y chromosome and the testosterone released from the fetal testes (and its conversion to dihydrotestosterone-DHT in local skin). The vaginal folds and labioscrotal swellings join together to produce the penile urethra and the scrotum, respectively. The penis is formed when the genital tubercle enlarges. Finally, the midline fusion of the foreskin and glans occurs. This phase lasts from 11 to 16 weeks of pregnancy. Hypospadias will result from any interference with this development.¹⁰

History and Physical

The aberrant positioning of the urethral meatus in baby males may worry the parents. The meatus is frequently stenosed, which can lead to the urine stream becoming narrow and splayed as well as

soaking underwear during micturition. In the upright posture, micturition may be challenging. A bifid scrotum and cryptorchidism may be present in posterior hypospadias, giving the appearance of ambiguous genitalia. Particularly in adults, the penis's curvature, which is more obvious during erection, might be the presenting characteristic. This may make it difficult to have a sexual encounter and prevent the semen from depositing in the vagina, which might result in infertility.¹⁰

A detailed medical history, including a family history of hypospadias, is required. Hypospadias is now diagnosed shortly after delivery. A glandular groove and a dorsal hood of the foreskin are important characteristics, although the prepuce is usually always ventrally lacking. Additionally, the placement of the urethral meatus is typically aberrant. After circumcision, the hypospadias could be seen if the baby has a full foreskin. Any hypospadias found during circumcision needs to be reported right away
4.

to a urologist, and the procedure should be stopped. A patient's related penile curvature, which may be seen during an erection, may exist in some cases.¹⁰

Evaluation

The classification of the hypospadias has changed throughout time. The classification most commonly used, divides hypospadias as follows: distal, midshaft, proximal (Figure. 2).⁷

1. Distal hypospadias is the most common (60% to 70%). It is also called anterior or minor and includes glandular and sub-coronal hypospadias
2. Midshaft hypospadias, also called penile, includes distal, midshaft, and proximal hypospadias
3. Posterior hypospadias includes peno-scrotal, scrotal, and perineal hypospadias.

Figure 2. Increasing severity of hypospadias (left to right): distal, midshaft, penoscrotal, and perineal⁷



Patients may have a hooded foreskin, which is defined as abundant foreskin in the dorsal side of the penis and nonexistent or sparse foreskin in the ventral surface of the penis, regardless of where the meatus is located.⁷

The urine stream is often unaffected by moderate hypospadias, but in more severe cases, the meatus may constrict and the angle of the stream may be slanted downward. Patients with aberrant penis angulation may experience uncomfortable erections, reduced fertility due to abnormal ejaculation, and in certain circumstances, difficulty penetrating during intercourse.⁷

In the majority of individuals, hypospadias manifests as a solitary abnormality, however it can occasionally coexist with other genito-urinary anomalies. Inguinal hernias and cryptorchidism, both of which occur often in proximal hypospadias (8% to 10% of cases each), are the two most frequent malformations. Other genito-urinary abnormalities, including vesicoureteral reflux, ureteropelvic junction obstruction, pelvic or horseshoe kidneys, crossed renal ectopias, and renal agenesis, are more frequently observed in patients with proximal hypospadias but can also occur in a small number of patients with distal hypospadias.⁶

Treatment/Management

The purpose of surgery is to enhance genital attractiveness, stop splaying of the urine flow, allow the patient to pee while standing, eliminate sexual problems brought on by curvature, and enable semen deposition into the vagina during sexual activity. Isolated glandular hypospadias, on the other hand, frequently does not require surgical treatment.¹⁰

Hypospadias is often surgically rectified between 6 to 18 months of age, depending on the severity, if it manifests in the early stages of life.¹³ Some surgeons advise preoperative testosterone supplementation because they believe that micropenis, which is defined as penile length below the third percentile, may lead to technical problems. In contrast, only modest penile development happens during the first few years of life, and there is insufficient data to recommend testosterone supplementation. Delaying surgery therefore has minimal advantage. Another reason why this is significant is that teenagers who cannot remember having their genitalia operated upon were more likely to have a favorable body image than those who can. An individual's "genital awareness" begins at the age of 18 months, therefore having surgery early in life might lessen the psychological consequences. Additionally, surgery performed in later life is linked to higher difficulties, most likely as a result of increasing urethral secretions and nocturnal erections. The age of the repair and the likelihood of problems were not linked, according to other research.¹⁰

The use of magnification, delicate instrumentation and suture materials, non-traumatic tissue manipulation, and appropriate hemostasis are the fundamental prerequisites. A single-stage is used to correct the majority of anterior and middle hypospadias.¹³ A two-stage technique is frequently required for the posterior variant, though.¹³ Following are the steps involved in hypospadias surgery:

1. Penile degloving: To determine the degree of chordee, this is crucial. The release of all penoscrotal tethering bands is necessary.¹³
2. Orthoplasty: This procedure straightens up the penis' ventral curvature while preserving its length and erection.⁷ Typically, curvature less than 15 degrees does not require any correction, however curvature more than 30 degrees necessitates a complex operation.⁷ The corpus

spongiosum is liberated from the corporal bodies after degloving, and the glans wings are lifted. After that, the dorsal placcation, proximal spongiosum dissection, and distal urethral plate division are performed. The fibrotic spongiosum is sliced several times in a tiny area. Next, corporotomy is done incising the tunica of the corpora cavernosa, and the resulting ellipsoid defect is covered with a graft from the skin, intestinal submucosa, or testicular tunica vaginalis.⁷

3. There are several methods for urethral reconstruction, which are frequently determined by the surgeons' training and expertise. Urethral plate (UP) tubularization, UP augmentation, and UP replacement are a few examples.¹⁴
4. Glansplasty: This is the reconstruction of the glans penis, where extensive dissection of the glans is done to create a midline, anterior-based flap. The tubularized urethra is brought out through the incision made on the glans. Finally, cosmetic skin coverage is done to give the appearance of a circumcised penis.⁷

In some cases, patients before surgical repair undergo systemic treatment with testosterone derivatives to increase the penile size and allow better tubularization and avoid or decrease dehiscence, although there are no specific guidelines for the use of testosterone. Surgery is recommended when the patient is between 6 and 18 months of life to limit psychological stress and behavioral problems that have been seen in patients who undergo the treatment later in life. Late repairs are usually associated with more complications including urethra-cutaneous fistulas. The repair of hypospadias is complex and involves many steps.⁷

Prognosis

Overall, if the problem is corrected early, both the moderate and proximal forms of hypospadias have favourable prognoses. Following surgical treatment of hypospadias, particularly the posterior form, males may have symptoms of the lower urinary tract, such as obstruction of urine flow, hesitancy, etc. Following hypospadias surgery, meatal stenosis, fistulas, and urethral stenosis are often reported sequelae. Therefore, long-term monitoring is required until "genital maturity" is reached.¹³ Less desirable

aesthetic consequences are associated with the posterior and complicated hypospadias of these. Due to their "altered" genital look, some men worry about how others may perceive them.

Complications

The older the age, the higher the rate of complications after surgery. Hypospadias is best repaired by a team that has experience in dealing with this deformity. Immediately after surgery, edema and minor blood spotting are common. Some cases of bleeding may require a return to the operating room. Infections are rare. In the long term, urethrocutaneous fistulas are a major concern; they are far less common when the surgery is done in a single-stage. These fistulas rarely close spontaneously and usually require a skin flap. However, it is vital to avoid hair-bearing skin as a flap because it may result in recurrent urinary tract infections and a nidus for stone formation. Even after repair, recurrence of the fistula is common. Other complications including meatal stenosis, urethral strictures, urethral diverticulum, and erectile dysfunction.¹⁵

Urethroplasty

Decision making for urethroplasty is aided by a variety of proposed algorithms and surgical approaches.¹⁶ According to current procedures, the choice of operation is frequently influenced by the surgeon's experience. It is hoped that ongoing attempts to prospectively monitor surgical results would result in more consistent, fact-based hypospadias decision-making. Surgery can be broken down into one- or two-stage operations as well as into operations including tubularization, augmentation, and replacement of the urethral plate (UP).⁷

UP Tubularization

This urethroplasty technique comprises several procedures that involve tubularization of the UP distal to the hypospadiac meatus. The Thiersch Duplay technique and the glanular approximation procedure (GAP) procedure involve simple tubularization of the UP after lateral incisions circumscribing the meatus. The TIP procedure proposed by Snodgrass in 1994 involves a midline incision of the UP to widen it and achieve a better caliber urethra, which is then tubularized. The superior cosmetic results and the low incidence of complications has led to wide

consensus that the TIP urethroplasty is the most commonly used technique for distal hypospadias.¹⁴ An alternative technique, which discards the distal UP and relies on urethral mobilization to bring the meatus to an acceptable location, involves dissection of the urethra proximally to allow an advancement of the meatus to the glans.⁷ This procedure obviates potential complications, such as urethrocutaneous fistula, but achieves limited advancement even after extensive proximal mobilization.¹⁷

UP Augmentation

Snodgrass et al, who devised the TIP procedure, have shown that UP width does not impact results of tubularization using the TIP technique. However, alternative UP augmentation techniques have been used selectively in cases with poor UP quality. An inner preputial free graft, referred to as a "Snodgraft" procedure places a preputial inlay graft on the incised surface of the UP with the premise that a graft covering a deep UP incision would decrease scarring. The Mathieu procedure flips a rectangular piece of foreskin distally, which is sutured to the edges of the UP on either side as an onlay flap to the UP. A transverse island flap, described by Asopa and Duckett, is derived from the dorsal preputial hood and can also be translocated ventrally to provide an onlay flap to augment the UP. Several studies with blinded raters have found superior cosmetic outcomes for TIP compared to Mathieu or onlays.⁷

UP Replacement

In the presence of significant VC, a proximal hypospadias, and a poor UP, urethral transection may be required, thereby, precluding the use of UP tubularization. There are several management options for urethroplasty in this situation. Most surgeons prefer to perform a two-stage urethroplasty with an initial preputial graft placement or a Byars flap followed by a second stage tubularization after six months. Alternative options include the Koyanagi repair and its modifications or a composite repair involving tubularization proximally and distally with a transverse preputial flap onlay in the middle.⁷

Outcomes

1. Distal hypospadias

The outcomes of distal hypospadias repair are favourable, with a low incidence of redo surgery, but

complications are encountered in 5–10 % cases. A systematic review of outcomes of the TIP urethroplasty and the Mathieu procedure for distal hypospadias showed a lower fistula rate in the TIP group (3.8% vs. 5.3%) and a lower stenosis rate in the Mathieu group (0.7% vs. 3.1%).¹⁸ The use of dartos coverage and stents was associated with lower complication rates in this review.

2. Proximal hypospadias

With a severe curvature, proximal hypospadias has a significant and varied complication risk of 15 – 56%.¹⁹ Although the evidence in favor of this method is minimal, two-stage procedures for proximal hypospadias correction in boys with >30° VC offer a dependable and reproducible alternative for success. Other practices that are thought to lower complication rates include the use of preoperative androgen stimulation, tunica vaginalis flap covering during the repair, and prolonged glans wings dissection.⁷

Management of Complications

The common complications following hypospadias repair include: Urethrocutaneous fistula, meatal stenosis, urethral stenosis, glans dehiscence, urethrocele, cosmetic issues, hair-bearing urethra, recurrent/persistent penile curvature, spraying or misdirected urinary stream and/or irritative symptoms, erectile dysfunction, and balanitis xerotica obliterans leading to strictures.⁷

The management of hypospadias repair complications are performed after a period of healing over 4–6 months, with the exception of urethral or meatal stenosis, which require more emergent attention. Urethral fistula closures involve excision and closure of the fistula with adequate dartos flap coverage after excluding distal urethral stenosis. Coronal or more distal fistulas may also require a redo glansplasty. Symptomatic meatal stenosis will often require a dilatation or a meatotomy. Glans dehiscence can be managed with reoperative glansplasty. When a redo urethroplasty is required, the degree of postoperative scarring and the possibility of balanitis xerotica obliterans (BXO) may dictate reoperative management. A redo TIP procedure can be a viable option in the presence of a non-scarred urethral plate or primary glans dehiscence. In the absence of dorsal preputial tissue,

a buccal graft harvested from the lip or cheek can be used to perform a stage redo procedure for more scarred or proximal repairs.²⁰

Functional Outcomes after Hypospadias Repair

The majority of hypospadias outcome papers focus on surgical complications and there are few publications assessing long-term functional outcomes. Obstructive flow based on evaluation of Qmax lower than the 95th percentile was found in 13.5% of patients compared to 2.9% of controls. Fortunately, low flow rates have been found to improve in a majority of patients by puberty.²¹ A recent review of 93 adults with hypospadias presenting to a reconstructive urologist highlight the long-term issues that can occur following childhood repairs, including lower urinary tract symptoms (55%) and significant rate of urethral stricture (47%), although there is a selection bias in this study.²² Long-term sexual issues, such as erectile dysfunction, ejaculatory difficulties, lower self-esteem, teasing, and negative genital perception, have been reported in patients with hypospadias.⁷ Several studies have found overall sexual function to be equivalent or slightly lower compared to controls.²³

Single-Stage and Two-Stage Comparison

1. Single-Stage Urethroplasty

Single-stage urethroplasty can be used for anterior to posterior hypospadias. Developed from a simple technique for epispadia by Karl Thiersch in the 19th century, Anger and Duplay used tubularization for hypospadias repair, utilizing urethral plate and ventral penile skin to form the urethral tube.⁴ Duckett popularized the one-stage transverse tubularized preputial island flap technique intended for severe chordee hypospadias with a long urethral defect (up to 2–6 cm). Elder et al. described the onlay preputial island flap to overcome the flaws of the Mathieu perimeatal-based flap, demonstrating the use of the transverse preputial island flap as augmentation for the native urethral plate for anterior or middle hypospadias with minimal chordee. In 1994, Snodgrass introduced tubularized incised plate (TIP) urethroplasty technique for anterior hypospadias with minimal chordee. For severe hypospadias, Koyanagi et al. pioneered the use of the meatal-based ‘manta-wing’ and paramental-based flap with circumferential foreskin flap urethroplasty in a single-stage fashion.

The single-stage repair (Duckett technique) was performed according to the description in the literature. A circumferential incision was made proximal to the corona and reached a depth of Buck's fascia. The dorsal skin was degloved toward the proximal penis, and the scar fiber around the corpus spongiosum was excised to release the chordee. An artificial erection was induced to identify the site and degree of chordee. The urethral plate was transected to correct the accompanying chordee after the ventral dissection and urethral plate mobilization failed to release the curvature completely. After urethral plate transection, the meatus dropped back to the penoscrotal junction or the proximal shaft. If the curvature was not completely corrected, dorsal plication or a patch of tunica vaginalis free graft was used to correct the refractory penile curvature. The distance between the retracted meatus and the glans tip was measured to confirm the expected length of the neourethra. The rectangular flap was outlined at the inner aspect of the dorsal prepuce with methylthioninium chloride according to the length of the defect. The outlined foreskin was incised and rolled into a tube over a catheter and sutured with 6-0 polydioxanone sutures. The size of the catheter ranged from 8 to 14 Fr and depended on the diameter of the patient's urethra. The tubularized neourethra was transposed ventrally and anastomosed with the native urethra with mucosa-to-mucosa sutures. The glans was incised deeply, the neourethra was placed, and the new meatus was sutured on top of the glans.²⁴

Urethrocutaneous fistula is the most common complication following urethroplasty, and often emerges early (<12 months) at the coronal-subcoronal level with/without glans dehiscence or late (>12 months) after urethroplasty. Single-stage urethroplasty is a versatile procedure for various hypospadias cases, with an overall urethrocutaneous fistula rate of 12.8%. Posterior hypospadias, preoperative pyuria and longer urethral defect were associated with urethrocutaneous fistula formation.³

2. Two-Stage Urethroplasty

The first steps of the two-stage repair (incision, degloving the penis, releasing the curvature) were identical to those described for the single-stage repair. A rectangular buccal mucosa graft or transverse inner dorsal preputial pedicle flap was dissected according to the length of the defect. The

glans was then split to facilitate dissection of the glans wings. The grafts or flaps were quilted from the native plate to the glans to create a neourethral plate. A protective tie-over dressing was placed to reduce the chance of hematoma collecting under the graft. The repair was completed 6 months later using the Snodgrass modification of the standard Thiersch–Duplay technique. The neourethral plate was deeply incised along its entire length, followed by tubularization over a 8-Fr to 14-Fr urethral stent.²⁴

Despite many reports of the clinical use of two-stage surgery in recent years, most surgeons still choose for the one-stage approach for proximal hypospadias.²⁵ In comparison to single-stage urethroplasty, two-stage urethroplasty of proximal hypospadias had much less problems. Specific problems for two-stage repairs were much lower for foreskin free graft (FFG) than for foreskin pedicled flap (FPF), but overall complications were not significantly different. Higher case loads enhanced the outcomes of two-stage procedures, lending credence to the idea of specialized hypospadias centers.²⁶ The two-stage urethroplasty is preferred for treating proximal hypospadias with severe chordee after correction via urethral plate mobilization and transection. In contrast, the Duckett technique should be used with caution.²⁴

Conclusion

Hypospadias is a congenital anatomical abnormality of the male external genitalia caused by unknown but affected by genetic, hormonal, environmental, and maternal factors. Hypospadias is often surgically rectified between 6 to 18 months of age, depending on the severity, if it manifests in the early stages of life. Urethroplasty can be broken down into single- or two-stage operations as well as into operations including tubularization, augmentation, and replacement of the urethral plate. Single-stage urethroplasty can be used for anterior to posterior hypospadias. In comparison to single-stage urethroplasty, two-stage urethroplasty of proximal hypospadias had much less problems. The two-stage urethroplasty is preferred for treating proximal hypospadias.

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