

Rupture of the male membranous urethra

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Abstract

Background Management of traumatic rupture of the male membranous urethra remains controversial. Long-term morbidity can include urinary incontinence, urethral stricture and erectile dysfunction.

Aims To review management and outcome of urethral rupture to improve treatment protocols.

Methods A retrospective study of 47 patients presenting with traumatic urethral rupture over 25 years was performed.

Results All patients underwent emergency suprapubic catheterisation, 32 patients had open surgical realignment at 1-2 weeks; 78% of whom developed strictures. Ten patients unsuitable for early repair underwent delayed transabdominal transpubic urethroplasty at three months: 40% of whom developed strictures. Five patients with partial rupture were managed by cystoscopy and urethral catheter. Erectile dysfunction correlated to initial injury rather than treatment.

Conclusions If the patient is stable and requires emergency laparotomy for other abdominal injuries, he should have immediate realignment of the urethra. Early realignment of the urethra at laparotomy at 1-2 weeks can be combined with orthopaedic fixation of pelvic fractures. Patients who remain unstable due to associated injuries should have delayed urethroplasty at three months.

Introduction

Rupture of the male membranous urethra complicates 10% of pelvic fractures, in particular those with combined fractures of the pubic rami and sacroiliac joints — Malgaigne's fracture.^{1,2} Management remains controversial. Approaches include early re-alignment over a catheter at laparotomy between the first and second week after injury or delay of definitive treatment for approximately 3-6 months, at which point formal urethroplasty may be performed. Membranous urethral injuries may be associated with long-term morbidity including incontinence, impotency and urethral stricture. In this retrospective study we reviewed our experience with rupture of the membranous urethra to identify lessons for future management.

Methods

A retrospective review of hospital records from 1950 to 1997 identified patients with ruptured membranous urethra treated in the Meath Hospital.

The extent of urethral injury at presentation was assessed by ascending urethrography and suprapubic cystography. Thirty seven (79%) patients had complete disruption while ten patients (21%) had partial avulsion.

Management

All patients were treated initially by suprapubic catheterisation, the majority before transfer. Thirty-two patients (68%) were treated by primary open surgical realignment of urethra 1-2 weeks after their injury (Group 1). The retropubic space was

explored via lower midline incision and residual haematoma was evacuated. The haematoma had usually organized and no significant bleeding was encountered. The bladder was opened between stay sutures. A urethral catheter was passed in a retrograde manner from below and a second catheter passed into the prostatic urethra via the cystotomy. Both catheters were brought through the defect in the membranous urethra and joined with a nylon ligature through the drain holes. The catheters were then withdrawn proximally into the bladder thus realigning the ruptured urethra. In all cases a suprapubic catheter in addition to the urethral catheter was left in situ. Recently urological reconstruction has been combined with pelvic fixation by internal plating of the anterior pelvic rim or by external gantry fixation. The urethral catheter is removed 6-8 weeks post-operatively after urethro-cystogram to outrule leakage. After successful voiding per urethra the suprapubic catheter is removed. Follow-up assessment includes clinical history, examination and uroflowmetry. More recently it has included flexible cystoscopy under local anaesthetic to identify recurrent stricture.

Delayed repair

Urethroplasty was performed at three months in 10 patients by a combined suprapubic and perineal approach (Group=2). In all cases an attempt was made to achieve approximation of the urethral ends through a perineal approach. Extensive peri-urethral scarring, however, necessitated a combined approach in all patients requiring delayed urethroplasty. Seven patients

had a one stage end to end urethral repair, but three patients required two stage repair with a scrotal inlay to bridge the long urethral defect after stricture excision — the Turner Warwick's technique. Five patients with partial membranous urethral rupture were managed by cystoscopy and placement of transurethral catheter (Group 3).

Follow-up

Patients have been followed-up for a mean period of 6.5 years (range 9 months - 46 years).

Results

Forty-seven patients presenting with traumatic urethral rupture over 25 years were identified. The mean age at presentation was 28 years (range 3-81 years). Injuries were the consequence of road traffic accidents (53%), falls (17%) and crush injuries (28%). One further patient, a child, sustained a penetrating injury with transection of the membranous urethra. There were no deaths in this series.

Urethral stricture

A total of 34 (72%) patients developed urethral stricture after surgical repair of urethral injury. Strictures were managed by dilatation or internal urethrotomy. More recently patients with recurrent stricture were started on intermittent self dilatation. Failure of these modalities constituted an indication for urethroplasty.

Seventy-eight per cent (25 of 32) of patients undergoing primary urethral realignment, subsequently developed urethral stricture (Table 1). Fifteen patients (60%) were managed successfully by internal urethrotomy or dilatation. Ten patients (40%) developed a dense stricture not amenable to urethrotomy and underwent formal secondary urethroplasty. Three had further residual stricturing after urethroplasty but this responded to dilatation or internal urethrotomy. The remaining seven cases are stricture free with average follow-up of 8.7 years (range 3 months - 18 years).

Forty per cent (4 of 10) patients undergoing early suprapubic catheterisation with delayed urethroplasty developed urethral stricture requiring urethrotomy or dilatation.

All five patients with partial avulsion managed by catheterisation developed stricture (Group 3), but these strictures were minor and successfully managed by urethrotomy or dilatation.

Incontinence

Four patients (8%) developed incontinence, two from Group 1 and two from Group 2. Of the Group 1 patients, one was rendered incontinent after bladder neck resection for recurrent bladder neck stricture. It is speculated that the remaining three patients were incontinent due to concomitant bladder neck injuries which went unrecognised.

Both patients in Group 1 had satisfactory artificial sphincter implantation, but the sphincter cuff in one patient eroded the urethra and he ultimately required ileal conduit urinary diversion. Both Group 2 patients underwent urinary diversion, neither was considered technically suitable for artificial sphincter as both had undergone complex transpubic repair.

Impotence

The potency status of five patients is not known while 16 of the

remaining 42 patients (38%) are impotent. Intracavernosal vasoactive agents (Papaverine/ Prostaglandin E1) were administered in patients seeking treatment. Patients failing vasoactive therapy were offered a penile prosthesis. One patient in Group 1, was impotent before the injury, and potency status of two others is not known. Eight of the remaining twenty nine (27%) are impotent. Only three sought treatment. One responded to intracavernosal prostaglandin injections, and two had penile prostheses implanted.

The potency status of three Group 2 patients is not known. Five of the remaining seven patients are impotent (71%). One patient had a penile prosthesis implanted but the remaining patients declined treatment. Four of five patients (80%) in Group 3, with partial membranous urethral tears managed by transurethral catheterisation alone were impotent.

Discussion

Membranous urethral injury associated with pelvic fracture is uncommon³ but there is significant long-term morbidity including stricture, incontinence and impotence irrespective of treatment. The high incidence of urethral stricture in this series is not unexpected considering experimental evidence, which has shown that unless the cut ends of the urethra are sutured together immediately, urethral transection leads to fibrosis and stricture.⁴

Pelvic fracture injury of the membranous urethra can destroy the distal sphincter in which case continence relies on an intact bladder neck. Webster reports an 18% incidence of bladder neck injury in association with posterior urethral disruption and advocates immediate reconstruction to prevent incontinence.⁵ Three incontinent patients in this series may have had unrecognised bladder neck injury.

Ascending urethrography, the standard investigation in the diagnosis of urethral rupture, proved misleading in five patients deemed to have complete urethral disruption. Exploration revealed only partial rupture. These might have been managed endoscopically. Urethroscopy is recommended prior to open repair. Patients with partial rupture on x-ray and confirmed by cystoscopy, were easily managed by urethral catheterisation. The high rate of stricture is misleading because these were minor a complication in all cases.

No patient underwent immediate urethral repair for membranous urethral rupture. Immediate realignment is reserved for patients with associated major vascular injuries requiring reconstruction, or rectal or bladder injuries. Early primary realignment at 1-2 weeks of membranous urethral rupture is safer. Patients at this stage are haemodynamically stable and the risk of bleeding on evacuation of pelvic haematoma is minimal.

Delayed urethroplasty (at 3-6 months) is the alternative management of urethral rupture. One advantage is the simplicity of initial suprapubic cystostomy alone and this is attractive in units without a staff urologist. The majority of cases in this series had suprapubic catheterisation prior to transfer. Subsequent cystography revealed the catheter in the retropubic space in several patients. Suprapubic catheterisation by open cystostomy or under ultrasound guidance is preferable. Cystography should be performed to confirm correct position. Immediate cystotomy and delayed urethroplasty is associated with reduced blood loss compared to immediate urethral repair but not with repair at one to two weeks. The initial conservative approach obviates the risk of converting partial to complete urethral tears. In some series, ini-

tial cystostomy and delayed urethroplasty gives superior results regarding stricture, impotence and incontinence.^{6,7}

Delayed urethroplasty was associated with a lower incidence of postoperative stricture compared to early realignment but this was achieved at the cost of higher surgical morbidity. Strictures were extensive, requiring a combined transpubic and perineal approach, and protracted hospital stay and longer off work than those who had primary urethral realignment. Moreover delayed transpubic repair may be particularly difficult if the pubic rami have been fixed by internal orthopaedic plating.

The incidence of stricture was higher with early realignment but these were short and could be managed endoscopically or by dilatation. Patient self dilatation is used in well motivated patients. Postoperative impotence was historically attributed to neuro-vascular injury at the time of urethral repair. However, MRI and Doppler studies suggest that impotence is a consequence of injury rather than treatment.⁸ MRI findings of avulsed corpora cavernosa, displaced fracture of the corporal bodies, or displacement of the prostatic apex indicate a high probability of future erectile dysfunction.^{9,10} In this series the potency rate for early re-alignment was better than delayed urethroplasty.

Traumatic membranous urethral disruption is associated with significant long-term morbidity irrespective of treatment. Management should be tailored to the patient's condition and available expertise. Initial cystostomy and delayed urethroplasty (3-6 months) is preferred in unstable patients. Patients not requiring urgent exploration should have early urethral realignment (1-2 weeks) with the expectation of favorable outcome.^{11,12-17} This is easier and associated with lower morbidity and shorter hospital stay. Urethral realignment at 1-2 weeks is now combined with orthopaedic fixation of the pelvis allowing earlier recovery from bony injuries.¹⁸ Urethral stricture following realignment should initially be treated by internal urethrotomy/dilatation. Recurrence may necessitate self-dilatation or even formal urethroplasty.

Table 1. Treatment and outcome for ruptured membranous urethra

Treatment	N	Stricture rate	Erectile dysfunction rate	Incontinence rate
Primary Realignment	32	25/32 (78%)	8/30 (27%)	2/32 (6%)
Group 1				
Delayed repair	10	4/10 (40%)	5/7 (71%)	2/10 (20%)
Group 2				
Cystoscopic catheterisation	5	5/5 (100%)	4/5 (80%)	None
Group 3				
Total	47	34 (72%)	16 (38%)	4 (9%)

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