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INITIAL MANAGEMENT OF PFUI
ORIGINAL ARTICLE

The case against primary endoscopic realignment of pelvic fracture urethral injuries

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KEYWORDS

Pelvic fracture;
Urethral injury;
Primary endoscopic realignment;
Stricture;
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ABBREVIATIONS

PFUI, pelvic fracture urethral injury;
PER, primary endoscopic realignment;
SPT, suprapubic tube;
BMAU, bulbomembranous anastomotic urethroplasty

Abstract ***Objectives:*** To review previous reports and present our experience on the outcomes after treating pelvic fracture urethral injuries (PFUIs) with primary endoscopic realignment (PER) vs. placing a suprapubic tube (SPT) with elective bulbomembranous anastomotic urethroplasty (BMAU).

Methods: We reviewed previous reports and identified articles that reported outcomes after PER vs. SPT and elective BMAU for patients who sustained PFUIs. We also present our institutional experience of treating patients who were referred after undergoing either form of treatment.

Results: The success rates for PER after PFUI are wide-ranging (11–86%), with variable definitions for a successful outcome. At our institution, for patients treated by SPT/BMAU, the mean time to a definitive resolution of stenosis was dramatically shorter (6 months, range 3–15) than for those treated with PER (122 months, range 4–574; $P < 0.01$). The vast majority of patients treated by PER required multiple endoscopic urethral interventions (median 4, range 1–36; $P < 0.01$) and/or had various other adverse events that were rare among the SPT/BMAU group (14/17, 82%, vs. 2/23, 9%; $P < 0.05$).

Conclusion: While PER occasionally results in urethral patency with no need for further intervention, the risk of delay in definitive treatment and the potential for adverse events have led to a preference for SPT and elective BMAU at our institution.

Introduction

The immediate management of pelvic fracture urethral injuries (PFUI) remains a controversial and challenging decision for urologists. As previous reports are predominantly case series, meaningful comparisons of primary endoscopic realignment (PER) vs. placing a

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suprapubic tube (SPT) with elective bulbomembranous anastomotic urethroplasty (BMAU), are challenging [1,2]. Some surgeons prefer to leave the SPT for several months, followed by an elective BMAU. Others attempt to re-establish urethral continuity early with PER. A potential benefit of PER is avoidance of the need for urethroplasty altogether, or a decrease in the technical difficulty of additional procedures, although this too remains debatable.

Although a urethral stricture is almost inevitable in patients with PUFI and treated with an SPT alone [3], it is nearly always amenable to BMAU after allowing for tissue healing. However, the failure of PER can subject patients to many subsequent interventions, often delaying a definitive treatment of obstructive voiding. At our tertiary-care institution patients referred are those who have undergone either form of treatment, and those who were primarily realigned endured significantly more procedures and longer intervals before the re-establishment of unobstructed voiding [4].

Methods

We evaluated patients referred to our institution after the acute management of PFUI elsewhere, all of whom then underwent BMAU by one reconstructive urological surgeon using a standard technique. Patients were stratified into two groups based on their initial method of treatment before referral, i.e., those receiving a SPT alone followed by elective BMAU (group 1) were compared with those who underwent PER (group 2). We analysed clinical information such as stricture length, urethroplasty technique, time to durable symptom resolution, number of interval interventions, and treatment outcomes. We also compared clinical data between the groups to determine the frequency of adverse events.

Results

Of 888 urethroplasties performed at our referral centre from 2007 to 2014, 40 (5%) patients were referred for BMAU after a PFUI; 23 (58%) had SPT alone (group 1) and 17 (42%) had PER (group 2) resulting in bulbomembranous strictures. The mean (range) follow-up was 35 (5–64) months for group 1, and 41 (5–76) months for group 2. There were no differences between the groups in age or medical comorbidities.

Patients in group 1 had a significantly shorter time to the resolution of obstructive voiding (mean 6 months, range 3–15) than those in group 2 (mean 25 months, range 4–574; $P < 0.01$). Patients in group 2 (10/17, 59%) were five times more likely to have a delay of >1 year before urethroplasty compared to patients in group 1, and nearly a quarter of group 2 (4/17, 24%) had a delay of more than two decades. Most patients in group 2 had several interval endoscopic procedures (median 4, range 1–36; $P < 0.01$) before referral for reconstruction, compared to none in group 1.

Adverse events were markedly more common in group 2. Most patients sustained at least one of the following adverse outcomes: failure of the initial urethroplasty, the need for prolonged self-dilation (>6 months), overflow incontinence (requiring a condom catheter), and pelvic abscess, before referral. Furthermore, a clinical evaluation of patients in group 2 at our centre often showed additional signs of iatrogenic trauma, including false passages, radiographic signs of complexity at the injury site, and/or the development of synchronous strictures.

PER did not facilitate urethroplasty and there was no significant difference in operative duration (mean 169.5 vs. 180.7 min; $P = 0.49$), or stricture length (2.8 vs. 2.6 cm; $P = 0.7$). The overall initial success rate of BMAU was 93%, but patients in group 2 had a lower success rate (14/17, 82%) after initial urethroplasty than those in group 1 (all 23; $P < 0.05$). Two of the three failures in group 2 were successfully treated with a re-operative BMAU (one abdominoperineal) for an ultimate success rate of 98%. All three patients in group 2 in whom the initial urethroplasty failed at our centre had marked evidence of periurethral fibrosis and an extremely long duration of repeated endoscopic treatments conducted over many years (one patient had five dilatations over 4 years, two had 11 and 36 over 40 years).

Discussion

Complications and delay with PER

Advocates of PER attempt to achieve an earlier return to voiding and/or obviate the need for future urethral reconstruction. Also, resultant strictures can be shorter and the urethra better aligned for a subsequent urethroplasty [5]. However, our experience shows that neither advantage is achieved. There was no difference in mean stricture length or mean operative duration between the treatment groups.

Reports over the preceding half-century have been variable and inconclusive, but PER appears to decrease the risk of urethral stenosis by ≈30% [3]. In a recent meta-analysis of published reports over the last three decades, the authors concluded that PER reduces stricture rates by 37.2%, with a ‘number needed to treat’ of 2.76 [6]. This is consistent with recent single-institutional series that have reported success rates of 14–45% [7–9]. While patients treated by PER tend to maintain some degree of urethral patency, we also noted that they tend to undergo numerous endoscopic procedures over a lengthy period, often continued for several years or even decades.

Similar findings were described for patients with anterior (bulbar) strictures managed with repeated endoscopic procedures. Hudak et al. [10] reported a delay of nearly 16 years in patients who had two or more endoscopic repairs before urethroplasty, compared to only 2 years for those receiving none or one previous treatment; increasing complexity and difficulty of repair were also noted after repeated instrumentation. Similarly, Park and McAninch [11] noted that straddle injuries treated by PER tended to require more complicated repairs than those treated by SPT/BMAU.

Strictures after PER

Patients with a PFUI treated by PER often have their acute injury turned into an unstable chronic-disease state, having tenuous urethral patency that usually requires daily self-dilatation or regular painful office dilatations. Young men strongly prefer not to be subjected to such interventions, or the threat of recurrent urinary retention with accompanying emergency procedures [12]. Recent studies showed the futility of urethrotomy, with virtually all reporting low success rates of $<10\%$ [13]. As the urethra is a delicate anatomical structure, increasing the frequency of dilatation-associated assault inflicts unnecessary tissue injury, resulting in pain, false passages, bleeding, and lost time from work.

Also, PER followed by repeated instrumentation seemed to complicate the performance of posterior urethroplasty, an already challenging procedure. As might be expected, repeated dilatations can propagate scar formation [10], and in our experience, PER actually *increased* periurethral fibrosis (Fig. 1). Unfortunately, we also noted a wide range of adverse sequelae in these patients, e.g., synchronous stricture formation, false passages, initial urethroplasty failure, and/or infectious complications. Admittedly, these complications were probably unrelated to PER directly, but rather to the subsequent aggressive endoscopic manipulations required following impending urinary retention after being lost to follow-up.

We acknowledge that PER can be successful in selected cases, resulting in durable urethral patency. However, a close follow-up and/or prompt referral to a reconstructive subspecialist in the event of stricture formation is imperative. Despite most authorities advocating routine interval evaluations after PFUI [14], it is clear that many men are being lost to follow-up and/or dilated indefinitely, with no subspecialty referral. Fortunately, BMAU appears to be an effective salvage strategy regardless of the initial and subsequent management.

Benefits of SPT and elective BMAU

Because of the extreme forces necessary to cause a pelvic fracture, patients often have concomitant, potentially life-threatening injuries that warrant emergency intervention. After placing a SPT, these patients can recover from their initial insult, and be referred to a specialist for further management. A SPT can be readily placed transcutaneously in the acute setting, with or without ultrasonographic guidance, or at the time of exploratory laparotomy. A urethral stricture is almost inevitable in this scenario, but nearly always amenable to urethroplasty after allowing for tissue healing [4,15–19].

Complete excision of the stricture with a primary tension-free anastomosis is the standard approach for resolving obstructive urethral lesions. Contemporary success rates for anastomotic urethroplasty for both PFUIs and for bulbar strictures are reported to be $\approx 93\%$ [20,21]. More than 30 years ago, a controlled experiment in dogs showed that the urethra heals much more reliably when mucosa is precisely opposed to mucosa, compared to simply realigning over a catheter alone [22]. Histological analysis confirmed that the intervening gap was not replaced by re-epithelialisation, but rather by fibrotic scar, as is the case with PFUIs.

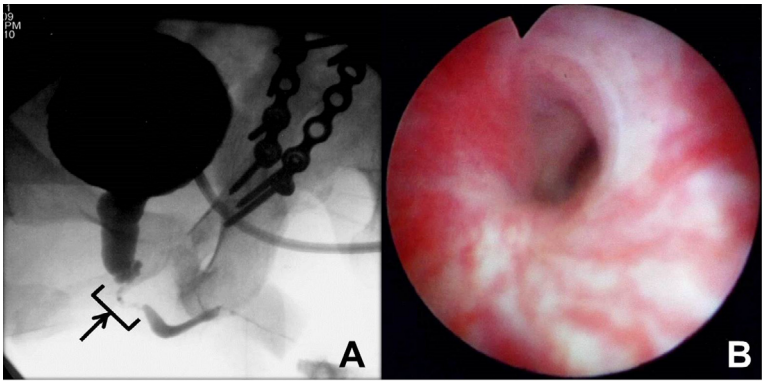

Figure 1 (A) A voiding cysto-urethrogram of a patient who sustained a pelvic fracture and underwent PER. Dense fibrotic scar developed, and he had several office dilatations over several years before referral for obstructive voiding. An endoscopic image (B) confirms the resultant scarring after many procedures.

Finally, with the emphasis on decreasing the economic burden on the healthcare system, physicians must provide the best possible care while reducing unnecessary costs. Although our retrospective analysis did not include a cost-analysis, the additional costs associated with the added interval follow-up visits, office procedures, and operative interventions required for patients treated by PER would probably significantly outweigh those of patients undergoing SPT/BMAU.

Conclusion

Patients referred to our institution who underwent PER had a significantly longer delay to a durable resolution of obstructive voiding than those who had an immediate SPT and BMAU. Patients treated by PER had significantly more invasive procedures, such as dilatations and direct visual internal urethrotomies before definitive management. Achieving stable urethral patency was ultimately successful in all patients, but required significantly less time and fewer procedures in those patients managed with SPT and elective BMAU.

Conflict of interest

None.

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