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Case Report

"From Dinner to Death" Fish Envenomation Presenting as Acute Fulminant Necrotizing Fasciitis in an Adult Filipino. A Case Report

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Abstract

Introduction: The Philippines is home to an array of marine animals and as such, marine stings and deadly envenomations are not uncommon. Despite this, there is a scarcity of locally published literature discussing its frequency, natural course of disease and the appropriate management.

Case Description: We present the case of EL, a 35/M previously diagnosed with Grave's Disease, controlled on Methimazole. Patient has good baseline functional capacity prior to envenomation. 33 hours prior to admission, while preparing a fish for dinner (Local Name: Bugao/Burog, Synanceia verrucosa), the patient accidentally punctured his left thumb with one of its spine. Brisk bleeding was noted on the puncture site. 12 hours after the incident there was erythema with progressive swelling and violaceous discoloration of the thumb progressing to involve the pulp of the digits, all the fingers, forearm and arm. There were multiple tensed bullae with brownish, foul smelling fluid, progressive numbness (50% sensory loss) and progressive motor weakness as well. 37 hours post injury, the patient consulted at the emergency room, hypotensive (BP 70/40 mmHg), tachycardic at 110 bpm and tachypneic. On physical examination, he had pink conjunctivae, flat neck veins, no visible anterior neck mass, bronchovesicular breath sounds, distinct heart sounds, with no bipedal edema. The left upper extremity is marked swollen, erythematous, with areas of multiple bullae formation. After vigorous fluid challenge with 3L of PNSS with minimal blood pressure response, vasopressor support with Norepinephrine and Dopamine was started. He was diagnosed with Acute Necrotizing Fasciitis of the left upper extremity probably from Fish Envenomation. Shock, was multifactorial likely from hypovolemic from 3rd spacing and Sepsis Induced. Patient was given tetanus prophylaxis and was started on broad-spectrum antibiotics (Piperacillin, Tazobactam and Vancomycin). Since no antidote was locally available, patient was stabilized to undergo emergency debridement and fasciotomy of the left hand and forearm. Extensive necrosis of the fascia and foul smelling grayish discharge were seen intra-operatively. Post operatively, the patient succumbed from multiple organ dysfunction syndrome. Blood samples and bullae fluid samples were obtained and a heat labile protein toxin was identified. The potent toxin is found in the species of stonefish.

Discussion: Stonefish venom consists of 4 biologically active factors: (1) hylauronidase fraction, (2) capillary permeability factor, (3) toxic or lethal fraction, and (4) pain producing factor. The capillary permeability factor is a potent hypotensive agent which has direct myotoxic and neurotoxic activity. Combination of these factors resulted into refractory hypotension leading to demise of our patient. A high index of suspicion is warranted to prevent mortality and morbidity associated with fish envenomation. While no stonefish antivenom is locally available, simple management consists of removal of protruding spines, aggressive fluid hydration, adequate analgesia, hot water immersion techniques and adequate empiric antibiotics can be instituted. The role of early surgical debridement cannot be overemphasized as well. This case report aims to increase the awareness about local fish envenomation. Locally published guidelines for the prevention and treatment protocols for local fish envenomations should be developed and distributed locally.

Keywords: *Stem Cells; Tooth Banking; Dental Pulp; Cryopreservation; Magnetic Freezing*

Introduction

The Philippines forms an ocean region that has long been recognized as the world's center of marine biodiversity. With the Malay Archipelago, Papua New Guinea and Australia, the country forms the 'Coral Triangle,' so-called because of the abundance of its coral reef life [1]. This coral triangle is home to about 2,500 species of fishes. Carpenter, a world-renowned marine biologist in 2005 suggested that the Philippines is not only part of the center but is, in fact, the epicenter of marine biodiversity, with the richest concentration of marine life on the entire planet [2].

The Philippines is home to an array of marine animals and as such, marine stings and deadly envenomations are not uncommon. Data from the Australian sources in 2010, suggest that 20 - 50 Filipinos succumbed to box jellyfish envenomation while there is no available data for fish sting envenomation [3]. The true number of stonefish poisoning is unknown. More than 100 reported cases of captive lionfish envenomations in medical literature, nearly all of which occurred on the hands of unwary marine aquarist. After extensive review of data available at present, there is a scarcity of locally published data discussing the frequency of fish envenomation, its natural course of disease and its appropriate toxicologic management.

Clinical management is specific for each type of envenomation, and first aid includes varied treatments such as cardiopulmonary resuscitation, compression/immobilization, bandaging, prevention of further envenomation and local analgesia in the for of hot or cold therapy. Medical treatments may include advance life support, systemic analgesia, antivenom administration, specific drug therapy, and management of both systemic and regional vascular problems [3].

In this paper, we report the case of a 35-year-old Filipino male who sustained acute necrotizing fasciitis of the left upper extremity secondary to local fish envenomation. To our knowledge, this is the first reported case in local literature of deadly fish envenomation.

Case Description

A right handed, previously healthy 35 year old male was admitted at the Emergency Room of the Philippine General Hospital after sustaining an injury while cleaning and scaling a fish. He was previously diagnosed with Grave's Disease based on an enlarged anterior neck mass, palpitations and proptosis. Patient underwent radioactive iodine ablation treatment in 2011 and was clinically and biochemically euthyroid since then. He denied smoking, alcohol intake nor illicit drug use. The patient had good baseline functional capacity prior to envenomation.

33 hours prior to admission, while preparing a fish for dinner (Local Name: Bugao or Burog), the patient accidentally punctured his left thumb with one of its spine. There was brisk bleeding noted on the puncture site. The patient washed the puncture site with running tap water. 12 hours after the incident, there was note of erythema, progressive swelling and violaceous discoloration of the thumb progressing to involve the pulp of the digit, all the fingers of the left hand, forearm and arm. There were multiple tensed bullae with brownish foul smelling discharge. Progressive numbness (about 50% sensory loss) and progressive motor weakness were reported as well.

37 hours post injury, the patient consulted at the UP PGH Emergency Room. He was received hypotensive with a blood pressure of 70/40 mmHg, tachycardic at 110 beats per minute, tachypneic at 30 cycles per minute and afebrile at 37^{0}C. The patient was on cardiorespiratory distress. He had pink conjunctivae, anicteric sclerae, flat neck veins, no cervical lymphadenopathies with no palpable anterior neck mass. He had bronchovesicular breath sounds, no adventitious sounds. He was tachycardic, with distinct heart sounds, no S3 or gallop rhythm, no murmurs. The abdominal exam was normal. Focusing on the area of injury, the left upper extremity was markedly swollen, erythematous, with areas of multiple violaceous bullae formation. There was positive Nicholsky sign. There was brownish foul smelling discharge on some of the ruptured bullae. On neurologic examination, all the cranial nerves are intact. There was 50 - 60% sensory deficit on the areas of C5-T1 distribution of the left arm. There was motor weakness on the left upper extremity as well (3/5 MMT).

Figure 1: *Acute necrotizing fasciitis of the left upper arm in a 35 year old male with fish envenomation.*

Aggressive fluid resuscitation was started upon ER admission. After a total of 3L of PNSS infused with minimal blood pressure response, vasopressor support with Norepinephrine and Dopamine was started, subsequently titrated to reach their maximum doses. Patient was maintained on 1L D5NR x 8 hours. The patient was diagnosed with Acute Necrotizing Fasciitis of the left upper extremity probably from Fish Envenomation. Shock, was multifactorial likely from hypovolemia from extra vascular fluid sequestration and sepsis induced vasodilation. Patient was given tetanus prophylaxis, analgesics and was started on broad-spectrum antibiotics (Piperacillin Tazobactam 4.5g IV q8 and Vancomycin 1g IV q12). Patient was referred to the National Poison Management and Control Center as well as Orthopedics for co-management. Since no antidote was locally available, patient was stabilized to undergo emergency debridement and fasciotomy of the left hand and forearm to search for retained fish spines.

Figure 2: *Status post debridement and fasciotomy.*

The patient underwent emergency debridement and fasciotomy within 4 hours of ER admission. Extensive necrosis of the fascia and foul smelling grayish discharge were seen intra-operatively. Extensive debridement was done until there was bleeding observed in the muscle fibers. Extensive washing done. Specimens were sent for intra-operative gram stain/culture and biopsy.

Intra-operatively, the patient was persistently hypotensive, which initially responded to vasopressor support. Intraoperative blood loss was about 500 cc. Post operatively, the patient went into refractory shock. Piperacillin Tazobactam was shifted to Meropenem 1g IV q8 to provide a wider gram negative bacterial coverage. Inotropic support continued.

3 hours post operatively, the patient was referred for upper gastrointestinal bleeding. There was 500 cc of coffee ground material admixed with fresh blood per NGT. Hypotension was persistent. Patient was given another liter of PNSS as fast drip and blood products were ordered for transfusion. Omeprazole drip was started. Unfortunately, blood products were not available at this time. The patient succumbed to refractory shock. Advanced cardiac life support measures were instituted in the patient however the family signed a waiver declining further resuscitation efforts. Post mortem, the baseline laboratory results revealed hemoconcentration (hemoglobin of 162, hematocrit 0.46), thrombocytopenia (platelet count of 62), acquired coagulopathy (PT INR of 2.05, PTT 2x elevated) and azotemia (Crea 125). WBC count was 5.0 with a neutrophil count of 80%. Blood samples and bullae fluid samples were obtained and submitted to Bureau of Fisheries for examination. A heat labile protein toxin was identified likely belonging to species of stonefish or lionfish. The final diagnosis was Multiple Organ Dysfunction Syndrome (Refractory Shock, Acquired Coagulopathy, Thrombocytopenia and Acute Kidney Injury) secondary to Acute Necrotizing Fasciitis from Fish Envenomation.

Discussion and Conclusion

The challenge in managing a Filipino patient who comes in at the emergency room with a suspected fish envenomation was identifying the species of fish itself. There are numerous local names given for particular species and the lack of a readily accessible comprehensive national registry of different local fish species with their various local names was the first problem identified.

There are three genera of fishes known for their very potent venoms. Genus *Pterois* (lionfish, zebrafish, butterfly cod) are identified based on long slender spines with small venom glands with less potent stings. Genus *Scorpaena* (scorpionfish) have shorter and thicker spines with larger venom glands and a more potent sting. Genus *Synanceia* (stonefish) have stout powerful spines with highly developed venom glands and a potentially lethal sting.

The patient likely succumbed from either lionfish or stonefish venom. Lionfish venom causes massive release of inflammatory mediators [5]. Stonefish envenomation is caused by a number of potent toxins. Stonustoxin is a haemolytic and a vasorelaxant agent which is responsible for refractory hypotension. Capillary permeability factor causes extensive edema formation. Trachynilysin is a neurotoxin which depletes neurotransmitter levels at the synapses. Hyaluronidase causes collagen breakdown hence the extensive soft tissue necrosis [6]. Stonefish venom is highly antigenic and heat labile. Proposed treatment is based on the heat-labile characteristics of these proteins. Combination of these factors resulted into extensive soft tissue injury and refractory hypotension leading to demise of our patient.

There are no specific laboratory work ups to clinch the diagnosis of fish envenomation. Plain film radiography/soft tissue radiography is the initial study modality when attempting to exclude retained foreign bodies since most calcareous spines are visualized directly or indirectly. Non-radiodense objects may be revealed as filling defects, or they may be outlined by air drawn into the wound during injury. CT scanning and MRI can identify and precisely localize retained foreign material.

While no stonefish antivenom is locally available, the management should consists of recognition of the injury as a potential envenomation, gentle removal of visible spines, direct pressure to control bleeding, aggressive fluid hydration and vasopressor support,

adequate analgesia, hot water immersion techniques and empiric broad spectrum antibiotics. The role of early surgical debridement cannot be overemphasized as well. Gentle manual removal of protruding spine prevent further penetration or breakage and continued envenomation. Hot water immersion technique works on the principle that bioactive enzymes in the venom are largely heat labile and are deactivated by heat immersion. Hot water also causes thermal modulation decreasing the perception of pain in the affected area [6]. The affected limb should be immersed in water no warmer than 114 degrees fahrenheit or 45 degrees celsius for 30 - 90 minutes or until the pain subsides. Studies have concluded that hot water soaks are effective in controlling the pain in 74% of cases [7].

Ideally, this patient should have received stonefish antivenom, (hyperimmunized equine anti-sera). Following dilution, a slow intravenous administration may be preferable: 1 ampule (2000U) for every 1-2 punctures and 3 ampules for more than 4 punctures. It should be diluted in 50 - 100 mL of isotonic sodium chloride solution and run through at least 20 minutes [8]. This antivenom is indicated for patients with severe pain, systemic symptoms, muscle weakness and paralysis or those who were injected with large amount of venom. Unfortunately, the stonefish antivenom is not locally available.

Lastly, all marine injuries are at risk for secondary infection and antibiotics are recommended for puncture wounds. Empiric antibiotics should also cover for marine organisms not usually covered in typical antibiotic regimen such as *Vibrio* sp., *Aeromonas* sp., *Mycoplasma marinum* and *Erysipelothrix rhusiopathiae*.

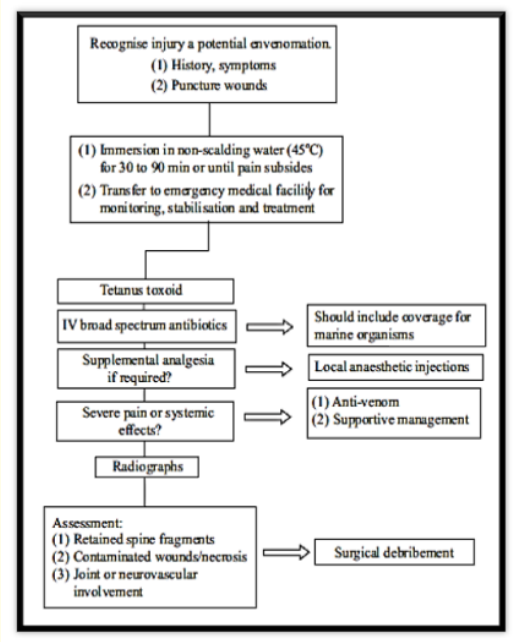

Figure3: *Adapted algorithm in the initial management of fish envenomation.*

This case report aims to increase the awareness about local fish envenomation. Locally published guidelines for the prevention and treatment protocols for local fish envenomations should be developed and distributed locally. A high index of suspicion is warranted to institute early management to prevent mortality and morbidity associated with deadly fish envenomation [9-13].

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