

First report of successful refashioning using the Bracka technique after complete glans penile amputation from a dog bite injury in a child

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ABSTRACT

Traumatic penile amputation and re-implantation or refashioning is scarcely reported in the literature. We present our case, the first report of successful glans refashioning in an 11-year-old boy, using the Bracka (refashioning) technique after complete glans penis amputation from a dog bite injury, with unsuccessful re-implantation due to the nature of the injury, during the dog bite. We elaborate on the process, technique, as well as the satisfactory postoperative results of the abovementioned procedure.

Keywords: Bracka operation; child; dog bite; glans penis refashioning; pediatric penile amputation.

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Introduction

Herein, we describe the case of an 11-year-old boy with a complete amputation of the penis from a dog bite injury. The incidence of dog bites in children is high but still higher at 47% in regard to genital dog bites.^[1] This may be due to dogs' attraction to the perineal area, especially for those who are defenseless, immobilized, or scantily dressed, such as children. The current treatment of such injuries involves either macro- or microsurgical re-implantation and repair. We describe a successful refashioning using the Bracka technique, proving to be of significance for future cases and yielding satisfactory cosmetic and functional results.

Case presentation

An 11-year-old boy presented to the emergency department with a traumatic penile amputation after a dog bite. The level of amputation is visualized in Figure 4. On examination, the genitalia displayed irregular edges due to the chewing and mauling from the dog bite, with complete amputation of the penile subcoronal glans and associated hemorrhage (Figure 1a, b). The scrotum was intact with no wound involvement. The amputated appendage was

recovered by the patient's father. On further enquiry, the child was observed to be circumcised 1 week before presentation and without any medical comorbidities.

The boy was bitten by his neighbor's dog, who was noted to have all the canine vaccinations up to date. The patient received tetanus and rabies vaccines on admission as well as amoxicillin/clavulanic acid 500 mg intravenous stat, and the National Institute for Communicable Diseases was notified.

Surgical re-attachment of the amputated tissue was attempted within 110 minutes of the incident. Because of the chewing effect, the residual glans edges were not viable for a flush closure, and the neurovascular bundles were not identifiable. After cleaning and draping the patient, a 16-Fr suprapubic catheter was inserted under ultrasound guidance. Intra-operatively, the corpus cavernosum was noted to be intact with a complete cut of the corpus spongiosum with the urethra. The urethra was sutured clockwise with Dexon over a 10-Fr catheter, and the fascia was sutured thereafter. The skin was sutured with Monocryl and Chloromex ointment applied. The patient was covered with augmentin and

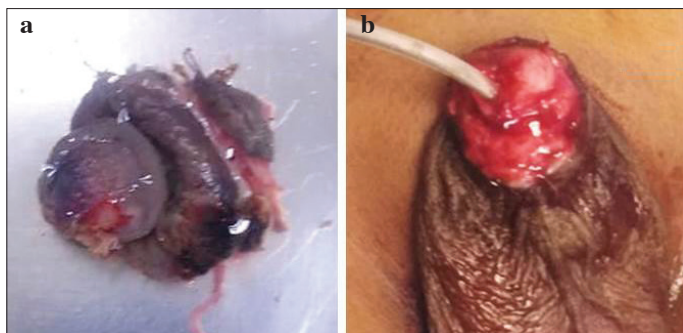


Figure 1. a, b. Photographic image of the severed chewed segment of the penis. The glans, coronal ridge, and shaft are clearly visible (a). Resultant viable penile shaft and corporal bodies seen intact after debridement was performed (b)

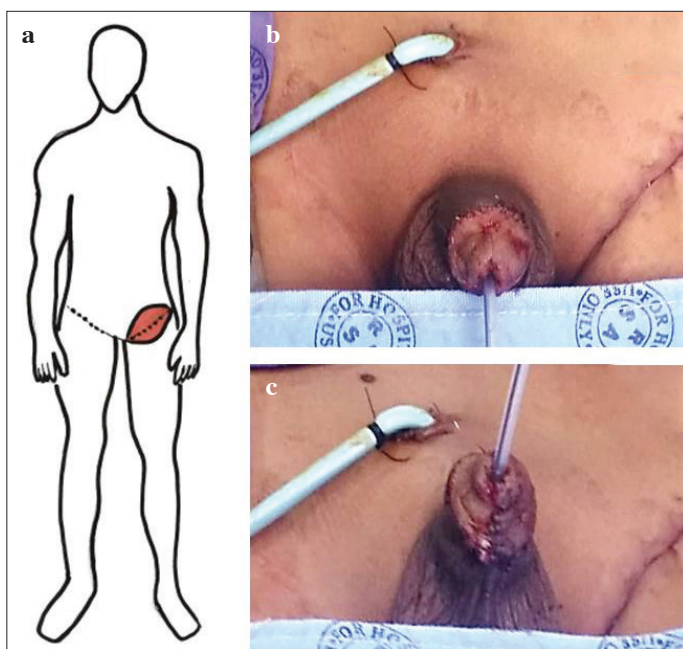


Figure 2. a-c. Anatomical free skin flap harvested from the left "groin" region (marked in red) (a). Immediate postoperative result (dorsal view) (b). Immediate postoperative result (ventral view) (c)

Main Points:

- Dog bite injuries to the male genitalia are rare and present a urological emergency, thus often requiring penile refashioning if re-implantation fails.
- The main goal for management of penile amputation is to reduce the functional damage, diminish the postoperative complications, and achieve as close to normal appearance as possible.
- The Bracka technique for penile refashioning in a child, although never performed before, yielded satisfactory results and may be of significant use for future cases.

gentamycin. Surgicel dressing was applied, and hyperbaric oxygen therapy regimen was utilized on day 0 and day 1 postoperatively. He also received heparin 50 IU/kg on day 0 and day 2 postoperatively.

On review at 48 hours postoperatively, it was noted that the re-attachment edges were necrotic with early rejection despite using hyperbaric oxygen and early re-anastomosis. The patient presented with complete penile glans necrosis 1 week postoperatively, and subsequent debridement was performed, leading to the need of a penile refashioning procedure. Two weeks after the operation, the necrotic glans was excised, and the Bracka procedure was performed. A tourniquet was applied to the base of the penis, a subcoronal incision was made, and dissection was performed under the glans cap. The necrotic glans was removed, leaving a circular meatus, and the urethra was advanced into a vertical slit shape, sutured with Vicryl 4-0 suture at 6 and 12 o'clock positions. The penile skin envelope was re-draped to create a neocoronal margin, and a 2.5-cm diamond-shaped ellipse skin graft, taken from the left groin, was fixed around the penis with continuous Vicryl sutures. The urethral meatus was sutured to the graft with interrupted Vicryl sutures and thereafter approximated with continuous sutures using the technique as described by Bracka. The grafted glans was then sutured with multiple interrupted sutures. After 10 days of postrefashioning, the patient was taken to theater for dressing change, and the 2-stage Bracka technique was performed (Figure 2a-c). The neocoronal ridge was refashioned using bulking interrupted sutures to create the neoridge. Medical tattooing is planned for after puberty, to further enhance this demarcation, if needed.

Postoperative (Figure 3a-d) review showed excellent results. Voiding and erectile function was preserved. His voiding cystourethrogram was normal without any postvoid residual volume.

Discussion

Although rare in the reported literature, dog bite injuries to the external genitalia in children are more common than those in adults, having a 3.2-fold higher rate.^[2] This is possibly due to dogs being attracted to the perineal area, especially in those scantily dressed, defenseless, or immobilized. These injuries are also known to cause infection but in only 15% - 20% of the cases.^[2] Most cultured is *Staphylococcus aureus* of aerobic organisms, witnessed in 20% - 30% of dog bites.^[2]

Rabies and tetanus are the infections of concern, and their vaccines should be administered when dealing especially with a stray dog and those lacking primary immunizations or boosters.



Figure 3. a-d. Two-week postoperative image (right dorsolateral view) (a). Two-week postoperative image (ventral view) (b). Four-week postoperative image. The “groin” skin harvest site is completely healed (frontal view) (c). Three-month postoperative image (left ventrolateral view) (d)

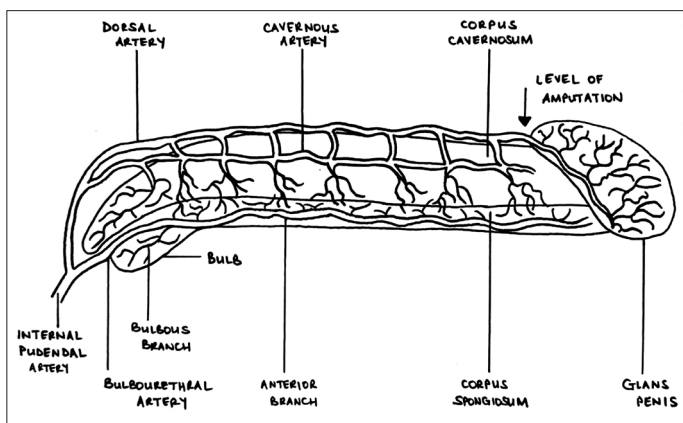


Figure 4. Anatomy and vascular supply of the penis including the level of amputation in our case

Management of these wounds includes irrigation and debridement, broad spectrum antibiotics, and vaccines for rabies and tetanus, as mentioned. Use of antibiotics has been controversial because although they decrease the incidence of infection, their benefits are unknown.^[1]

Penile amputation, in general, is a urological emergency, requiring urgent surgical intervention owing to the associated life-threatening hemorrhage.

At present, the main goal for management of penile amputation is to reduce the functional damage such as sensory loss, diminish the postoperative complications, and achieve as close to normal appearance as possible. However, there is no specific guideline of management for these cases because of the complexity of the injury.^[3]

In 1977, the first microsurgical repair was reported, which changed the management of penile amputations, because in some cases, not only erectile function but also sensation was preserved. Microsurgical re-implantation depicts better chances of organ survival with less complications.^[4,5] Macrosurgical re-implantations have shown to have a higher rate of complications such as skin necrosis, strictures, and fistulas. However, this does not imply that macrosurgical surgery has not been successful. As published by Mensah et al., who cited Riyach et al., they successfully re-implanted an amputated penis by macrosurgery by approximation of the corporal bodies and urethra without reconstructing the neurovascular bundle. They reported adequate voiding and erection.^[6] Results of a study indicated that the dorsal artery and nerve are the most significant in microsurgical repair.^[7] Vascular supply of the penis is demonstrated in Figure 4.

If re-implantation fails, as seen in our case, a neophallus may be created by harvesting a graft or flap. In cases such as ours, where there has been pediatric penile amputation, the technique of using advancement of the residual erectile tissue by division of suspensory ligaments has been proven to be successful. This was reported by Mensah et al.,^[6] who fashioned the glans using a full-thickness skin graft. Benjamin et al.,^[8] through three cases, reported successful retrieval of the residual erectile tissue in children with penile amputations but noted difficulty in mobilizing the urethra, where a urethroplasty with oral mucosa as well as skin coverage offered the best cosmesis.

Hyperbaric oxygen therapy causes hyperoxia, which allows improved oxygen delivery to the hypoxic tissues.^[9] Reports have also shown that hyperbaric oxygen, through neovascularization and collagen synthesis, provides accelerated wound healing and applies an anti-apoptotic effect on the nervous tissue. Our patient had an ischemia time of 110 minutes; however, reports stated that when the total ischemic time was under 15 hours, it was associated with successful re-implantation and outcome.^[10,11] However, in our case, hyperbaric oxygen therapy failed, resulting in our patient presenting with necrosis of the penis and subsequent debridement being performed. This led us to perform the Bracka technique, which, until now, has never been performed in children.

The Bracka procedure is the primary treatment for early penile carcinoma where the lesion is confined to the glans. It is secondarily used when the glans has been vastly destroyed. In childhood, it has been utilized in managing iatrogenic injuries to the glans, such as in circumcision or repair of congenital deformities. In short, a rectangular section of medium-thickness split-skin graft is harvested from the upper outer part of the thigh. A glansectomy is usually performed, and a neoglans is created. A slit-shaped meatus is created to avoid meatal stenosis. The skin graft is draped over the neoglans and tailored. Gluckman et al.^[12] reported that satisfactory vascularization of the distal glans tissue supports good graft take. Multiple quilting sutures are applied to the neoglans because it is unrealistic to apply effective compression dressings. These sutures allow points of fixed contact between the graft and wound bed, avoiding strangulation and limiting hematoma formation.^[13] In 2005, Giovany et al.^[14] utilized buccal mucosa graft to stimulate the coronal sulcus after a penile amputation, yielding satisfactory results. Appiah et al.^[15] reported successful glanuloplasty using lower lip oral mucosa in a neonate using the Venkov and Slavov method.

This is the first report of successful penile refashioning in a child using the Bracka technique, yielding satisfactory results and proving to be of significant use in future cases. It does not only improve the quality of life for a child with such an injury but also offers acceptable functional and cosmetic results.

Ethics Committee Approval: Ethics committee approval was received for this study from the Human Research Ethics Committee (Medical) of University of the Witwatersrand, Johannesburg (Clearance Certificate NO. M1911179 Date of Approval: 03/12/201)

Informed Consent: Written informed consent was obtained from the parents of the patient who participated in this study.

Peer-review: Externally peer-reviewed.

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