

Urethroplasty for Long Anterior Urethral Strictures

Report of Long-term Results

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Introduction: We reviewed the long-term outcome of substitution urethroplasty with skin flaps for anterior urethral strictures, comparing 1-stage with 2-stage repairs.

Materials and Methods: A total of 45 patients with urethral strictures, 2.5 cm or longer, had undergone skin flap urethroplasty. A 1-stage surgical operation had been done in 10 patients (Orandi and bilateral pedicle island of penile skin) and a 2-stage surgical repair had been performed in 35 using the Johanson technique. They were followed up by retrograde urethrography for 1 to 10 years.

Results: The mean age of the patients was 46.3 ± 17.1 years. Etiology of the stricture was instrumentation in 33.3% of the patients, urethritis in 28.9%, trauma in 13.3%, and unknown in 24.5%. At the first postoperative year, the success rate was 75.6%. This rate was 71.4% and 90% for the 1-stage and 2-stage operations, respectively ($P = .23$). There were 1 (10%) and 10 (28.6%) cases of recurrent stricture and 1 (10%) and 3 (8.6%) cases of fistula in the patients with the 1-stage and 2-stage operations within the first year, respectively. During the 5 postoperative years, 70% of the patients with the 1-stage repair, 57.1% with the 2-stage repair, and 60% in total had no complications.

Conclusion: Based on the previous studies and our experience, we recommend skin flap urethroplasty. However, some measures such as proper tailoring of the flap and the extension of the incision onto the intact segments should be considered for achieving a better outcome.

Keywords: urethra, stricture, urethroplasty, skin flap

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INTRODUCTION

Urethral stricture is a disturbing urologic disease with scar formation in the urethra and corpus spongiosum (spongiofibrosis) and subsequent urinary symptoms or urinary tract infections (prostatitis or epididymitis). Making an appropriate therapeutic decision is influenced by the location, length, depth, and severity of the stricture. Of the treatment options are urinary diversion, dilation of the urethra, endoscopic urethrotomy, and open surgical repair.⁽¹⁾ Open surgical techniques include 2 main approaches: resection of the stricture with end-

to-end anastomosis and substitution techniques by grafts or flaps, namely substitution urethroplasty. The latter technique is often used for long strictures in which resection and anastomosis are not possible.^(1,2)

Penile skin flaps enjoy ample vascular supply and are applicable for the repair of the long anterior urethral strictures. Moreover, urologists usually have greater experience in harvesting skin flaps compared to grafts. These factors make the use of penile skin graft reasonable and, subsequently, emerges a better understanding of their outcome and complications. The

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reported results of the anterior urethroplasty, either 1-stage or 2-stage procedures, with skin flaps from the external genitalia have been contradictory.⁽³⁻⁶⁾ This warrants measures to evaluate and identify the outcome of these surgeries and to find out the key points for the betterment of the surgical techniques used in every urological center. Accordingly, we reviewed the long-term outcome of the substitution urethroplasty with skin flaps for anterior urethral strictures.

MATERIALS AND METHODS

We reviewed the records of all patients with surgical repair of long anterior urethral strictures (2.5 cm or longer) performed from 1993 to 2001 at our surgical center. A total of 45 patients with available surgical and follow-up records were selected in this study. The collected data were the demographic and surgical information including the etiology, length, and location of the urethral stricture, surgical technique, and urinary diversion approach. The follow-up records were also reviewed for recurrent stricture, fistula, urethral diverticulum, hair growth, chordee, meatal stenosis, skin graft necrosis, and ejaculatory dysfunction.

Surgical Technique

Thirty-five patients had undergone a 2-stage surgical repair using the Johanson technique. At the first stage, the urethra and the corpus spongiosum at the stricture site were opened following the skin incision. The exposure was extended to the intact urethral segments at the proximal and distal ends of the stricture. Complete hemostasis was done and then the urethra and the corpus spongiosum were sutured to the skin with a 4-0 chromic suture material. The patient was discharged and the second surgical stage was performed at least 3 months later; 2 parallel asymmetric incisions were made on the skin at each side of the urethra and the harvested skin flap was tubed on an 18-F Nelaton catheter by 4-0 Vicryl sutures. Afterwards, a covering layer made of the surrounding dartos tissue, the scrotum, or the tunica vaginalis was drawn onto the suture and fixed. In case of glanular stricture, glanoplasty would be performed and then the skin would be repaired. A urethral catheter was fixed for all and a percutaneous cystostomy was placed for 13 patients.

A 1-stage surgical operation had been done on 10 patients, 5 with the Orandi method and 5 with bilateral pedicle island of penile skin (BIPIPS). The Orandi method was used for the strictures of the penile urethra and the BIPIPS for those of the bulbar urethra. In both techniques, the hair-free skin of the ventral penis was harvested as a flap. First, an incision along the stricture was made and the skin flap, tailored to the stricture length, was harvested. The defect was covered by the penile skin flap. The anastomosis was made by a 4-0 or 5-0 suture. In BIPIPS technique, the flap was transformed on the stricture segment through a tunnel under the scrotum. A protecting layer was drawn onto the suture line and the skin was repaired. The urethral catheter and cystostomy were placed for all of the patients.

Intravenous antibiotic prophylaxis by cephalothin and gentamicin was administered for 48 to 72 hours postoperatively and oral antibiotics were started on thereafter. The patients were discharged on the 5th postoperative day, on average. Their catheters were removed 2 weeks later and antegrade voiding cystourethrography (VCUG) or retrograde urethrography was carried out.

Follow-up

On the 6th month follow-up, physical examination and history with a special attention to voiding pattern were done. At the first postoperative year, retrograde urethrography was performed, as well. The next follow-up visits would be based on physical examination and history if the retrograde urethrography was unremarkable. Appropriate diagnostic measures would be done in case of any obstructive or irritative symptoms, ejaculatory dysfunction, or recurrent urinary tract infections (UTI).

The patients were followed up for an average of 5 years (range, 1 to 10 years). A successful surgical outcome was considered when a proper voiding achieved, no fistula developed, and retrograde urethrography results were uneventful during the first postoperative year. The 1-year outcomes of the 1-stage and 2-stage repairs were compared using the chi-square test and the Fisher exact test.

RESULTS

Forty-five patients with the mean age of 46.3 ± 17.1 years and the mean urethral stricture of 7.16 ± 3.65 cm (range, 2.5 cm to 15 cm) had undergone urethroplasty. The etiology of the stricture was instrumentation in 15 patients (33.3%), urethritis in 13 (28.9%), trauma in 6 (13.3%), and unknown in 11 (24.5%).

The location of the urethral stricture was penile in 24 patients (53.3%), bulbar in 7 (15.6%), and bulbopenile in 14 (31.1%). Overall, 11 cases of recurrent stricture (24.5%) and 4 cases of fistula (8.9%) were seen in 11 patients within the first year. Thus, the overall success rate was 75.6% (Figures 1 and 2). This rate was 71.4% and 90% for the 1-stage and 2-stage



Figure 1. Preoperative retrograde urethrography in a patient with complicated stricture of the bulbar urethra following drainage of a perianal abscess.



Figure 2. Retrograde urethrography after repair of the bulbar urethral stricture using bilateral pedicle island of penile skin.

Complications and Success Rate of Urethroplasty*

	One-stage Repair	Two-stage Repair
Complications		
Recurrent stricture	2 (20)	14 (40)
Fistula	1 (10)	3 (8.6)
Diverticulum	1 (10)	2 (5.7)
Meatal stricture	0	1 (2.9)
Ejaculatory dysfunction	0	1 (2.9)
Hair growth	1 (10)	0
Chordee	0	0
Necrosis of flap	0	0
Success rate		
1-year, %	90	71.4
5-year, %	70	57.1

*Values in parentheses are percents unless otherwise indicated.

operations, respectively ($P = .23$). There were 1 (10%) and 10 (28.6%) cases of restructure and 1 (10%) and 3 (8.6%) cases of fistula in the patients with the 1-stage and 2-stage operations, respectively.

The complications occurred during the 5 years' follow-up are summarized in Table. Chordee was not detected in any patients. Regarding the limited follow-up duration in a large proportion of the patients, the 5-year comparison of the complications between the 2 groups was not performed. During the 5 postoperative years, 70% of the patients with the 1-stage repair, 57.1% with the 2-stage repair, and 60% in total had no complications (Table).

All recurrent strictures were mild and proximal to the anastomosis, which were treated by internal urethrotomy and dilation. Meatal strictures were relieved by meatotomy. One out of 3 cases of urethral diverticulum was accompanied by calculus formation and led to open surgical repair and calculus removal. The other 2 cases were asymptomatic, thus, were observed. The only case of hair growth was seen during cystoscopic evaluation of a patient with recurrent UTI.

DISCUSSION

For choosing a well tailored substitution urethroplasty technique, 3 decisive factors must be considered: type of the flap, vascular supply of the flap, and the transfer mechanism of the flap.⁽¹⁾ Complications of the substitution urethroplasty increase in the long run and anastomotic repair is preferred if viable.⁽⁷⁾ However, some authors have

demonstrated acceptable results with urethroplasty. For a 1-stage repair, Quartey used a transverse flap from the prepuce and the penis based on the superficial external pudendal vessels. The prepuce is hair free and its pedicle allows it to be used as a tube or a patch in any part of the meatus to the prostatic urethra. Quartey followed the patients by urethroscopy up to 6 months and observed no stricture of the anastomosis site or permanent fistula. But, 1 case of stricture due to incomplete excision of the primary stricture and 3 cases of hair growth in the new urethra were seen.⁽²⁾ We found a significant number of recurrent strictures in our patients, most of which were proximal to the anastomosis site. It seems that such strictures result from an incomplete opening of the lumen and the fibrotic tissue. Hence, it is recommended that the incision made in surgical repair be continued on the adjacent intact area distal and proximal to the stricture site. Most recurrent strictures in our patients were relatively short and were relieved by internal urethrotomy and dilation. In 1 patient with recurrent UTI, we found hair growth on cystoscopy although retrograde urethrography was uneventful.

de la Rosette and colleagues performed 1-stage repair in 50 patients using skin flap. Recurrence was mostly reported in cases with a history of 3 or more urethrotomies within a short period. They found recurrent strictures in 32% and fistula in 20% of the patients. They recommended open surgical repair when 1 or 2 internal urethrotomies fail.⁽³⁾ Moreover, Joseph and colleagues reported the results of managing anterior urethral strictures previously treated with urethroplasty and/or urethrotomy. They found that the increased rate of revision in the staged procedures compared with the excellent outcome of 1-stage procedures appeared to be mostly in patients with multiple previous procedures.⁽⁸⁾ Motiwala and colleagues reported the outcome of 1-stage repair in 16 patients and 2-stage repair (Johanson) in 12 with long urethral strictures. Etiologies of the strictures in their patients varied and fistula and diverticulum were present in most of the cases. They used vascularized flap of the longitudinal ventral penile skin in most 1-stage cases and transverse scrotal flap and Duckket transverse preputial flap in 2. The success rate of the treatment was 100% and 75% in the 1-stage and 2-stage operations; hence, they recommended 1-stage repairs regardless of the length of the stricture.⁽⁹⁾

Overall, the published studies to date are indicative of the superiority of the 1-stage urethroplasty over the 2-stage repairs. This approach is also cost-effective and the patients are more satisfied. However, the success rate of these surgeries is dependent on the length and severity of the urethral stricture, the availability of an appropriate skin flap, and the past surgical history of the patient. Our study failed to show a better outcome for either of the techniques. But, the number of our patients with 1-stage repair was too small. On the other hand, in long strictures, especially in patients who are circumcised, a 2-stage repair is still of help. Nonetheless, we prefer a 1-stage repair when an enough long flap with ample vascular supply can be easily harvested.

In a study by Provet and coworkers, island scrotal flap was used in the 1-stage repair of severe strictures of the bulbomembranous urethra. Twenty percent of the patients required revision due to recurrent stricture, fistula, and pseudodiverticulum. They believed that an aggressive tailoring of a hair-free flap can prevent from diverticulum, hair growth, and calculus formation. They concluded that if there is a severe scar tissue and viability of a full-thickness free graft is questionable, their method is an appropriate alternative to the staged surgical approaches.⁽⁴⁾ We used supporting layers on the suture line and made sure the flap enjoyed a good vascular supply. Thus, fistula was not seen frequently. The diverticula formed in our patients were all in the proximal part of the urethra. A proper tailoring of the flap especially proximal to the stricture may help in such cases, as well as making sure of the opening of the distal urethra and substitution with the flap in the dorsal segment of the defect.

It has been reported that onlay island flap urethroplasty can be performed in 1 stage for the treatment of long multiple strictures, and it results in acceptable outcomes and low complication rate.⁽⁵⁾ Osegbe and associates performed 1-stage repair by penile transverse flaps in patients with severe stricture and multiple urethrocuteaneous fistula in the scrotum and perineum. They reported a 100% success rate, although active infection was present at operation. They suggested these flaps when infection and fibrosis preclude the use of grafts.⁽⁶⁾ Furthermore, it has been shown that placing the flap on the dorsal segment of the defect can result in a better

anatomical and functional outcome compared to ventral type.^(10,11)

Skin flaps are useful in the treatment of urethral strictures when the length of the defect and scarring tissue make anastomotic repair impossible. These flaps usually enjoy a good vascular support. Urologists are usually experienced in the harvesting of the flaps. However, complications, mostly recurrent stricture and fistula, make substitution urethroplasty a suboptimal alternative. Such complications were relatively frequent in our patients. Also, we found 1 case of hair growth accidentally during cystoscopy in a patient with recurrent UTI. We could not perform cystoscopy in all patients as a routine study. Thus, we might have more cases of hair growth.

CONCLUSION

Various surgical repair methods are applicable for the treatment of anterior urethral strictures, but the choices for long lesions are limited. Based on the previous studies and our experience, we recommend skin flap urethroplasty. However, choosing an appropriate technique, a good vascular supply for the flap, the use of a protective layer, proper tailoring of the flap, proper diversion, and the extension of the incision onto the intact segments should be considered to achieve a better outcome.

CONFLICT OF INTEREST

None declared.

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