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Pediatric and adolescent transperineal anastomotic urethroplasty

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Abstract *Purpose:* Pediatric urethral stricture disease represents a significant surgical challenge because of smaller pelvic confines, decreased caliber and increased tissue fragility. Operative series of pediatric urethral reconstruction usually involve small numbers. In this study, we examined the outcome of open reconstructive techniques for pediatric and adolescent patients with posterior urethral distraction injuries.
Patients and methods: Between February 2002 and September 2005, 15 patients from Kasr ElAini hospital presenting with posterior urethral distraction defects due to motor vehicle accidents were included in our study. Their age ranged between 5 and 17 years (mean 12.5). We used the progressive perineal approach to achieve a tension-free spatulated anastomosis.
Results: Mean follow-up was 28.4 months. Initial and ultimate success rates were 80 and 86.6%, respectively. Other than re-stricture, one child had a bladder stone treated by cystolithotomy 6 months after surgery. No penile curvature, shortening or urethral diverticulae were noted during follow-up.
Conclusion: Using the appropriate modern guidelines of urethroplasty, consistent success can be achieved in pediatric and adolescent patients with posterior urethral injuries. Open urethral reconstruction of adolescent and pediatric strictures provides excellent long-term results with minimal morbidity. Urethral reconstruction is strongly recommended as the primary treatment option, especially in the pediatric urethral stricture population, because of the repair durability.

Introduction

Pediatric urethral strictures, although uncommon, constitute a difficult urological condition. The pediatric urethra presents a challenge because of its smaller pelvic confines, decreased caliber and increased tissue fragility. Pediatric urethral strictures generally have an acquired etiology since congenital and infectious strictures are rare. Whether patients should or should not undergo open urethroplasty is still subject to debate [1].

Recent advances in the surgical management of urethral strictures resulted in improved long-term results for urethroplasty [2]. Operative technique developments include

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an improved understanding of penile vascular anatomy in relation to penile skin island flaps [3], buccal mucosal grafts for longer stricture segments [4] and single-stage perineal repair for traumatic posterior urethral distraction defects [5].

While several groups have recommended endoscopic urethrotomy or urethral dilation as first-line therapy [6,7], conflicting results have been reported [8] with multiple procedures often required to achieve success. Most published series of open urethral reconstruction in children involved small numbers or lack long-term follow-up. Yet, despite the technical demands of the urethroplasty procedure compared to direct visual internal urethrotomy (DVIU) or dilation, it is considered superior because of the high failure rate and lack of durability associated with DVIU and dilation [9—11].

Primary repair in children can be much more difficult and lead to inferior results. This is usually due to a significant distraction injury that is not amenable to endoscopic management [11—13]. Furthermore, the incidence of postoperative incontinence and later on erectile dysfunction was found to be higher after primary realignment [14].

We report here our experience with transperineal anastomotic urethroplasty to treat pediatric and adolescent patients with posterior urethral distraction injuries.

Patients and methods

Between February 2002 and September 2005, 15 pediatric patients from Kasr ElAini Hospital presented with a urethral distraction defect and were treated using the perineal approach. Their age ranged from 5 to 17 years (mean 12.5). Trauma (motor vehicle accident) was the etiology in all cases. In five patients (33.3%) previous management with open or endoscopic procedures had failed. Previous management included scrotal inlay in one patient, end-to-end urethral anastomosis in three patients, and one patient had undergone a failed trial of endoscopy.

Our primary management strategy is fixation of a suprapubic catheter, so long as there is no indication for exploration, and deferment of definitive repair for 3 months. This is recommended by many authors [15,16]. Some others perform the anastomotic urethroplasty after 6 months [17]. The patients were investigated with ante and retrograde urethrography. The definitive repair was done by a progressive transperineal anastomotic technique using the various lengthening maneuvers. A siliconized Foley catheter together with a suprapubic catheter was fixed at the end of the repair. The urethral catheter was left indwelling for 3 weeks. Follow-up in all patients consisted of symptomatic evaluation and VCUG. Mean follow-up period was 28.4 months. The follow-up visits were scheduled every 3 months in the first year and every 6 months thereafter, and whenever the patient experienced any deterioration of his voiding performance.

Results

One-stage perineal urethral reconstruction was performed in all our patients without retropubic or transpubic dissection (Fig. 1). Our results show an 80% immediate success rate which rises to 86.6% if we include the one patient who needed a DVIU procedure (Table 1). The operative time ranged between 120 and 300 min (mean 184 min). Overall intraoperative blood loss ranged between 100 and 600 cc with a mean of 200 cc. The length of the distraction

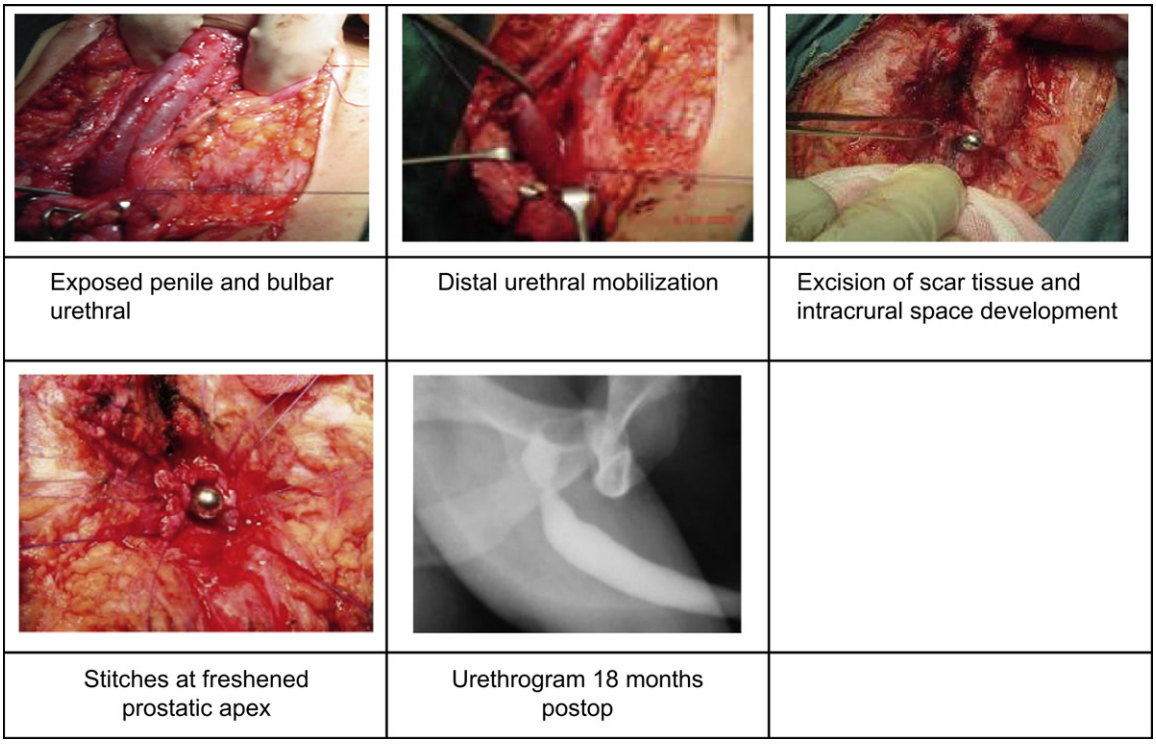

Figure 1 Perineal urethral reconstruction.

Table 1 Outcome of study

Patient	Age (years)	Fresh or recurrent	Follow-up	Success without DVIU	Success with DVIU	Failure
OAH	5	Fresh	4 years	Yes	No	No
MAM	11	Fresh	15 months	Yes	No	No
AH	12	Fresh	22 months	Yes	No	No
IA	12	Fresh	14 months	Yes	No	No
KAH	13	Recurrent	4 years	Yes	No	No
KAT	13	Recurrent	52 months	Yes	No	No
MH	13	Recurrent (scrotal inlay)	34 months	Yes	No	No
AN	13	Fresh	23 months	No	No	Yes
MM	13	Fresh	21 months	Yes	No	No
MMA	14	Fresh	23 months	Yes	No	No
AR	14	Fresh	20 months	Yes	No	No
AG	14	Fresh	20 months	No	No	Yes
MAA	15	Fresh	14 months	Yes	No	No
SS	16	Fresh	24 months	No	Yes	No
MMS	17	Recurrent	36 months	Yes	No	No

defect ranged between 2 and 6 cm (mean 3.5 cm). Distal mobilization of the urethra and separation of corporeal bodies were used in all of our patients. Inferior pubectomy was tried in one patient, while the re-routing step was not needed in any of them. All patients were discharged within 5 days. Penile shortening or curvature and urethral diverticula were not noted during follow-up. Other than re-stricture, only one pediatric patient had a complication, in the form of stone bladder 6 months postoperatively which was treated by cystolithotomy. Previous attempts at repair performed in five of the cases in our series did not affect the final outcome.

One of three children underwent a session of internal urethrotomy without the need for any further dilatation. There was a ring stricture at the site of the anastomosis which was successfully managed. The follow-up for this child was 2 years and the mean flow rate was 12.3 ml/s with mean residual urine of 19 cc (Table 2). The other two children experienced obstructive urinary symptoms 4 weeks after removing the urethral catheter; the flow rate was 6 and 7 ml/s with significant residual urine. A trial of internal urethrotomy failed and a suprapubic catheter was fixed. Three months later they underwent repeat anastomotic urethroplasty through a combined abdomino-perineal approach. No further surgery or dilatation was needed.

Discussion

The most common cause of urethral stricture in children is iatrogenic injury, representing 44—86% of cases in published series [6]. Successful treatment requires accurate assessment of stricture anatomy. Antegrade and retrograde urethrography combined with selective endoscopy provide a delineation of stricture length and accompanying spongiofibrosis. The aim is a patent, continent durable repair of the urethra with the least number of procedures and minimal urethral instrumentation [7]. In children, stricture dilation is often pursued as the initial treatment [18], even though long-term results have been poor [11]. Endoscopic urethrotomy in the pediatric population has been associated with a success rate as high as 86%; however, many cases require multiple operations, which can further complicate open urethral reconstruction when required [6]. The long-term results of DVIU in the adult population are usually poor. Endoscopic urethrotomy is indicated in short, wide bulbar urethral strictures associated with minimal spongiofibrosis. Repeat DVIU seldom achieves cure [10]. Open reconstruction of pediatric urethral strictures has generally yielded favorable results in spite of the small number of patients in these series and the added difficulties associated with the pediatric urethra. The difficulty arising from the smaller dimension is offset by shorter stricture length and more superficial placement of the urethra in the perineum. Minimizing morbidity is aided by

Table 2 Postoperative flow and residual urine

Patient	Age (years)	Mean residual urine (cc)	Mean flow rates (ml/s)	Success	Failure
OAH	5	18	13.5	Yes	No
MAM	11	24	14.2	Yes	No
AH	12	21	14.8	Yes	No
IA	12	13	13.7	Yes	No
KAH	13	20	15.6	Yes	No
KAT	13	18	14.9	Yes	No
MH	13	24	14.7	Yes	No
AN	13	—	—	No	Yes
MM	13	17	14.9	Yes	No
MMA	14	19	13.6	Yes	No
AR	14	17	14.6	Yes	No
AG	14	—	—	No	Yes
MAA	15	27	13.7	Yes	No
SS	16	19	12.3	Yes	No
MMS	17	28	13.4	Yes	No

sterilizing the urine with selective perioperative antibiotics. Proper patient positioning is of paramount importance [19].

In posterior urethral disruption, perineal urethroplasty can be achieved with aggressive urethral mobilization, development of the intracrural space and in select cases inferiorpubectomy with or without corporal re-routing. Tubularized grafts or flaps depend on the availability and health of local penile skin, but have a strong tendency to contract and re-stricture [4]. In recent reports, bulbar urethral strictures and membranous urethral disruptions were reconstructed through a single perineal incision. Retropubic or transpubic dissection was not required in any case even with strictures up to 6 cm [1]. The large series of posttraumatic membranous urethral disruptions in children reported by Koraitim showed a high success rate using the perineal (93%) and transpubic (91%) approach for bulboprostatic anastomosis [15]. Thus, it appears feasible to approach pediatric and adolescent strictures through a perineal incision.

Our results with delayed urethroplasty in pediatric and adolescent patients can be summarized as a primary success rate of 80% and an ultimate success rate of 86.6%; the latter group of patients included those requiring urethrotomy to achieve a stricture-free outcome. These results in pediatric patients are comparable to published reports [15,21]. Even though the longer the follow-up period the better the assessment of durability of repair, many authors have concluded that most if not all failures after anastomotic urethroplasty occur within the first postoperative year, and the results are sustained thereafter. Previous studies reported early rather than delayed failures. Corriere in his study of 60 cases of bulboprostatic anastomosis limited the follow-up to only 1 year [20]. Also, Hafez et al. reported an 89% success rate in 35 children with posttraumatic urethral strictures managed by perineal anastomotic urethroplasty. All treatment failures were at the anastomosis and were within the first year [21]. In our study, the failures were reported early (within first month after removing urethral catheter) and success was sustained thereafter without any deterioration of flow rates or increase in post-voiding residual urine.

Conclusions

Open urethral reconstruction of adolescent and pediatric urethral strictures is associated with excellent long-term results with minimal patient morbidity. Tension-free epithelium-to-epithelium repair can be accomplished in one stage via a perineal incision. Due to the importance of repair durability in the pediatric population, open urethral reconstruction should be strongly considered as primary treatment for pediatric urethral stricture disease.

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