Case Report

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Emergency Management of Crushing Perineal Avulsion with Complete Urethral Disruption: A Case Report

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ABSTRACT

High-energy machinery entrapment can result in catastrophic perineal injuries involving complete urethral disruption, extensive soft tissue avulsion, and associated orthopedic trauma. We report a 24-year-old man who suffered a crushing roller injury, resulting in total perineal avulsion with bilateral testicular exposure, complete bulbar urethral transection, right pubo and ischial ramus avulsion, and an open ipsilateral tibiofibular fracture. Given the patient's hemodynamic stability following resuscitation and the intraoperative finding of cleanly transected urethral ends without rectal or bladder neck injuries, a single-stage surgical approach was pursued. Primary urethral anastomosis and *in situ* subcutaneous testicular burial were performed, with primary closure of the perineal wound. At 6 months postoperatively, debridement was repeated for non-healing wound secondary to infection, followed by regular dressing changes. Complete healing was achieved at 1 year postoperatively. At the 3-year follow-up, the patient could ambulate independently without assistance, void with a normal stream, and reported preserved erectile function. These favourable outcomes support the value of aggressive early single-stage reconstruction in carefully selected, hemodynamically stable patients sustaining devastating perineal avulsion injuries.

Key words: perineal avulsion; urethral disruption; genitourinary trauma; first aid; urethral reconstruction

INTRODUCTION

Perineal avulsion is a rare clinical entity, most reported in the context of battlefield blasts or high-speed traffic collisions rather than industrial crush injuries. In cases involving complete urethral transection, soft-tissue loss, and pelvic-ring disruption, patients face high risks of complications including urethral stricture, urinary incontinence, erectile dysfunction, and the need for orchidectomy secondary to scrotal devitalization. Although staged urethroplasty after suprapubic urinary diversion remains the standard approach, we propose that in hemodynamically stable patients, immediate anastomotic repair combined with ectopic testicular burial may reduce reconstructive burden without compromising functional outcomes.

CASE PRESENTATION

In May 2018, a previously healthy 24-year-old man sustained severe crush injuries to the groin and perineum when his clothing became entangled in an industrial roller while working. He was transferred to our emergency department 6 hours later, presenting with pallor and tachycardia (heart rate 145 bpm, blood pressure 70/40 mmHg, 1 mmHg = 0.133 kPa). Full-thickness avulsion of the perineal skin and subcutaneous tissue was evident between both groins, with exposure of the penile shaft and both testes. The bulbar urethra was completely transected (**Fig. 1A**). Additional injuries included a right pubic and ischial ramus avulsion fracture and an open ipsilateral tibiofibular fracture.

After rapid volume resuscitation (heart rate 99

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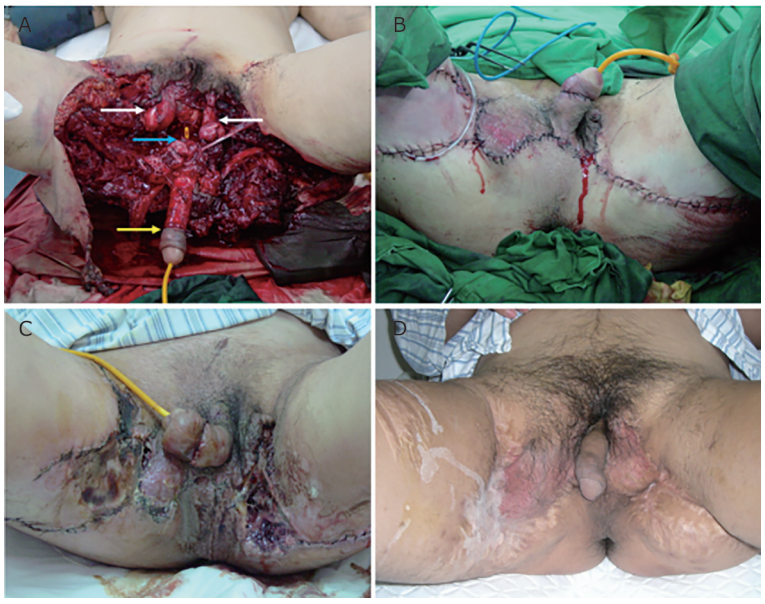

Figure 1. Perineal wound and urethral injury following industrial roller crush.
(**A**) Appearance at 6 hours post-injury, demonstrating bilateral exposed testes and spermatic cords (white arrows), penile skin avulsion (yellow arrow), and complete urethral transection (blue arrow). (**B**) Appearance following debridement and primary closure. (**C**) Appearance at 6 months after first debridement, showing a persistent non-healing wound with superficial infection. (**D**) Appearance at 1 year after the second debridement, showing good wound healing.

bpm, blood pressure 105/72 mmHg), he underwent emergency surgery under general anesthesia. Thorough debridement of the open wounds was performed, followed by primary closure (**Fig. 1B**). The transected urethra was re-established by primary spatulated anastomosis over a 16 Fr indwelling catheter. The urethral mucosal edges were approximated with eight evenly spaced, mucosa-to-mucosa sutures using 4-0 absorbable suture material. The transected corpus spongiosum was then secured to the surrounding tissues with three anchoring sutures to minimize tension on the anastomosis. Both spermatic cords appeared grossly intact with normal testicular perfusion, the testes were therefore buried *in situ* within the subcutaneous tissue without tension, and no fixation sutures were placed. Intraoperative transfusion requirements totaled 10,000 mL of blood products.

Postoperatively, the patient remained hemodynamically stable and was transferred to the rehabilitation ward on day 5. At 6 months, the perineal wound had not fully epithelialized and was complicated by superficial infection (**Fig. 1C**). Repeat debridement was performed with excision of necrotic tissue, and the defect was left open to heal by secondary intention, with daily dressing changes. The wound was essentially healed 1 year later (**Fig. 1D**). At the 3-year follow-up, the patient was able to walk unaided, void with a normal stream, and reported preserved erectile function.

DISCUSSION

Machine-driven crush frequently results in explosive degloving wounds that are invariably contaminated with debris and bacteria. The first priorities in such cases are hemorrhage control and temporary fecal/urinary diversion. The management of such heavily contaminated, high-energy injuries remains challenging. While primary debridement and repair carry inherent risks, including wound infection, anastomotic dehiscence, and recurrent urethral stricture, staged protocols likewise carry the risks of infectious complications and potential loss of organ function. Therefore, an individualized, context-specific approach tailored to the clinical circumstances is recommended.

In the present patient, the absence of a rectal tear or bladder-neck injury permitted single-stage urethral reconstruction. This approach aligns with current evidence indicating that gaps $\leqslant$ 2 cm can be primarily anastomosed without increasing stricture risk[1,2]. Early coverage of the exposed testes in thigh pouches—a technique originally described in battlefield surgery—prevented desiccation and eliminated the need for prosthetic mesh[3,4]. Intraoperatively, the spermatic cords and testes appeared macroscopically viable, predicting

a favourable gonadal outcome. Because the bladder remained intact and the urethral stumps were cleanly transected, a tension-free primary anastomosis was performed, offering an optimistic expectation of postoperative urethral patency without extravasation. Therefore, to minimize additional surgical trauma, suprapubic cystostomy was deferred. Although this decision carried inherent risk, the eventual outcome proved favorable.

Delayed wound breakdown was attributed to marginal ischemia rather than ongoing infection; once radical excision of all necrotic and contaminated tissue had been performed, healthy granulation tissue gradually filled the defect and matured into a stable scar. Consequently, at 3-year follow-up, genitourinary outcome matched that of traditional staged repairs[5], indicating that primary reconstruction can be safely performed in hemodynamically stable patient when appropriate surgical expertise is available. Although suprapubic cystostomy with deferred urethroplasty (> 3 months) remains the default for most pelvic-fracture urethral injuries[6], the presence of complete transection with fully exposed, cleanly transected ends rendered immediate one-stage anastomosis the more logical option in this case.

In conclusion, this case demonstrates that, in hemodynamically stable patients without rectal or bladder-neck involvement, immediate anastomotic urethroplasty and ectopic subcutaneous testicular burial can be safely integrated into the primary debridement of heavily contaminated, crush-related perineal avulsion. When surgical expertise and patient status allow, tertiary centers managing high-energy perineal trauma should consider this single-stage strategy rather than routinely deferring urethral reconstruction.

ARTICLE INFORMATION

Patient consent

Written informed consent was obtained from the patient prior to the publication of this case report.

Conflict of interest

The authors have no conflicts of interest to declare.

Authors' contributions

Wang J wrote the manuscript. Li GZ provided resources and materials. Man LB reviewed and revised the manuscript. All authors have reviewed and approved the final version of the manuscript.

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