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Case Report

Surgery Section

Degloving Injury of the Groin in a Young Factory Worker: A Case Report

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ABSTRACT

Genital degloving injuries are rare and mainly occur due to industrial machine accidents affecting workers at their places of employment. Most cases of genital degloving result in the loss of function—both urination and sexual capability—as well as the appearance of the genital organs. Immediate treatment is essential for minimising infection and necrosis, and it is also important for addressing potential psychological distress and preserving fertility. This case report presents an Indian factory worker, aged 24 years, who sustained severe penile and scrotal degloving injuries from a textile roller machine accident. Upon arrival, the patient exhibited no significant blood pressure disturbances but required urgent surgical intervention due to the exposure of his testicles and the complete separation of his penile skin from his body. The initial treatments included fluid resuscitation, broad-spectrum antibiotics, tetanus prophylaxis, analgesics, and surgical debridement. Reconstruction was carried out after serial debridement procedures resulted in a granulating wound surface. This allowed the surgeons to utilise a left gracilis muscle flap to cover the exposed testes. Vacuum-Assisted Closure (VAC) therapy promoted both wound healing and effective graft integration at the surgical site. The patient experienced a smooth postoperative recovery, as the skin flap survived without any complications, effectively preventing infection. Semen analysis conducted after the surgical intervention confirmed that spermatogenesis remained normal, indicating successful testicular recovery. This case highlights the necessity of strengthening workplace safety requirements to prevent accidents. It also demonstrates that gracilis flap surgery combined with VAC therapy yields positive outcomes in both health and aesthetic recovery. The preservation of fertility should be prioritised for all young adult males who sustain genital trauma.

Keywords: Debridement, Fertility, Infection, Spermatogenesis, Wound

CASE REPORT

A 24-year-old male Indian factory worker presented to the emergency department with substantial injuries to the groin area sustained during equipment usage. The injury occurred while the patient was operating a high-powered industrial textile rolling machine, which forcefully pulled the loose fabric of his clothing, dragging the external genitalia into the rotating rollers. The patient suffered severe trauma to the external genitalia during the incident. Upon arrival, he was in an anxious state due to pain and active bleeding. Both testes were visible through the damage, still connected by their spermatic cords. The penile shaft skin had avulsed extensively, showing full-thickness loss of the epidermis and superficial dermis while maintaining the integrity of the tunica albuginea. A complete removal of scrotal tissue exposed the underlying skin, resulting in a wound that contained moderate levels of contamination. The exposed penis and testes of the patient are illustrated in [Table/Fig-1].

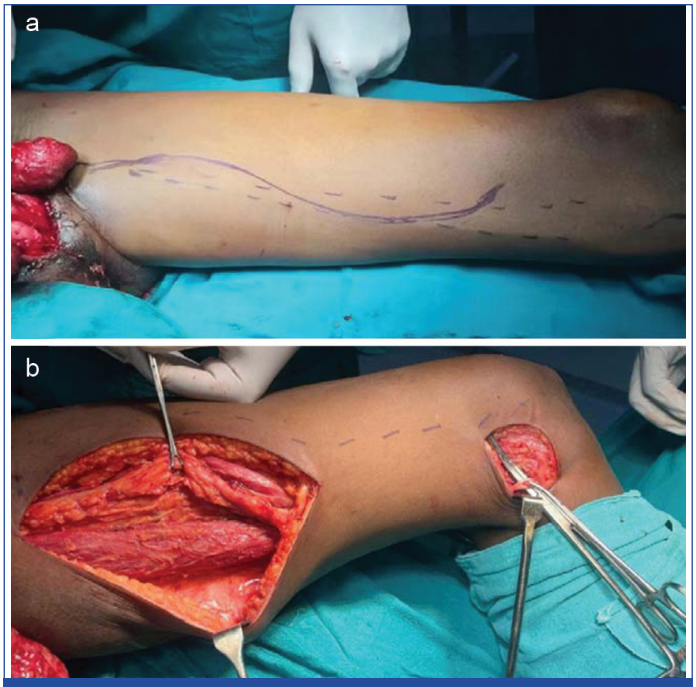
[Table/Fig-1]: The exposed penis and testes of the patient.

The patient was haemodynamically stable at the time of presentation. Initial treatments included fluid resuscitation with crystalloids, intravenous broad-spectrum antibiotics, and tetanus prophylaxis. Parenteral analgesics were administered to manage pain symptoms. Local anaesthesia facilitated the surgical debridement procedure, which followed wound irrigation in the procedure room. All grossly contaminated and devitalised tissues were removed from the wound.

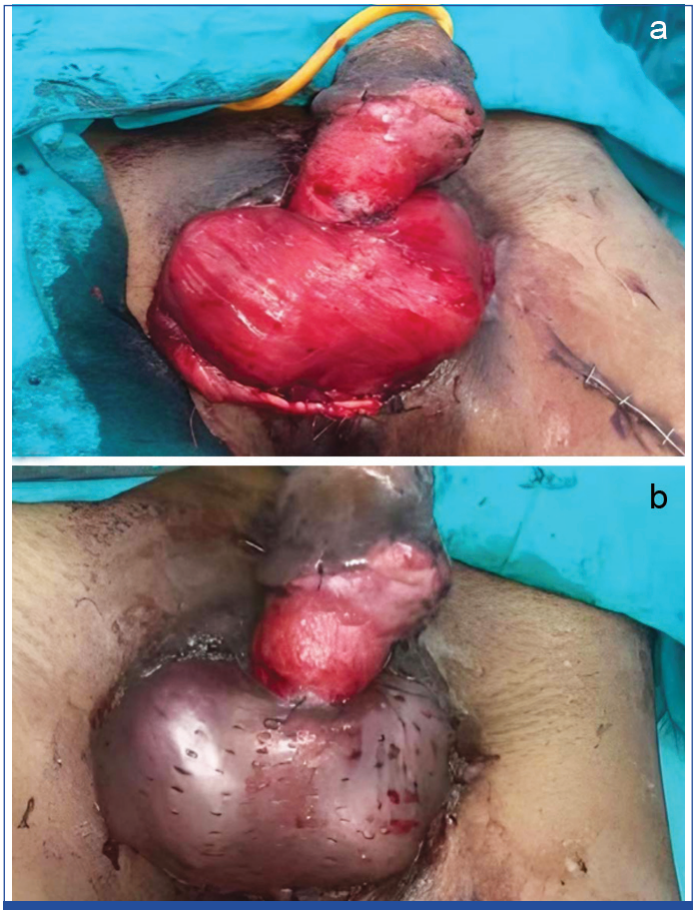
The patient underwent repeated debridement procedures over three consecutive days until all non-viable tissue was effectively removed, minimising the risk of potential infection. The preservation of both testes and the components of the corpora cavernosa was prioritised. The surgeon decided to proceed with definitive reconstruction after a clean granulating wound base was achieved.

On day three, following adequate wound preparation and the absence of signs of infection, the patient underwent surgical reconstruction under spinal anaesthesia. A left gracilis muscle flap was prepared to provide well-vascularised soft tissue coverage for the exposed testes. The gracilis muscle was harvested using standard techniques, and the muscle belly was tunneled to the scrotal defect. The 2-0 absorbable Vicryl sutures were used to secure the testes, while the muscle margins were anchored to the perineal and pubic soft tissue. A VAC dressing was applied over the graft to maintain its position, minimise the formation of seroma, and reduce the risk of infection. The harvesting of the gracilis muscle flap using standard techniques is depicted in [Table/Fig-2].

The patient tolerated the surgical procedure without complications and received standard postoperative care in the ward. The VAC dressing was used for seven days before being changed, revealing an intact graft site with no signs of infection or haematoma development. The gracilis flap appeared viable, demonstrating good muscle bulk and integration. Gracilis muscle flap reconstruction of the scrotal tissue, before and after, is shown in [Table/Fig-3]. The completed gracilis muscle flap reconstruction of the scrotal tissue and penis is depicted in [Table/Fig-4].

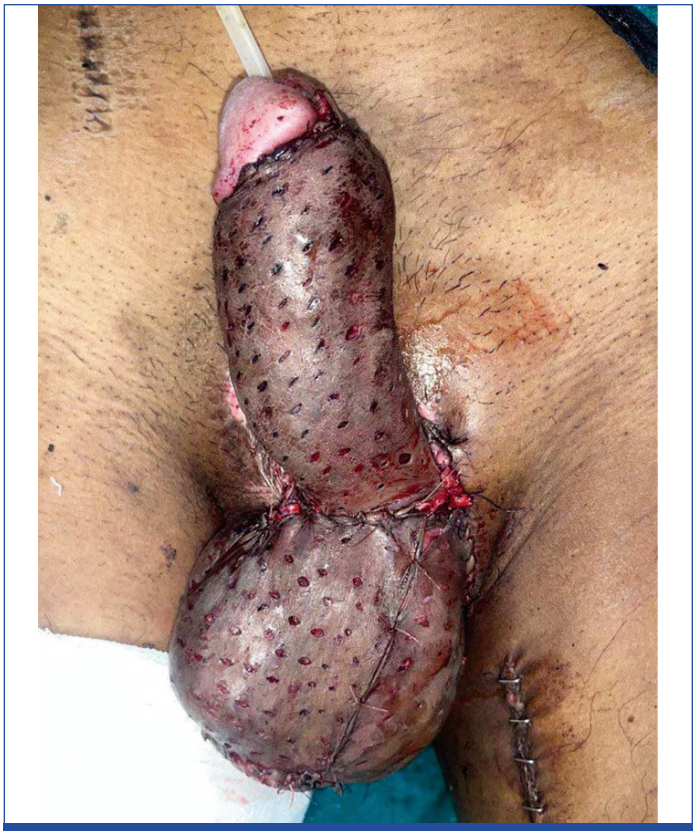


[Table/Fig-2]: Gracilis muscle flap harvesting through standard technique; a) Marking for harvesting of gracilis muscle flap; b) Process of gracilis muscle flap harvesting.



[Table/Fig-3]: Gracilis muscle flap reconstruction of scrotal tissue: a) Before reconstruction of gracilis muscle flap for scrotal tissue; b) After harvesting of gracilis muscle flap for scrotal tissue reconstruction.

After hospital discharge, the patient attended regular check-ups at the plastic surgery outpatient department for dressing maintenance and wound monitoring. During the three-week follow-up examination, wound healing was satisfactory. The graft material showed no signs of flap damage, graft failure, or secondary infections. The medical team counselled the patient about sexual function and fertility. To evaluate testicular functionality following reconstruction, a semen analysis was conducted. The results from this analysis indicated that spermatogenesis remained at normal levels, indicating effective testicular health and hormone function after the reconstruction.



[Table/Fig-4]: Completed gracilis muscle flap reconstruction of scrotal tissue and penis.

DISCUSSION

Genital degloving injuries are rare but predominantly occur in industrial and agricultural settings, posing significant surgical challenges that require timely soft tissue coverage while maintaining functional capabilities [1]. In some cases, the degloving injury is directly caused by mechanical traction from machinery, emphasising the occupational hazards present in factory environments [2]. The use of a gracilis flap provides both testicular muscle preservation through vascularised coverage and penile shaft skin restoration via grafting procedures in such cases [3]. Patients should undergo early reconstructive surgery within the first week after their injury to prevent tissue fibrosis, infections, and psychological distress [3,4]. Postoperative fertility assessment requires careful consideration, as similar reports often fail to document this critical information [5]. Protected semen test results validate the successful outcomes of reconstructive surgical procedures [6].

Although uncommon, genital degloving injuries pose significant reconstructive challenges due to extensive soft tissue loss and potential exposure of critical structures, such as the testes and penile shaft [7,8]. These injuries primarily result from industrial incidents involving high-powered machines that cause major damage to the groin area. Surgical debridement is performed immediately, followed by reconstructive surgeries that restore both shape and functional capabilities [8]. Current treatment for perineal and genital reconstruction includes gracilis muscle flaps, which provide high-quality blood supply with minimal adverse effects in the donor area [9,10]. VAC therapy has demonstrated benefits in wound healing for treating degloving injuries, in addition to its role in reconstructive surgeries [11]. The application of VAC therapy promotes granulation tissue formation and reduces swelling while minimising bacterial growth, thereby creating a prepared wound base for final closure [11]. When integrated with muscle flap reconstruction, VAC therapy yields favourable outcomes for treating complicated soft tissue lesions in both genital and other body areas [12].

The lack of proper safety measures in rapidly rotating equipment leads to most textile machine injuries, including genital degloving damage [8]. The external genitalia can become trapped in textile

machinery when loose clothing is caught in the rollers, resulting in injury via this mechanism [13]. The urgent need to maintain proper machine security and enforce safety guidelines becomes evident due to such hazardous accident scenarios [13]. Research data indicates that textile industry workers sustain the majority of their occupational injuries from machinery exposure, with poor equipment maintenance and insufficient protective features increasing the likelihood of such occurrences [13,14].

Multidimensional initiatives must be implemented to prevent such injuries. The effective operation of safety features relies on regular maintenance and prompt machinery servicing [13]. Providing comprehensive health and safety training programmes for employees leads to substantial reductions in work-related injuries in the workplace [13,14]. These training programmes should emphasise three essential points: proper clothing selection, machine operation knowledge, and hazard recognition skills [15]. The risk of occupational injuries is diminished when workers receive adjustments to their workstations to accommodate their dimensions and learn proper body positioning through ergonomic interventions [16]. Safety compliance rates increase when organisations actively supervise their workforce and establish safety committees to assist workers in identifying security risks [15,17].

Cases of trauma demonstrating genital degloving injuries have been documented in diverse paediatric and adult populations utilising different surgical techniques. In paediatric cases described by Górka GD et al., and Mathur RK et al., native penile skin was successfully preserved and later used for direct re-gloving when tissue viability was maintained in patients, leading to good functional and cosmetic outcomes without the need for further flaps or grafts [18,19]. Adolescent and adult patients described by Thompson H et al., and Bhattarai A et al., experienced high-impact trauma to the genital region, resulting in extensive tissue damage and contamination [20,21]. These cases were managed with initial debridement, testicular thigh pouching, and delayed skin grafting [20,21]. Injuries caused by industrial equipment, as described by Li D et al., involved complete genital exposure and were reconstructed using pudendal thigh flaps and split-thickness skin grafts, with adjunctive vacuum-assisted therapy [22]. In another similar case, Ward MA et al., described polytrauma from agricultural machinery, which primarily required complex multidisciplinary surgical intervention; however, postoperative graft failure occurred [23].

In comparison with these cases, the present case involves a 24-year-old Indian male with genital trauma from textile machinery, characterised by complete avulsion of scrotal skin and penile shaft skin loss.

After serial debridement and adequate infection control, definitive reconstruction was achieved using a gracilis muscle flap, which provided robust vascularised coverage for the exposed testes. Unlike previously reported cases that primarily relied on skin grafts or local flaps, the use of a muscle flap in this case provided stable coverage over contaminated areas of the genitals [20-23]. The postoperative course was uneventful, with proper graft take and preserved testicular function, leading to satisfactory healing. Thus, the efficacy of the reconstructive approach in complex industrial injuries is underscored in this case. A comparative analysis between the present case and previously published reports is shown in [Table/Fig-5] [18-23].

Case	Demographics	Clinical presentation	Time to surgical intervention	Initial surgical intervention	Postoperative outcomes	Clinical insights
Present case	24-year-old Indian male, factory worker	Penile and scrotal degloving, testicular exposure from machinery	Staged over days (after wound cleaning)	Wound debridement, gracilis muscle flap, staged closure	Flap integration confirmed, normal semen analysis	Emphasises staged repair, fertility assessment, and infection control
Górka GD et al., [18]	8-year-old Polish boy	Perineal and genital degloving from farm accident	Approximately 10 hours post-injury	Reattachment of penile skin, scrotal repair, catheter, antibiotics	Mild necrosis, good function and appearance at 6 months	Tissue transport and vascular viability enable delayed successful reattachment
Mathur RK et al., [19]	8-year-old Indian boy	Penile skin avulsion from dog bite	Within 8 hours	Direct re-gloving with native skin	No complications, functional and cosmetic success	Timely intervention allows skin preservation in children
Bhattarai A et al., [20]	28-year-old Nepalese male, under alcohol	RTA with penile and scrotal avulsion	Immediate for debridement, delayed for graft	Debridement, testicular burial, delayed graft	Discharged at 3 weeks, outcome of graft not detailed	Testicular burial preserves function; alcohol as complicating factor
Thompson H et al., [21]	14-year-old UK male	Handlebar trauma, genital skin avulsion, scrotum flipped	Immediate	Washout and primary closure	Uneventful recovery, no function reported	Limited contamination allows single-stage repair in adolescents
Li D et al., [22]	59-year-old Chinese industrial worker	Complete degloving, exposed spermatic cords	5 hours post-injury	Debridement, artery-based flap, split graft, VSD	100% graft take, recovered full penile function	Early intervention, vacuum therapy improved graft success
Ward MA et al., [23]	24-year-old American farm worker	Polytrauma, testicular avulsion, pelvic fracture, bowel injury	Emergency laparotomy (immediate)	Trauma surgery, sperm extraction, microsurgical repair	Tissue loss despite intervention	Multidisciplinary trauma care crucial; sperm extraction preserved fertility potential

[Table/Fig-5]: Comparative analysis between the present case and previously published reports [18-23].

CONCLUSION(S)

The presented case exemplifies a successful approach to treating a significant occupational genital injury in a young male adult through staged surgical procedures that integrate gracilis muscle flap techniques. The wound was optimally prepared due to prompt debridement, followed by the application of VAC dressing and subsequent medical management. The gracilis flap served as durable vascularised tissue, which protected the exposed testes both functionally and structurally. Postoperative semen tests revealed normal sperm production, underscoring the importance of fertility evaluation in such cases. The treatment requirements for adult industrial trauma exceed those of paediatric injuries and less severe trauma situations, as they necessitate multidisciplinary medical attention. Rapid intervention and proper reconstruction, along with functional monitoring, are crucial for achieving positive reproductive outcomes. The medical data highlight the need for improved workplace safety measures to prevent devastating injuries in industrial environments.

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