Plastic surgical management of a cobra bite – a case study

Plastisch-chirurgisches Management eines Kobrabisses – eine Fallbeschreibung

Abstract

Cobra bites are quite rare in European countries as these snakes are not native there. Toxins are devastating for tissue resulting in massive necrosis, thus plastic surgery might play a role in reconstruction of the lost tissue. A case of a male patient bitten by a thai cobra in the left index finger is presented. Antitoxin administration was delayed due to secondary patient admission. Progressive tissue necrosis made radical debridement necessary, resulting in the need for plastic surgical defect coverage with a flap. While a radical debridement to prevent toxic necrosis due to lytic enzymes in cobra venom has been favoured beforehand, large case studies led to a more restrained initial surgical intervention. However, antitoxin administration should be first line therapy in management of these cases. If severe necrosis is present as it might occur in delayed admission, a plastic surgical management of the patient might be advantageous.

Keywords: cobra venom, snake bite, snake venom, nectoric enzyme, defect coverage

Zusammenfassung


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Introduction

Worldwide, an incidence of 421,000 envenomations and 20,000 deaths due to snake bites is expected, while the estimated numbers of unreported cases of 1,841,000 envenomations and 94,000 deaths are assumed [1], [2]. However, snake bites can be considered as rarely occurring in Europe, probably because there are few venomous snake species existing. Life threatening snake bites are mostly seen in animal owners and stock men and only one person every three years dies from a snake bite [1]. Nevertheless, due to the severe neurotoxicity of cobra venom, in particular the South-Eastern Asian monocle cobra (Thai cobra, *Naja kaouthia*), bites are of a certain clinical significance if they have to be treated. Pre- and postsynaptic neurotoxins interfere with acetylcholine-receptors and thus paralyze in a curare-like manner [2], [3]. As the venom of these snake bites often contains hemolysines, myolysines, procoagulants, hemorrhagines, cytolytines, and necrotizing enzymes, envenomations might as well be of significance for the plastic surgeon [3].

Here we present a case of a cobra bite managed by a plastic surgery department in a German university hospital to illustrate current treatment guidelines.

Case presentation

The patient presented herein is a 29-year-old male with cannabis and alcohol abusus who held a monocle cobra (Thai cobra, *Naja kaouthia*) at home beside other snakes. While he was feeding his cobra at around 1:00 AM, he was accidently bitten dorsally into the second ray of the left hand. He went to a peripheral hospital due to pain in the bit, headache, beginning ptosis and dizziness and collapsed there in the emergency unit. Emergency care including endotracheal intubation had to be performed due to respiratory insufficiency. Later, dorsal excision of the bit as well as release of the carpal tunnel was performed in order to reduce local distribution of the venom and thus tissue necrosis. However, after operation persistent respiratory insufficiency caused by neurotoxicity of cobra venom occurred and the patient had to be reintubated. Exubilation attempts were unsuccessful twice and 10 hours after the bite, respectively. In a revision operation on the second day, a hard swelling of the whole left arm was noticed and dorsal and palmar escharotomy was performed. As the swelling was increasing, the patient was transferred intubated and ventilated air-bound to our department as a specialized plastic surgery university hospital for secondary treatment.

Treatment

While the patient was transferred, six charges of polyclonal cobra antibody were purchased and transported from the Bernhard Nocht Institute of Tropical Diseases in Hamburg, Germany (Cobra Antivenin, Thai Red Cross, Thailand). Regarding the delayed administration, such high doses were indicated [1], [2]. The patient arrived at our emergency room and was examined by the authors (Figure 1A). Due to a beginning compartment syndrome, immediate transfer to the operation theatre was indicated to avoid loss of the arm. Here, multiple tissue necroses distributed diffusely in the whole left arm were noticed (Figure 1B, C) and excised as well as thorough fasciotomy of all compartments was performed. Radical excision of necrotic skin was necessary around the site of the bite on the dorsal side of the second ray of the hand. During the operation, in total four vials of the cobra antivenin were given in an interval of 2 hours together with Tavegil and Rantidin. High doses of hydrocortisone were held in reserve to prevent anaphylactic shock. Microbiological smears were taken in order to isolate possible infective agents.

Wounds were covered with Epigard® (Biovision GmbH, Ilmenau, Germany; Figure 1D). The patient was transferred to the intensive-care unit, where weaning and extubation could be initiated until 30 hours after the bite. Catecholamine treatment could be reduced gradually while vegetative side effects caused by deprivation of alcohol and cannabis occurred. However, these could be treated by substitution of 3 x 1 mg of a synthetic cannabinoid (Dronabinol®, THC Pharm GmbH, Frankfurt am Main, Germany). Additionally, 2 g of cefazolin were given thrice daily as an antibiotic prophylaxis. A fast recovery of the patient could be observed and the patient could be transferred to normal ward. Microbiological analysis revealed ciprofloxacin-sensitive *Morganella morgani* as infective agent and antimicrobial therapy was changed to 500 mg of ciprofloxacin twice daily. 4 days after the bite, a second look operation was performed with debridement and neurolysis of all digital nerves of the palm. Vacuum-assisted closure therapy (KCI Medizinprodukte GmbH, Wiesbaden, Germany) was started and device was changed on day 9. Definitive defect coverage could be achieved with an anterior lateral thigh flap from the ipsilateral side on day 16 (Figure 1E, F). The flap showed a good healing and no further operation was needed.

On day 31, the patient could be transferred to an outpatient treatment, rehabilitation was initiated. However, follow-up examination could not be performed due to lack of compliance of the patient.

Discussion

Concerning the surgical management of snake bites, during the last decades a paradigm shift appeared. While in earlier publications, an early debridement was favoured with the intention to remove wound site contaminated with venom [4]. However, in newer publications, a more restrained approach is recommended with the aim to prevent venom distribution due to manipulation of the limb [4], [5], [6]. A causally aimed treatment, i.e. admin-
Figure 1: A: Situation of the wound at admission in emergency room. B, C: Local tissue necrosis due to lytic effect of cobra venom. B: Necrosis in situ; note the greenish-yellow color of the lytic tissue; C: Necrosis after excision on sterile gauze. D: Situation of the wound after excision of necrotic tissue at the dorsum of the hand and temporary coverage with Epigard® (Biovision GmbH, Ilmenau, Germany). E, F: Defects after definite coverage with an ALT-flap. E: Dorsal view, F: Side view.

Administration of anti-toxin should be targeted early in the management as a delayed administration might require higher doses [2], [6]. Regarding the specific case presented herein, a surgical management was required as already a compartment syndrome with a menacing loss of the extremity was apparent. For that reason, the recommendations in literature are clear as well [2], [6]. Additionally, anti-toxin was delivered under antihistaminic medication and hydrocortisone in reserve to allow early reaction to an anaphylactic shock. An intensive care monitoring of respiratory rate, blood pressure, heart rate, renal function, fluid balance and coagulation status is essential as well [2]. Not least, the bacterial spectrum and thus infection due to cobra bites should be regarded, as in the case report presented here, Morganella morganii was identified as a typical germ for cobra bites [7].

In cases of delayed availability, Tensilon as well as neostigmine as inhibitors of acetylcholinesterase showed very good effectiveness, in one study even better results for treating paralysis caused by cobra venom [8], [9]. Concerning the local effects, i.e. tissue necrosis, in most recent publications, good results could be achieved by treating these local tissue damages with tea polyphenols [10].

Conclusion

Hitherto, a radical debridement to prevent toxic necrosis after cobra bites was favoured due to lytic enzymes in the cobra venom. However, in most recent case studies, a more restrained initial surgical intervention was advocated. Antitoxin administration should be first line therapy...
in management of these cases, if accessible. Nevertheless, a plastic surgical management of the patient in terms of severe necrosis with significant loss of tissue as it might occur in delayed admission might be advantageous.

Notes

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Authors contribution

JWK: Guided the admission, antitoxin transport and application, examined the patient, assisted in operations, researched literature, and wrote the manuscript. CR: Examination of the patient, performed operations, and helped in conceiving the manuscript. PMV: Examinations of the patient, supplemented materials, and helped conceiving the manuscript.

Competing interests

The authors declare that they have no competing interests.

References


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