

POST-TRAUMATIC POSTERIOR URETHRAL STRICTURES: PREOPERATIVE DECISION MAKING

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ABSTRACT

Objectives. To assess the reliability of certain preoperative findings in helping select the correct operation for post-traumatic posterior urethral strictures and distraction defects.

Methods. We reviewed all urethrography and endoscopy studies of 167 posterior urethral strictures and distraction defects complicating pelvic fracture urethral injury that had been corrected between 1977 and 2002. Correction was by anastomotic urethroplasty in 149 cases (107 perineal, 2 elaborated perineal, 40 perineo-abdominal), scroto-urethral inlay in 2, and optical urethrotomy in 16. The findings were correlated with those encountered during surgery.

Results. Successful results after optical urethrotomy were encountered only in cases of genuine urethral stricture with no loss of urethral continuity. Anastomotic urethroplasty could be accomplished by an ordinary perineal procedure when the length of the distraction defect was 3 cm or less and only by an elaborated perineal or a perineo-abdominal procedure when it was 3 cm or more. The 2 cases that were corrected by scrotal inlay had an extensively scarred anterior urethra that precluded urethral anastomosis.

Conclusions. A genuine stricture may indicate optical urethrotomy, but a distraction defect indicates anastomotic urethroplasty. Defects shorter than 3 cm may be corrected by an ordinary perineal anastomosis, while defects longer than 3 cm usually need an elaborated perineal or perineo-abdominal procedure. The finding of a scarred anterior urethra usually precludes urethral anastomosis and dictates substitution urethroplasty. UROLOGY 64: 228-231, 2004. © 2004 Elsevier Inc.

Current procedures for the treatment of post-traumatic posterior urethral strictures and distraction defects range from the extremely simple to the extremely radical, that is from optical urethrotomy through perineal urethral anastomosis, elaborated perineal and perineo-abdominal transpubic procedures, and substitution urethroplasty.¹⁻⁴ However, it is a mistake to look on the various types of urethroplasty and urethrotomy as competitive with each other for a particular case of urethral stricture; rather, they should be considered as different complementary means available for the cure of different types of strictures.⁵ Selection of the appropriate procedure for each case is crucial for a successful result.

The final decision to determine the correct procedure is generally made according to the actual

findings at surgery. Nevertheless, this may be anticipated by certain preoperative information.^{1,6} These include a genuine urethral stricture versus a distraction defect, extent of periurethral fibrosis, length of the distraction defect, and normality or otherwise of the anterior urethra. We assessed the reliability of these data in preoperative decision making and helping to select the correct operation.

MATERIAL AND METHODS

We reviewed all urethrocytography and endoscopy studies performed for patients who had undergone correction of post-traumatic posterior urethral strictures and distraction defects between 1977 and 2002. The findings were analyzed and correlated with those encountered during surgery. Sufficient information was available for 152 patients who had undergone 167 surgical or endoscopic procedures and were assessed for this study. Patient age ranged from 3 to 58 years (mean 21), and all had sustained a pelvic fracture urethral injury as the initial causative trauma.

Of the 167 operative procedures, 149 were performed by end-to-end urethral anastomosis, 2 by scroto-urethral inlay, and 16 by optical urethrotomy. Of the 149 anastomotic urethroplasties, 107 were performed by a perineal procedure after liberal circumferential mobilization of the anterior urethra. This was not sufficient to achieve a tension-free anastomosis

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in the other 42 cases, and restoration of urethral continuity was accomplished by an elaborated perineal procedure* (incising into the angle of the crural bifurcation) in 2 and a perineo-abdominal transpubic approach in 40. The details of the operative techniques have been previously published.¹

RESULTS

Preoperative urethrography and endoscopy studies showed a genuine stricture with preservation of urethral continuity in 15 cases (9%) and a distraction defect separating the 2 urethral ends in 152 (91%). Of the 16 patients who underwent optical urethrotomy only, 9 (62.5%) had a successful result. Retrospectively, we found that these 9 patients had had genuine urethral stricture with an opening connecting the bulbar and prostatic urethra. The results of anastomotic urethroplasty were successful in 98 patients (90%) after perineal repair (including 2 elaborated perineal approach) and in 39 (98%) after transpubic urethroplasty. We found that the length of the distraction defect in cases successfully corrected by an ordinary perineal anastomosis was 3 cm or less (range 1 to 3, mean 2.2), and that of cases corrected by a perineo-abdominal or an elaborated perineal procedure was 3 cm or more (range 3 to 8, mean 4.7).

Of the cases with a distraction defect, 25 (16%) had a small cavity continuous with, or overlapping, the proximal urethra. The extra-urethral nature of the cavity was revealed by urethrograms obtained either before complete filling of the cavity or at varying degrees of oblique view (Fig. 1). The 2 cases corrected by scroto-urethral inlay had successful results and were found to have had an irregularly narrowed anterior urethra over a long segment, as well as extensive scarring that precluded anastomotic urethroplasty.

COMMENT

Careful evaluation of post-traumatic posterior urethral strictures and distraction defects may be very useful in preoperative decision making. Certain findings help in identifying cases requiring optical urethrotomy from those requiring surgical correction and still other findings may suggest the appropriate reconstructive procedure. In true strictures, with preservation of urethral continuity, optical urethrotomy may be the appropriate line of treatment. In this experience, optical urethrotomy was successful only for true strictures that were limited in length and depth, with minimal periurethral fibrosis and had an opening connecting the anterior and posterior urethra. In this regard, it may be argued that urethral ultrasonography more accurately measures stricture length and diameter and better identifies periurethral fibrosis compared with conventional urethrography. However, ure-

thral ultrasonography provides more information for strictures of the anterior, rather than the posterior, urethra for which satisfactory images cannot be obtained.⁷

In distraction defects, on the other hand, urethral continuity is lost, and the proximal and distal urethral ends are separated by a segment that is entirely composed of scar tissue, with no remnants of urethral wall. Also, the two urethral ends may not be in the same anteroposterior plane but overriding each other.¹ In such cases, optical urethrotomy is not indicated even if the distraction defect is short. The insistence on repeated "urethrotomy" of a fibrous nonurethral segment, which then should be appropriately termed "fibrotomy," would not be expected to provide more than a temporary effect, and, moreover, may jeopardize the elasticity of the anterior urethra to a degree that precludes subsequent anastomotic repair. The general consensus is that excision of the fibrous segment and bulbo-prostatic anastomosis is the ideal treatment for these cases.¹⁻⁴

The length of the distraction defect may have a role in adopting or adapting the type of reconstructive procedure. The findings of this study showed that all successful cases after an ordinary perineal anastomosis had a distraction defect of 3 cm long ($\times 0.83$ magnification factor = 2.5 actual length) or less. This indicates that the mobilized anterior urethra can bridge a bulbo-prostatic gap of up to 2.5 cm long to achieve a tension-free anastomosis. Considering that a length of 2 cm is dispensed with for trimming and spatulation of the two urethral ends as a prerequisite for anastomosis, one may conclude that the mobilized anterior urethra normally provides an extra 4.5 cm (2.5 + 2) of elastic lengthening. However, this is not sufficient to bridge a gap longer than 2.5 cm. In such cases, the anterior urethra has to reach the prostate by a direct and shorter way than the original curved one to the perineum and back into the prostate. This can be accomplished by circumventing the original perineal way and rerouting the mobilized anterior urethra around a corporeal body to take a transpubic route direct from the penoscrotal junction to the prostate (Fig. 2). By this technique, a bulbo-prostatic gap of up to 6.6 cm (8 cm by roentgenographic measurement) is bypassed, and a tension-free anastomosis can be achieved by the same 4.5 cm of elastic lengthening normally provided by the mobilized anterior urethra. This is the rationale for the perineo-abdominal transpubic procedure.⁶

Underestimation of a distraction defect as shown on the urethrogram may occur because of a urinoma cavity overlapping or continuous with the prostatic urethra. The cavity then may be mistaken for the proximal urethral segment and its fibrous wall incorrectly anastomosed to the bulbar ure-

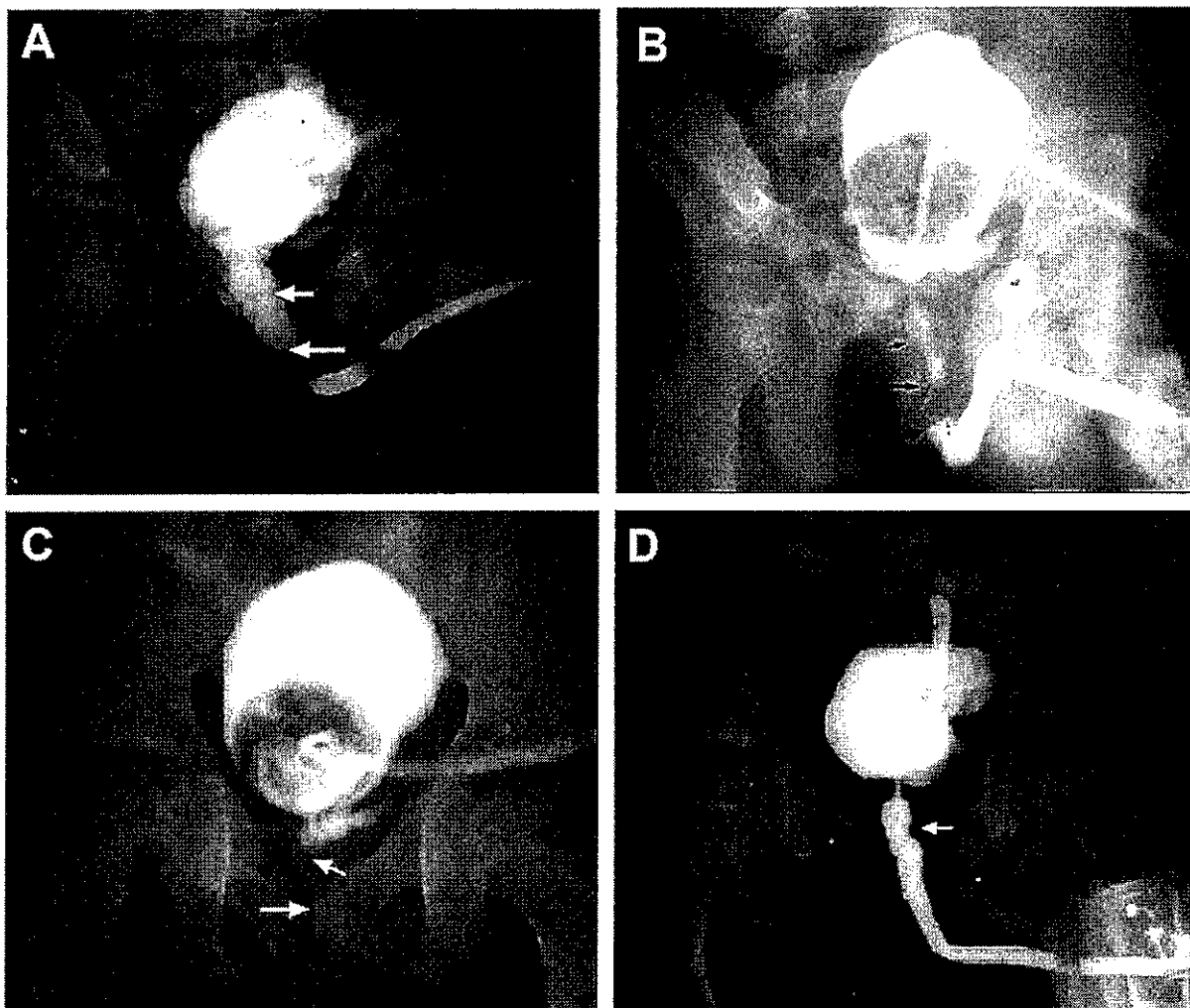


FIGURE 1. Urethrogram of posterior urethral distraction defect demonstrating urinoma cavity continuous with proximal urethral segment at varying degrees of filling. (A) Overfilling shows end of cavity (long arrow) as if it was actual end of proximal segment (short arrow). (B) Same case with moderate filling of cavity (long arrow) revealing true length of distraction defect from proximal urethral end (short arrow) to distal urethral end (curved arrow). (C) Proximal urethral end (short arrow) well demonstrated with minimal filling of cavity (long arrow). (D) Postoperative urethrogram after excision of pathologic segment, including cavity, and bulbo-prostatic anastomosis (arrow).

thra. This explains obstruction recurrence shortly after removal of the urethral stent when a successful result had been erroneously expected. Urethrograms obtained before complete filling of the cavity or at varying degrees of oblique view usually discriminate the cavity from the proximal urethra, and the actual length of the distraction defect can be estimated.⁸ We are well aware that magnetic resonance imaging provides noninvasive method of measuring the length of the distraction defect with no problems of spurious estimation as with urethrography. Also, it clearly depicts the extent of scar tissue, as well as the degree and direction of prostatic displacement, aiding in preoperative decision making.⁹ However, magnetic resonance imaging of the posterior urethral injury was first introduced in 1992, many years after completing

most of this series. This issue is under investigation at our institution and will be the subject of another report.

Selection of the reconstructive procedure may be largely influenced by the condition of the anterior urethra as determined by urethroscopy, urethrography, and urethral ultrasonography.^{1,6,7,10} Anastomotic urethroplasty almost always is possible regardless of the length of the gap between the two urethral ends provided that the anterior urethra is normal. The gap to be bridged is not due to a loss of urethral tissue as much as to a proximal displacement of the prostate, as well as distal retraction of the bulbar urethra.¹ The urethral loss itself usually includes only the length of the membranous urethra and a portion of the inframontanal prostatic urethra. This explains why a mobilized normal an-

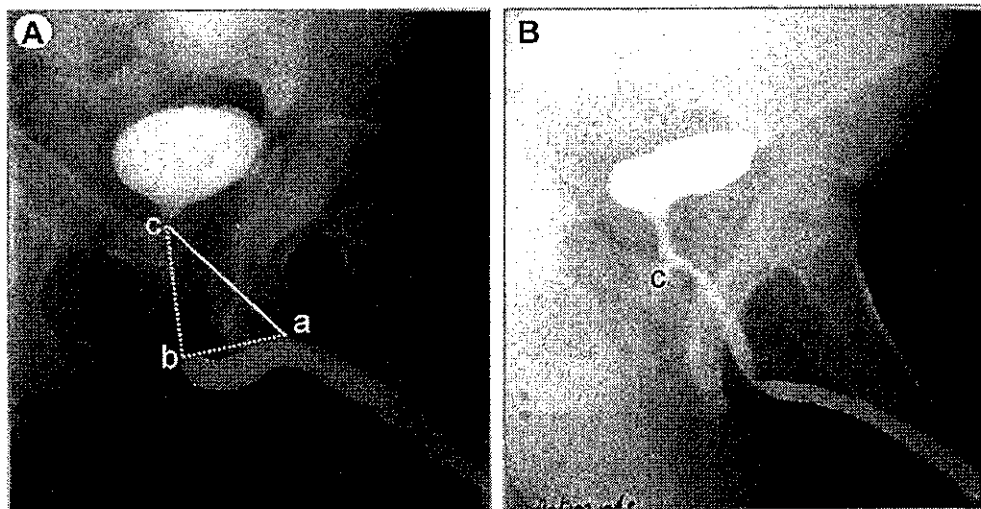


FIGURE 2. (A) Combined antegrade and retrograde urethrogram showing 6.5-cm long bulbo-prostatic distraction defect (b to c). (B) Postoperative retrograde urethrogram of same patient after transpubic urethroplasty. Note rerouting of bulbar urethra to take direct course from penoscrotal junction (a) to apex of prostate (c). New route (a to c) is shorter than original from penoscrotal junction (a) to distal urethral end (b) and back to prostatic apex (c), which may be represented by one side of a triangle (8 cm) and the sum of the other two sides ($5 + 6.5 = 11.5$ cm).

terior urethra can bridge a defect as long as 7 or 8 cm, such as found in this study and reported by others.[†] However, if the anterior urethra is extensively fibrosed and has lost its elasticity, as may occur after repeated urethrotomies and dilations, anastomotic urethroplasty is impossible and a substitution procedure is the best alternative.

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