Journal of Pediatric Urology (2005) ■■, ■–■

Journal of Pediatric Urology

ELSEVIER

CASE REPORT

Urethral substitution using vein graft for hypospadias repair

O.K.Z. Shaeer [a,*], A. El-Sadat [b]

[a] Department of Andrology, Faculty of Medicine, Cairo University, Cairo, Egypt
[b] Department of Pediatric Surgery, Faculty of Medicine, Cairo University, Cairo, Egypt

Received 24 July 2005; accepted 15 November 2005

KEYWORDS
Hypospadias;
Urethra;
Saphenous;
Vein

Abstract *Objective:* Complex hypospadias surgery requires abundant and stretchable tissues for urethroplasty. Genital skin is ideal for this purpose but is often unavailable in re-do cases. Extragenital tissues have their drawbacks such as the limited length of buccal and bladder mucosa, and contracture of skin grafts. Tubularization and on-lay techniques comprise one or two longitudinal suture lines that are the source of complications. We investigate the possibility of using a saphenous vein graft to construct a long, wide, stretchable and pre-tubularized neourethra that is not compromised by the longitudinal suture line.
Patient and method: A male patient with proximal hypospadias for which surgical correction had failed underwent the operation. The patient had a penoscrotal meatus and was circumcised. A saphenous vein graft was passed through a tunnel created on the ventral aspect of the penis, and was anastomosed to the urethra proximally and the distal opening of the tunnel at the tip of the penis.
Results: After 12 months, the patient had a forward stream, no dilatation of the neourethra, and no penile curvature upon morning erection (as reported by the parents).
Conclusion: This initial experience with saphenous vein urethroplasty shows that the technique is feasible, and may provide a reliable and practical alternative to the current techniques.

Introduction

A wide variety of techniques have been proposed for hypospadias repair. In searching for the 'best' technique, new procedures keep emerging. Urethroplasty may be performed using local or distant 'extragenital' tissues. Local tissues, especially the

* Corresponding author. 21 Gaber Ibn Hayan St., Dokki, 12311 ARE, Cairo, Egypt, (PO Box: 47 Bab El-Louk, 11513, Cairo, Egypt). Tel.: +20 2 3359047/ +20 2 3374360/ +20 106600606; fax: +20 2 7605181/ +20 2 7951742.
E-mail address: dr-osama@link.net (O.K.Z. Shaeer).

1477-5131/$30 © 2005 Published by Elsevier Ltd on behalf of Journal of Pediatric Urology Company.
doi:10.1016/j.jpurol.2005.11.006

prepuce, are thought to offer the best results, being accustomed to both urine and air, stretchable so as to cope with erection, and non-hairy to avoid stone formation. Unfortunately, the limited availability of these tissues for re-do surgery forces the surgeon to search for alternatives: extragenital tissue.

Distant tissues include buccal mucosa, bladder mucosa, skin and tunica vaginalis. These tissues have downsides. Skin grafts exhibit contracture and have relatively low elasticity. Bladder and buccal mucosa are relatively thin, predisposing to ballooning upon distal obstruction. The available area of mucosa may sometimes limit the possible length of the neourethra. These are some of the reasons why alternatives are always being investigated. Extragenital tissues are particularly needed in complex cases such as a circumcised patient, a patient with paucity of suitable shaft skin, and a patient with a long defect to reconstruct.

For a successful repair, the suture line should be water-tight. On the other hand, sutures must not be too tight or else necrosis of the edges of the anastomosis will ensue. It is also important to avoid overlapping suture lines to prevent fistula formation.

Ideally, the tissue for urethroplasty should be abundant to allow for a long urethra in proximal hypospadias and a wide urethra in all cases, should be elastic to allow erection without curvature, and should be pre-tubularized to eliminate the need for a longitudinal suture line that may be a site for fistula formation and repair dehiscence.

A cylindrical vein graft may provide an alternative to the currently utilized tissues. We describe the first case of urethral substitution using a vein graft for hypospadias repair.

Patient and method

A male patient, 8 years of age, had penoscrotal hypospadias that had been operated upon three times, consuming the prepuce in the process. The penoscrotal meatus was of adequate caliber. He had no curvature or fistulae. Ventral skin showed a scar, but the subcutaneous tissues were abundant and lax. The glans penis was small and irregular.

The procedure was performed under general anesthesia. The proximal urethra was outlined with a scalpel and mobilized by sharp dissection for a distance of 1 cm. The edges of the urethra were freshened. Ventral skin and subcutaneous tissues were pinched ventrally to delineate them from the corpora cavernosa. A blunt-tip long scissor was driven closed through the pinched tissues from proximal to distal along the length of the penis, to emerge ventral to the corona (Fig. 1). The neourethra was intended to stop at the coronal sulcus, since the glans was mutilated and unable reliably to maintain a neourethra without significant stenosis. The scissor was opened to split the tissues, and withdrawn in the open position. The resulting track was then dilated into a tunnel using urethral dilators. A 16-F dilator was eventually left in the tunnel while the vein graft was harvested.

The saphenous vein was exposed from the saphena varix downwards for a distance that was double that of the urethra to be constructed, the length of the urethra measured being in the stretched state. This abundance in length (without redundancy) provides an uncompromised, full-length graft, with reserve elasticity to counteract possible graft contraction and to cope with morning erection.

The branches of the vein were ligated. The caudal end of the vein was marked and the vein was harvested (Fig. 2). The vein was occluded from one orifice and saline injected from the other one to dilate the vein. One valve was identified in the process. The adventitia of the vein was carefully removed.

A urethral catheter was inserted into the tunnel from the distal orifice. The tip of the catheter was received at the proximal end, and was inserted through the vein graft, from the cranial orifice of the vein to the caudal orifice which was pre-marked (Fig. 3). The tip of the catheter was then inserted into the penoscrotal meatus and onto the urinary bladder. Mounted on the catheter, the vein graft was pulled through the tunnel using a hemostat. The cranial orifice of the vein was received at the distal opening of the tunnel, where it was sutured to the skin.

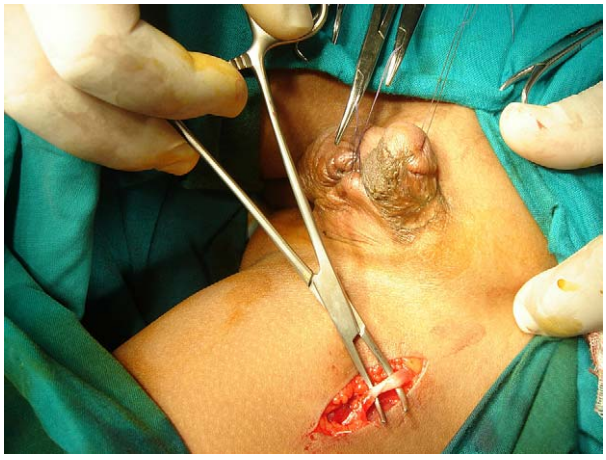

Figure 1 Creating a tunnel for the neourethra.

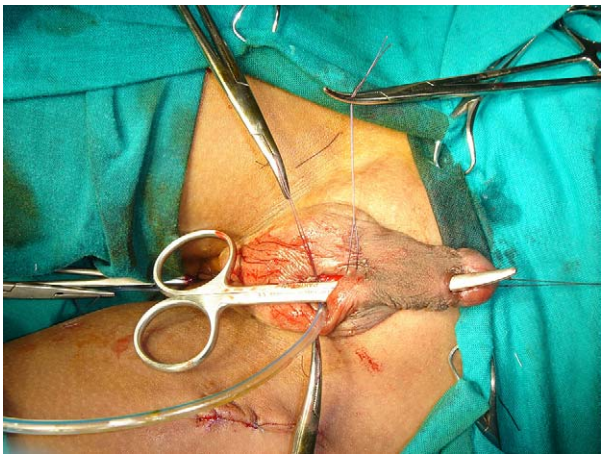

Figure 2 Harvesting the saphenous vein.

The caudal orifice of the vein was spatulated and sutured to the penoscrotal meatus. The anastomosis was covered by a layer of Dartos muscle. The incisions were closed (Fig. 4). Suprapubic urinary diversion was performed.

The patient was discharged on the same day as surgery under cover of antibiotics. The urethral catheter was removed after 7 days, and the suprapubic cystostomy after 14 days.

Results

The neourethra survived adequately. Initially, repeated dilatation was required, especially at the external meatus which showed some tendency for crust formation. Dilatation of the meatus was performed by the supervised and trained parents on a daily basis starting on day 10. Formal dilatation with urethral dilators was performed at

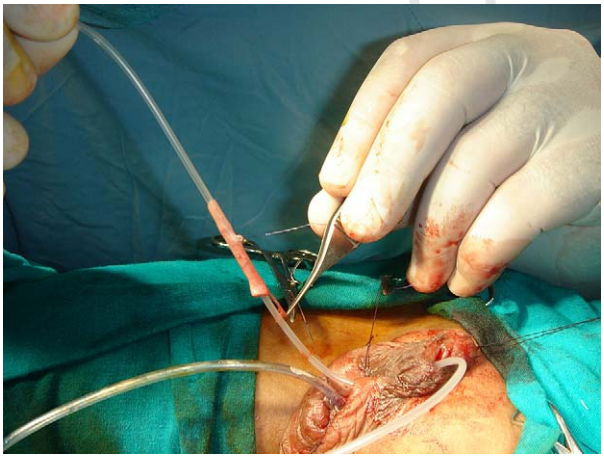

Figure 3 Mounting the vein graft on a catheter with the caudal end marked by a stitch.

Figure 4 The saphenous vein graft inset in place.

day 20 and day 30, on account of stenosis of the graft and retention of urine. After the first month, this was apparently no longer required. Prophylactic dilatation was performed at the start of the third and fourth months following surgery. After 12 months, the patient had a forward stream, no dilatation of the neourethra and no penile curvature upon morning erection (as reported by the parents).

Discussion

Not only is hypospadias a common congenital anomaly, afflicting 1–8 per 1000 male births [1], but complications issuing from surgical repair are common as well, ranging from <2% for distal hypospadias cases and simple techniques, to 6–30% for more complicated reconstructions [2]. Among the common complications are fistula formation, strictures, meatal stenosis, urethral diverticulum and hairy urethra [2].

Some of these complications necessitate reconstructing the urethra, in which case local tissues, especially the prepuce, may not be available. Paucity of suitable tissues is particularly evident when the urethra to be constructed is a long one. In this situation, distant tissues are used. Among those tissues are buccal mucosa [3], bladder mucosa [4], full thickness skin graft [5] and tunica vaginalis [6]. However, there is no consensus as to the best distant tissue for urethroplasty, each of the aforementioned having pros and cons.

Skin grafts, for instance, are notorious for contracture and poor elasticity that is incompatible with the erectile function, and carry the hazard of a hairy urethra, even if harvested from an apparently non-hairy area [2]. Bladder and buccal mucosa though popular, have limits to the area available for

harvesting, posing limits to the length of urethra that can be constructed. Worst of all, a common limitation with urethroplasty is the longitudinal suture line that spans the length of the neourethra. This line is a point of weakness, predisposing to many of the abovementioned complications.

Substituting the urethra with a saphenous vein graft may eliminate these limitations. The saphenous vein is of sufficient length to serve the most ambitious urethroplasty, and the length of the vein all along the thigh is usually of suitable caliber for an adequate urethra. Being of generous length, the neourethra is constructed according to the stretched length of the penis. This, in addition to the inherent elasticity of the vein, should avoid hindrance to erection and avoid curvature. Hair is not a problem with vein grafts. The multilayer structure of a vein provides a sturdy graft that may be less prone to ballooning or fistula formation at needle puncture sites. Although thicker than mucosal grafts, the vein graft has shown excellent survival in the case at hand.

Above all, the saphenous vein is cylindrical; that is, pre-tubularized. This eliminates the need for the longitudinal suture line that is an integral part of any urethroplasty, and confines the line of anastomosis to a circular one: vein to urethra. Elimination of the longitudinal suture line should theoretically decrease the incidence of fistula formation, especially in a long neourethra. The possibility of stricture formation on account of a circular suture line can be decreased by spatulation of the vein and urethra.

Operative time is considerably less than with other procedures in a similar case. This is because suture lines are minimized to those of the urethra-to-vein proximally, and the vein-to-skin distally, without need for the longitudinal suture line and the covering layers necessary for sealing and nourishing it. Harvesting the saphenous vein is also easier and faster than harvesting buccal or bladder mucosa.

In conclusion, this initial experience with saphenous vein urethroplasty shows that the technique is feasible, and may provide a reliable and practical alternative to the current techniques.

References

[1] Czeiel A, Toth J. Correlation between the birth prevalence of isolated hypospadias and parental subfertility. Teratology 1990;41:167.
[2] Retik AB, Atala A. Complications of hypospadias repair. Urol Clin North Am 2002;29:329—39.
[3] Humiy GA. A one-stage operation for hypospadias. Br J Urol 1941;29:84.
[4] King LR. Bladder mucosal grafts for severe hypospadias: a successful technique. J Urol 1994;152:2338—40.
[5] Devine Jr CJ, Horton CE. A one stage hypospadias repair. J Urol 1961;85:166.
[6] Khoury AE, Olson ME, McLorie GA, Churchill BM. Urethral replacement with tunica vaginalis: a pilot study. J Urol 1989;142:628.