14 Modifications in Inner Prepucial Flap Repair of Hypospadias

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14.1 Introduction

TIP urethroplasty is the standardized approach for most distal and middle hypospadias. But the management of severe hypospadias remains the "Holy Grail" of hypospadiology [1]. Surgical technique in single-stage and two-stage repairs is described for the management of severe hypospadias with variable results. However, two-stage repairs are not free of complications. A recent review shows comparable results of one and two-stage repair. The urethral plate should be preserved and used in the modern approach for any hypospadias repair if possible [2]. Recently tubularized incised plate urethroplasty is being chosen more frequently for proximal hypospadias repair [3]. Other techniques for these patients are onlay flap urethroplasty, transverse island flap urethroplasty, and multiple stage repair. The urethral plate is usually transected and resected to correct chordee in proximal hypospadias. And transverse flap or skin graft urethroplasty is done for a single-stage repair.

If the prepucial flap falls short, it forcing the surgeon to go for a two-stage repair in some of the cases. Glassberg (1987) used an augmented Duckett repair for these cases. First, a part of the neo urethra is constructed with midline skin and is anastomosed to the inner prepucial skin tube [4]. The complications are very high, varying from 25% to 42%, as reported in the literature [5, 6]. The flap procedures and two-stage approach are preferred in proximal hypospadias with severe curvature and poor urethral plate, re-operative hypospadias and balanitis xerotica obliterans [7–9]. The chordee is corrected by resecting the urethral plate in the first stage and is substituted with either a genital (prepuce) or extra-genital graft (Buccal mucosa or post-auricular skin). The second stage, urethroplasty, reconstructs the neourethra with a substituted urethral plate after 6 months. Long-term cosmetic results of the two-stage inner prepucial skin graft urethroplasty and buccal mucosal grafts are reported to be good. Still, voiding and ejaculatory problems have been reported in up to 40% of the cases [8].

Disadvantages of the two-stage repairs are multiple surgeries causing the loss of patient's or parents' time and money. There are chances of some late complications such as post-void dribble,

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A. Bhat (ed.), *Hypospadiology*, https://doi.org/10.1007/978-981-16-8395-4_14

splaying of the stream, anejaculate and milking of the ejaculate. The advantages of a single-stage repair are the availability of unscarred healthy skin, less financial burden, cost-effectiveness, a decreased anesthesia risk and separation anxiety, and a better psychological impact [10, 11]. The complication rates in single-stage procedures using inner prepucial flap have been reported from 17% to 42%, with an average of 32% [5, 12, 13]. The repair offers greater convenience, comfort, and ease to the patients' parents and the surgeon.

Flap repair in hypospadias has a very long history. Bouisson (1861) was the first to describe flap use in hypospadias repair [14]. Inner Prepucial flap repairs were the mainstay of treatment in the nineteenth century. There have been many modifications in the flap repairs from time to time.

Island flap technique (Asopa 1971) [15], transverse prepucial island flap procedures (Duckett 1980) [16], and double island flap technique (Asopa 1984) [17] were frequently performed for proximal hypospadias in the 1980s and 1990s. These time-tested procedures have lost their sheen, even to the extent that the Tubularized Duckett tube was considered history in a recent round table discussion by Hypospadiologists [7]. But, the procedures are in practice even today. Unfortunately, a high incidence of late complications brought the flap procedures to disrepute. Though flaps have better blood supply, but the flap results were poorer than grafts, and two-stage procedures have replaced the flap procedures with Buccal Mucosal and Skin grafts. We prefer a single-stage procedure in severe hypospadias because of comparable results of one stage or two stages of urethroplasty. Some modifications in the flap procedures to reduce the complications have been suggested utilizing the concept of urethral plate preservation in hypospadias repair and providing a functional urethra up to the penoscrotal junction [1]. So we modified the flap repairs to improve the results.

14.2 Modified Flap repair (Surgical Technique) [1]

The steps of modified flap repair are:

1. Chordee correction
2. Raising inner prepucial flap and tubularization of skin flap
3. Tubularization of mobilized and preserved urethral plate
4. Bringing the skin tube ventrally
5. Inner prepucial skin tube is anastomosed to the tubularized urethral plate and covering it with spongiosum
6. Anastomosis of inner prepucial skin tube to glans tip
7. The inner prepucial skin tube is covered with dartos and fixed to corpora
8. Scrotoplasty and skin closure

14.2.1 Chordee Correction

An adrenaline solution of 1:100,000 is injected at the proposed incision site, and a circum-coronal circumferential incision is given. Penile skin degloving is done by dissecting at Buck's fascia. The urethral plate transaction is done at the corona, and the urethral plate with spongiosum is mobilized proximally up to the meatus dissecting at the tunica albuginea. The mobilized urethral plate and spongiosum are preserved for the proximal segment of the neo-urethra (Fig. 14.1a–d). Gittes test is done to confirm chordee correction. Midline and lateral dissection of Buck's fascia correct the ventral curvature if persist, and the same is ensured by penile erection test. Dorsal plication is done if persisted chordee is less than 30 degrees & superficial corporotomies/corporoplasty for more than 30 degree. Gittes test is repeated to ensure the complete correction rather than relying on the visual impression of chordee correction alone.

Step-by-step correction of chordee is done in the patients in whom a urethral plate preservation procedure is planned. Chordee correction is being attempted by the urethral plate with the spongiosum and urethra mobilization; the urethral plate is still attached to glans and chordee can still not be corrected because of short spongiosum segment due to tethering of the urethral plate (Fig. 14.2a–d). The urethral plate is transected at the corona to correct the curvature (Fig. 14.2e), and the plan is changed to flap urethroplasty. Gitte's Test is done to confirm the

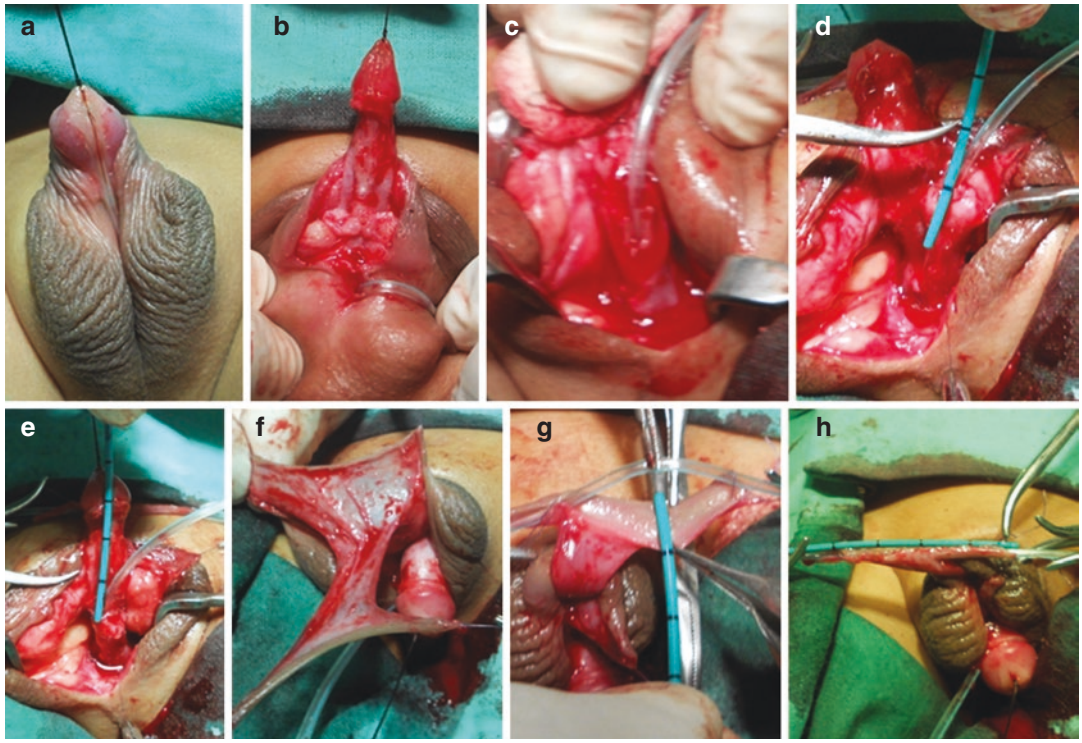

Fig. 14.1 Showing the correction of chordee, length of required neo-urethra, raising & measuring. (**a**) Scrotal hypospadias with bifid scrotum. (**b**) Penile skin degloving and urethral plate with spongiosum mobilization. (**c**) and (**d**) Measuring the length of mobilized and preserved urethral plate. (**e**) Measuring the required length of the flap. (**f**) Mobilization of the inner prepucioplasty flap. (**g**) Measuring the flap width. (**h**) Measuring the flap length

chordee correction (Fig. 14.2f), and residual curvature (if any) is again corrected by midline dissection of corporeal bodies, lateral dissection of Buck's fascia with or without superficial corporotomies/dorsal plication. Chordee correction is always confirmed at its completion by the Gittes test. Minimal electrocautery should be used to avoid postoperative fibrosis.

14.2.2 Mobilization of Inner Prepucial Flap and Tubularization

A dissection plane is created between the two layers of dartos fascia in the de-gloved penis & the pedicle is dissected up to the penis root to prevent the penile torsion (Fig. 14.1f). The required length is measured from the tip of the glans to the receded meatus after chordee correction. The flap is measured slightly longer than this length after stretching the skin (Figs. 14.1e, g, h and 14.2g, h), the width of the flap is measured according to the size of the urethra as per the age of the child, and measurement is done after stretching the flap to a distance of 1–2 cm to have the same width over the whole length (Figs. 14.2i, j and 14.3a–c). Measuring the width of the unstretched skin flap may result in a larger size of the flap (Fig. 14.4a–d), leading to diverticula formation. Figure 14.4 shows a 5–8 mm difference in width when measured on stretching. Skin is trimmed to have an adequate width of the flap to prevent urethral diverticula. The mobilized inner prepucial flap is tubularized with 6-0 or 7-0 PDS sutures over a 6-8 Fr urethral stent. The sutures are taken in a sub-cuticular inverting fashion, either interrupted or continuous. Sutures at both ends are always taken interrupted to allow trimming of the skin tube if required. Trimming the skin tube is done if the

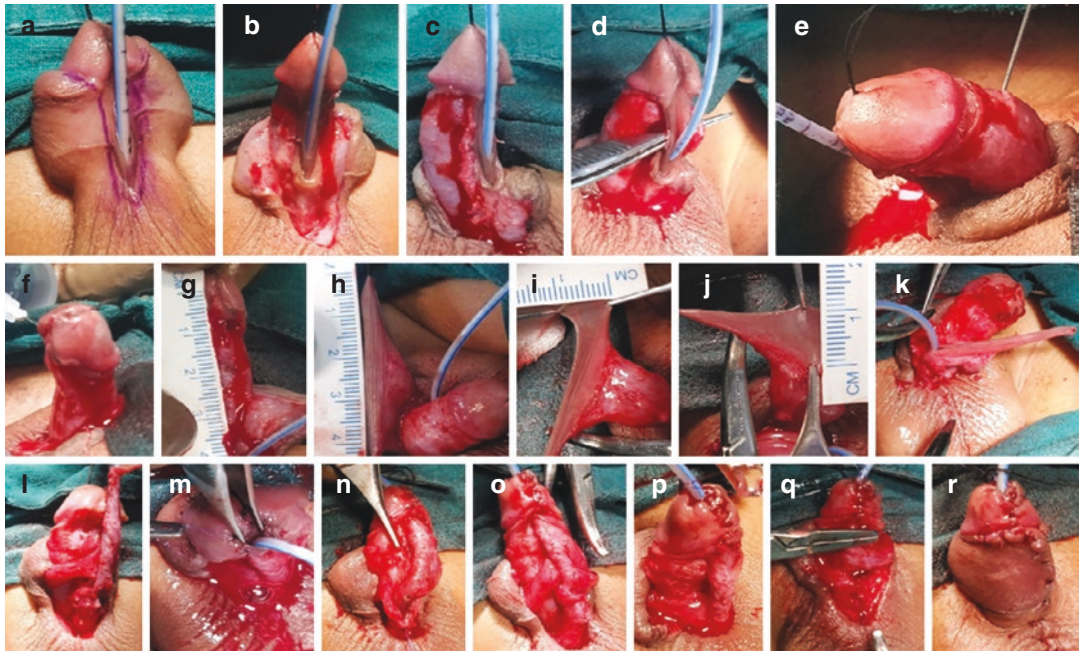

Fig. 14.2 Showing the steps of modified flap repair. (**a**) Penoscrotal hypospadias with moderate chordee. (**b**) Penile Skin degloving. (**c**) and (**d**) Urethral plate and spongiosum mobilization. (**e**) Gittes test showing persistence of chordee. (**f**) Gittes test showing chordee correction after urethral plate transection at corona. (**g**) Measuring the required length of the neourethra. (**h**) Measuring the flap for required neo-urethra length. (**i**) Measuring width at different places. (**k**) Anastomosis of the flap to the urethra. (**l**) Tubularization of the inner prepucial flap. (**m**) Distal anastomosis to the glans margins. (**n**) Glanuloplasty. (**o**) Spongioplasty over the anastomosis. (**p**) and (**q**) Dartos cover over the skin tube. (**r**) Final picture after skin closure

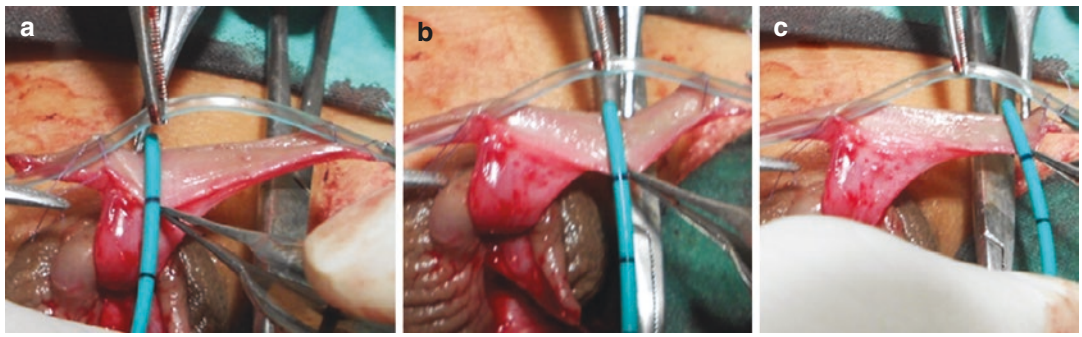

Fig. 14.3 Showing the measurement of the flap width at 2 cm distance. (**a**) Measuring flap width on left end of flap, (**b**) Measuring flap width on mid-part of flap, (**c**) Measuring flap width on right end of flap

terminal portions' vascular supply is questionable or the flap is excessive. Bucking of the neo-urethral tube is avoided if continuous sutures are used. The other skin flap tubularization technique is to complete the skin flap's anastomosis to the urethral plate and then tubularize it on the dorsal side (Fig. 14.2k, l).

14.2.3 Tubularization of Preserved Urethral Plate and Spongioplasty

The preserved urethral plate's length may vary 1–2 cm (Fig. 14.1d). The mobilized urethral plate is tubularized with continuous 6-0 or 7-0 PDS or

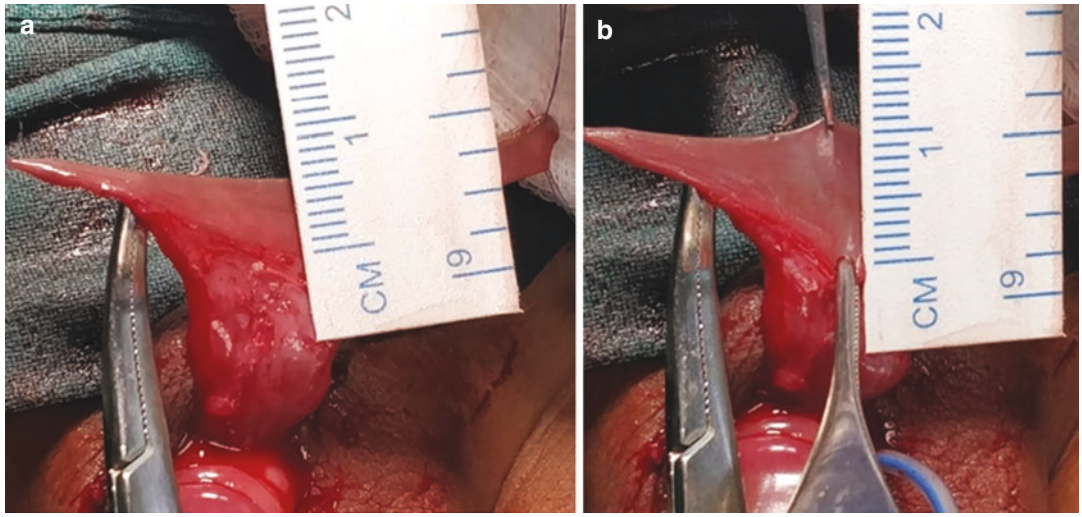

Fig. 14.4 Showing the difference in width un-stretched and stretched flap. (**a**) Un-stretched width center 7 mm. (**b**) 11 mm after stretching

5-0, 6-0 Vicryl/PDS suture to construct the proximal urethral segment with spongiosum as long as possible. Preferably the proximal neo-urethra segment with spongiosum should be reconstructed up to the penoscrotal junction. If needed, the proximal urethra can be mobilized up to the bulbar region to increase the proximal urethral length (Fig. 14.1c). Addition of this tubularized urethra with spongiosum reduces the required length of skin tube and reduces the complications. The addition of this tubularized urethral plate segment enhances the chances of a successful single-stage repair in cases where inner prepucial skin falls short. The longer the segment of tubularized urethral plate with spongioplasty, the fewer chances of late complications.

14.2.4 Bringing the Inner Prepucial Flap Ventrally

Traditionally, the skin flap is brought ventrally from one side of the shaft, which is likely to cause traction on the pedicle and torsion of the penis. We make a hole in the dartos flap sparing the vessels, and the skin tube is brought ventrally, keeping one-half of dartos on each side. Extra care is taken not to damage the pedicle vessels. This will prevent traction on the vascular pedicle, maintain the skin flap's vascular supply, and the shaft's symmetry (Fig. 14.5a, b).

14.2.5 The Anastomosis of the Tubularized Inner Prepucial Skin Flap & the Tubularized Urethral Plate Covering it with Spongiosum

The urethral plate's mucosa preserved is denuded to about 8–10 mm from the margin of the urethral plate. In cases with a very narrow and poorly developed urethral plate, the urethral mucosa is resected, preserving the spongiosum to cover the anastomosis and the skin tube. The anastomosis of the neo-urethras is done in an elliptical shape with 6-0 PDS or Vicryl interrupted inverting sutures, with the spongiosum spared to cover the anastomosis keeping the stent in situ (Fig. 14.1c). The anastomosis is covered with spongiosum to prevent fistula at the site of anastomosis (Fig. 14.1d). In case of tension on the suture line, the spongiosum is sutured to the dartos flap to cover the anastomosis with healthy tissue of the spongiosum and dartos. It is important to protect the anastomosis with healthy vascular tissue to ensure proper healing (Fig. 14.6a–c).

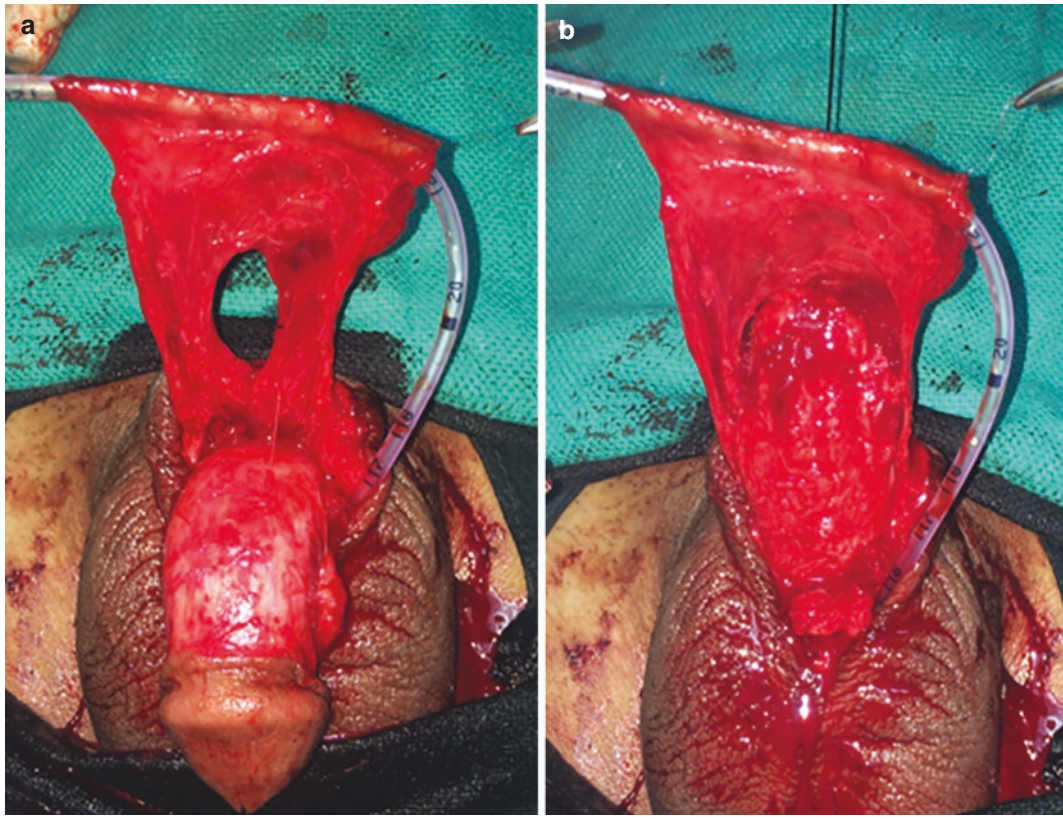

Fig. 14.5 (**a**) Showing Button holing in the pedicle of the flap. (**b**) Flap brought ventrally taking penis above though the hole

14.2.6 Distal Anastomosis

Glanular wings are dissected deep up to the tunica albuginea and laterally to raise wide glanular wings. These glanular flaps have intact mucosa inside. The anastomosis of the transverse island flap skin tube is done 5–8 mm proximal to the glans' tip with 6-0 PDS/Vicryl, (Fig. 14.7a) thus preventing the skin's protrusion on the glans. The glanular wings are sutured to reconstruct a wide natural-looking meatus to reduce the chances of meatal and sub-meatal stenosis (Fig. 14.1e and Fig. 14.7a–c). There should be adequate space between the skin tube and sutured glanular wing to avoid vascular compromise and postoperative edema.

14.2.7 Covering of Skin Tube with Dartos and its Fixation to Corpora

The suture line of the skin tubularization is kept dorsally opposing the corporal bodies, and few interrupted sutures are taken to fix it to the corpora. The skin tube is covered by suturing the dartos pedicle from both sides, sparing the vessels, and the skin tube is fixed to the corpora on both sides to decrease the laxity of the tube. Proximally, the dartos is sutured to the spongiosum. Thus, the whole length of the tubularized skin tube is covered either with the dartos or the spongiosum (Fig. 14.8a, b).

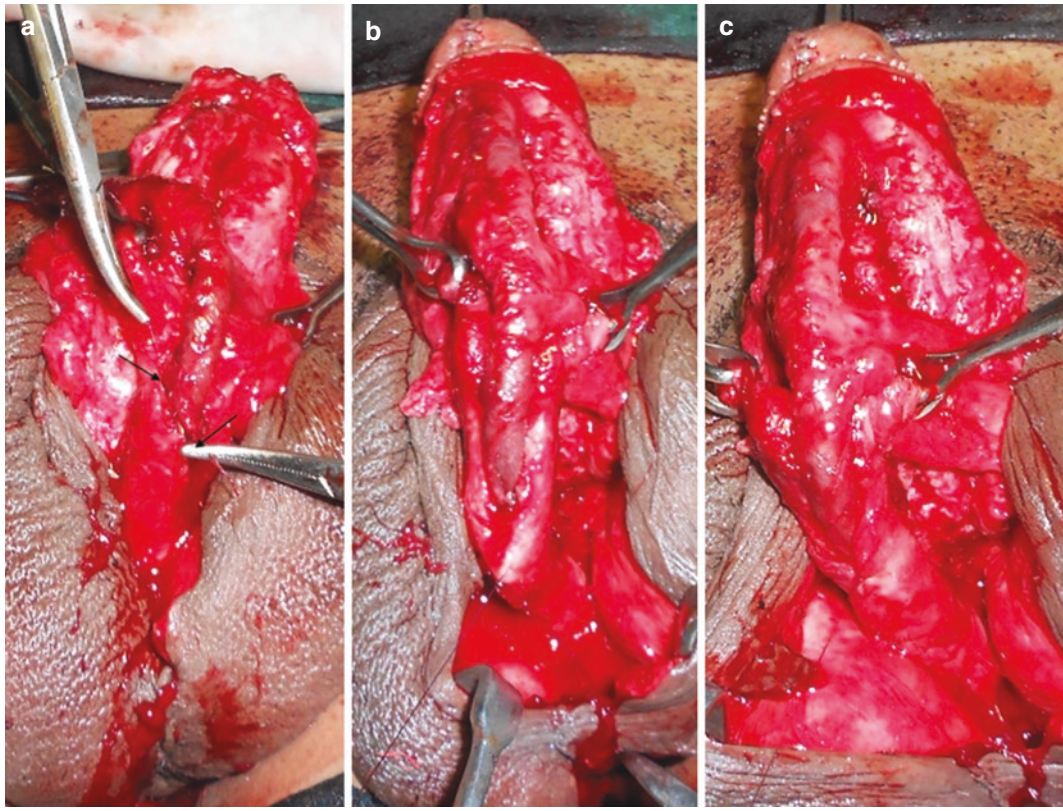

Fig. 14.6 Showing anastomosis of neourethra with urethra and covering it spongiosum. (**a**) Elliptical anastomosis of neo-urethra and urethra. (**b**) and (**c**) Covering the anastomosis with spongiosum (with permission Bhat et al. [1] @ copyright Elsevier)

14.2.8 Scrotoplasty and Skin Closure

Depending upon the severity of penoscrotal transposition, scrotoplasty is done. In mild penoscrotal transposition, scrotal skin is mobilized & the midline skin is excised. The scrotal sac is also mobilized then sutured in the midline over the neo-urethra in two layers, and then skin closure is done (Fig. 14.8c). In severe penoscrotal transposition, scrotal flaps and then scrotal sacs are mobilized on both sides and sutured in the midline in three layers after excising the midline skin. Thus, the proximal neo-urethral anastomosis is covered by the reconstructed scrotum, which prevents the fistula at the proximal anastomosis. Skin closure is done after putting in a drain tube and the stent; the drain tube is taken out in 2–3 days, and the urethral stent is removed after 10–14 days.

14.2.9 Postoperative Protocol

The patients are asked to follow up 1, 3, 6, and 12 months after the surgery and then yearly. They are evaluated for the urinary stream, uroflowmetry, and cosmetic function (Fig. 14.9) and complications are noted and rectified accordingly.

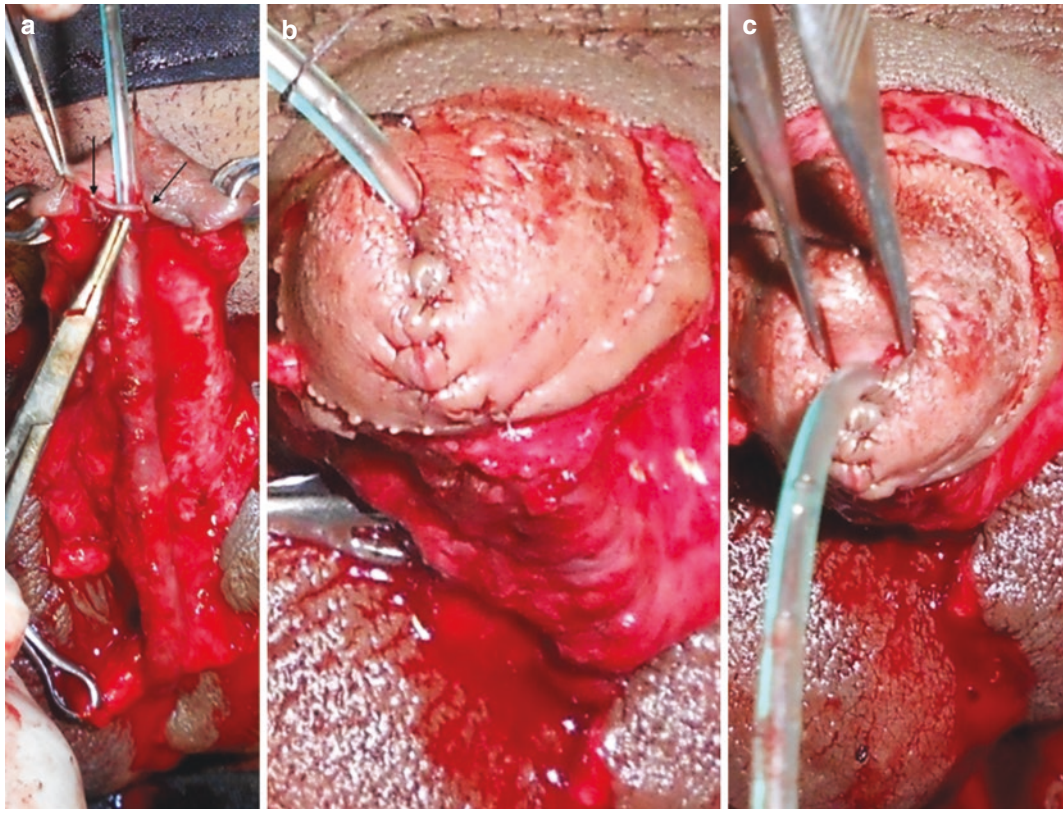

Fig. 14.7 Showing distal anastomosis of skin tube and glanular wings. (**a**) Anastomosis of skin tube with glanular wings. (**b**) and (**c**) Completed anastomosis and glanuloplasty with the large meatus (with permission Bhat et al. [1] @ copyright Elsevier)

The meatus is calibrated at 6 and 12 months. If uroflow is poor and meatus is found narrow, then these cases are identified as meatal stenosis. Meatoplasty is considered if meatal dilatation is required beyond 6 months. Urethrogram is done in suspected cases of the urethral stricture and diverticula and managed accordingly.

14.3 Prevention of Complications in Flap Repairs

Common complications that led the flap repair to disrepute are high fistula rate, diverticula, torsion, asymmetry of the shaft, and greater disfigurement than two-stage repairs. Results of two-stage repair are claimed to be better than the tubularized skin repair in one stage. Let us see the technical differences in the two-stage and the one-stage flap repair. The graft is stretched and fixed to the corpora in two-stage repair that facilitate keeping the exact width and length of the urethral plate in the second stage of the repair. Fixity of the graft helps in ensuring a good blood supply. While in flap tube repairs, wider flap tube than required, skin tube is not fixed, allowing the turbulence in the urine flow, leading to diverticula and fistula. Another technical point is to bring the skin tube pedicle from one side of the penile shaft responsible for torsion and asymmetry of the penile shaft. The dartos covers neourethra in two-stage repair, but in flap repair, it lies just below the skin lacking the dartos support that may be responsible for fistula and diverticula. There is no anastomosis in two stages but in one stage two anastomoses, skin tube with urethra and glans skin distally. A circular anastomosis may cause stricture and meatal stenosis and,

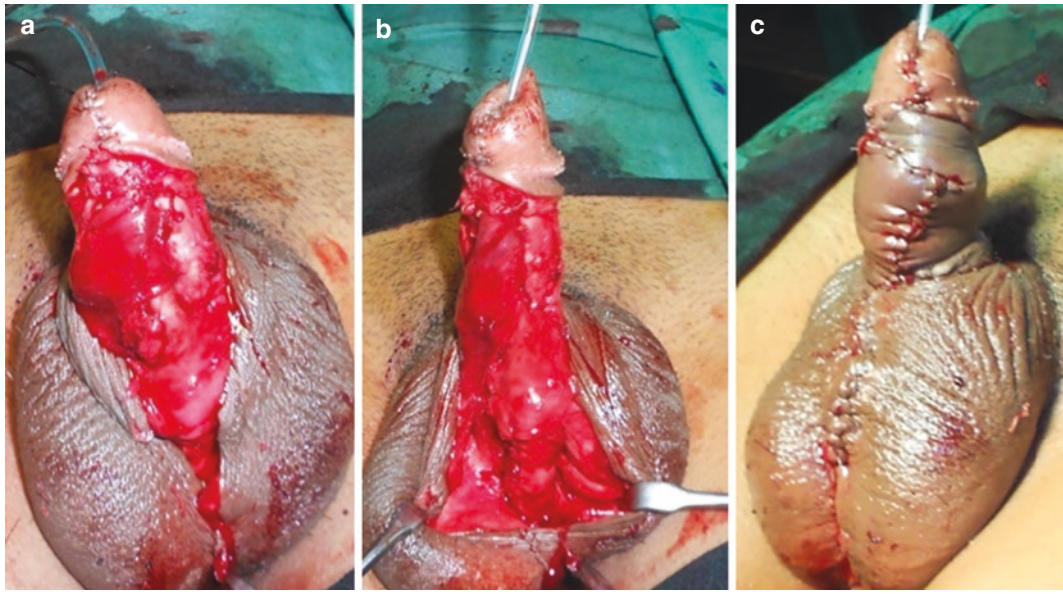

Fig. 14.8 Showing healthy tissue cover over the skin tube and Scrotoplasty. (**a**) and (**b**) Proximally spongiosum and distally with dartos over the neo-urethra. (**c**) Scrotoplasty and skin closure (with permission Bhat et al. [1] @ copyright Elsevier)

Fig. 14.9 Postoperative straight penis with the normal-looking meatus

poor healthy tissue cover over proximal anastomosis may lead to fistula. Modified flap repair eliminates all these pitfalls of flap repairs. The modifications are:

1. Rather than excising the urethral plate and spongiosum, we mobilize, preserve, and utilize it.
2. Measuring the length and width of flap after stretching the skin.
3. The vascular pedicle is brought ventrally by making a Buttonhole in the middle sparing the vessels.
4. Proximal segment of the urethra is reconstructed by the preserved urethral plate tubularization and spongioplasty, reducing the required length of the skin tube.
5. Skin tube is fixed to the ventral surface of the corpora.
6. Skin tube is covered in its whole length by the dartos pedicle.
7. Ugly skin outside the external urethral meatus can be prevented by anastomosis 5–8 mm proximal to the meatus to create a wide meatus.

14.3.1 Fistula

The fistula's commonest site in a single stage with inner prepucial flap urethroplasty is at anastomosis of the tubularized skin tube and urethra

[18, 19]. However, it may form anywhere along the whole length of the urethra. Predisposing risk factors for fistula formation are failure to invert all epithelial edges during anastomosis of the urethra and skin tube and the lack of healthy tissue support over the anastomosis [11]. The skin flap tube under the skin without the support of dartos is one of the causes of a higher fistula rate. With the modifications, the anastomosis is covered by the spongiosum, and the skin tube is covered with dartos which provides an additional protective layer and support to the reconstructed neo-urethra. Thus, the entire length of the neo-urethra is covered by a healthy interposing tissue layer, which helps preserve the neo-urethral blood supply and reduces fistula chances. Proximal anastomosis and urethra are covered by the overlying scrotal tissue, which again lowers fistula chances.

14.3.2 Penile Torsion

Penile torsion is one of the common complications of flap repairs. The vascular pedicle is brought down by one side of the shaft. The causes of torque are traction on the vascular pedicle and improper adjustment of skin flaps during skin closure. Inadequate mobilization of the vascular pedicle is the cause of the traction. The flap is mobilized up to the root of the penis to release the traction on the pedicle and brought ventrally by making a hole in the dartos pedicle, dividing the dartos into two halves to prevent torsion. Patel et al. (2005) brought the flap by creating a 'buttonhole' through the vascular pedicle at the penopubic junction minimizing the risk of penile torque [20]. Another vital step to avoid penile torsion is adjusting skin flaps during skin closure [21]. The dorsal dartos pedicle is slit in the midline to split into two equal parts. This maintains the aesthetic symmetry of the shaft and prevents torsion.

14.3.3 Diverticula

The possible factors for diverticula in flap repairs are

1. A larger width and/or length of the unstretched dartos-based flap
2. The laxity of the dartos-based flap
3. The lack of fixation of the flap to the corpora
4. The lack of support to the skin tube
5. Meatal stenosis due to a circular anastomosis at the meatus

The second stage of the two-stage urethroplasty is done with the well-stretched graft fixed to the corpora cavernosa allowing the adequate length to be measured. While in the transverse island flap, urethroplasty, the flap is dartos based, and the dartos contracts during surgery; so, unstretched measuring will give a larger width. The modification, measuring the width after stretching the flap at a distance of 1–1.5 cm in the whole length of the flap, ensures an adequate flap width. There is a significant difference in width (about 0.8–1 cm) when measuring the flap without stretching it (Fig. 14.3c, d). Another modification, the skin tube is covered with the dartos pedicle to ensure adequate support and is also fixed to the corpora. Fixing the skin tube to the corpora and covering it with a dartos vascular flap provides stability to the skin tube, a major pitfall in the Duckett/Asopa repair. Similar to our technique Patel et al. (2005) did the modification in transverse flap urethroplasty to fix the flap. The flap's medial margin is anchored longitudinally to corpora cavernosa just right or left to the midline. These subcuticular sutures do not pass through the epithelium of the flap—(Fig. 14.10). Then the flap is tubularized, trimming the excessive skin [20].

A normal-looking wide meatus is reconstructed by anastomosing the skin 5–8 mm proximal to the glans margin. Anastomosis of the skin

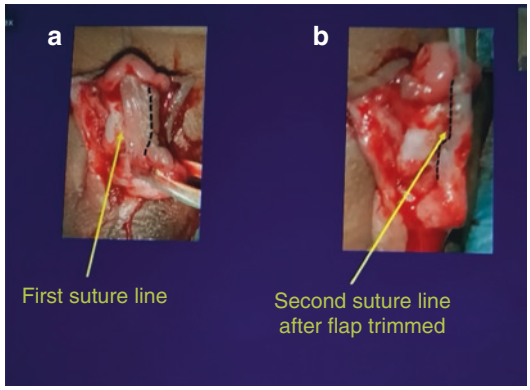

Fig. 14.10 Showing the flap fixation to the corpora. (**a**) Fixing the flap to create a urethral plate. (**b**) Urethral plate tubularization to construct the neourethra (by courtesy Prof D. Canning CHOP USA)

to mucosa provides better healing, resulting in good cosmetic results and the prevention of meatal stenosis, which also helps prevent diverticula.

14.3.4 Residual Curvature

Residual chordee is a known complication of flap procedures. To prevent residual curvature, complete curvature correction is confirmed before proceeding for urethroplasty. The neo-urethra's adequate required length is achieved after measuring both by tubularized inner prepucial flap and having a proper neo-urethra length. A good vascular flap provides adequate blood supply to the skin tube, avoiding the tube contracture and curvature. Minimal electrocautery is used on the ventral surface of corpora to prevent fibrosis. Many a time, infection leads to fibrosis which may be the cause of residual curvature. The excessive plications will shorten the penis, while excessive ventral dissection will leave a raw area vulnerable to later scarring. The recurrent curvature on many occasions develops years later. A clear message is that do not over excise or dissect extensively to prevent scarring and curvature.

14.3.5 Meatal Stenosis

Wide glanular flaps are raised by dissecting deep up to the tip of the corpora. The circular anastomosis of the skin tube too far distally on the glans may lead to skin protruding outside the meatus and increase meatal stenosis risk. The prepucioplasty tube is sutured 5–8 mm proximal to the glans' tip, creating a wide slit-like meatus with no skin protrusion outside, provides better cosmetic results, and decreases the risk of meatal stenosis. Meatal stenosis is a significant risk factor in fistula and diverticula formation [16], prevention reduces fistula and diverticula chances.

14.3.6 Post Void Dribble and Ejaculate

Long and unsupported neourethra by spongiosum cannot propel semen and the last drops of urine. This sequalae is seen in one-stage flap as well as in two-stage repairs. Bracka reported high long-term complications, 40% urine dribble, 33% dribble of ejaculate, and 45% retained ejaculate [8]. These can be minimized with modifications, as the proximal neo-urethra is covered with spongiosum up to the penoscrotal junction by tubularization of the preserved urethral plate. The proximal extended urethral mobilization can be done to bring the urethra up to the penoscrotal junction to increase the length of the urethra (about 2–3.5 cm) [22]. The dartos pedicle also supports the distal urethra. Thus, it creates a comparatively functional proximal segment instead of a lax skin tube that does not propel semen and leads to ejaculate problems.

14.4 Discussion

Transverse prepucioplasty island flap and double island flap are vascular pedicles based on sound surgical principles. Yet, they did not yield the long-term expected results, likely because of the wrong case selection or some technical inadequacy. Some modifications were published to improve the results. Prof. Canning group reported an important modification of fixing the skin tube to corporal bodies, and they brought the flap ventrally by making a hole in dartos pedicle. They fixed the flap lateral to the midline and the spatulated urethra and fixed flap to the ventral surface of corpora and then tubularized, thus fixing the tube, and overcoming the flap's flaw of mobility & torsion of the penis [20]. We used the principle of fixing the skin tube differently, taking a few sutures through the dartos pedicle sparing the vessels. Glassberg modified the Duckett technique by augmenting a midline tubularized skin tube to a tubularized inner prepucial tube. They corrected the chordee by resecting the spongiosum. The complication rates of Glassberg's procedure have been reported to vary from 26% to 42% [4–6]. The hair can grow at adulthood in the hair-bearing area included with the margins of non-hair-bearing midline skin. The proximal skin tube without supporting tissue will increase the risk of diverticula as well as fistula formation. Our modification preserving and utilizing the urethral plate and spongiosum to create a spongiosum supported urethra up to the penoscrotal junction will have fewer complications like fistula and diverticula. We also do an elliptical anastomosis of skin tube proximal 1 cm urethral plate margin and cover it with spongiosum. The overall complication rate of the inner prepucial tube used for single-stage repair of proximal hypospadias was reported to vary from 17% to 42%, with an average of around 32% [5, 12, 13]. We had an acceptable complication rate (19%) with the modified inner prepucioplasty flap repair. These modifications are likely the bring back lost shine to the flap urethroplasties.

14.5 Conclusions

Flaps have a better blood supply than grafts; still, flap repairs have poorer results than graft repairs. However the technique still has an important place in the management of hypospadias repair. The results can be improved by critical analysis of the flaws and rectifying them by modifications. Mobilized and preserved urethral plate is tubularized to bring the urethra up to the penoscrotal junction. This functional urethra helps in the prevention of postvoid dribble and retained ejaculate. Mobilizing the vascular pedicle up to the root of the penis and bringing it ventrally by splitting it midline prevents the torsion and constructs an aesthetically symmetric penile shaft. Covering the elliptical anastomosis with spongiosum helps in reducing fistula and stricture. Measuring the stretched skin flap adequate width and length; covering the neo-urethra with dartos pedicle, and fixing it to corpora help prevent diverticula. The distal anastomosis of the skin tube is done 5–8 mm proximal to the glans margin to create a wide slit-like normal-appearing meatus and prevent meatal stenosis. The modified flap urethroplasty for treating severe hypospadias is feasible with an acceptable complication rate and can avail the advantages of one stage repair; cost-effectiveness, less mental trauma to patients and parents, and saving the patient's time.

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