

Tunica Vaginalis Free Graft Urethroplasty: Early Experience

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ABSTRACT

INTRODUCTION: In the last few decades, many tissues have been used as substitution for long segment urethral strictures. The tissue of choice is still controversial, so new tissues and techniques are continuously being prescribed. The purpose of the present report was to describe the author's experience with the use of tunica vaginalis (TV) free graft for substitution urethroplasty, along with midterm follow up.

METHODS: Between October 2005 and November 2008, a total of 20 patients had TV free graft urethroplasty in 2 institutions by the same surgeon [HA]. Patients were assessed preoperative by urethrography. In 8 cases, dorsal urethrotomy was done and the TV graft was placed dorsally and sutured with 3/0 polyglactin running sutures. In 12 cases, complete dissection of the stricture was done; both ends were spatulated, and the TV graft was placed using augmented anastomosis urethroplasty. Urethral stent fixed to a suprapubic catheter was left in situ for 2-4 weeks. The patients were assessed postoperatively by measuring the urine flow rate and by micturating cystourethrography. Follow up ranged from 2 to 38 months. Successful criteria were: patient satisfaction, urine flow rate above 15mL/s, patent urethrogram, and no need for dilation or any instrumentation during the follow-up period.

RESULTS: Out of 20 patients, 1 failed due to severe wound sepsis and the TV was redone successfully 6 months later. One had recurrent urethral stricture 3 months later, managed by optical urethrotomy. The remaining patients (18/20) were voiding well, with an average flow rate >16mL/s. Two developed superficial wound infection that did affect the urethra. None of the patients had any scrotal pain or discomfort in the follow-up period.

CONCLUSION: This early experience of using tunica vaginalis for substitution urethroplasty has shown encouraging results. The procedure is easy and convenient; donor tissue is obtained through the same incision as the one used for stricture repair. Tunica vaginalis urethroplasty should be considered as an additional option by reconstructive genitourinary surgeons.

KEYWORDS: Urethral stricture; Urethroplasty; Graft; Tunica vaginalis

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INTRODUCTION

The treatment of the urethral stricture is among one of the oldest medical practices by mankind. In approximately 600 B.C. Egyptians used bougies made of wood, papyrus, feathers and metal to widen the constricted urethra [1]. Open surgical urethral stricture can be achieved by end-to-end anastomosis in short segment stricture less than 2-3cm, or by substitution urethroplasty for longer stricture.

The ideal tissue for substitution urethroplasty remains controversial [2]. Currently, the buccal mucosa graft prevails in the treatment of stricture urethra, but donor site may not be sufficient for very long strictures. Attention is being directed toward tissue engineering to get tissue-engineered buccal mucosa (TEBM) for substitution urethroplasty [3]. However, the cost of TEBM is high. Full thickness penile skin (prepuce) is limited if previous circumcision was performed, or if the tissue was affected by diseases such as lichen sclerosus and balanitis.

The author presents early experience in the use of tunica vaginalis free graft for substitution urethroplasty. Advantages of this procedure are that it is easy to harvest, tissue is abundant, and there is little complication at the donor site.

METHODS

Participants

A total of 20 patients received operations by the same surgeon in two institutions from October 2005 to November 2008. The age of the patients ranged from 22 to 60 years old.

Patients were assessed preoperatively by clinical history, physical examination, urine culture, ascending urethrogram and micturating cystourethrogram. The patient's HIV status, full blood count, urea, creatinine and electrolytes were also determined. Patients selected in this study were those with long and/or recurrent strictures; 12 patients had failed attempts at urethral dilatation, 8 had failed attempts of optical internal urethrotomy, and 5 had hydrocele (3 unilateral, 2 bilateral). All patients were counseled and well informed about the procedure and any possible complications, and written consent was provided.

Preoperative Information

Table 1 contains etiology and site of stricture information. A preoperative parenteral antibiotic was administered. The length of the stricture varied from 3.5 to 9 cm.

Table 1. Etiology and Site of Strictures (N = 20)

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Etiology of Stricture	n	Site of Stricture	n
Inflammatory	8 (4 HIV+)	Penile Urethra	5
Lichen Sclerosus	1	Bulbar Urethra	7
Trauma	6	Bulbopenile	5
Idiopathic	5	Multiple Strictures	3

Surgical Technique

All patients had substitution urethroplasty using tunica vaginalis (TV). Spinal or general anesthesia was administered, and the patient was placed in the lithotomy position. The urethra was mobilized through midline perineal incision and freed from underlying spongy tissue (see Figure 1). The site of stricture was identified by passing metal urethral sound.

In 8 cases, dorsal urethrotomy was done at the site of stricture up to the healthy mucosa at the proximal end. In 12 cases, dissection of the stricture (complete removal of scar tissue) was done and both ends of the urethra were spatulated. The testes were delivered through the perineal incision (see Figure 2) and the appropriate size of TV was harvested (see Figure 3). Trimming of cremaster fibers was then done, and the tissue was kept in saline until it was ready to be placed on the recipient site.

Figure 1. 3D CDI-TRUS: Urethra Completely Mobilized

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Figure 2. 3D CDI-TRUS: Testis Delivered Through the Same Incision. doi: 10.3834/uij.1944-5784.2009.04.07f2

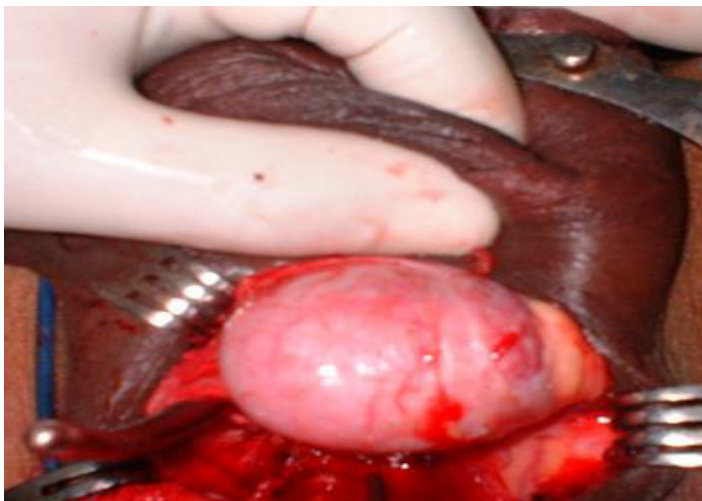
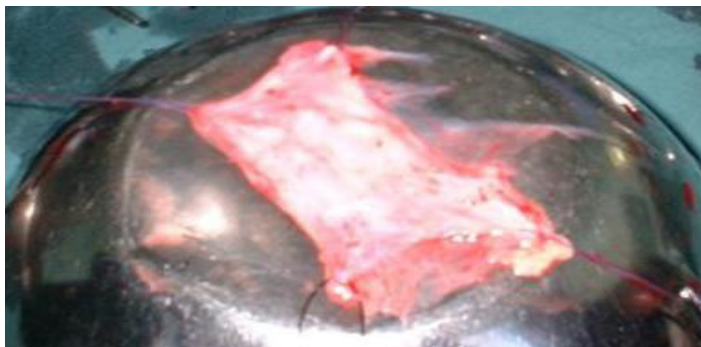


Figure 3. 3D CDI-TRUS: Tunica Vaginalis Graft doi: 10.3834/uij.1944-5784.2009.04.07f3



(Gentamycine 160mg bid) and non-steroidal anti-inflammatory (Indomethacine 50 mg 3 times per day) for 5 days. A pericatheter urethrogram was done before removal of the catheter.

In the 8 cases of dorsal urethrotomy, the opened urethra was rotated 180 ° onto the right side. The TV graft was applied and sutured on the corpora cavernosa using 3/0 Polyglactin absorbable running sutures [4]. The right urethral margin was sutured to the right side of the graft. The urethra was rotated over the graft and the left side of the graft sutured to the left side of the urethra. At the end of the procedure, the graft was completely covered by the urethra (see Figure 4).

In the 12 cases of dissection, the stricture and the urethral scar were completely removed. The distal and proximal ends of the urethra were spatulated and the TV graft inserted using augmented roof strip anastomosis [1- 5]. The TV graft was spread and fixed using 3/0 Polyglactin running sutures to the underlying corpora, and its lower margin was sutured to the proximal mucosal edge of the urethra. The left mucosal margin of the opened distal urethra was sutured to the left side of the graft. The urethra was rotated back over the grafted area and sutured to the proximal mucosal edge and to the right corpora cavernosa. The bulbocavernous muscles were sutured over the bulbar urethra, and the perineal closure was made. A small drain was placed in the region of repair. At the end of the procedure, a size 18F silicone catheter (if it was available) was inserted and fixed to the suprapubic catheter (with the balloon not inflated). If a silicone catheter was not available, a size 18F nasogastric tube was substituted and left in situ for 2-4 weeks.

Postoperative Information

Postoperatively, patients were given parenteral antibiotic

Postoperative evaluation was done by assessing patient satisfaction, performing a urethrogram, and observing and timing the flow rate (volume of urine flow per time) using a stop watch (because flowmetry was not available).

Follow-up was done at 1, 3, 6 and 12 months and annually thereafter. Successful criteria were: patient satisfaction, urine flow rate above 15mL/s, patent urethrogram, and no need for dilation or any instrumentation during the follow-up period.

RESULTS

The tunica vaginalis free graft procedure was technically successful in all patients. Operative time varied from 90 to 140 min and there was no need for intraoperative blood transfusion.

Figure 4. 3D CDI-TRUS: Final Aspect of Tunica Vaginalis Urethroplasty. doi: 10.3834/uij.1944-5784.2009.04.07f4



Figure 5a. Preoperative Cystourethrogram Showing Multiple Strictures with Extravasation

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Figure 5b. Postoperative Voiding Cysto Urethrogram After Tunica Vaginalis Urethroplasty

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One patient, who was HIV positive, had severe wound sepsis. This led to breakdown of the anastomosis, and the operation needed to be redone after 6 months using a TV graft that was harvested from the contralateral testes. Another patient developed recurrent urethral stricture at the site of anastomosis (0.5cm) 3 months later, which was managed by optical urethrotomy.

The remaining 18 patients (90%) were voiding well, with flow rate varying from 16 mL/s to 22 mL/s. Voiding cystourethrograms showed patent uniform urethra. An example of a pre and postoperative cystourethrogram is shown in Figures 5a and 5b, respectively.

No instrumentation was needed during the follow-up period. Patients were satisfied and passing urine in good stream (see Figure 6). Although 2 patients developed superficial wound infections in the perioperative time, the infections were treated by antibiotics and did not affect the urethra. To date, all patients are satisfied and voiding very well. None had any scrotal pain or discomfort in the follow-up period.

DISCUSSION

Although end-to-end anastomosis remains the method of choice in short segment urethral stricture (2-3 cm), patients with long segment and multiple stricture particularly in the penile urethra require substitution urethroplasty with either genital or extra-genital graft material.

The ideal tissue for substitution urethroplasty is much debated. Candidate tissues have included split and full thickness skin

grafts derived from the scrotum, penis, and extra-genital areas, bladder mucosa, and buccal mucosa. Initially, scrotal skin was used, but its long term efficacy has proved unacceptable [2]. Non-hirsute full thickness skin grafts provided satisfactory results but donor site problems, recurrence stricture, and the high chance of failure in the presence of lichen sclerosus have restricted their use [6]. Penile skin graft is also limited by problems such as balanitis.

Memmelhaar [7] was the first to report the use of bladder mucosa for urethral reconstruction. Following initial enthusiasm with this substitute, there were reports of problems with harvesting tissue for substitution and meatal exuberance [8].

Figure 6. Patient Voiding in Good Stream After Tunica Vaginalis Urethroplasty

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Humby was the first to describe the use of buccal mucosa for urethral substitution as early as 1941, but it was only in the early 1990s that buccal mucosa was rediscovered for this indication. el-Kasaby et al. [9] had the first reported use of buccal mucosa in urethroplasty for adults.

Various factors have contributed to the acknowledgement of buccal mucosa grafts as an ideal substitute for the urethra. These factors include easy accessibility and manual handling, resistance to infection, compatibility with a wet environment, a thick epithelium, and a thin lamina propria allowing early inosculation and good medium term results which are at least comparable to full thickness skin grafts [10]. However, the harvesting procedure is not without morbidity. Oral numbness and tightness of the mouth seem to be the long term problems [11]. Other reported complications include bleeding, scarring, and lip deviation or retraction [12].

The donor site is not sufficient for some degree of stricture. Therefore, attention is now being directed toward tissue engineered buccal mucosa (TEBM). Unfortunately, it has a high cost.

Calado et al [13] evaluated tunica vaginalis as substitution for buccal mucosa using an animal model, which showed patent and functional urethra as evidenced by radiographic and histological analysis. Foinquinas et al [14] reported their initial experience in 11 patients using TV dorsal graft urethroplasty with encouraging results. Barbagli, commenting on this article, emphasized that "this article confirmed that buried strip of TV becomes an epithelialized tube which confirm and expend the ingenious Duplay's principle: each strip of autologous epithelial tissue has the potential to be used for urethral regeneration. This is an important message for people involved in tissue engineering studies (p 531)" [14].

The TV graft is much easier to harvest than other materials because it can be harvested through the same incision using regional anesthesia. Therefore, there is no need for another wound, general anesthesia, and additional morbidity. The tissue is abundant and suitable for any length of stricture. TV graft has significantly reduced operative time which helps to prevent complications for the prolonged high lithotomy position [14].

Economically, the TV graft is suitable for developing countries. There, many of the surgeons use spinal anesthesia because general anesthetic agents are in short supply. Additionally, access to tissue engineering (TEBM) with its high cost may not be available.

Since October 2005, the author has been using TV free grafts as substitution for long segment urethral stricture, with encouraging midterm results. Long-term follow up is needed. Comparative studies between TV graft, skin graft, and buccal mucosa are also needed.

CONCLUSION

Tunica vaginalis free graft urethroplasty is easy, safe, and not time consuming. Economically, TV graft is suitable for developing countries where access to tissue engineering with its high cost may not be available.

Since October 2005, this technique has been used in the author's department with encouraging results. It needs to be considered as an alternative to buccal mucosa. Long-term follow up and comparative studies with other urethral substitution tissues are needed.

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