Reconstruction of Pelvic Fracture Urethral Injuries With Sparing of the Bulbar Arteries

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OBJECTIVE To present a novel reconstruction technique for patients with pelvic fracture urethral injuries (PFUI) with bulbar artery sparing.

MATERIALS AND METHODS We modified the traditional technique for PFUI reconstruction to preserve the proximal arterial inflow to the bulb. Since 2008, 26 consecutive patients have undergone this technique at our institution. The bulbar arteries are located using a Doppler ultrasound stethoscope and then the bulb is mobilized from one side only, without detachment from the perineum. The artery from that side is sacrificed to preserve the contralateral one; sometimes both arteries can be spared. Removal of the scar and end-to-end anastomosis is performed as usual. Successful arterial preservation was verified by postanastomosis Doppler auscultation.

RESULTS Mean age was 37 years (15 to 70). Median time from trauma to urethral reconstruction was 11 weeks and mean stenosis length was 2.3 cm (1 to 4.5 cm). The left bulbar artery was preserved in 14 cases, the right in 4, and both arteries were spared in seven; an accidental injury of the artery to be preserved occurred in the remaining case. At a mean follow-up of 20 months (2–69), all patients are voiding normally stricture free.

CONCLUSION Preservation of proximal arterial blood supply to the bulb during PFUI reconstruction is feasible and safe. A well-perfused reconstruction should heal better and theoretically our technique may avoid ischemic failure of the urethroplasty. A larger series and replication of our results in other centers are necessary to validate our technique's potential benefits. UROLOGY 88: 207–212, 2016.

Traditional reconstruction of pelvic fracture urethral injuries (PFUI) requires mobilization of the bulbar urethra to reach the prostatic apex. After deep dissection of the spongiosum in the perineum, the bulb is detached from the perineal membrane at the site of the bulbomembranous urethral injury, a maneuver that requires division of the bulbar arteries.[1,2] The distal spongiosal stump then becomes a flap, with retrograde flow through the glans and some perforating arteries, branches of the dorsal artery of the penis. Under normal circumstances, this retrograde blood supply is sufficient to maintain good vitality of the spongiosum and urethra. However, in some cases, penile arterial blood supply may be compromised by the pelvic fracture due to injury of the penile arteries at the ischiopubic ramus, resulting in penile arterial insufficiency. In such cases, retrograde flow to the spongiosum is insufficient and ischemic necrosis may result, leading to a failure in the reconstruction. Characteristically, these patients fail to void soon after removal of the catheter, with subsequent retrograde urethrography (RUG) showing a long urethral defect involving the bulbar urethra.

Posttraumatic penile arterial insufficiency may also be responsible for posttraumatic arteriogenic erectile dysfunction (ED). For this reason, it is recommended that PFUI patients complaining of ED after the injury should be evaluated with pharmacodynamic penile Doppler studies to rule out penile arterial insufficiency.[3] When confirmed, penile microvascular revascularization prior to urethroplasty has been advised to prevent necrotic failure.[4-8]

In 2007, Jordan et al described a technique for bulbar vessel sparing during excision and primary anastomosis (EPA) in proximal bulbar strictures[9]; however, their technique is for proximal bulbar strictures and requires indemnity of the bulbomembranous junction, which is not the case in PFUI that has a more extensive periurethral scarring and distortion of the normal anatomy, with loss of the urethral continuity. The value of this vascular preservation may not be too significant in cases of proximal bulbar strictures, but we believe it is highly relevant in the PFUI scenario, for it can theoretically help avoid ischemic failure. Consequently, we modified the standard reconstructive

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technique for PFUI by preserving bulbar artery inflow to the bulb to avoid necrotic failure. We present herein our technique and medium-term results.

MATERIALS AND METHODS

In 2008 we modified the standard technique for the reconstruction of PFUI to preserve the antegrade proximal vascularization of the spongiosum by sparing the bulbar arteries.

A midline perineal incision is made and the spongiosum is exposed by opening the bulbospongiosum muscle as per the traditional technique. Before further dissection, the bulbar arteries are located using a directional Doppler ultrasound stethoscope (Fig. 1). A decision is made to sacrifice the artery with the lowest Doppler signal to preserve the contralateral best artery. The bulbar urethra is then mobilized dorsally and from one side only, without detachment of the bulb from the perineal body. The intercrural septum is opened widely to provide space for deep perineal dissection; the scar is removed completely and the apical prostatic urethra is exposed as usual. No dissection is performed contralaterally at the bulb to preserve the artery of that side (Figs. 2, 3). The bulbar urethra is separated distally from the corpus cavernosum to gain sufficient length for a tension-free anastomosis. The end-to-end anastomosis is performed using six 5-0 poliglecaprone absorbable sutures and the procedure was completed as usual. Preservation of arterial flow into the spongiosum coming from the spared bulbar artery was verified by Doppler ultrasound auscultation at the end of the anastomosis. A silicone catheter was left for 3 weeks and a pericatheter urethrography was performed prior to its removal.

Preoperative evaluation included antegrade and retrograde urethrography under fluoroscopic guidance to evaluate urethral distraction length and displacement of the prostatic urethra. A pharmacodynamic penile Doppler study with intracavernous injection of E1 prostaglandin was made in cases reporting post-traumatic ED. Clinical follow-up was made at months 1, 3, 6, and 12, and annually thereafter. No patient was lost to follow-up. Early in our protocol, a voiding cystourethrography was performed at month 6; later it was replaced by uroflowmetry after 3 months, which is repeated if urinary symptoms arise.

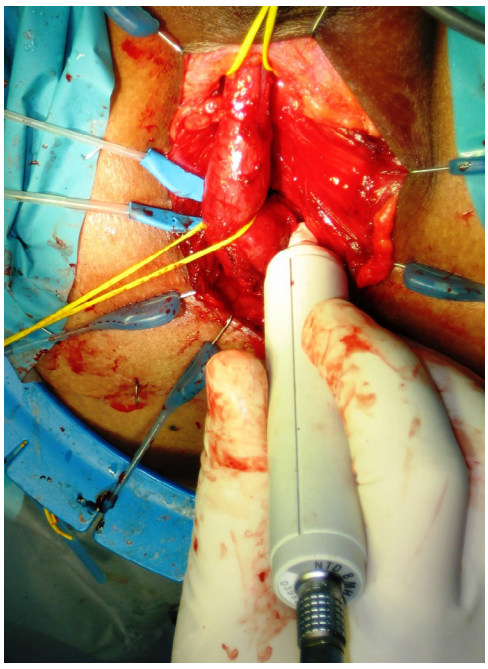

Figure 1. Use of Doppler stethoscope to locate the bulbar arteries. (Color version available online.)

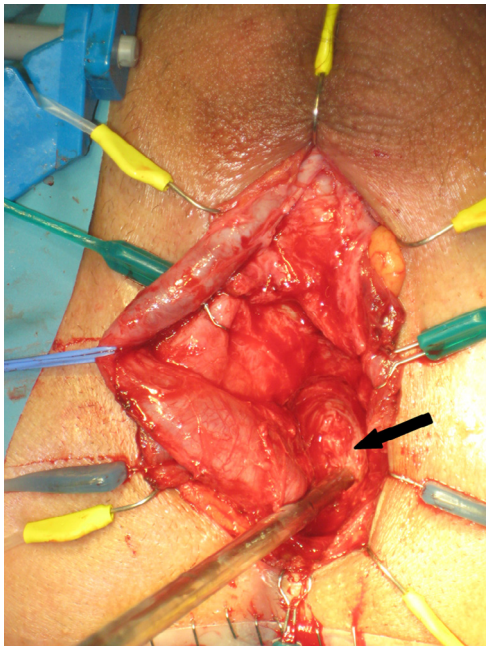

Figure 2. The bulb has been mobilized dorsally and from the left side; the crura has been split and the left bulbar artery divided, exposing the scar to be removed (arrow). (Color version available online.)

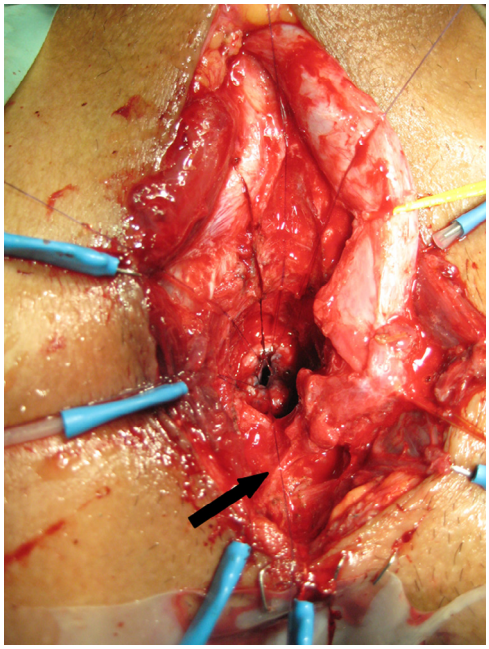

Figure 3. In this other case, a right-sided approach has been taken; the bulb is retracted to the left, the scar has been removed, and the proximal urethra is ready for anastomosis. Note that the bulb remains attached to the perineum (arrow). (Color version available online.)