Original Article
A new technique for immediate endoscopic realignment of post-traumatic bulbar urethral rupture

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Abstract: Objectives: Urethral injury with partial or complete disruption of urethral integrity can lead to voiding problems and serious infections. We report a new management technique involving immediate endoscopic realignment with drainage via peel-away sheath for post-traumatic bulbar urethral rupture. Methods: Thirteen patients presenting with post-traumatic bulbar urethral rupture between July 2010 and May 2013 were treated. An 18F peel-away sheath was inserted into the anterior urethra, then a ureteroscope or nephroscope was inserted into the peel-away sheath with continuous normal saline infusion and drainage through the cavity between ureteroscope and sheath to maintain operative field clarity. A guide wire was negotiated across the disruption to the bladder and an 18F Foley catheter inserted for 2-4 weeks. Rupture severity was evaluated by urethroscopy during operation. Two patients had partial urethral rupture and 11 complete rupture. Before Foley catheter removal, pericatheter urethrography was performed to determine if urinary extravasation had occurred. Urethroscopy was performed after catheter removal. Follow-up uroflowmetry was conducted monthly for 1 year. Results: This technique was successful in all patients and none experienced urinary extravasation or required open surgery. Mean operation time was 4.9±1.6 min (3-8 min) and the mean Foley catheter indwelling time was 25.8±5.3 days. During follow-up (18.4±5.4 months, 12-26 months), 6 patients developed urethral strictures (8.7±10.5 weeks, 1-28 weeks post-treatment). Strictures were managed by internal urethrotomy (1 patient) or urethral sound dilation (5) without open urethroplasty. Conclusions: Immediate endoscopic realignment with drainage via peel-away sheath is a fast, effective, and safe technique for bulbar urethral rupture.

Keywords: Endoscopic realignment, post-traumatic, bulbar urethra, urethral rupture

Introduction
Bulbar urethral rupture, usually caused by straddle injury, is more common than posterior urethral injury [1]. The key to successful management of a bulbar urethral rupture is maintenance of urethral continuity to minimize the risk of complications [2]. The best method for treatment is still a matter of debate. Many reports on immediate endoscopic realignment have supported this approach [3-5]. We report a new technique for immediate endoscopic realignment of bulbar urethral rupture that can reduce the time of operation, simplify the operative technique, reduce fluid extravasation intraoperatively, and increase the operation success rate.

Materials and methods
Thirteen patients with bulbar urethral injuries presented to our hospital from July 2010 to May 2013. Transurethral catheterization was unsuccessful in all cases. Patients were treated by immediate endoscopic realignment with drainage via peel-away sheath, followed by insertion of an 18 F Foley catheter for 2-4 weeks. Patients were followed-up for more than 1 year with monthly uroflowmetry. Mean patient age at surgery was 41.1±10.8 years (24-63 years). The most common cause of bulbar urethral rupture was straddle injury from falls (12 patients, 92.3%), followed by traffic accidents (1 patient, 7.7%). Various organ injuries, including scrotal and perineal hematomas and testicular injury, were associated with the urethral rupture. The chief urologic complaint was urethral bleeding (11 patients, 84.6%). The degree of injury was classified on the basis of urethroscopy findings. All patients had partial (15.4%) or complete (84.6%) urethral rupture (Figure 1). Injuries are summarized in Table 1.
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Under spinal or epidural anesthesia, patients were placed in lithotomy position with the legs on adjustable leg supports. An 18 F peel-away sheath with a fascia dilator was inserted into the anterior urethra near the bulbar urethra rupture in the retrograde direction. The sheath was used as a conduit to pass a ureteroscope or nephroscope (Li-xun) to observe the urethra cavity and locate the proximal urethra under normal saline irrigation. Fluid pressure during irrigation was reduced by drainage through the cavity between the ureteroscope and the peel-away sheath (Figure 2). Clots in the urethra were gently washed away by normal saline irrigation or removed by forceps to keep the operative field clear for locating the proximal urethra. The ureteroscope was then inserted into the proximal urethra and bladder, and a 0.035-inch hydrophilic glide wire passed carefully through the ureteroscope to the bladder. Finally, an 18 F urethral Foley catheter was placed over the guide wire.

The urethral catheter was left in place for 2 to 4 weeks, depending on the severity of injury. Our intended indwelling time was 2 weeks for partial injury and 4 weeks for complete injury. Before removal of the Foley catheter, a percutaneous urethrogram was performed to determine if urinary extravasation had occurred, and urethroscopy was performed routinely after the removal of the catheter. Follow-up uroflowmetry was conducted monthly for one year. We retrospectively collected patient data for a minimum of 1 year. Incidence of urethral stricture, a major complication, was recorded.

Results

Immediate endoscopic realignment with drainage via peel-away sheath was successful in all 13 patients presenting with bulbar urethra injury, and no patient required open surgery or experience aggravated fluid extravasation. The mean time to the operation after injury was 6.7±2.0 hours (range, 3 to 10 hours). The mean operation time was 4.9±1.6 minutes (3-8 minutes) and the mean indwelling time of the urethral Foley catheter was 25.8±5.3 days (14-28 days). Mean maximal flow rate was 18.2±1.6 mL/s (15.8-21.3 mL/s) within the first year after surgery. Patients were monitored for 18.4±5.4 months (12-26 months).

Vesicopuncture was performed in 2 patients with acute retention of urine. Suprapubic cystostomy was unnecessary in all cases. All patients were treated with immediate endoscopic urethral realignment within 12 hours of injury. Under spinal or epidural anesthesia, patients were placed in lithotomy position with the legs on adjustable leg supports. An 18 F peel-away sheath with a fascia dilator was inserted into the anterior urethra near the bulbar urethra rupture in the retrograde direction. The sheath was used as a conduit to pass a ureteroscope or nephroscope (Li-xun) to observe the urethra cavity and locate the proximal urethra under normal saline irrigation. Fluid pressure during irrigation was reduced by drainage through the cavity between the ureteroscope and the peel-away sheath (Figure 2). Clots in the urethra were gently washed away by normal saline irrigation or removed by forceps to keep the operative field clear for locating the proximal urethra. The ureteroscope was then inserted into the proximal urethra and bladder, and a 0.035-inch hydrophilic glide wire passed carefully through the ureteroscope to the bladder. Finally, an 18 F urethral Foley catheter was placed over the guide wire.

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During follow-up, 6 patients (46.2%) complaining of voiding difficulty due to development of urethral strictures, and maximal flow rate was less than 15 mL/s. The mean time between the operation and development of stricture was 8.7±10.5 weeks (1-28 weeks), with most developing within 3 months after surgery. The mean stricture length was 0.5±0.1 cm (0.3-0.7 cm) as determined by urethrogram or cystourethroscopy. Strictures were managed by internal urethrotomy in 1 patient (7.6%) and urethral sound dilation in 5 (38.5%), but no open urethroplasty was performed.

Discussion

Anterior urethral injuries including the bulbar urethra are usually caused by blunt trauma, including straddle injuries [6]. The optimal method for managing bulbar urethra injuries continues to be debated. Suggested treatment modalities include (a) immediate primary simple realignment over a stenting catheter, (b) immediate primary suture repair, and (c) immediate suprapubic cystostomy alone, with delayed urethroplasty for the resulting stricture [7]. Some urologists prefer delayed reconstruction with a suprapubic cystostomy and subsequent open repair several weeks or months after cystostomy [8]. According to some reports, primary surgical repair results in better outcome in patients with bulbar urethra injury [5, 9]; however, numerous reports have shown satisfactory results using primary realignment [10, 11].

Traditionally, catheterization has been avoided in the treatment of suspected urethral injury to prevent converting a partial rupture into complete rupture, resulting in infection via the hematoma [12]. However, given that there is little actual evidence for partial to complete rupture conversion, others recommend one careful attempt at Foley catheterization. Indeed, Shlamovitz and McCullough found that attempts at blind catheterization in patients with suspected urethra injury did not increase severity [13]. For patients with partial rupture, primary transurethral catheterization can be initially performed [4], while for more complex or complete disruption, endoscopic realignment or open urethroplasty is required [14].

As endoscopic equipment and techniques have improved in the past two decades, primary realignment of urethral ruptures has become more common. The goal of transurethral catheterization is to allow a urethral injury to heal in the correct position while diverting the urine via the catheter. Several techniques have been reported for successful endoscopic realignment [14, 15]. Porter et al. [16] reported successful realignment using coaxial magnetic urethral catheters. Cohen et al. [17] used a flexible cystoscope to identify the bladder neck and a fluoroscope to guide the advancement of the instrument. Seo et al. [10] treated all patients by initial suprapubic cystostomy to create a working tract, followed by insertion of a 16 F flexible cystourethroscope and guide wire for insertion of a rigid cystourethroscope from the urethral meatus.

Alternatively, we used a peel-away sheath as a conduit to pass a ureteroscope or nephroscope under constant irrigation by normal saline with drainage through the cavity between the ureteroscope and the sheath. Clots in the urethra were washed away or removed by forceps to keep the operative field clear in order to find the proximal urethra and avoid intraoperative fluid extravasation. Suprapubic cystostomy is not necessary using this technique as the endoscope is used only to advance from the urethral side, without insertion of a flexible cystourethroscope through the cystostomy tract. Those patients with acute retention of urine can be treated immediately with vesicotomy instead of suprapubic cystostomy. In fact, our initial operative plan included a suprapubic cystostomy as another working tract in case it was difficult to find the proximal urethra. However, we found that it was easy to find the proximal urethra without guidance from the cystostomy side, as the operative field was clear enough. Using this technique, the operation time was reduced to only several minutes, and resulted in less fluid extravasation with high operation success rate.

Development of post-realignment urethral stricture is a major complication of primary endoscopic realignment. Ying-Hao et al. reported a stricture frequency of 12.6% after urethoscopic realignment of ruptured bulbar urethra in a case series of 16 men, while Ku et al. [5] reported a stricture rate of 18.5% in 65 patients. Park et al. [18] studied the 5-year follow-up results of endoscopic realignment in 11 patients with
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anterior urethral injuries and found that 6 (54%) had urethral stricture necessitating internal urethrotomy and sound dilation. This is similar to the incidence reported in our series (46.2%). In our patients, all strictures could be cured by urethral metal sound dilation and/or internal urethrotomy, and open urethroplasty was not necessary. Although long-term follow-up and more cases are required, these early results suggest that immediate endoscopic realignment with drainage via peel-away sheath is a simple, safe, and minimally invasive therapeutic modality for post-traumatic bulbar urethra rupture.

Our study has some limitations. The sample size was small and we did not compare the results of this new operative technique to primary endoscopic urethral realignment by traditional techniques or to open urethroplasty.

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Disclosure of conflict of interest

None.

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