A Novel Approach to the Treatment of a Stingray Injury to the Abdomen

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CASE PRESENTATION

A 24-year-old female presented to the Emergency Department with a puncture wound to her abdomen from a cownose stingray (Rhinopterus bonasus). She sustained the injury as part of her job trimming stingray barbs at the zoo.

On presentation, the patient was alert and appeared uncomfortable. Her heart rate was 72 beats per minute, her blood pressure was 86/58 mmHg, her respiratory rate was 24 breaths per minute, and her oxygen saturation was 100% on room air. In the right lower quadrant of the abdomen there was a 2 cm puncture wound surrounded by a well-demarcated, blanching erythematous rash with centrally located bullae, extending from just anterior to the right flank to the umbilicus (**Figure 1**).

Laboratory values for Complete Blood Count (CBC), Comprehensive Metabolic Panel (CMP), Fibrinogen, D-Dimer, Prothrombin Time (PT), International Normalized Ratio (INR), and Activated Partial Thromboplastin Clotting Time (aPTT) were all within normal limits.

Figure 1. Patient's right lower abdomen with stingray puncture wound centrally and surrounding bullae and well-demarcated erythema.

DISCUSSION

Stingrays are generally bottom-dwelling flatfish related to sharks that live in both salt and freshwater. Injuries are caused by their purely defensive venomous dorsal tail barbs. Only one or two stingray fatalities are reported annually, with the most publicized being Steve Erwin in 2006 from a barb to the chest from the short-tail stingray (Dasyatis brevicaudata), which can grow to be 14 feet long. In the Greek play Odysseus Acanthoplex by Sophocles, Odysseus was killed by his son with a spear dipped in stingray venom.

Trauma from the puncture and envenomation are the clinically relevant components when treating a stingray barb injury.[1,2] The barb must be removed and the wound treated as if it were caused by a serrated knife. Not all trauma from a barb is equivalent – though injuries are typically seen around the lower extremities when a person accidentally steps on the stingray – stingray barbs can also penetrate more dangerous areas such as the abdomen or the mediastinum. Further imaging may be indicated depending on the location of the trauma, as was the case with this patient. The patient had a CT abdomen and pelvis done, which did not show intraperitoneal involvement. Point-of-Care Ultrasound (POCUS) is another imaging modality that can offer information quickly at the bedside.[3,4,5]

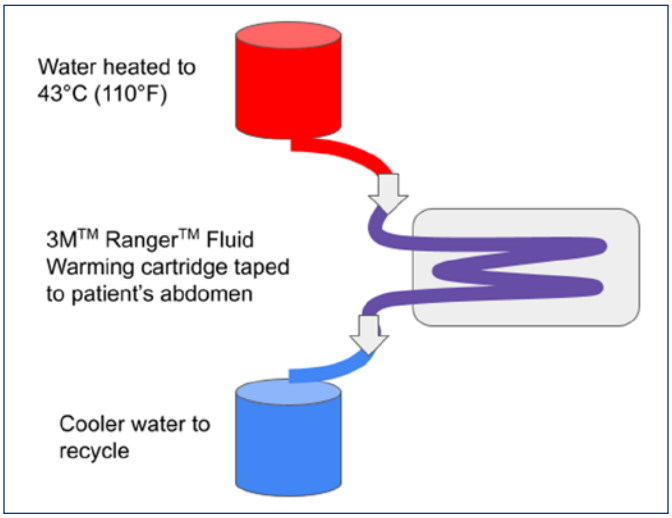
Stingray envenomation causes local pain, soft tissue necrosis, and can also cause systemic effects such as hypotension and cardiovascular collapse. Three active components in stingray venom have been identified: Serotonin, 5-nucleotidase, and phosphodiesterase.[6] Because these mediators are heat labile, treatment for stingray envenomation involves supportive care and local heat application. There are different opinions on the optimal temperature needed to deactivate them. The toxin has been reported to be deactivated at 50°C (122°F).[1] However, there have been multiple reports of patients having relief at lower temperatures.[6-10] The general consensus is to immerse the patient's affected area in water at a temperature as hot as the patient can tolerate for 30–90 minutes.

The location of this patient's wound required additional consideration because immersion in hot water was not possible. A 3M™ Ranger™ Fluid Warming cartridge was taped to the patient's abdomen over the puncture wound (**Figure 2**). Tap water was externally heated in a microwave

to 43°C (110°F). This heated water was placed in a bucket above the patient's bed. It flowed by gravity down into the cartridge through IV tubing and out of the cartridge via IV tubing into a second bucket on the floor. Heated water was added as needed to maintain the required temperature, allowing for a continuous hour-long treatment and significant pain relief for the patient (**Figure 3**).

Figure 2. 3M™ Ranger™ cartridge on patient's abdomen.

Figure 3. Schematic of fluid warming system with 3M™ Ranger™ cartridge.



The patient immediately reported pain relief when hot water was applied in this manner. In the Emergency Department the patient was treated for the possibility of anaphylaxis to the venom because she was hypotensive, receiving 0.3 mg Epinephrine, 10 mg dexamethasone, 50 mg Benadryl, 40 mg Pepcid, 650 mg Tylenol, and 2 liters of IV fluid.[11] She was given Levofloxacin and Doxycycline in order to cover for marine organisms, considering the open wound and exposure to saltwater. The patient's blood pressure normalized and she was admitted to the Intensive Care Unit for close monitoring. She was discharged two days later.

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