Transperineal End-to-End Anastomotic Urethroplasty for Traumatic Posterior Urethral Disruption and Strictures in Children

F.J. Zhou, Y.H. Xiong, X.P. Zhang and P.F. Shen. 1 Cancer Centre, Sun Yat-Sen University, Guangzhou, and 2 Department of Urology, XiangYa Affiliated Hospital of Hunan Medical University, Changsha, People’s Republic of China.

OBJECTIVE: To report the long-term results of transperineal end-to-end anastomotic urethroplasty for post-traumatic posterior urethral stenosis in children.

METHODS: From 1975 to 1996, 25 boys (aged 3 to 12 years) with post-traumatic posterior urethral stenosis or obliteration, and one boy (aged 7 years) with disrupted posterior urethra were treated with transperineal end-to-end anastomotic urethroplasty. Final follow-up assessments including voiding status, urinary continence and erectile function were performed in June 1999.

RESULTS: Smooth voiding was restored in 25 boys postoperatively. One child failed an ill-prepared repair and was waiting for further intervention. Among the 25 patients, seven were lost to the final follow-up. All seven boys had a single urethroplasty for simple urethral stenosis and had been followed for 3–5 years postoperatively with smooth voiding. The other 18 boys, including seven with complex urethral stenosis (three with a history of failed previous urethroplasties, three with urethrectal fistula and one with urethropерineal fistula), underwent a total of 22 end-to-end anastomotic urethroplasties (one successful primary repair, 17 successful delayed repairs and four failed repairs). Of the 17 patients with successful delayed repair, 14 succeeded with one repair, two with two repairs and one with three repairs. The success rate per repair for simple urethral strictures was 94.7% (18/19), and for complex strictures 63.6% (7/11). Stress incontinence was found in three cases, impotence in two. Concomitant impotence and stress incontinence were found in one of the five patients.

CONCLUSION: Transperineal end-to-end anastomotic urethroplasty can achieve good long-term outcomes in children with simple post-traumatic posterior urethral stenosis. In experienced hands, good results can also be achieved for complex urethral strictures. (Asian J Surg 2002;25(2):134–8)

INTRODUCTION

Nearly all post-traumatic posterior urethral stenosis or obliteration in adults, regardless of length, can be corrected by one-stage transperineal end-to-end anastomotic urethroplasty.1 However, in children, due to the confined perineum, high incidence of supramembranous injury resulting in less predictable distraction defects of the posterior urethra and a high incidence of prostatic displacement, transperineal urethroplasty seems technically more difficult than in adults; thus, the transpubic approach seems more feasible.2 Nonetheless, recent reports revealed that both approaches could result in almost the same clinical outcomes for children with post-traumatic posterior urethral strictures.4,5 Since 1975, we have performed 26 consecutive transperineal end-to-end anastomotic urethroplasties in boys with pelvic fracture, posterior urethral stenosis or obliteration, and obtained excellent long-term outcomes. The approach we used has evolved greatly, and has been further developed since its early days as described by Webster and MacDiarmid1 and Koraitim.3,6

Address reprint requests to Professor Fang-Jian Zhou, Department of Urology, Cancer Centre, Sun Yat-Sen University, #651 Dongfeng Road East, Guangzhou 510060, People’s Republic of China. E-mail: zhoujf118@21cn.com Date of acceptance: 3rd July 2001
**Patients and Methods**

From 1975 to 1996, 26 boys with disruptive injuries to the posterior urethra due to pelvic fractures underwent transperineal end-to-end anastomotic urethroplasies (primary repair in one case and delayed repairs in 25 cases). Mean age at injury was 7.1 years (range: 3–12 years). All of the boys were victims of traffic accidents that caused pelvic fractures complicated by disruptive injuries of the posterior urethra. Initial management consisted of diversion suprapubic cystostomy and urethral catheter realignment without traction in six patients, and simple cystostomy in 19. One primary end-to-end anastomotic urethroplasty was performed in a boy with a pelvic fracture complicated with posterior urethral disruption and complex laceration to the perineum, anus and rectum. After cystostomy and colostomy, the two ends of the disrupted urethra could be clearly seen while attempting to repair the anus and rectum. Therefore, end-to-end anastomotic urethroplasty was also performed. All of the 25 boys referred for delayed urethral repairs had suprapubic cystostomy catheters in place. Of them, two had one failed transperineal repair and 1 had two failed transperineal repairs before referral to us. The patients were evaluated with plain abdominal films, excretory urography, urine culture, and combined voiding and retrograde urethography. The length of urethral stricture or obliteration measured by roentgenography ranged from 0.5 to 2.5 cm (mean 1.2 cm), and the site of the stricture or obliteration was at the membranous urethra in all cases. Urethrorectal fistulae were found in three cases, urethroperineal fistula in one, vesical stones in three and posterior urethral stones in two. The patients were considered as having complex urethral strictures if they had fistulae or failed previous urethroplasty.4

Delayed transperineal end-to-end anastomotic urethroplasty was performed 6 to 24 months (mean, 10 months) after injuries or previous failed urethroplasties. Diversion colostomy was performed on patients with urethrorectal fistula 3 to 6 months prior to urethral repair. After washing the bladder with 0.5% furacillin solution twice a day for 3 days and exchanging the suprapubic catheter, we placed the patients in the exaggerated lithotomy position. Through an inverted Y-shaped perineal incision (in 27 repairs) or a straight midline anoperineal incision (in two repairs), the bulbar urethra was mobilized and transected at the point just distal to the stricture or obliteration.9 The stricture or obliteration was excised under the guidance of a sound in the proximal urethra passed through the suprapubic cystostomy tract as described by Webster.8 In the early cases of our experience all scars or fibrotic tissues occupying the distraction defect were excised, including inframontanal prostate and surrounding fibrosis (complete or extensive scar excision), as done in repairs for adult post-traumatic posterior urethral strictures.6 Because of the high incidence of postoperative impotence and incontinence in our early experience, we performed limited scar excision beginning in 1993. Only the stricture or obliterated segment and a portion of scar surrounding the prostate apex were excised. When the normal prostatic urethra was reached, its mucosa would be found to be smooth and pliable. The proximal and distal urethral ends were anastomosed with four to six sutures of 3-zero chromic catgut over an 8 to 12 Fr, catheter according to the patient’s age. Sometimes, we found it was necessary for a tension-free anastomosis to extend the urethra mobilization to the distal portion of the penile urethra. No spatulation on the urethral ends was done. Care was taken to ensure that every suture picked up the mucosa of each end of the urethra. In four patients with urethreorectal or urethroperineal fistula, the fistula openings were located just proximal to the stricture or obliteration. Complete excision or flap closure of the fistula was attempted in two transanoperineal repairs. In six transperineal repairs of the stenosis with fistula, after the fistula opening in the posterior urethra was excised, the bulbar urethral end was pulled up and anastomosed with the prostatic urethra. Vesical or urethral stones were removed through the cystostomy tract before urethral anastomosis. The wound was closed in at least three layers. A drain was placed and removed 2 or 3 days following surgery. In our early cases, urethral stenting catheters were removed 3 to 4 weeks postoperatively. From 1993 onward, the catheter was removed 2 weeks postoperatively. The suprapubic catheter was removed if the patients voided smoothly for 2 or 3 days. If the repair was considered to have failed, the catheter would be left in place until another repair could be performed.

 Voiding status and urinary continence were evaluated every 3–6 months for 3 years. Final follow-up, including urinary continence, erectile function and voiding status, was done in June 1999 for all patients. The mean interval between the final follow-up and urethroplasty was 10.1 years (range, 1–23 years). The urethroplasty was considered successful if the patient remained free of all obstructive symptoms and did not require any further intervention.
The repair was considered a failure if the stricture remained or recurrent stenosis developed requiring repeated urethral dilatation or other definite therapy. A postpubertal patient was considered impotent if he could not obtain an erection adequate for vaginal penetration. A prepubertal child was considered impotent if he could not obtain any erection. However, it should be noted that preoperative erectile function was not investigated in this series.

RESULTS

Smooth voiding was restored in 25 patients (one failed), with an overall success rate of 96.2% (Table). Seven patients with simple urethral strictures were lost to the final follow-up. They had been monitored for 3–5 years postoperatively with smooth voiding and their urethral repairs were considered successful. Only one patient required short-term urethral dilation (six times) post-repair. The patient was monitored for 5 years with good voiding. The patient with primary repair was monitored for 10 years with good urinary and faecal continence. He was also sexually potent. Seven patients with complex strictures (with fistula or failed previous repair) were restored to smooth voiding after a total of 11 repairs. Of them, four patients succeeded with one transperineal repair, one with two transperineal repairs, one succeeded with one transanoperineal repair after a failed transperineal repair, and one with one transperineal repair after a failed transperineal and a failed transanoperineal repair. The success rate per repair for simple strictures was 94.7% (18/19). For complex strictures, the success rate per repair was 63.7% (7/11). Five patients developed complications (including stress incontinence in three cases and impotency in two cases). Concomitant impotency and stress incontinence was found in one of the five patients. All complications were seen during our early experience (the first 16 consecutive delayed-repair cases) of urethroplasty with extensive scar excision. Five patients were married and four of them had children.

DISCUSSION

It is believed that pelvic fracture urethral strictures in children are different from those in adults. Firstly, the location of urethral injury and resultant stricture is more proximal because the prostate and puboprostatic ligaments in children are rudimentary. Secondly, the repair of the stricture is more difficult because of limited perineal space. Transpubic or perineal-transpubic repairs seem the best choice of treatment. In the present report and Podesta’s study, all of the strictures were located below the verumontanum. In Koraitim’s large study, the strictures were almost invariably inferior to the verumontanum. These facts suggest that the majority of the paediatric post-traumatic posterior urethral strictures are, in essence, similar to those seen in adults.

In adults, transperineal anastomotic urethroplasty is the treatment of choice for urethral strictures secondary to pelvic fractures, which are usually located at the membranous urethra. In children, because of the rudimentary prostate and puboprostatic ligaments, the injury is believed to be more proximal and, thus, the repair more difficult, with a higher incidence of incontinence and impotence. Transpubic or perineal-transpubic approaches were strongly recommended for children with traumatic posterior urethral strictures. Nonetheless, in experienced hands, excellent results can be achieved with one-stage transperineal bulbo-prostatic anastomotic urethroplasty. In the present report, except for two transanoperineal repairs in the early experience, all of the

<table>
<thead>
<tr>
<th>Urethroplasty</th>
<th>Number of patients</th>
<th>Number of repairs</th>
<th>Successful outcome (%)</th>
<th>Success rate per repair (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall repair</td>
<td>26</td>
<td>30</td>
<td>25 (96.2)</td>
<td>83.3</td>
</tr>
<tr>
<td>Repair for simple stricture (plus 1 primary repair)</td>
<td>19</td>
<td>19</td>
<td>18 (94.7)</td>
<td>94.7</td>
</tr>
<tr>
<td>complex stricture</td>
<td>7</td>
<td>11</td>
<td>7 (100)</td>
<td>63.6</td>
</tr>
<tr>
<td>Transperineal repair</td>
<td>24</td>
<td>28</td>
<td>23 (95.8)</td>
<td>82.1</td>
</tr>
<tr>
<td>Transanoperineal repair</td>
<td>2</td>
<td>2</td>
<td>1 (50)</td>
<td>50</td>
</tr>
</tbody>
</table>
repairs were transperineal. Satisfactory outcomes were achieved for simple strictures (success rate per repair was 94.7%). However, for complex strictures, only two-thirds of the repairs (63.7%) were successful.

In children, the distance between the skin and the membranous urethra was shorter than that in adults and exposure of the membranous urethra was easy to perform. The anastomosis of urethral ends was not as difficult as anticipated, based on the imagined smallness of children’s perineums. The imagined difficulty in performing repairs on a confined perineum could, in fact, be overcome by the shorter distance between the perineal skin and the membranous urethra. Inverted Y-shape incisions were better for the exposure of the membranous urethra than straight incisions. The length of stricture segment in our patients was exclusively below 3.0 cm, and this may be a favourable factor for successful transperineal repair. In Podesta’s study, transperineal end-to-end anastomotic urethroplasty was also successful on patients with strictures as long as 5 cm.5 Even on patients with previously failed urethroplasties or fistula, namely with complex strictures, good results were achieved with the technique.4 In our opinion, resecting a piece of the pubis was never necessary, nor was it of any help in the repair of membranous urethral strictures less than 3.0 cm in length. Regardless of the length of the stricture segment and whatever the methods used to measure it, all repairs should be initiated via the transperineal route. Only when accurate tension-free anastomosis cannot be achieved, transfer to the transpubic or abdomino-perineal approach is required.4,5

Based on our experiences with posterior urethral repairs in adults, in which complete excision of scar tissue was an important point for a successful urethroplasty,13 we performed complete excision of scar tissue in our earlier cases to achieve a patent urethra postoperatively. Indeed, we achieved what had been expected, but quite a number of patients (5/16 or 31.6%) developed stress incontinence or impotence. Clinically, it was difficult to assess the real rate of impotence after urethroplasty in young children because of unclear potency history prior to the surgery. Even in adults, it is also uncertain whether impotence resulted from the original injuries or the urethroplasties.8 Stress incontinence in all of our cases could be attributed to the urethroplasty procedure because the patients were continent before injury and showed a well-closed bladder neck on cystography performed before urethral repair. Extensive removal of inframontanal prostate and fibrosis around the apex, which was always the case in adult urethral repair, rarely resulted in impotence and urinary incontinence postoperatively.6 In children, the manipulation might injure the neurovascular bundles travelling to the corpus cavernosum along the apex dorsolaterally and the striated urethral sphincter surrounding the membranous urethra and prostatic apex, resulting in incontinence or impotence. In our early experiences, we encountered arterial bleeding at the sites of 5 or 7 o’clock quite often when extensively removing fibrosis around the prostatic apex. Almost half of the patients with arterial bleeding at the 5 or 7 o’clock position were impotent or incontinent after surgery. After changing to limited scar excision, nine consecutive patients were all continent and potent and with a patent urethra postoperatively, except one whose repair was not well prepared. This suggests that special attention should be paid to the removal of scar tissue.

The urethral ends were usually spatulated before anastomosis.1,8,14 This manipulation might create excessive calibre of the urethral ends, which was believed important for a successful repair, but sacrificed about 1.0 cm length of urethra.15 In our study, the anastomosis was performed without spatulation and excellent outcomes were achieved in the majority of repairs. In patients with previous urethral repairs, an additional 1 cm of urethral length might be especially important for a successful tension-free anastomosis.13 We believe that the failures encountered in our study were the result of poor operative techniques in the preparation or/and anastomosis of the urethral ends, rather than of spatulation. Therefore, excessive calibre of the urethral ends might not be necessary for a successful anastomosis. The failure rate of transperineal repair in our study was somewhat higher than that of transpubic and transperineal repair with spatulation.4,5 This might be attributable to the fact that several surgeons performed the urethral repairs. There is also a learning curve for the technique. Furthermore, four out of five failures were encountered in patients with urethrectoral fistula. This condition poses further difficulties, and transpubic repair was considered the best choice in such cases.16

Although the operative failure rate via the perineal approach was high in our study, we believe that posterior urethral stricture associated with urethrectoral fistula can be successfully managed in experienced hands using this technique. Accurate identification and excision of the fistulous opening in the urethra, and pull-through of the
bulbar urethra end beyond the fistula opening and anastomosis of it to the prostatic urethra without tension are the key points for a successful perineal repair of posterior urethral stricture associated with urethrorectal fistula.

**Conclusion**

Transperineal end-to-end anastomotic urethroplasty with limited scar excision, without spatulation could result in good long-term outcomes in children with posttraumatic posterior urethral strictures. Limited excision of scar tissue around the prostatic apex was important for maintenance of urinary continence and sexual potency in children. Resecting a piece of the pubis was not necessary in the majority of membranous stricture repairs, and the transpubic or abdomino-perineal approach should be reserved for those with long segmental defects, transprostatic or supraprostatic strictures. Appropriate excision of the stricture segment and surrounding scar tissue, accurately picking up the mucosa of each end of the urethra for every suture and approximating the urethral ends without tension were the key points for a successful anastomotic urethroplasty.

**References**