

# Evaluation of Tunica Vaginalis Free Graft as a Better Alternative to Tunica Vaginalis Pedicled Flap for Providing Waterproof Cover in Stage II Hypospadias Repair

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## Abstract

**Background:** Tunica vaginalis (TV) flap has been used by many surgeons as a waterproof layer to cover neourethra. We present our experience in using free TV graft as an alternative to TV flap for providing waterproof cover in second-stage hypospadias repair. **Materials and Methods:** A retrospective review of ten patients with severe hypospadias who underwent Stage II hypospadias repair over a period of 15 months was carried out. Free TV graft was used to cover neourethra in all the patients. **Results:** The median age of patients was 3.5 years. Six patients had proximal hypospadias with severe chordee and four patients had peno-scrotal hypospadias. Eight patients had undergone Byars procedure and two patients had undergone Bracka's procedure during the first stage repair in the same institute. The mean operative time for Stage II repair using free TV graft was 150 min (standard deviation  $\pm$  15 min). All patients passed urine in good stream following stent/feeding tube removal. The average duration of hospital stay was 11 days. None of our patients developed urethrocutaneous fistula. Only one patient had superficial surgical site infection. All patients are well on follow-up after 6 months. **Conclusion:** Free TV graft could be used in place of TV flap as an intermediate waterproof cover to reduce the incidence of urethrocutaneous fistula in staged II hypospadias repair; however, studies involving a larger number of patients would be required to draw conclusions.

**Keywords:** Free graft, hypospadias, proximal, second stage urethroplasty, tunica vaginalis

## INTRODUCTION

Staged repair of hypospadias is gaining acceptance as the standard of care for the management of severe hypospadias. It involves excision or transection of fibrotic native urethral plate and correction of chordee in first stage. In second stage, neourethroplasty is done by tubularising ventral penile skin over an appropriate size urethral stent/infant feeding tube. It is evident from studies that soft-tissue cover over neourethra gives good functional results and also reduces the incidence of urethrocutaneous fistula.<sup>[1]</sup> Available literature describes the use of various tissues such as de-epithelised overlap skin flap, dartos fascia, corpus spongiosum and tunica vaginalis (TV) to provide cover to neourethra.<sup>[2-6]</sup>

Snow BW was the first to introduce the use of TV as a blanket wrap to cover reconstructed neourethra.<sup>[6]</sup> Since then, TV flap

has been used by many surgeons as an intermediate soft-tissue cover in primary hypospadias repair, redo repair and repair of urethrocutaneous fistulae.<sup>[7-9]</sup> The main described advantage of TV flap is good intrinsic vascular supply which does not depend on the scarred local tissue. Dissection of TV flap has been reported to be easy, and its pedicle length can be increased by dissection up to superficial inguinal ring; however, pedicled TV flap sometimes may be limited by its length to reach up to the apex of urethroplasty. Sometimes, TV flap also carries other layers of scrotum along with it making it thick and impossible to use to cover neourethra under the glansplasty.

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In 1990, Voges *et al.* reported the successful use of free TV graft in repair of hypospadias. They used TV as free graft to cover closure of urethrocutaneous fistula.<sup>[10]</sup> Free peritoneal graft has been used successfully for many years as adjunct to various surgical procedures.<sup>[11,12]</sup> The TV is a thin and barely transparent membrane that originates from an invagination of the peritoneum which posteriorly descends into the scrotum. It is a mesothelium-lined sac that covers testis anteriorly and laterally. The thin and transparent-free TV graft overcomes the limitations of pedicled TV flap as it can easily reach up to the apex of neourethra also it can be used conveniently to cover neourethra under glansplasty. Herewith, we present our experience with free TV graft as an intermediate cover for waterproofing the neourethra in Stage II urethroplasty.

## MATERIALS AND METHODS

A retrospective analysis of ten consecutive patients with severe hypospadias who underwent staged hypospadias repair in the Department of Paediatric Surgery at a tertiary institute from January 2019 to March 2020 (total 15 months) was carried out. All patients were earlier operated for stage I hypospadias repair in the same institute. Second stage hypospadias repair was performed by the same team of surgeons using free TV graft as vascular cover for neourethra as described subsequently.

### Operative technique

The procedure was done under general anesthesia. Glans stitch was taken, and the patient was catheterised with an appropriate sized infant feeding tube (6–9 Fr depending on his age). A U-shaped incision was made over ventral aspect from the distal limit of neourethral meatus (glanular) to proximal urethral meatus with the lower limit of the U incision skirting closely around the margin of proximal urethral meatus. Neourethroplasty was then done by tubularising the strip of ventral skin around feeding tube with 6-0 or 5-0 polyglactin 910 continuous sutures around 2–3 mm apart and inverting the edges without tension. In all patients, the left testicle was brought out by a separate midline scrotal incision. The TV was incised at the lower pole of testis and parietal layer of TV was harvested as a rectangular free graft of enough size to cover the neourethra [Figure 1]. This free TV graft was tucked just above corona with polyglactin 910 and also secured with few intermittent absorbable sutures [Figure 2]. Glansplasty was done in a single layer with Polydioxanone 5-0 or 4-0 round body suture. Penile skin was mobilised and was closed with absorbable suture. Scrotal skin was closed after fixing the respective testicle. Fine instruments and bipolar diathermy were used in all patients. Patient received intravenous antibiotics post-operatively for 5 days and then switched to oral antibiotics. Check dress was done on 3<sup>rd</sup>, 5<sup>th</sup> and 7<sup>th</sup> post-operative day, after which the wound was kept open. The feeding tube was removed on 10<sup>th</sup>–12<sup>th</sup> day. The patient was discharged once he passed urine without any difficulty.

All patients were followed up at 1 week, 15 days, 3 months and 6 month intervals.

All data were entered in MS Excel, coded and analysed in statistical software Stata Statistical Software, Version 12, manufactured by College Station, (Texas, US) and assessed for normality; those with a normal distribution were reported as mean with standard deviation (SD) and those with a skewed distribution were reported as median with range. Data analysis included descriptive statistics with respect to age at presentation, type of hypospadias, type of glans, stretched penile length, type of first stage repair done, duration between first and second stage repair, intra-operative time (calculated from the time the glans stitch was taken to the completion of skin closure), duration of hospital stay, functional outcome, wound infection and fistula rate.

## RESULTS

The median age of patients under the study was 3.5 years (range 2–9 years). Six patients had proximal hypospadias with severe chordee and four patients had penoscrotal hypospadias. None of them received testosterone therapy to increase phallic size. The glans was splayed in eight patients and conical in two patients. The first stage surgery was done using Byars flap (splitting and rotating dorsal prepuce ventrally) in eight patients and Bracka's (free graft from inner prepuce) repair in two patients. Mean duration between Stage I and Stage II surgery was 8 months (SD  $\pm$  2 months).

The mean operative time for Stage II repair using free TV graft was 150 min (SD  $\pm$  15 min). All patients passed urine in good stream following stent/feeding tube removal. The average duration of hospital stay was 11 days.

Only one patient had superficial surgical site infection which was managed by Sitz bath and local application of antibiotic ointment. Complications such as urethrocutaneous fistula, glans dehiscence and ascent of testis and/or scrotal haematoma were not seen in any of these patients.

All patients are well on follow up after 6 months.



**Figure 1:** Free tunica vaginalis graft being harvested from left testis after completion of neourethroplasty



**Figure 2:** Intra-operative image after application of free tunica vaginalis graft over the neourethroplasty

## DISCUSSION

Operative techniques for hypospadias are evolving, and consensus regarding the best technique for repair of hypospadias has varied with time. Initially, staged repair of hypospadias was the preferred technique for repair of hypospadias. Later, during 1970–1990, single stage approach for hypospadias repair was popularised by Duckett and others.<sup>[13-15]</sup> Bracka, in 1995, again reintroduced the two-stage repair for hypospadias.<sup>[16]</sup>

In staged repair of hypospadias, first stage involves chordee correction, excision/transection of fibrotic native urethral plate and all fibrotic tissue and covering the raw ventral area of penile shaft by using Byars flap, free inner preputial skin graft or oral mucosa. The technique for coverage of ventral raw area during Stage I hypospadias surgery is always based on the surgeon's preference. In our study, ventrally rotated Byars' flap was used in eight patients, whereas two patients had free preputial skin graft.

Available literature suggests that introduction of protective intermediate layer contributes to reduced incidence of the urethrocutaneous fistula.<sup>[17]</sup> There are many available options for protective intermediate layer such as de-epithelised overlap skin flap, dartos fascia, corpus spongiosum and TV. Each of these tissues has its own advantages as well as disadvantages. Local dartos flap can be obtained easily without a second incision, but it requires meticulous dissection. The main disadvantage of dartos flap is devascularisation of penile skin during dartos dissection, leading to increased incidence of urethrocutaneous fistula.<sup>[18]</sup> The paucity of local paraurethral tissue and unavailability of dorsal subcutaneous tissue in Stage II hypospadias surgery makes harvesting of dartos flap a difficult task.

Tunica vaginalis flap has good intrinsic vascular supply independent of scarred local tissue. Dissection of TV flap is easy and its pedicle length can be increased by dissection up to superficial inguinal ring.<sup>[1]</sup> It provides robust flap coverage

for the neourethra. Reduced incidence of urethrocutaneous fistula has been reported in series where pedicled TV flap was used as intermediate layer.<sup>[6,7,16,19-22]</sup> Ipsilateral testicular ascent, torsion of testis, scrotal haematoma and even scrotal abscess are the complications reported in TV flap.<sup>[1,23]</sup>

Das S in 1980 used TV autograft in the management of Peyronie's disease.<sup>[24]</sup> Perlmutter *et al.* in 1985 were the first to use free TV graft in hypospadias repair.<sup>[25]</sup> They used TV graft ventrally as a substitute of dermal graft in patients with persistent chordee even after dorsal plication. Later in 1990, Voges *et al.* successfully used TV as free interposition graft between skin and urethra after closure of urethrocutaneous fistula.<sup>[10]</sup> In 2010, Rosito *et al.* reported a good result with free TV graft for dorsal placement in Bracka repair.<sup>[26]</sup>

Few authors reported that harvesting of TV flap is associated with risk of injury to vas, spermatic cord or vessels.<sup>[27]</sup> In addition, there is a loss of length of pedicle in tunnel for pedicled TV flap making it sometimes difficult to reach up to the apex of urethroplasty. Sometimes, TV flap is too thick to use for covering neourethra under the glansplasty. In contrast, TV free graft is thin, transparent and can easily be used to cover neourethra under glansplasty. It does not require dissection up to superficial inguinal ring, hence injury to cord structures and ipsilateral testicular ascent is also avoided. There was no urethrocutaneous fistula following the use of TV graft in our series.

Tunica vaginalis is a mesothelium lined tissue that has been already used as autograft in various other surgical procedures. The successful use of peritoneum in various abdominal surgeries and successful use of free TV graft in repair of urethrocutaneous fistula by Voges *et al.* questions the validity of using pedicled TV flap.<sup>[10,28,29]</sup> Free TV graft thus promises to be more versatile as compared to TV pedicled flap.

The major constraint of this study is the limited number of patients managed by free TV graft and duration of follow-up; however, this study may serve as a pilot study to develop future population-based randomised control trials.

## CONCLUSION

The choice of intermediate layer in second stage urethroplasty remains controversial. Our study suggests that free TV graft could be used as an intermediate waterproof cover and also avoids complications related to TV flap. However, prospective comparative studies based on randomised control trials would be required to arrive at effective conclusions.

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## Conflicts of interest

There are no conflicts of interest.

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