Case - Penile gangrene and necrosis requiring reconstructive allograft following constriction-induced trauma

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INTRODUCTION

This report presents a rare case of penile gangrene and necrosis secondary to constriction by a plastic bottle neck that required staged surgical management involving multiple debridements and corporal reconstruction, as well as an overview of long-term healing progress.

CASE REPORT

Presented in this case is a 53-year-old male with a complex past medical history, including traumatic brain injury, epilepsy, and neurogenic bladder with chronic urinary retention managed with indwelling Foley catheterization. On his initial presentation, the urology service was consulted for a penile wound. The penile shaft was found to be swollen and erythematous, with evidence of progressive traumatic hypospadias, circumferential induration, and extensive necrosis and gangrene at the mid-to-distal aspect. The wound was noted to be 2 x 3 cm, located on the ventral shaft of the penis, and containing superficial ulceration with pink granulation tissue (Figure 1).

At this time, a Foley catheter was placed due to the patient being in renal failure. While no constructive object was seen encircling the base of the penis or causing mechanical strangulation, the physical exam finding was concerning for an object-induced tourniquet injury to the mid-to-distal penile shaft. This was confirmed when the patient notified the care team that he had been using a plastic bottle to collect urine for at least a week after his caretaker removed his chronic urethral catheter. It was therefore likely that the bottle neck became tightly wedged at the penile base during a prolonged period of urine collection, resulting in progressive distal swelling and necrosis.

After initial evaluation, the patient underwent cystourethroscopy, suprapubic cystostomy catheter placement, and sharp excisional debridement of penile gangrene. Intraoperative findings included an unremarkable cystourethroscopy, marked penile edema, and sharply demarcated areas of both dry and wet gangrene involving the distal penile shaft skin and overlying skin. The glans appeared relatively spared and well-vascularized.

A suprapubic catheter was placed via percutaneous cystostomy. Penile debridement was then performed using sharp dissection, targeting necrotic skin along the mid-to-distal shaft. The total debrided segment involved approximately 5 cm of the penile shaft skin (Figure 1). The penis, including corporal bodies and glans, appeared viable and free of necrotic tissue.

Three days later, a repeat penile debridement was performed for a 4 x 5 x 1 cm deep area of necrotic tissue along the proximal ventral penile shaft, penetrating beyond the tunica into the superficial corpora spongiosum. Sharp debridement was performed to excise all non-viable tissue while maximally preserving healthy structures. The final debridement occurred on hospital day 8 and included the application of a reconstructive graft matrix. No further necrotic tissue was identified, and a 6 x 6 cm Tutoplast® Pericardium Allograft (Coloplast Corp., Minneapolis, MN, U.S.) was secured and overlaid on the ventral penile defect, anchored to the tunica albuginea and median raphe, with Surgifoam® (Ethicon, Inc., Cincinnati, OH, U.S.) beneath the graft.

In total, the patient underwent three surgical debridements for progressive penile necrosis, with gradual excision of demarcated necrotic tissue until a stable, well-perfused penile shaft was achieved. Daily dressing changes demonstrated a healthy wound bed and good glans perfusion (Figure 2). Postoperative lab studies revealed resolution of the acute kidney injury and leukocytosis. The grafts remained well-perfused, with no evidence of graft rejection. He was discharged on postoperative day 18 with close urologic followup after adequate cosmetic results were noted (Figure 3).

KEY MESSAGES

- Progressive penile gangrene and/or necrosis resulting from high-grade constriction injuries remain a clinical outlier in urology.
- Surgical debridement and reconstruction are emergent and necessary for cases of significant necrosis, especially that of the penile shaft and corpus cavernosum.
- Structural allografts can be effective in reconstructing the superficial penile shaft to cover post-debridement defects in the tunica albuginea of the corporal bodies to encourage tissue granulation for eventual epithelialization.

The patient was routinely followed outpatient with monthly, complication-free suprapubic tube changes; penile examinations showed healthy, healing granulation tissue on the ventral aspect (Figure 4A). At seven months postoperatively, the patient was doing well, and the prior debridement bed was healing appropriately, with stable graft take and good cosmetic results (Figure 4B).

DISCUSSION

Penile strangulation by constrictive objects is rare, with less than 100 cases reported in the urologic literature.[1-3] This case highlights a unique and atypical instance of penile gangrene secondary to delayed identification of a constriction injury from a plastic bottle neck. Plastic bottle necks have caused serious ischemia in past cases; in one series, they accounted for approximately 13% of reported penile entrapment cases since 2000.[4,5] Prolonged circumferential penile entrapment (i.e., longer than 72 hours) is the most serious.[1] In some cases, patients delay seeking care due to embarrassment, leading to more severe injury, significant long-term morbidity, including partial or total penectomy, urethral injury, erectile dysfunction, and psychosocial distress.[4-7]

A five-grade classification proposed by Bhat et al provides a grading system for such injuries, ranging from simple edema or minor reversible injuries (grade I) to complete gangrene, extensive necrosis requiring aggressive surgical intervention, and total penectomy or autoamputation (grade V).[8] According to this grading, our case aligns with a grade V injury due to severe necrosis and gangrene of the distal penile tissue requiring surgical debridement and grafting.

Figure 1. Day 0: Preoperative (left, middle) and postoperative (right) appearance of necrotic/gangrenous wound. Sharp demarcation between viable and necrotic tissue is evident.

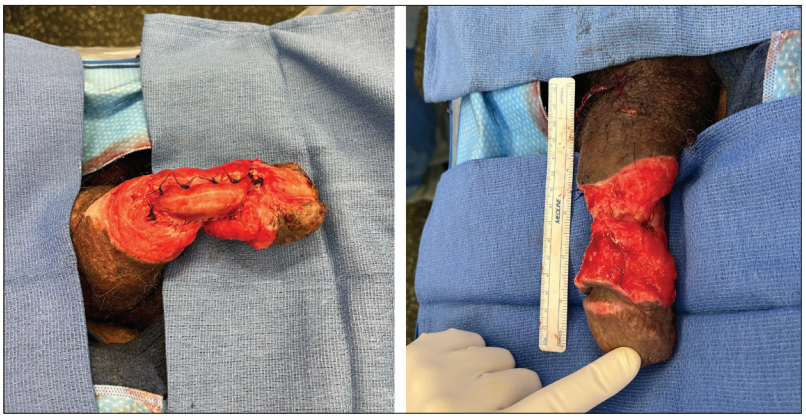

Figure 2. Day 8: Immediate postoperative appearance following third and final debridement and reconstructive graft. Reconstruction grafting with Tutoplast® Pericardium. Graft placed atop ventral penile defect, anchored to the tunica albuginea and median raphe. Photos show well-granulating tissue and healthy proximal corporal edges. The wound bed is clean, with no signs of infection.

Figure 3. Day 18: Postoperative followup prior to discharge. Well-perfused margins; no graft rejection.

Notably, this case is among the most emergent penile constriction injuries to have ever been reported in the literature, in which total penile preservation was possible via reconstructive allografting and without the

Figure 4. Post-discharge healing progress and routine postoperative followup. (A) 3 months postoperative presentation following graft placement. Healthy, healing granulation tissue on the ventral aspect of the penis was visualized. (B) 7 months postoperative presentation following graft placement, showing excellent graft integration, epithelialization, and good healing and cosmesis. No signs of infection, wound dehiscence, or graft failure present. The patient maintained urinary function and reported no residual pain.

need for total penectomy, urethroplasty, or autografting. The management strategy consisted of staged surgical debridement, followed by corporal grafting using Tutoplast® Pericardium Allograft, a thin, decellularized collagen matrix used as a scaffold for tissue regrowth. In urologic surgery, Tutoplast® is well-established for patching tunica defects in Peyronie's disease and for grafting in complex reconstructive cases.[9,10]

This case demonstrates that if part of the tunica albuginea or erectile tissue is lost post-debridement, then structural allografts may be an effective option to reconstruct the superficial penile shaft.[9,10] The successful use of allografting following staged debridement demonstrates a viable reconstructive approach for corporal defects in the absence of formalized guidelines. This approach may be underused or underreported due to the use of auto-grafting.[11]

The decision not to graft the overlying penile skin following corporal defect closure with the allograft was due to the patient's decision to forgo any further surgical intervention. The intended subsequent reconstructive plan for skin substitution was to use either a partial thickness skin graft or Cytal™ Wound Matrix (ACell, Inc., Columbia, MD, U.S,), based on surgeon preference. Therefore, superficial grafting was not done but remains a viable adjunctive option in hindsight. As penile gangrene remains a clinical outlier in urology, continued documentation of these cases is essential to build evidence-based management strategies and guide future surgical innovation.

CONCLUSIONS

This report presents a rare instance of gangrene and necrosis of the penile shaft and corpus cavernosum secondary to mechanical trauma. The patient was managed with multiple debridements and placement of a corporal allograft. This case fills a knowledge gap in the management of high-grade penile strangulation injuries and emphasizes the need for more structured clinical pathways and reporting standards in urologic trauma care.

COMPETING INTERESTS: The authors have no competing personal or financial interests to disclose.

This paper has been peer-reviewed.

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