

Tubularized paramental based dartos-spongiosum flap urethroplasty in distal hypospadias with flat glans, shallow meatal groove, and severe glans tilt

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ABSTRACT

Objective: To report the technique and results of single stage tubularized paramental based dartos-spongiosum flap urethroplasty for distal hypospadias with flat glans, shallow meatal groove, and severe glans tilt. **Materials and Methods:** The study was conducted over a period of 2-year from October 2013 to October 2015, and 19 patients with distal hypospadias were included in the study with flat glans, poor urethral groove, and severe glans tilt, who otherwise would have been subjected to transection of urethral plate and a two-stage procedure. In this technique, bilateral flaps were fashioned along the preputial edge beginning from the hypospadiac meatus with intact dartos, keeping the base of the flaps attached to the bifurcated spongiosum. The urethral plate was transected. Glans was split wide open. Bilateral flaps joined at ventral midline creating new urethral plate which was tubularized with the creation of slit like wide meatus at the tip of glans. Neourethral coverage was provided with double dartos flap. Complications and aesthetic appearance on a score of 1-10 were outcome measures. **Results:** There was no urethral stricture, residual chordee, penile rotation, or asymmetrical penis. The average aesthetic score was 8.5. Meatus was at the tip of glans with adequate caliber in all patients. Two (10.5%) out of 19 patients developed subcoronal fistula that required surgical closure. **Conclusion:** Tubularized paramental-based dartos-spongiosum flap urethroplasty is viable and easy to reproduce option for management of a specific group of patients with distal hypospadias (with flat glans, poor urethral plate, and glans tilt) and is associated with very low complication rate.

Key words: Distal hypospadias, Flat glans, Poor urethral groove, Severe glans tilt

The aim of reconstructive surgery of hypospadias is to convert this birth defect into normal looking circumcised penis. Out of more than 300 described techniques of one stage or staged repairs, popularity of many techniques have disappeared with the passage of time due to suboptimal results, complications, and lack of reproducibility in others' hands [1-3]. With reference to the results achieved, currently the two most popular techniques are tubularized incised plate urethroplasty described by Snodgrass [4] and the other described by Bracka, i.e., chordee correction and placement of graft in the urethral bed followed by the second stage procedure of tubularization of the graft [5]. But in patients of distal hypospadias where glans is flat, meatal groove is shallow, and the glans is severely tilted (Fig. 1), utilizing the technique of tubularized incised plate urethroplasty would not yield optimum results and placement of graft after transecting the urethral plate and later tubularization becomes a two-stage procedure for distal hypospadias. Thus in these cases, to gain all the advantages of a two-stage procedure and yet accomplish it in one stage, we describe a technique which is a modification of the technique described by Koyanagi et al. [6]. In our technique, the graft survival is based on vascularity

from the dartos as well as from the perforators from divergent spongiosum.

MATERIALS AND METHODS

The study was conducted over a period of 2-year from October 2013 to October 2015, and 19 patients of distal hypospadias with flat glans, poor urethral groove, and severe glans tilt were included in the study. Age at procedure ranged from 14 months to 9 years.

Surgical Technique

Under general anesthesia with endotracheal intubation, the patient is put to supine position, and parts are painted and draped. A stay suture on the glans is taken with 4-0 silk round body suture and the hypospadiac meatus catheterized with 8 or 10 French infant feeding tube depending on the age of the patient. An assessment of the degree of glans tilt, urethral plate, length of neo-urethral requirement from the hypospadiac meatus to the glans tip, quality of the urethra just proximal to the meatus, and the splaying of the spongiosa is made.

The dorsal hooded prepuce is held with stay sutures at the junction of the outer and the inner prepuce, in the paramedial locations dorsally and laterally at the junction of the ventral and dorsal prepuce (Fig. 2). Skin incisions are marked for raising bilateral paraurethral flaps based on the divergent spongiosa, with the base of the flaps lying at the hypospadiac meatus (Fig. 2). The skin marking for the flap begins about 7 mm proximal to the hypospadiac meatus, runs laterally on the outer prepuce reaching up to dorsal paramedial stay suture, the line then returns back ventrally on the edge of the prepuce (at the junction of outer and inner prepuce) to meet the urethral plate. A similar flap is marked on the opposite side also. Dorsally, incision line is marked at the junction of outer and inner prepuce extending circumferentially from apex of one flap to the apex of other. The proposed site of meatus at the apex of glans is also marked.

Saline is injected in the subcutaneous plane across the planned incision lines. About 7 mm proximal to the hypospadiac meatus, midline raphae is incised and subdartos plane is entered, following which incisions are completed over the proposed lines such that both flaps remain attached to hypospadiac meatus as “wings of a bird” (Fig. 3) with dartos remaining attached to them.



Figure 1: Distal hypospadias with ventrally migrated meatus with flat glans and narrow urethral groove

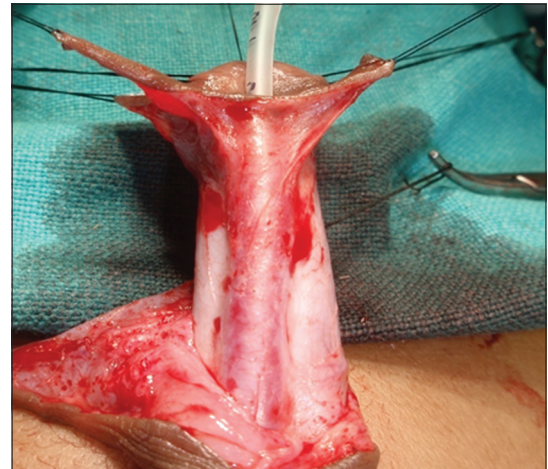


Figure 3: Penis has been degloved and bilateral paramedial flaps have been raised based on the divergent spongiosa



Figure 2: Placement of stay sutures and skin marking to raise bilateral paramedial flap based on divergent spongiosa

Dorsally incision is made at the junction of the outer and inner prepuce, and inner prepuce is separated from the outer prepuce in a plane such that all the dartos remain attached to outer prepuce, inner prepuce, in this case, derives its blood supply from the coronal plexus. Penile degloving is carried out till the base of the penis (Fig. 3) leaving the bird wing flaps with dartos attached to hypospadiac meatus and bifurcated spongiosum. The urethral plate is then transected and detached from glans along with the divergent spongiosum with both the flaps remaining attached to meatus and their base overlying and deriving their blood supply from divergent spongiosum (Fig. 4). The transection of urethral plate corrects any degree of glans tilt.

A longitudinal incision is made over the distal retracted part of narrow urethral plate up to the tip of glans to deepen the glans groove and shift the meatus to tip of glans at the proposed site (Fig. 4). The medial edges of both the flaps are sutured together with 6-0 vicryl suture, which forms the dorsal aspect of neo-urethra (Fig. 5). Sutured flap is then fixed to the apex of glans incision at the proposed site of neo-meatus and suturing along the glans margin is continued laterally just short of corona so that later tubularization creates a very wide meatus (Fig. 5). The lateral edges of flaps are tubularized over a No. 8 or 10 French

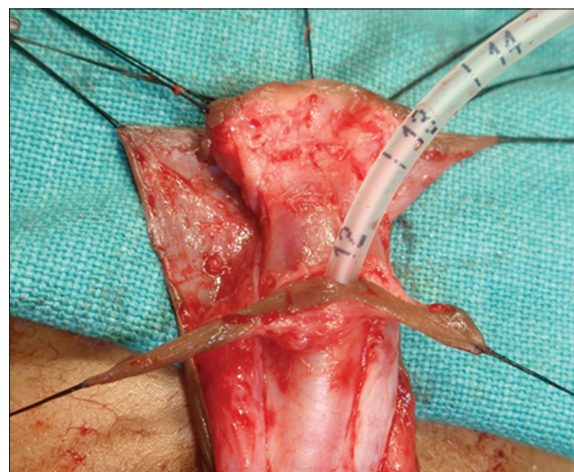


Figure 4: Urethral plate has been transected and glans longitudinally incised to shift the neo-meatus to the tip of the glans

infant feeding tube with continuous 6-0 vicryl suture to form the ventral aspect of neo-urethra (Fig. 6).

Dartos flaps are raised bilaterally and transposed ventrally, in a double breasted fashion, to provide dual waterproofing coverage to neo-urethra in its entire length (Fig. 7). The widely mobilized glans wings are then approximated in midline over the neo-urethra in two layers using 6-0 vicryl sutures (Fig. 8).

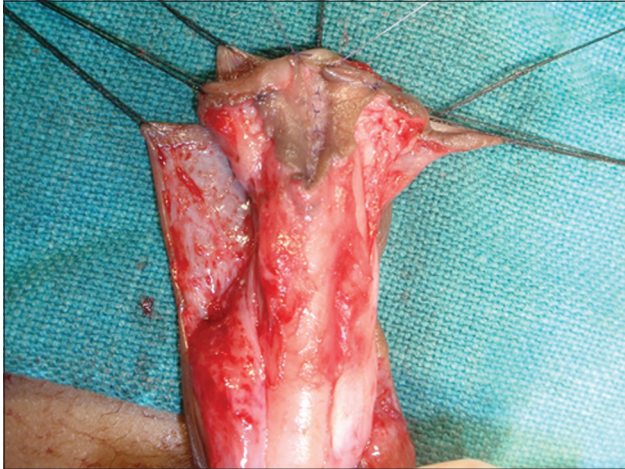


Figure 5: Both the flaps are approximated in the midline to form the dorsal part of the distal neo-urethra

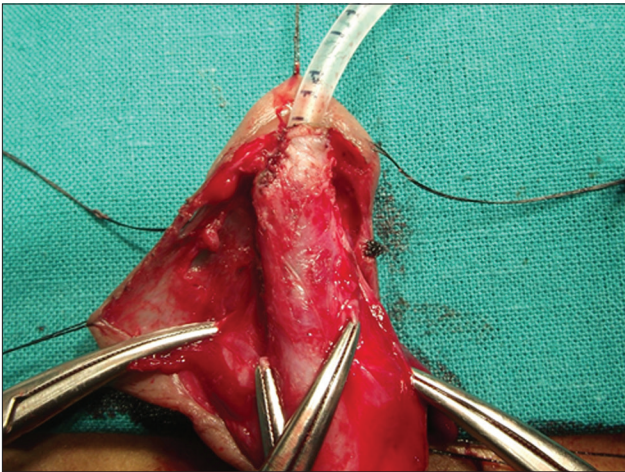


Figure 6: The flaps are tabularized over an 8-10 French catheter

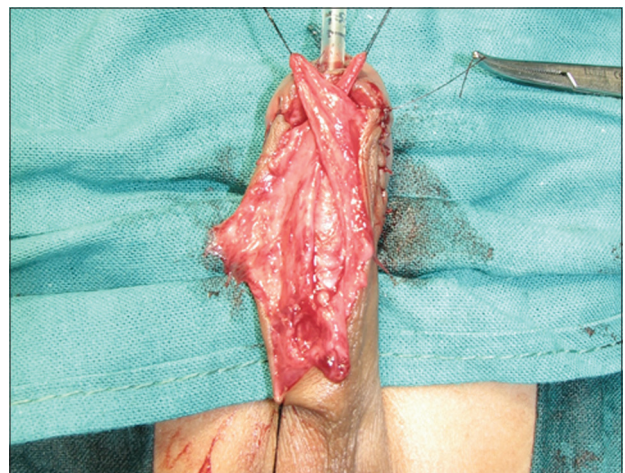


Figure 7: The neo-urethra is covered with double dartos flap

Skin management to cover the penis begins with raising Byar's flaps by bisecting the outer prepuce and dorsal shaft skin. Inner prepuce which had earlier been separated from outer prepuce is reverse advanced over the shaft of penis to provide dorsal, lateral and subcoronal coverage on ventral aspect (Fig. 9), while the Byar's flaps are transposed ventrally to cover the remaining

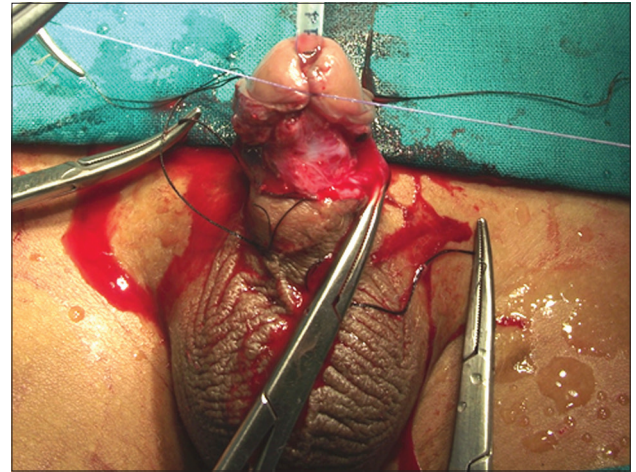


Figure 8: Glans wings are approximated in the midline



Figure 9: Inner prepuce is reverse advanced to cover the dorsum of the penile shaft



Figure 10: The dorsal hood of skin is bisected, transposed ventrally and approximated in the midline

ventral and lateral aspects of penile shaft. Both the flaps are sutured in midline to give the appearance of midline raphe (Figs. 10 and 11).

After repair is complete, stay suture over the glans is tied to catheter to prevent any inadvertent dislodgement of catheter which remains in place for 10 days postoperatively. Dressing of penis is applied with non-adherent paraffin gauze piece with minimal pressure over the penis in such a way that penis stays in a vertical position to long axis of the body.

Post-operative Care

Postoperatively patient is allowed orally after about 4 h. IV antibiotics are administered for 5 days as determined by the routine culture profile of our wards. All patients were routinely started on syrup lactulose to avoid straining during defecation, which could lead to pericatheter urine leak and urinoma formation. The patients were also put to anti-edema medications and vitamin C. Catheter is removed on 10th post-operative day. After catheter removal, the patient was given a voiding trial when the characteristics of stream were noted including the presence of any urethra-cutaneous fistula. Subsequently, the patient was discharged on oral medications and first post-operative visit was scheduled after 2 weeks.

Follow-up

At first follow-up at 2nd post-operative week, a thorough penile examination was done, which included noting of tissue edema, orientation of neo-meatus, any discharge from suture line, characteristics of urinary stream, presence of any urethra-cutaneous fistula, and spontaneous resolution of urinary leaks from suture line detected at the time of initial catheter removal. Further follow-up was done at 6 weeks (Fig. 12) followed by at 6 months.

Outcomes were measured in terms of (1) post-operative complications: (a) Immediate complications include edema, wound infection, fistula, glanular dehiscence, complete dehiscence, skin necrosis, and others. (b) Late complications include meatal stenosis and urethral stricture. (2) Post-operative outcomes include placement of neo-meatus at the tip of glans and correction of glans tilt. (3) Aesthetic appearance by scoring: Scores were allocated by operating surgeon at the end of the 6 weeks after edema has subsided taking following parameters into consideration. Each parameter scored between 1 and 10 and then average score calculated out of 10: (a) Provision of external urethral meatus at tip of glans, (b) adequate caliber meatus, (c) complete elimination of chordee and glans tilt, (d) symmetrical distribution of penile skin dartos complex, (e) creation of median raphe, and (f) elimination of rotation and glans tilt.

Scores were also allocated by the parents, which were measured on a scale of 1-10, where 1 stands for the current hypospadiac state and 10 stands for a normal penis. The final score was calculated by taking the average of scores given by surgeon and the parents.



Figure 11: Post-operative appearance



Figure 12: Post-operative result after 6 weeks showing the slit like meatus

RESULTS

Postoperatively, neo-meatus was placed at the tip of glans and glans tilt was corrected in all the patients. 14 (73.68%) patients had transient edema that resolved within 3 weeks, while in 4 (21.05%) patients, edema lasted for 6 weeks. Only in 1 patient (5.26%), edema lasted for more than 6 weeks. Only 1 patient (5.26%) had mild wound infection which resolved with oral antibiotic therapy. A total of 4 patients developed urethra-cutaneous fistula, out of which 2 healed spontaneously within 6 weeks and rest of the 2 patients (10.5%) required surgical fistula closure. Fistula was associated with only initial 10 cases in our study followed by no fistula in subsequent 9 cases. This could be the result of increased experience with the procedure in later cases and standardization of the procedure. There was no meatal stenosis or urethral stricture in any patient. Aesthetic appearance was calculated as mentioned above and average score as allocated by surgeon was 8.9, and score by the parents was 8.89. The average total score was 8.9.

DISCUSSION

In patients of distal hypospadias with shallow meatal groove, flat glans and glans tilt, forced tubularization of incised plate

urethroplasty will not provide optimum results. This may be because, even if we include the paraurethral skin into the urethral plate and tubularize after incising the narrow urethral plate, in most cases, problem of ventral facing meatus, residual chordee, persistent glans tilt, and meatal stenosis, further complicating into delayed fistula is likely to occur. Division of the urethral plate, wide splitting of glans, placement of inner preputial graft, and subsequent tubularization is more likely to end up in straight penis with wide caliber meatus but necessitates a two-stage repair.

Other options that can address the situation have been described by Duckett [7] and Asopa et al. [8] as tubularization of inner prepuce and ventral transfer on a pedicle of dartos on its vessels as urethral substitute, but the occurrence of penile rotation, asymmetrical redistribution of penile skin dartos, unsatisfactory appearance of external meatus, and occurrence of diverticulum have been the associated problems. The principle of preserving and tubularizing paramental strip of penile skin continuous along the skin of inner prepuce with possible vascular support from dartos as described by Koyanagi et al. [6] are associated with high complication rates. In our technique, we have used some different principles which are as under:

First, the inner prepuce was completely separated from outer prepuce with all dartos remaining attached to outer prepuce. This spare dartos was used to cover the neo-urethra as bilateral dartos flaps. Inner prepuce, in this situation, draws its blood supply from perforators of coronal plexus.

Second, same plane of separating inner prepuce with outer prepuce was extended across the urethral plate to correct glans tilt. A strip of penile skin attached to hypospadiac meatus bilaterally and continuous on dorsal prepuce and dartos was used, but the precaution was taken that base of the flaps along with dartos is also left attached to bifurcated spongiosum. Although in random pattern flap, length to width ratio of 3:1 is maintained; but, if paraurethral dartos is left attached to skin as well as the spongiosum, a flap with larger length to width ratio can be obtained with maintained vascularity which results in bridging of gap between hypospadiac meatus and tip of glans in almost all cases of distal hypospadias. Since the distal most end of paraurethral flap is also vascularized which does not heal as a free graft, the chances of meatal stenosis are minimized despite liberal dorsal splitting of glans. For the same reason, chances of stricture were also eliminated. We also provide a double breasted dartos cover over tubularized neo-urethra to minimize the fistula rate.

One of the possible disadvantages of this procedure is that, after correction of glans tilt and harvesting of the paraurethral flap, if the gap between hypospadiac meatus and glans tip is longer than the length of paraurethral flaps, overenthusiastic forced application of longer flaps may result in diminished vascularity

at the tip of glans resulting in meatal stenosis. Therefore, in such situation of gap and flap disproportion, the procedure must be abandoned to be replaced with free graft and tubularization in the second stage.

The described procedure helps to manage these cases of distal hypospadias in a single stage that would otherwise require a two-stage procedure for optimum outcomes. The procedure appears to be a variant of Koyanagi et al. repair but is based on a robust blood supply from the divergent spongiosum as well as the dartos. The procedure is associated with low complications, and fistula rate is further expected to decrease as the more experience is gained in the procedure. In our series, there was no urethrocutaneous fistula in last 9 cases operated. The aesthetic appearance after the surgery was also excellent.

CONCLUSION

Preputial edge flap (paramental flap) urethroplasty is a viable and easy to reproduce option for management of a specific group of patients with distal hypospadias (with flat glans, poor urethral plate, and glans tilt) and is associated with very low complication rate and excellent aesthetic appearance.

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