

A Comparative Study Of Tunica Vaginalis Flap And Dartos Flap As Soft Tissue Cover For Tubularised Incised Plate Urethroplasty In Primary Hypospadias Repair

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Abstract : Background: Warren Snodgrass advocated a versatile Tubularised incised plate (TIP) procedure for most cases of hypospadias repair, which showed favourable cosmetic and functional results. Vascularity is one of the major factors in any reconstructive surgery, as in hypospadias, for a successful outcome. Several options for providing vascularised soft tissue cover to the neourethra have been described. Both dartos fascia and tunica vaginalis provide robust cover to the urethra and act as a barrier between the suture lines. We attempt to evaluate and compare the outcomes between two common soft tissue covers; i.e. tunica vaginalis flap and dartos flap for tubularised incised plate urethroplasty in primary hypospadias repair for patients with hypospadias.

Methods: 50 patients with clinical diagnosis of anterior, middle and posterior hypospadias from August 2016 to July 2017 were included and divided into two groups of 25 each, comparable in age and type of hypospadias. Group A underwent TIP procedure with soft tissue cover of tunica vaginalis flap (TVF) whereas Group B underwent TIP procedure with soft tissue cover of dartos flap

Results: The difference in the Urethrocutaneous fistula rate in two groups was not found to be statistically significant. Superficial penile skin necrosis was more in Group B than Group A.

Conclusions : In our study, tunica vaginalis flap was found to be superior to Dartos flap as a waterproofing layer for primary TIP repair in proximal penile hypospadias whereas in case of anterior hypospadias, dartos flap was superior to Tunica vaginalis flap. TVF might have a role in redo hypospadias repair where dartos tissue may be unavailable.

Keywords : tunica vaginalis flap, dartos flap, tubularised incised plate urethroplasty

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I. Introduction

In Greek 'hypo' means 'under' and 'spadion' means 'rent'. Hypospadias is a developmental anomaly characterized by a urethral meatus that opens onto the ventral surface of the penis, proximal to the end of the glans. The meatus may be located anywhere along the shaft of the penis from the glans to the perineum.

W. Snodgrass advocated a versatile Tubularized incised plate (TIP) procedure for most cases of anterior and middle hypospadias repair as it showed favorable cosmetic and functional results. Although a one-stage repair for hypospadias was first introduced in 1900 by Russel, it has gained popularity only in recent years. The confidence of surgeons has been enhanced by changing concepts of the urethral plate and chordee,^{1,2} with additional advantages of using skin that is unscarred. Snow in 1986⁶ and Kirkali in 1990⁷ showed that the Tunica vaginalis pedicled wrap (TVPW) is a good vascular tissue for adding vascularity to the neourethra. Snodgrass and lorenzo⁸ proposed (TIP) and a dartos wrap for urethroplasty in hypospadias and in urethral stricture. Both dartos fascia and tunica vaginalis provide robust cover to the urethra and act as a barrier between the suture lines. Dartos fascia, harvested from the dorsal penile skin, is more frequently used. The choice between the two depends more on surgeon's choice and experience. So, the present study is therefore an attempt to evaluate and compare the outcomes between two common soft tissue covers; i.e. tunica vaginalis flap and dartos flap for tubularised incised plate urethroplasty in primary hypospadias repair for patients with hypospadias.

II. Materials And Methods

All patients with clinical diagnosis of anterior, middle and posterior hypospadias from August 2016 to July 2017 were included. Non randomized division of 50 consecutive patients into two groups (A or B;

25 for each group) comparable in age and type of hypospadias was done. The inclusion criteria was all primary cases of hypospadias from 6 months to 12 years. The exclusion criteria were age less than 6 months and

more than 12 years, redo cases, previous inguino-scrotal surgery (herniotomy, orchidopexy or circumcision), glanular, penoscrotal, scrotal or perineal hypospadias.

Surgeon decided the type of surgery and no preference criteria was employed regarding the type of flaps used in TIP urethroplasty. All patients were operated under general anesthesia with endotracheal intubation. Group A included TIP procedure with tunica vaginalis flap. Group B included TIP procedure with dartos flap. All the patients in group A and B were similar in their demographic features. The type of hypospadias varied from coronal, subcoronal, distal penile, midpenile and proximal penile, was similar in distribution in both the groups. In both the groups, only those patients were selected where a tubularized incised plate repair was possible. Patients were followed up at 1 month, 3 month, 6 month and 1 year postoperatively and any urethrocutaneous fistula or any other complication(s) were noted.

A suitable proforma was used. Variables noted down were demographic data, detailed history, clinical examination findings (site of meatus, degree of chordee), investigation reports (blood for complete blood count, BT, CT, blood urea and serum creatinine, Urine for routine and culture & sensitivity, USG KUB region), operative notes (preoperative diagnosis, anesthesia technique used, surgeon's note, time required, any adverse effect), early postoperative evaluation data (wound infection, seroma formation, hematoma formation, penile skin necrosis, wound dehiscence) and follow up data at 1,3,6,12 months (urethrocutaneous fistula, meatal stenosis, urethral stricture, urethral diverticulum, testicular ascent or atrophy).

Postoperative complications were compared thorough clinical examinations noting the wound, penile skin, testis for position or any decrease in size, pus from the wound; aspiration from swelling near wound of serious fluid or blood; examination by anterior urethral dilator (size 2/3) with xylocaine jelly (2%) and examination especially during micturation.

In both the groups, the operative technique was the same. The urethral plate was incised and tubularized over an appropriate sized catheter (6-8 Fr, according to the age of the patient and size of the urethral plate) using 5-0 polyglactin with running subepithelial sutures. In group A, tunica vaginalis graft was harvested by bringing the right testis with its tunica and spermatic cord into the operative field by blunt and sharp dissection of the penoscrotal junction, after degloving the penis, but in anterior hypospadias a separate incision over the scrotum was made. Tunica vaginalis was incised near the lower pole of the testis and a flap was raised off the testis and the cord structures, taking care not to damage the vas and vessels. Sufficient length of the flap was ensured by careful dissection upto the external ring. The tunica vaginalis graft was brought over the urethral tube to provide a cover along the entire length by fixing with Buck's fascia and the bases of glanular wings around the neourethra with 5-0 polyglactin sutures to secure the flap in position. For the portion meant to go underneath the glans, the tunica vaginalis graft was trimmed to prevent tight glans closure. Glansplasty was done with 5-0 polyglactin sutures. The coronal collar of skin was also reconstructed in continuity with the glansplasty.

In group B, the dartos flap was harvested from the dorsal prepuce and the penile skin with meticulous dissection between the dartos and the skin. The dartos fascia was then swung ventrally over the neourethra and tacked with 5-0 polyglactin sutures. The flap is mobilised adequately to prevent torsion of the phallus. The distal part was thinned to cover the glanular portion of the neourethra. Excess skin was excised and the dorsal skin was transposed ventrally so that the suture line was not in the midline, ensuring that the suture line of the neourethra and that of skin were not in the same line. Light compression dressing with antibiotic impregnated gauge was done.

III. Statistical Analysis

Descriptive statistics were employed to characterize the data. Chi-square test was used for qualitative data and students' t test for quantitative data. P-value of <0.05 was considered to be statistically significant.

IV. Results

Most of the patients (68%) were between 1-4 years of age with 60% coming from rural background. All the patients with meatal stenosis had anterior and distal hypospadias (P value 0.003). Minimal chordee was more commonly associated with anterior (coronal and subcoronal) and distal penile hypospadias in both the groups (P value 0.07). Significant chordee was more commonly associated with proximal penile and mid penile hypospadias in both the groups (P value 0.0005). The most common associated diseases were inguinal hernia and UDT. The mean duration of operation was 109.00±5.00 minutes (range: 100-115 minutes) in Group A, which was more than Group B with 102.80±4.58 minutes (range: 95- 115 minutes) which is statistically significant (P value 0.001). The commonest early complications were postoperative edema and pericatheter leak. The difference in the urethrocutaneous fistula rate in two groups is not statistically significant (P value 0.071) with 8% patients in Group A and 12% patients in Group B. It is statistically significant that TVF is superior to dartos flap as a waterproofing layer for primary TIP repair in proximal penile hypospadias whereas in case of anterior hypospadias dartos flap is superior to TVF (P value 0.011). Wound dehiscence developed in 8% patients in Group A was significantly more than Group B where there was no wound dehiscence (P value 0.004). Superficial penile skin necrosis was more in Group B than Group A (P value 0.007). There was no significant difference in terms of wound infection, meatal stenosis, urethral stricture,

urethral diverticulum, testicular ascent, postoperative hospital stay and cosmetic outcome. The results obtained in the two groups have been summarized in **table 1**.

Table 1: Summary of Comparison of Results between Two groups:

Paramaters	Group A	Group B	P Value	
Postoperative Complications	Pericatheter Leak	20%	16%	0.617
	Postoperative Oedema	32%	28%	0.141
	Wound Infection	8%	12%	0.071
	Wound Dehiscence	8%	0%	0.004
	Penile Skin Necrosis	0%	12%	0.153
	Urethrocutaneous Fistula	8%	12%	0.071
	Meatal Stenosis	8%	12%	0.538
	Urethral Stricture	4%	8%	0.461
	Urethral Diverticulum	4%	0%	0.108
	Testicular Ascent	4%	0%	0.297
Excellent or Good Cosmetic Outcome	86%	100%	0.046	
Mean Operating Time (minutes)	109.00 ± 5.00	102.80 ± 4.58	< 0.001	
Mean Postoperative Hospital Stay (days)	10.20 ± 0.58	10.04 ± 0.20	0.197	

V. Discussion

Surgery for hypospadias is continuously evolving. No single technique is considered perfect.⁵ The use of interposition flaps is well documented in the literature. Snodgrass⁸ described additional coverage of neourethra by vascularized subcutaneous tissue dissected from dorsal prepuccial and shaft skin. This dissection requires skill and there are chances that vascularity of the skin cover may get compromised resulting in subsequent dermal necrosis. Although there are various options for soft tissue coverage, the ideal one is still to be established. Dartos based flaps have the advantage that they are available locally and do not require another incision or extension of the incision.

Snow *et al.*⁶ in 1995, were the first to report the use of tunica vaginalis as interposition graft. The fistula rate reported was 9%. It is a dependable soft tissue cover for redo cases and posterior hypospadias surgery. In his recent study reports, Snodgrass could reduce the fistula rate to approximately 0% with the use of TVF.⁸

During our study maximum cases (68%) were in the age group of 1-4 years. 70% patients came to seek medical advice for abnormal location of meatus and cosmetic reasons, thus highlighting the fact that a procedure with better cosmetic result is essential for patient/parents satisfaction. 20% patients had a thin urinary stream.

Meatal stenosis was more commonly associated in anterior (coronal and subcoronal) and distal penile hypospadias in both the groups. Duckett and Baskin (1996) stated that the more distal the meatus, more often it is associated with meatal stenosis. In our series also, the patients with meatal stenosis had anterior and distal hypospadias. (P value 0.003)

Chordee was present in 40(80%) cases. Out of 40 cases, 30 (75%) were minimal chordee and 10 cases (25%) were significant chordee. Minimal chordee was more commonly associated with anterior and distal penile hypospadias.(P value 0.07) Significant chordee was more commonly associated with proximal and mid penile hypospadias (P value 0.0005) and it is statistically significant.

Inguinal hernia was associated in 60% cases and UDT was associated in 40% cases. Mean operating time in Group A was 109.00±5.00 minutes and Group B 102.80±4.58 (P value 0.001). Operating time in Group A was more than Group B and it is statistically significant.

The most common complications were pericatheter leak and postoperative edema. Out of total 50 patients 9 patients developed pericatheter leak and 15 developed postoperative edema. However, this was not bothersome as it subsided by conservative management within 10-12 days. Wound infection developed in 2 patients in Group A and 3 patients in Group B. Although, wound infection is a rare problem in hypospadias repair. In our series, it occurred in 10% patients and it was managed by postoperative antibiotics.

Wound dehiscence developed in 2 patients (4%) in Group A and in Group B there was no wound dehiscence. It was statistically significant that wound dehiscence more in Group A than Group B (P value 0.004) Superficial penile skin necrosis developed in 3 patients in Group B and in Group A there was no penile skin necrosis and it was also statistically significant that penile skin necrosis more in Group B than Group A (P value 0.007) Although it was inconsequential in long run, it did cause anxiety and distress to the families and invited more hospital visits and causes significant morbidity because of these inconsequential complications.

In our study, urethrocutaneous fistula was observed 8% patients in Group A and 12% patients in Group B. Out of 2 fistulae in Group A, 1 closed spontaneously and 1 required operative treatment. In Group B, reoperation was done in 2 patients and 1 closed spontaneously. Urinary leakage through the suture lines may be temporary after surgery, unless the tract becomes epithelialized into a fistula.⁴ To overcome the tensile force of voiding in the early phase of healing, we empirically maintained the catheter for 10 days. In Group A, urethrocutaneous fistulae developed in patients with subcoronal variety of hypospadias whereas in Group B, these developed in patients with proximal penile hypospadias. It was statistically significant that TVF is superior to Dartos flap as a waterproofing

layer for primary TIP repair in proximal penile hypospadias whereas in case of anterior hypospadias Dartos flap is superior to TVF (P value 0.011).

Meatal stenosis developed in 2 patients (8%) in Group A and 3 (12%) out of 25 patients in Group B. Urethral stricture developed in 1 patient (4%) in Group A and 2 (8%) out of 25 patients in Group B. Although routine urethral dilatation may not be necessary after Snodgrass repair, we carried out regular urethral calibration at outdoor clinic every week for approximately 3 months after 21 days of the operation and then optionally at later follow-up. In our series, only dilatation sufficed to treat the stricture.

Urethral diverticulum developed in 1 patient (4%) in Group A and in Group B there was no urethral diverticulum and it was repaired by operation. Testicular ascent developed in 1 patient (4%) in Group A and in Group B there was no testicular ascent.

Urinary stream is uniform and projectile in 22 out of 25 patients in both the groups. 2 patients in Group A and 1 in Group B had thin and jet urinary stream. 1 patient in Group A and 2 in Group B had spraying urinary stream causing soiling of undergarments. However, these did not cause problems as it resolved by regular urethral dilatation.

An abnormal aesthetic appearance affects the patients' body image and has a negative influence on his self-esteem. Psychological stress is brought on from genital comparison with schoolmates. The cosmetic result was evaluated depending upon-

- Wound healing by secondary intention or infection
- Vertically oriented slit-like neomeatus at the tip of glans
- Conical glanular configuration
- Supple penile skin

They were divided into poor, fair, good and excellent response.

18 patients had excellent cosmetic outcome in both the groups. 5 patients had good cosmetic outcome in Group A whereas in Group B, 7 patients. Only 2 had fair cosmetic outcome in Group A. There was no bad cosmetic outcome in any group.

Mean duration of postoperative hospital stay in Group A 10.20 ± 0.58 days and in Group B 10.04 ± 0.20 days. From our study it was found that mean postoperative hospital stay is slightly more in Group A than Group B but that is not statistically significant. (P value 0.197)

We could find few articles comparing these two methods of soft tissue cover. Chatterjee US et al⁴ have prospectively compared the two techniques of neourethral coverage after a TIP procedure. They have concluded that TIP with TVF could be an alternative to other techniques in a primary case of hypospadias but did not reach statistical significance. However, it was a multi-institutional study inviting surgeons variations. In their study, the fistula rate for cases with TVF and Dartos flap were 0% and 15-20%, respectively. Dhua AK et al³ have concluded that TVF may have an edge over dartos fascia for soft tissue coverage of the neourethra but did not reach statistical significance. In their study fistula rate for Dartos flap is 12% and they have been seen three cases of superficial skin necrosis following Dartos flap and that was treated conservatively. Dhua et al. compared the results of single stage TIP hypospadias repair in children receiving TVF cover versus historical controls that received dartos fascia cover operated previously by the senior surgeon. There is a one major fallacy in such a study. It is well known that the results of any operation improve as the surgeon gains more experience with the operation. Horowitz and Salzhauer demonstrated a definite learning curve in hypospadias surgery⁹. They prospectively analyzed the results of hypospadias surgery performed by a single surgeon over a 5-year period. They found that the results improved throughout the 5 years, and the absolute reduction of fistula rates between the first 2 and the last 2 years was 12.7% (P<0.02; chi-square test). Babu R et al¹⁰ compared Tunica vaginalis flap to inner preputial dartos flap as a waterproofing layer for primary TIP repair in midshaft hypospadias. They have concluded that TIP repair using inner preputial dartos flap has significantly higher complications when used for midshaft hypospadias compared to distal hypospadias and TVF reduces the fistula rate and it is superior to inner preputial dartos flap as a water proofing layer for primary TIP repair in midshaft hypospadias.

In primary TIP urethroplasty, the dorsal subcutaneous (dartos) fascia is intact, abundant, easy to mobilize, and can cover the neourethral suture line even down to the penoscrotal junction. Harvesting the TVF was also easy although this endeavor took some extra time, this gradually decreased as we climbed the learning curve. The trend showing decrease in the operating time as the study progressed.

VI. Conclusion

TVF was found to be superior to Dartos flap as a waterproofing layer for primary TIP repair in proximal penile hypospadias in our study whereas in case of anterior hypospadias, dartos flap was superior to TVF. TVF has no added advantage over the dartos flap in primary hypospadias repair except in cases of proximal penile hypospadias. Routine use of TVF in primary hypospadias repair is not to be encouraged. TVF might have a role in redo hypospadias repair where Dartos tissue may be unavailable.

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