Urology Case Reports 39 (2021) 101844

Contents lists available at ScienceDirect

Urology Case Reports

journal homepage: www.elsevier.com/locate/eucr

Scrotal necrosis after cobra (*Naja annulifera*) envenomation

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ARTICLE INFO

Keywords:
Scrotum
Penis
Snouted cobra
Envenomation

ABSTRACT

A 47-year-old man received a snouted cobra (*Naja annulifera*) snake bite to his genitals while on holiday in South Africa. His penis and scrotum were noted to be swollen, deep purple in color, and painful on hospital admission. Scrotal necrosis was diagnosed, and he received multiple doses of a non-specific snake venom antiserum and broad-spectrum antibiotics. Although no neurological sequelae developed, he did require hemodialysis due to acute kidney injury. After stabilizing, he was repatriated to the Netherlands for further treatment and has since made a full recovery.

1. Introduction

Only one snake native to the Netherlands is venomous (*Vipera berus*), with envenomation being rare by these and exotic snakes kept by reptile keepers and zoos. However, the toxic effect of snake venom varies by species, including tissue necrosis, hemolysis, paralysis, hypoxic shock, and death. A patient will usually require a specific snake venom antiserum, broad-spectrum antibiotics, a tetanus booster, and supportive care.[1]

2. Case presentation

A 47-year-old otherwise healthy male was on holiday in a South African nature reserve, and while toileting, a snake struck from the toilet and bit his genitals. The species was identified as a snouted cobra (*Naja annulifera*) and he waited 3 hours for transport by helicopter to the nearest trauma center (350 km). During this time, he felt a burning sensation in his genitals and a pain that ascended through his groin to his flank, upper chest, and abdomen. He also reported vomiting but no neurological symptoms.

We have incomplete details of the patient's acute care in South Africa. On arrival at hospital, it is known that he was hemodynamically stable, fully conscious, and had swollen genitals with a deep purple discoloration, indicating scrotal necrosis. Snake venom antiserum (8 doses) and tetanus prophylaxis (medications and dosages unknown) were first administered 5 hours after envenomation, and he was admitted to intensive care for observation. During admission, he also received piperacillin/tazobactam (4.5 g intravenous every 8 hours for 7 days) for a fever, and from day 2, required intermittent hemodialysis due to acute kidney injury (AKI). The necrotic defect in his genitals stabilized over 1 week, at which point a urologist performed surgical debridement. The scrotal necrosis was reported to involve the entire fascia (skin to internal spermatic) and was excised with extensive margins. Primary closure was performed, leaving a drain in situ. The defect in the penile shaft was treated by superficial debridement and a vacuum assisted closure pump. After 9 days, the patient was repatriated to the Netherlands.

On arrival at our hospital, the scrotal wound looked stable (Fig. 1) and a granulomatous wound was revealed on the penis when we removed the vacuum pump. This was initially treated with fusidic acid-impregnated gauzes. Laboratory findings showed normocytic anemia (hemoglobin, 4.8 mmol/L), leukocytosis (leukocyte count, 23.2×10^9/L), hypokalemia (potassium, 3.0 mmol/L), and renal impairment (estimated glomerular filtration rate [eGFR], 23 mL/min/1.73m^2), which we treated by erythrocyte and potassium supplementation. Electrocardiography, thoracic x-ray, and renal ultrasound were normal. We then consulted The Harbor Hospital and Institute for Tropical Diseases, who advised that no specific effects of the snake venom or antidote were to be expected given that the acute phase had passed.

Two days after repatriation, the patient developed a fever that was treated with Meropenem (500mg every 12 hours for 6 days) based on wound cultures taken at arrival showing *Klebsiella pneumoniae* and *Enterobacter cloacae*. Six days after repatriation, a plastic surgeon performed penile shaft debridement, with extensive resection of dead tissue extending into the corpus spongiosum to the fold of the preputium. After

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https://doi.org/10.1016/j.eucr.2021.101844
Received 25 August 2021; Accepted 8 September 2021
Available online 9 September 2021
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Abbreviations

AKI Acute kidney injury

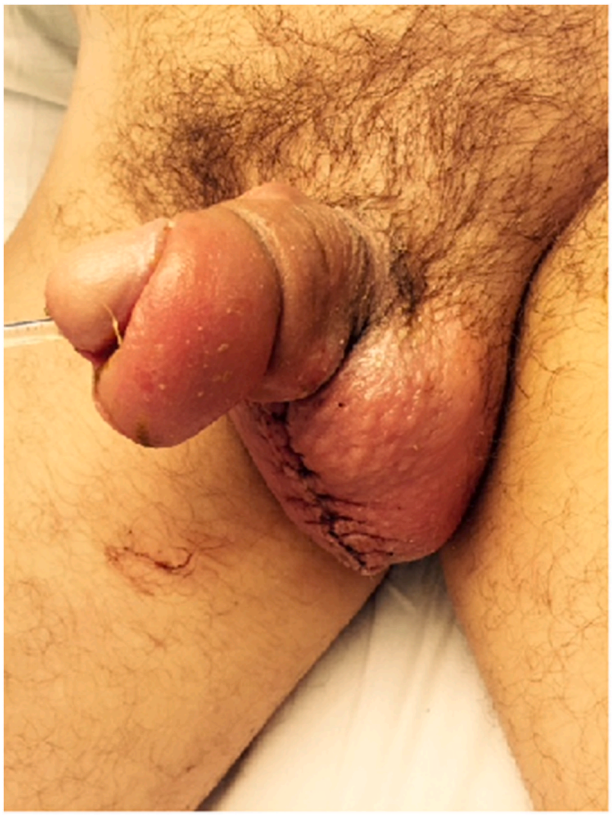

Fig. 1. Scrotal wound and penile edema on arrival in the Netherlands.

a further 6 days, a full-thickness graft was harvested from the groin and placed over the penile defect (Fig. 2). Renal function gradually improved by 2 weeks after repatriation (eGFR, 43 mL/min/1.73m^2), at which point he was discharged.

At 1 year follow-up, the wounds had healed well (Fig. 3), and penile function and sensation had fully recovered. Because of a pulling sensation on the scars, the plastic surgeon performed a *Z*-plasty. Renal function remained slightly impaired (eGFR, 52 mL/min/1.73m^2) and is under nephrology follow-up.

3. Discussion

The National Poisoning Information Center in the Netherlands received just 37 notifications of snake bites last year, with only 15 requiring snake venom antisera. By contrast, snake bites cause 81,000–138,000 deaths and a further 400,000 disabilities worldwide each year,[2] though the actual numbers are likely to be higher because incidents in rural areas are underreported.[3]

Studies on *N. annulifera* venom are limited, mainly because it only became a distinct species in 2009. A recent analysis of the venom revealed high levels of cytotoxins, but relatively low levels of alpha-neurotoxin and no phospholipase A2.[4] Given the high cytotoxin levels and excess of pro-inflammatory toxins, local tissue damage and systematic inflammation are the main clinical presentations. The low alpha-neurotoxin content makes it less likely to be lethal or to cause neuromuscular paralysis, which could explain the absence of neurological symptoms in our case. However, while AKI is a well-known complication of viper envenomation due to myotoxic and hemotoxic effects,[5] it has not been described after cobra envenomation. Given that the venom of *N. annulifera* differs from other cobra species in containing significant amounts of hemotoxic metalloproteinase, AKI might simply be underreported.[4] Unfortunately, laboratory findings are not available from South Africa, especially coagulation tests, so we cannot be certain of the primary cause of AKI.

Concerning treatment, tetanus prophylaxis and antibiotics are indicated initially.[1] Although no specific antiserum is available for *N. annulifera* venom, immunoreactivity has been shown by two polyvalent antivenoms commonly used in Africa (PANAF [Premium Serums Pan Africa polyvalent antivenom] and VAPAV [VINS African polyvalent antivenom]).[4] These are indicated in the presence of systemic poisoning, rapid local swelling, >50% involvement of the affected limb, or excessive blistering. Due to the risk of anaphylactic shock, they should be administered in an intensive care unit.

4. Conclusion

Snake bites usually occur on the extremities, with few reports of bites

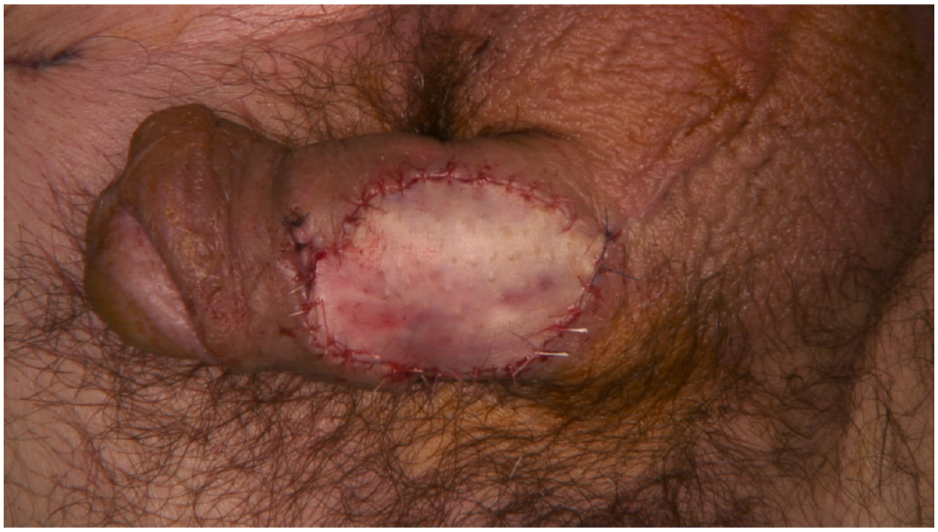

Fig. 2. Full-thickness graft on the penile shaft six days after surgical debridement.

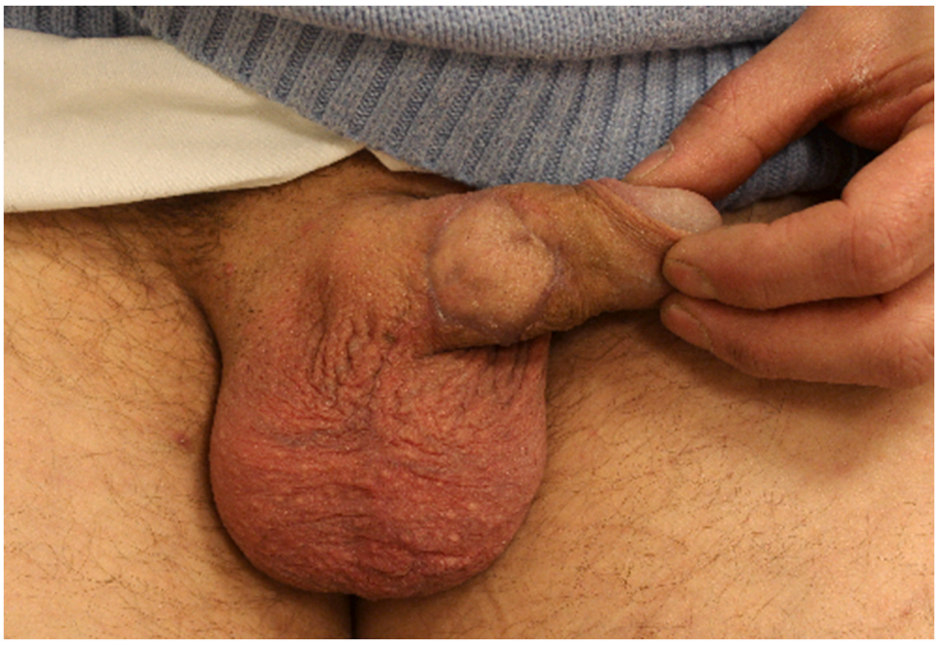

Fig. 3. Penile shaft one year after the full-thickness graft.

to the genitals (all received the antidote, three required surgical debridement, and all made full recoveries). Ours is the first case describing *N. annulifera* envenomation of the genitals. Treatment requires snake venom antiserum and broad-spectrum antibiotic administration, with some cases also needing surgical debridement, renal or respiratory failure management, and possibly even resuscitation. Genital function and esthetics have a good chance of recovery if treatment is early, although esthetic surgery should only be performed after the acute phase.

Our take home message? Always flush the toilet before sitting down in countries notorious for their snake population!

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Acknowledgments

We thank Dr Robert Sykes (www.doctored.org.uk) for providing editorial services.

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