Surgical vacuum-assisted closure for treatment of dramatic case of stonefish envenomation

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【Abstract】Skin necrosis of the foot, oedema and lymphangitis from stonefish (Synanceia verrucosa) sting are complications well known for a long time and with potential long-term sequelae. Literature reports of stonefish envenomation give no specific reference on soft tissue management and surgical reconstruction. This is the first report describing a case of foot stonefish envenomation treated by vacuum-assisted closure therapy as an easy to use, accessible and simple adjuvant tool for management of large soft tissue necrosis.

Key words: Verrucotoxin protein, Synanceia verrucosa; Foot injuries; Negative-pressure wound therapy; Wound healing

S tonefish (Synanceja horrida), a member of the family Scorpaenidae, is considered the most venomous fish1,2 and can be found in the shallow waters of the Indo-Pacific region. As main defense weapons, the stonefish has 13 dorsal spines, each connecting to a pair of venomous glands that produce a very potent but heat-labile venom.1–3 The venom is myotoxic, neurotoxic, vasopermeable, and cardiotoxic.3,4 Due to their camouflage and the habit of burring in the mud, stonefish envenomation usually occurs in swimmers or divers by accidently treading on the fish. The pressure of the victim’s body weight thrusts the dorsal spines into the skin, facilitating venom injection.1 In most cases, the injury is self-limiting with no significant consequences, but victims experience severe pain at the venom injection site, usually situated in the limbs.1,2 The correct initial treatment is neutralization of the venom by hot water, effectively controlling the severe pain due to the heat-labile nature of the toxin, followed by disinfection, antivenom and antibioprophylaxis.1–5 Most of the previous papers in the scientific literature report on stonefish envenomation without any specific reference on soft tissue management and surgical reconstruction.6–8 This is the first report describing a case of foot stonefish envenomation treated by vacuum-assisted closure (VAC) therapy as an adjuvant tool.

CASE REPORT

A 61-year-old man was admitted in our institution, ten days after coming back from an Indo-Pacific maritime region, for a plantar cutaneous lesion due to a stonefish sting in the right foot. The patient received a cold-water bath treatment at the admission in the nearest local hospital, along with removal of the dorsal spines from the planta. No previous minor trauma of the foot preceded the appearance of the lesion and no associated systemic diseases were found in our patient. On admission, routine blood tests revealed a white blood cell count of 13.7 x 10^9/L, haemoglobin 147 g/L, C-reactive protein 217 mg/L and haptoglobin 3.77 g/L. The patient complained of pain, erythema and swelling, with a wide plantar necrotic area of 15 cm x 5 cm (Figure 1).

An initial misdiagnosis of necrotizing fasciitis was established. Therefore, according to the infectious disease service, intravenous antibiotic therapy was initiated with Clindamycin 600 mg three times per day plus oral Clarithromycin 250 mg twice a day for the first two days, followed by Imipenem 500 mg four times per day. Meanwhile, radical surgical debridement of the necrotic tissues was performed and a vacuum-assisted closure dressing (KCI Medical GmbH, Geroldswil, Switzerland) was applied for 3 weeks (Figure 2). Cultures taken from the necrotic area revealed a combined infection with Enterobacter aerogenes, Enterobacter cloacae, Enterococci and Pseudomonas aeruginosa.
Histological examination showed a necrotic suppurring process involving the dermis and the deep layers with vessel thrombosis and typical signs of vasculitis.

Lymphangitis and painful edema were detectable from the medial side of the ankle till the groin area, where a lymph node swelling was clearly detectable both clinically and through ultrasound examination.

After 7 days, a mild clinical improvement was detected due to the aggressive surgical and antibiotic care. Then, Imipenem was stopped and an antibiotic therapy based upon oral Amoxicillin 750 mg three times per day and Ciprofloxacin 500 mg twice a day was administered. Due to persistent edema and lymphangitis, the final tissue cover with a free microsurgical flap was delayed and wound closure was achieved by a full-thickness skin graft 1 month after injury. Subsequently the patient refused any further microsurgical reconstructive flap. Lower limb lymphangitis disappeared six months after operation.

At the three years' follow-up, the patient refers no local skin burning, but mild pruritus on the medial side of the foot. No further general side effects related to the stonefish sting were detectable, with complete resolution of all symptoms. Clinical examination of the plantar surface revealed a painless area of mild hyperkeratosis (Figure 3), which provided a durable coverage and with a normal appearance, allowing the patient to walk properly as well as wear normal shoes.

Both gait analysis and podogram taken at final follow-up and compared with the opposite side showed minor discrepancy to the contralateral side. The postoperative score according to the American Orthopedic Foot and Ankle Society was 83 with the need to use plantar orthosis only for walking on uneven grounds. No further microsurgical procedures were needed, owing to the final functional recovery with complete “restitutio ad integrum” both aesthetically and functionally.

DISCUSSION

Although it is the most venomous fish, stonefish envenomation rarely leads to death but can produce
complications such as necrotizing fasciitis, usually due to the first hot water therapy, used to break down the active component of stonefish venom, which is a heat labile cytotoxin.\textsuperscript{10} Immersion of the affected body part in hot water for as long as it can be tolerated is considered the most effective pain therapy and reduces swelling.\textsuperscript{1-5} But this measure can also help spread an existing infection in the absence of antibiotic therapy, by stimulating bacterial growth.\textsuperscript{4} Since the patient received a cold water treatment upon admission in the nearest hospital, failing to inactivate the venom could explain the later development of the wide plantar necrotic area.

Given the local conditions of the foot and leg upon the admission in our institute, especially edema and vasculitis following venom injection, a primary microsurgical coverage was delayed and VAC therapy was chosen as a conservative measure to improve circulation and reduce edema and lymphangitis.

Large soft tissue defects created after surgical debridement in the plantar area have an indication for reconstruction, the solution of choice in weight-bearing areas of the sole being a pedicled or free flap. Since the lesion did not involve weight-bearing areas, a skin graft was chosen because of persistent lymphangitis and swelling of the distal third of the calf, which prevented any flap reconstruction. This allowed for a good healing of the defect, without long-term contracture or walking impairment. Podogram examination showed that wound healing after VAC therapy allowed the maintenance of a non-pathological width of the mid-foot between 30\% and 50\%, as defined in previous reports.\textsuperscript{11}

This case demonstrates that VAC therapy is easily accessible and simple in application and can be defined as a safe and effective alternative adjuvant therapy for management of large soft tissue necrosis following stonefish envenomation.

\textbf{REFERENCES}


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