



Spontaneous recovery of severely impaired penile arterial flow before urethroplasty for pelvic fracture urethral injury

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ABSTRACT

A 21-year-old male presented to our hospital for life-threatening pelvic fracture, mandating emergent transarterial embolization of the right internal pudendal artery. At five-month post-injury, penile arterial flow was severely impaired, thus penile revascularization surgery were planned, before attempting urethroplasty for a 2-cm gap in the posterior urethra. However, reevaluation angiography results obtained two months later revealed spontaneous recovery of penile arterial flow. Excision and primary anastomosis urethroplasty was successfully performed without signs of bulbar ischemia. This case suggests that the timing of urethroplasty following pelvic injury should be tailored according to recovery of penile arterial flow.

1. Introduction

Patients with a urethral rupture associated with a pelvic fracture (pelvic fracture urethral injury, PFUI) due to a blunt injury are not uncommon in tertiary care trauma centers. For some, urgent transarterial embolization (TAE) to control life-threatening pelvic bleeding is performed.^{1,2} The urethra has a dual arterial supply from the bulbar artery and retrograde blood flow from the penile artery, but those may be impaired in PFUI patients, because of the trauma itself and/or TAE.³ In such cases, preoperative revascularization may be required to minimize the risk of bulbar necrosis,⁴ though timing and indications for such revascularization surgery have not been established. Herein, we report a case of spontaneous dramatic recovery of severely impaired urethral blood flow in a patient with a PFUI, obviating the need for revascularization surgery.

2. Case report

A 21-year-old male was brought to the emergency care unit of our hospital for treatment of a pelvic fracture caused by a motorcycle accident. To stabilize hemodynamics, TAE of the bleeding branches of the right internal iliac artery including internal pudendal artery was performed, followed by an orthopedic repair procedure for a pelvic fracture. At that time, the urology department was consulted for difficulty with placement of a urethral catheter. Urethrography findings showed

flame-like leakage of contrast medium and the patient was diagnosed with a complete urethral rupture (Fig. 1a). A suprapubic cystostomy tube was placed and delayed urethroplasty scheduled.

Five months after the injury, combined urethrography revealed a 2-cm gap in the membranous urethra (Fig. 1b). The patient also noted erectile dysfunction (ED) and decreased temperature sensation in the glans penis. Penile blood flow was evaluated by color Doppler ultrasonography, which showed only scarce arterial flow in the left deep and dorsal penile artery. Angiography and simultaneous computed tomography (angio-CT) findings showed only minimal flow in the deep penile artery on the left side (Fig. 2a and b) and none in the right side. He was diagnosed with severe blood flow impairment of the deep and dorsal penile artery, which has a risk of ischemic bulbar necrosis upon bulbar mobilization in a urethroplasty procedure.

Seven months following the injury, bypass surgery for penile revascularization from the deep inferior epigastric wall artery to dorsal penile artery was planned and the patient was transferred to a hospital specializing in penile revascularization. However, contrast enhanced CT for reevaluation of blood circulation at that hospital showed marked improvement of penile blood flow (Fig. 2c), which was confirmed by Doppler ultrasound. Furthermore, angiography indicated recovery of interrupted right internal pudendal artery blood flow by collateral vessels and enhanced flow from the left innominate artery (Fig. 2d). The bypass surgery was cancelled, and the patient returned to our department for an excision and primary anastomosis (EPA) urethroplasty

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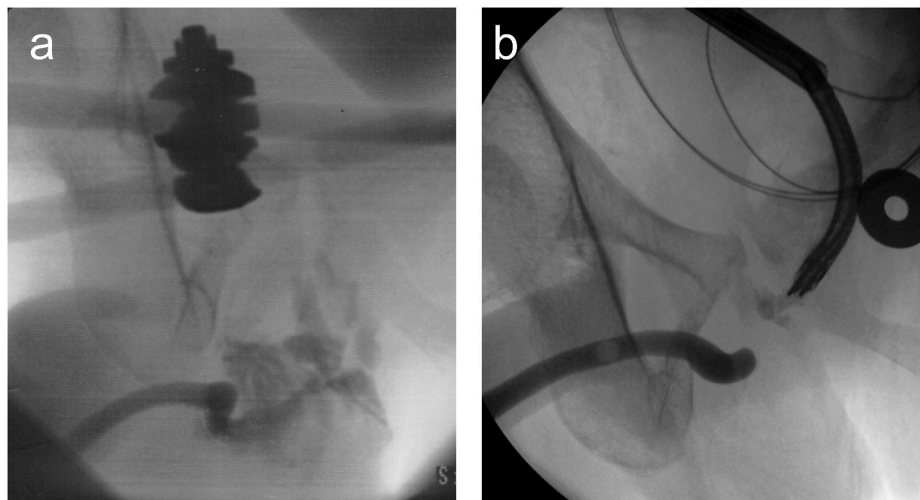


Fig. 1. a. Urethrography on the day of injury. Flame-like contrast leakage from the urethral tear was observed. b. Five months after the injury, a combined retrograde and antegrade urethrograph procedure was performed. The diagnosis was complete rupture of the membranous urethra with a gap of about 2cm, in comparison with a 2cm marker.

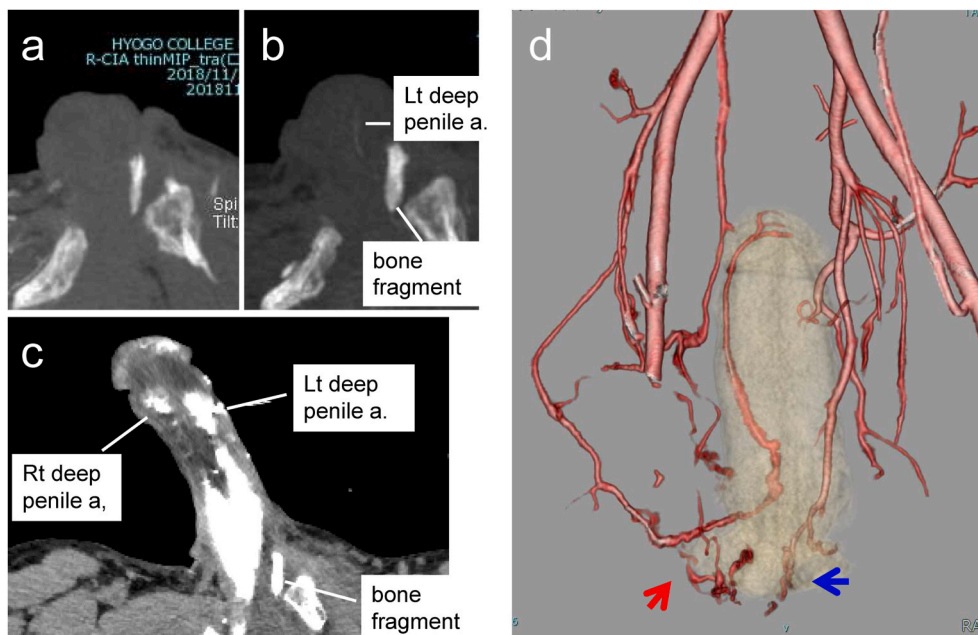


Fig. 2. a. Angio-CT findings at five months post-injury. The right deep penile artery was not visualized by selective contrast injection via right common iliac artery. b. The left deep penile artery was only slightly delineated by selective contrast injection via left common iliac artery. c. An intravenous dynamic CT findings at seven months post-injury revealed spontaneous robust recovery of bilateral deep penile arterial flow. d. Three-dimensional image reconstructed from angio-CT images obtained at seven months post-injury. Right side: collateral flow from embolized internal pudendal artery (red arrow). Left side: Native arterial flow from innominate artery (blue arrow). (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

procedure, which was performed at nine months after the injury. The color of the bulb remained good and its appearance was healthy at the time of urethral dissection, and the urethra showed good patency after the EPA (Fig. 3). At the latest check-up examination, the patient was able to urinate without difficulty.

3. Discussion

We report here a case of spontaneous recovery from severe insufficiency of penile arterial after a pelvic fracture, for which revascularization had been planned prior to a urethroplasty procedure. To the best of our knowledge, this is the first such case presented in literature.

A pelvic fracture itself as well as TAE for hemostasis are considered to be risk factors for urethral arterial flow.³ In cases with glans hypothermia or ED, it is important to evaluate penile and urethral blood flow by Doppler ultrasonography, contrast enhanced CT, or angio-CT, the latter of which provides the most reliable results.³ While TAE

contributes to improved life expectancy after a pelvic fracture and is frequently used in advanced emergency departments,^{1,2} pelvic TAE seems to have a negative impact on the success of a urethroplasty. A multicenter study conducted in the United States reported that, TAE, along with longer distraction defects were significantly associated with urethroplasty failure, and that success rate of EPAs for PFUI was 93.3% (99/106) without TAE, but only 75.0% (12/16) after TAE.⁴ TAE may reduce retrograde blood flow from the penile artery to the corpus spongiosum, increasing the risk of an ischemic anastomotic stricture or, in the worst case, bulbar necrosis following urethral dissection, thus penile arterial blood flow should be evaluated prior to performing a urethroplasty for PFUI, at least in all cases showing ED after the injury. To resolve the problem, Zuckerman et al. performed penile revascularization for 17 PFUI patients with arteriogenic ED, four of whom underwent the procedure prior to urethroplasty, for prevention of complications related to bulbar ischemia.³

In the present case, planned revascularization surgery was obviated

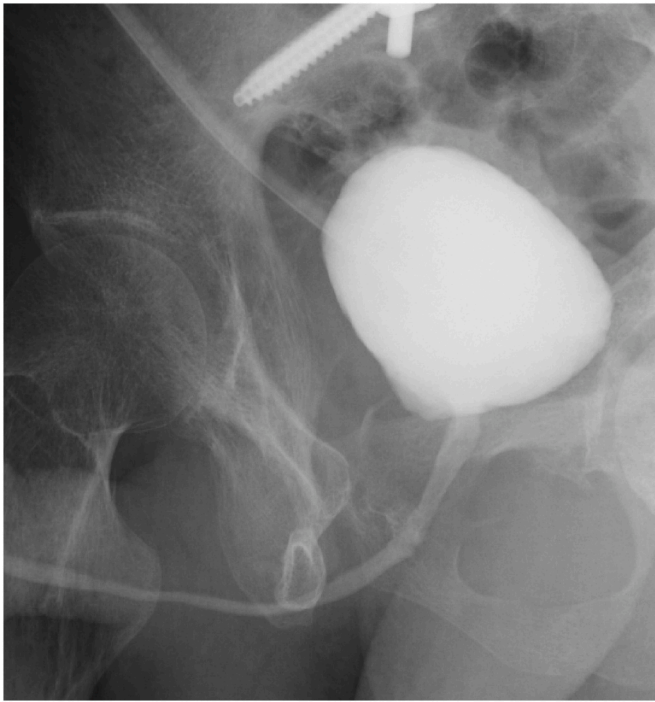


Fig. 3. Voiding urethrography performed after anastomotic urethroplasty showed smooth micturition.

by spontaneous recovery of penile arterial flow, which seems to have two mechanisms, recanalization and collateral formation. Degradation of Gelfoam, a commonly used embolic material that degrades within several months after use in TAE, did not seem to have a major role in our patient, because TAE was performed on the right side alone, where collateral formation was observed in the embolized internal pudendal artery. A more robust recovery of arterial flow was observed on the left side, which occurred as a result of increased flow from a native

innominate artery.

The present case illustrates the importance of evaluating penile and urethral blood flow before a urethroplasty procedure. Arterial ED account for 12.7% of all ED cases after pelvic fracture according to a report.⁵ Transient arterial ED cases may be more prevalent, and include those with severely impaired penile arterial flow as presented in this report. The precise epidemiological data about the rate of arterial insufficiency during acute phase of pelvic fracture, as well as the rate of spontaneous arterial recovery, as observed in this patient, should be prospectively evaluated in the future. At least, the timing of urethroplasty following a pelvic injury should probably be longer than the conventionally accepted three months after injury, when impaired penile arterial flow is present.

4. Conclusion

The timing of a urethroplasty procedure for PFUI should be tailored according to recovery of penile arterial flow.

Disclosures

None to declare.

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