



Original Article

A COMPARATIVE STUDY TO EVALUATE THE OUTCOME OF DOUBLE DARTOS FLAP IN TUBULARIZED INCISED PLATE URETHROPLASTY FOR DISTAL HYPOSPADIAS REPAIR

CHAKRABORTY AK¹, MAJUMDAR SK², ZAHID MK³, RAHMAN SM⁴, SAHA DK⁵, HASAN KM⁶

Abstract:

Background/purpose: The tubularized incised plate urethroplasty (Snodgrass technique) presents the procedure of choice for distal hypospadias repair. Fistula formation is the most common complication with various rates. Avoiding overlap of suture lines in the Snodgrass repair is critical to minimize fistula formation through second-layer coverage of the neourethra. We compared the outcome of double-layer dartos flaps to flapless procedure in the tubularized incised plate urethroplasty for distal hypospadias repair to assess the effectiveness of dartos flap in this method.

Methods: Our study included 28 patients aged upto 12 years who were treated with tubularized incised plate urethroplasty for distal hypospadias in Shaheed Suhrawardy Medical College Hospital from April 2010 to December 2011. They were divided into two groups. Group A (14 patients) had double dartos flap coverings. Group B (14 patients) had no dartos flap covering. The dissected dorsal dartos flap was

bisected vertically to form two pedicle wings. Each wing was rotated laterally from either side of the glans to cover the neourethra ventrally in a double-layer fashion.

Result: Mean follow up period was 9 months. In Group A, one patient (7%) developed fistula and one (7%) superficial skin necrosis. On the other hand three (21%) patients developed fistula and one patient (7%) meatal stenosis in group B, who were treated with Snodgrass procedure without using dartos flap. All successful repaired hypospadias patients of both groups had a cosmetically normal looking circumcised penis with ventrally slit meatus.

Conclusions : Double dartos flaps covering of the neourethra is a simple procedure and could be effective for the prevention of urethrocutaneous fistula after tubularized incised plate urethroplasty.

Key words: Double-dartos flap, Tubularized incised plate urethroplasty, Distal hypospadias, Outcome.

1. Abhi Kumar Chakraborty, Assistant Professor, Department of Paediatric Surgery, Shaheed Suhrawardy Medical College and Hospital, Dhaka, Bangladesh.
2. Sajal Kumar Majumdar, Associate Professor, Department of Paediatric Surgery, Shaheed Suhrawardy Medical College and Hospital, Dhaka, Bangladesh
3. Mirza Kamrul Zahid Associate Professor, Department of Paediatric Surgery, Mymensingh Medical College and Hospital, Mymensingh, Bangladesh
4. Sayed Mahmudur Rahman, Professor, Department of Paediatric Surgery, Shaheed Suhrawardy Medical College and Hospital, Dhaka, Bangladesh.
5. Dipankar Kumar Saha Registrar, Department of Paediatric Surgery, Shaheed Suhrawardy Medical College, Hospital, Dhaka, Bangladesh
6. Khandoker Moynul Hasan, Assistant Registrar, Department of Paediatric Surgery, Shaheed Suhrawardy, Medical College Hospital, Dhaka, Bangladesh.

Correspondence to: Dr. Abhi Kumar Chakraborty, Assistant Professor, Department of Paediatric Surgery, Shaheed Suhrawardy Medical College and Hospital, Dhaka, Bangladesh, E-mail: abhichakraborty@yahoo.com

Introduction:

Since 1994, the Snodgrass repair (tubularized incised plate or TIP urethroplasty) has been the procedure of choice for distal and mid shaft hypospadias repair. The procedure is easy to follow and gives good cosmetic and functional results¹. Despite its versatility and the obvious surgical advances that it represents in hypospadias repair, urethrocutaneous fistula is the most common complication of TIP, the reported incidence being as high as 13% -- 29.4%^{2,3}. The incidence of which has been used to evaluate the success of hypospadias repair. Other complications includes meatal stenosis, urethral stricture, infection and wound dehiscence. The goal of surgery is to reconstruct the penis to obtain both normal function and

appearance with as few complications as possible, while minimizing the need for multiple surgeries. The development of any complication in children is another trauma to the child and family. So efforts continued to minimize functional and cosmetic problems after TIP urethroplasty through different surgical modifications⁴.

The dartos flap is composed of vascularized subcutaneous tissue that is dissected from the dorsal preputial and shaft skin. Its placement over the neourethra in incised plate urethroplasty reduces the incidence of postoperative urethrocutaneous fistula^{1,5}.

We compared the outcome of TIP urethroplasty with and without dartos flap for distal hypospadias to assess the effectiveness of vascularized dartos flap over the neourethra.

Materials and methods:

A total of 28 boys with distal hypospadias with no or mild chordee were treated with the Snodgrass tubularized incised plate urethroplasty between April 2010 and December 2011 in the department of Pediatric Surgery, Shaheed Suhrawardy Medical College Hospital. They had no history of previous hypospadias repair or circumcision. Patients were divided into two groups. Patients were selected alternatively for each group. In 14 patients (group A), neourethra was covered with fashioned vascularized dartos flap which was dissected from the dorsal preputial and shaft skin. Other 14 patients (group B) were treated by tubularized incised plate urethroplasty (Snodgrass procedure) without using dartos flap.

Urethral dilatation was started for each patient at 3rd week with appropriate size feeding tube and continued upto 3 months after operation. Assessment of the patient was done at the time of dressing removal, stent removal and in follow up.

Patient age, meatal location, urethral plate configuration, presence of ventral curvature, methods of urethroplasty, operation time, duration of follow up, post operative evaluations and complications were determined.

Surgical technique

Under general anesthesia, a stay suture was placed through the glans for traction. A tourniquet was applied to the penile base to achieve a

bloodless field. Penile skin is degloved with a circumferential incision extending in a U-shaped direction back to healthy urethra. Two parallel longitudinal incision were made to separate the lateral edges of the urethral plate from the glans wings. Then, a relaxing midline incision was made through the urethral plate from the tip of the penis to the hypospadiac meatus.

The incised urethral plate was tubularized using 6/0 polyglactin sutures with one layer running subepithelial suture over a 6-10 Fr stent that passed into the bladder. Tubularization of the urethral plate started at point near the mid section of the glans so that the neomeatus would have an oval configuration with an adequate width.

For group A, a vascularized dartos flap was dissected from the dorsal preputial and shaft skin (Fig.1).



Fig.-1: Vascularized dartos flap harvested from dorsal preputial and shaft skin

Dissection of the flap from the shaft skin did not go beyond 1 to 2 cm distal to the root of the penis, depending on the size of the penis. This preserves as much blood supply to the flap as possible. The flap was incised vertically in the midline to form two well-vascularized rectangular wings (Fig. 2). One of the dartos strip was secured over the neourethra (Fig. 3).



Fig.-2. Vertical incision of dartos flap to form two separate vascularized retriangular wings of dartos flap



Fig.-3: One wing of dartos flap rotated ventrally to cover neourethra. Other wing shown stretched to opposite side.

It was stitched to the periurethral tissue using 6/0 polyglactin sutures and tacked into the lateral recesses of the raised glans wings. The other strip was secured over the first one in the fashion of overlapping bat wings (Fig. 4). The glans wings must be incised deeply and widely separated to accommodate this additional tissue cover of the neourethra.

The glans and skin closures were completed over the overlapped double dartos covering flaps. Byars'



Fig.-4: The other wing rotated laterally from opposite side; it overlaps the first wing and is sutured.

flaps are created from the preputial hood to allow ventral midline skin closure to mimic the median raphe.

In patients with group B follow the same procedure but dartos flap was not harvested and cover the neourethra. Instead adjacent periurethral subepithelial tissue were approximated and sutured in the midline over the neourethra.

The stent was secured to the glans with traction suture at the end of the procedure. The operation was finished by the application of a light compression dressing with gauge to the penis. The dressing was removed on fifth postoperative day and wound was left exposed. All patients were discharged on tenth postoperative day after the stent removal.

All patient received parenteral ceforoxime started intraoperatively and continue for three days, followed by oral preparation until removal of the urethral stent.

Result:

Results are summarized in Table-I. Total 39 hypospadias patients were treated in the hospital

Table-I
Observation and results

	TIP Urethroplasty with dartos flap Group A (n==14) (%)	TIP Urethroplasty without dartos flap Group B (n==14) (%)
Age range at surgery (mean age)	2 yrs—12 yrs(5 yrs 6m)	2 yrs 2m-12 yrs(5 yrs 7m)
Meatal location		
Coronal	03	04
Distal penile	11	10
Operative time (minutes)(mean time)	65—85 (74)	60—75 (66)
Complications	02 (14%)	04 (28%)
Urethrocutaneous Fistula	01 (7%)	03 (21%)
Meatal stenosis	01 (7%)	
localized superficial necrosis of the ventral penile skin	01 (7%)	

during the study Period. Out of them 28 (72%) were distal variety who were enrolled for this study. Age range of the patients was 2 years to 12 years (mean 5 years 6 months). Eleven patients of group A had distal penile and three had coronal hypospadias. In group B (n=14), ten and four had distal penile and coronal variety respectively. One patient of each group with distal penile variety had mild chordee. After degloving, the chordee was corrected.

Mean operation time for group A and group B was 74 minutes (65 minutes to 85 minutes) and 66 minutes (60 minutes to 75 minutes) respectively. Postoperative follow-up ranged from 3 to 18 months (mean 9 months).

Complications occurred in two patients (14%) of group A and four (28%) in group B.

Early complication noticed in group A was superficial skin necrosis in one patient (7%) but with healthy underlying dartos tissue. This was managed with frequent daily dressing until healed completely without any further sequelae. Urethrocutaneous fistula was diagnosed 10 days to 3 weeks (mean 14 days) after surgical repair in one patients of group A (7%) and three patients of group B (21%). The fistulae were small but required surgical correction.

Meatal stenosis was observed in one patient of group B at 3rd week of operation. All the remaining patients with successful repair of both groups had good urinary flow and void with a single stream. All had a cosmetically normal looking circumcised penis with ventrally slit meatus. Neourethral caliber was satisfactory in the follow up period of this study.

Discussion:

Distal hypospadias is the commonest form of hypospadias and accounts for about 70% of all cases⁶. Tubularized incised plate (TIP) urethroplasty for hypospadias repair has gained widespread acceptance because of its excellent functional and cosmetic results with minimal complications⁴. The advantage of this procedure is the provision of a generously mobile plate for tubularization without the use of supplemental flaps and also the creation of a functional neourethra with a vertical, slit-like meatus⁷. The most common and particularly annoying complication is urethrocutaneous fistula. Interposition of well vascularized tissue between the penile skin and neourethra is essential for its prevention. Different tissues and techniques have been described to solve this problem⁸.

Although the initial description did not highlight the importance of interposing dartos tissue between the neourethral suture line and the ventral skin closure, several subsequent descriptions of the procedure by Snodgrass and others do stress the importance of providing a barrier layer to decrease fistula rates^{9,10}.

Interposition of subcutaneous dartos flaps or de-epithelialized skin flaps between the neourethra and ventral skin closure has been described to prevent fistula formation. El-Kassaby AW et al used de-epithelialized preputial flap to cover the neourethra and other half of the prepuce as skin cover⁴.

The dartos flaps have been raised from either dorsal or ventral dartos and sometimes the dorsal flap have

been subdivided into two strips to provide overlapping flaps coverage to the neourethra. There have been many reports of different techniques for harvesting and applying the dartos flap.

Selami Sozubir and Warren Snodgrass buttonholed and transposed the harvested dorsal dartos flap to the ventrum for neourethra coverage and noted 5% fistulae in distal variety¹¹. A ventrally based dartos flap was also used to reduce fistula formation¹². Furthermore, reports of having used dorsal double dartos flaps have proven to be more superior than single rotational dorsal dartos flap with the least complications of fistulae and penile torsion^{3,5}.

In other studies the use of a dartos flap to cover the neourethra reduced the risk of fistula development to as low as 0%-9.6%^{5,11,13}.

In our study we created a well vascularized overlapping double dartos flaps over neourethra in one group of TIP urethoplasty and compared the effect to other group of TIP urethoplasty without dartos flap for distal hypospadias. It was done to assess the effectiveness of vascularized dartos flap to minimize the urethrocutaneous fistula rate.

Flaps, harvested from dorsal skin are abundant, well vascularized and follow the axial course of blood vessels⁸.

In the initial period of the study one patient (7%) of Group A developed localized superficial skin necrosis but settled conservatively and did not have any implication in the final outcome of the repair. superficial skin necrosis of some part was also noticed in cases in other studies where vascularized dartos flaps were also mobilized to cover the neourethra^{13,14}. Dissection of dartos from skin requires skill and there are chances that vascularity of the skin cover may get compromised resulting in subsequent dermal necrosis¹⁴.

The low prevalence of fistula (7%) in group A patients in comparison to group B (21%) is related to the surgical procedure. A dartos flap is superior to dartos tissues alongside the urethra as a barrier layer interposed between the neourethra and skin closure. This result may relate to the fact that flaps were secured with sutures off the midline, while adjacent dartos layers consisted of tissues approximated in the midline in the same plane as the urethral and skin closures¹⁵.

Meatal stenosis in one patient (7%) of Group B could possibly be explained by technical error resulting from tubularizing the plate too far distally.

Meatal stenosis was successfully managed with routine dilatation schedule for 3 months after surgery. Significant meatal stenosis after surgery is probably the adherence of both raw sides of the incised plate during healing. Regular dilatation for 3 months seems to be adequate for the epithelialization of the raw area of the tubularized-incised urethral plate. Thus urethral calibration is important for prevention of fistula formation and meatal stenosis¹⁶. In this series urethral calibration was carried out in all patients for 3 months.

Both groups give satisfactory cosmetic results. All successful repaired hypospadias (Group A and Group B) patients had a cosmetically normal looking circumcised penis with ventrally slit meatus. No penile rotation occurs in Group A since the equal dartos strips create counter traction on both sides of the penile shaft.

The dartos flap, whether single or double, was too thin to create any form of tension that would hinder suturing of the overlying glans or skin edges and deep dissection of the glans wings obtain their good mobility for later closure at the end of the procedure and do not produce any effect cosmetically.

Mean operative time required for group A and Group B was 74 minutes and 66 minutes respectively.

It is not clear how urethrocutaneous fistula develops in the presence of an interposed dartos flap. The fistula can find its way through a small unnoticed perforation in the flap. Perforation results from direct injury during dissection, overdissection with focal ischemic atrophy or infection. If double dartos flap is used, a small perforation in one flap would be protected by the intact second flap⁵. It was not necessary to dissect the dartos flap from the shaft skin all the way to the root of the penis. Leaving about 1 to 2 cm of intact dartos fascia according to the size of the penis distal to the root of the penis provided a better blood supply to the dissected dartos flap. This measure provided an extra protective mechanism for the prevention of postoperative fistula development. The well vascularized overlapping double dartos flap allows better suture line separation and offers an additional layer that subsequently maximize the chance of fistula prevention. So, it was not surprising that no urethrocutaneous fistula occurred in others using a similar technique^{1,5}.

Conclusions

It has been suggested that double dartos flaps interposed between the neourethra and the glans and

skin closure in tubularized incised plate urethroplasty are effective for prevention of urethrocutaneous fistula. It can be used not only in distal hypospadias but in mid penile variety also. The double dartos flaps do not hinder the healing power of the suture lines during glans closure, do not interfere with the excellent cosmetic outcome of the operation. A larger number of patients with double dartos flaps need to be evaluated before definitive conclusions can be made.

References:

1. Abolyosr A. Snodgrass hypospadias repair with onlay overlapping double-layered dorsal dartos flap without urethrocutaneous fistula: Experience of 156 cases. *Journal of Pediatric Urology* 2010; 6: 403-7.
2. Holland AJA, Smith GHH. Effect of the depth and width of the urethral plate on tubularized incised plate urethroplasty. *J Urol* 2000; 164: 489-91.
3. Yigiter M, Yildiz A, Oral A, Salman AB. A comparative study to evaluate the effect of double dartos flaps in primary hypospadias repair: no fistula anymore. *Int Urol Nephrol* 2010; 42: 985-90.
4. El-Kassaby AW, Al-Kandari AM, Elzayat T, Shokeir AA. Modified Tubularized Incised Plate Urethroplasty for Hypospadias Repair: A Long-Term Results of 764 Patients. *Urology* 2008; 71(4): 611-15.
5. Kamal BA. Double dartos flaps in tubularized incised plate hypospadias repair. *Urology* 2005; 66(5): 1095-98.
6. Erdenetsetseg G, Dewan PA. Reconstruction of the hypospadiac hooded prepuce. *J Urol* 2003; 169: 1822-24.
7. Luo CC, Lin JN. Repair of hypospadias complications using the tubularized, incised plate urethroplasty. *J Pediatr Surg* 1999; 34(11): 1665-67.
8. Djordjevic ML, Perovic SV, Slavkovic Z, Djakovic N. Longitudinal dorsal dartos flap for prevention of fistula after a Snodgrass hypospadias procedure. *Eur Urol* 2006; 50: 53-57.
9. Snodgrass WT, Nguyen MT. Current technique of tubularized incised plate hypospadias repair. *Urology* 2002; 60(1): 157-62.
10. Cheng EY, Vemulapalli SN, Kropp BP, Pope 4th JC, Furness PD, Kaplan WE et al. Snodgrass hypospadias repair with vascularised dartos flap: the perfect repair for virgin cases of hypospadias? *J Urol* 2002; 168: 1723-26.
11. Sozubir S, Snodgrass W. A new algorithm for primary hypospadias repair based on TIP urethroplasty. *J Pediatr Surg* 2003; 38: 1157-61.
12. Furness 3rd PD. Successful hypospadias repair with a ventral based vascular dartos pedicle for urethral coverage. *J Urol* 2003; 169: 1825-27.
13. Singh N, Sharma E, Saraf R, Goswamy HL. Tubularized incised plate urethroplasty (Snodgrass procedure) for distal penile hypospadias - a regional centre experience. *Indian J Urol* 2005; 21(2): 109-11.
14. Dhua AK, Aggarwal SK, Sinha S, Ratan SK. Soft tissue covers in hypospadias surgery: Is tunica vaginalis better than dartos flap? *Journal of Indian Association of pediatric Surgeons* 2012; 17(1): 16-19.
15. Nguyen MT, Snodgrass WT. Tubularized incised plate hypospadias reoperation. *J Urol* 2004; 171: 2404-6.
16. Elbakry A. Tubularized-incised urethral plate urethroplasty: Is regular dilatation necessary for success? *BJU Int* 1099; 84: 683-88.