

Stonefish envenomation presenting to a Singapore hospital

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ABSTRACT

Introduction: Stonefish, belonging to the genus *Synanceia* and classified under the Synanceiidae family, are commonly found in the shallow waters of the Indo-Pacific region and are considered the most dangerous and venomous of this family. The aim of the study was to describe the presenting features, clinical course and current management of this series of patients with stonefish envenomation presenting to a tertiary general hospital in Singapore.

Methods: Data involving stonefish stings was retrospectively retrieved from the Singapore General Hospital Accident & Emergency Emerge Version 3.7.6 database from October 2004 to September 2006. Information, such as the patients' demographics, date and location of the incident, identity of the fish, local or systemic effects, pain score (upon arrival and after treatment), investigations and treatment as well as the outcome of the patients, were evaluated.

Results: 30 cases were identified. The median age of the patients was 28 years. The majority of patients were male (80 percent) and 47 percent of cases were foreign nationals. Most incidences occurred on weekends/public holidays (77 percent), with November having the highest number of cases (seven cases). The majority of cases (80 percent) arrived at the hospital within two hours of envenomation. Symptoms included extreme pain, swelling and redness of the affected limbs. 24 (80 percent) patients received hot water soak treatment and 27 (90 percent) patients received either intramuscular pethidine or diclofenac for analgesia, where nine patients (33 percent) required additional analgesics after a period of observation. 17 patients (58 percent) were treated and discharged, eight (26 percent) were referred to a specialist for follow-up and five (16 percent) were admitted for an average of three days. 13 out of 25 patients (52 percent) were discharged with

antibiotics. One case complained of persistent pain and hyperalgesia five months post-envenomation. One patient required surgical intervention. No deaths and systemic symptoms were reported.

Conclusion: Cases of stonefish envenomation that presented to our hospital showed that the majority of patients were young male adults. Stonefish envenomation, though it rarely kills, can cause extreme pain, swelling and erythema, which can be managed with symptomatic treatment.

Keywords: bites, fish venom, poisoning, stings, stonefish envenomation, stonustoxin, *Synanceia horrida*, Synanceiidae

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INTRODUCTION

Stonefish, belonging to the genus *Synanceia* and classified under the Synanceiidae family, is commonly found in the shallow waters of the Indo-Pacific region. They are considered to be the most dangerous and venomous of the scorpionfish family.⁽¹⁾ The two best known species are the *Synanceia horrida* and *Synanceia verrucosa*. In Singapore, *Synanceia horrida* can be found in the reef flats of the small islands to the south of Singapore.⁽²⁾ Stonefish frequently look like seaweed-encrusted stone and have a habit of burying themselves in the sand. This makes them difficult to detect and avoid. We report a series documenting the management and clinical outcomes of stonefish envenomation presented to a tertiary general hospital in Singapore. The aim of the study was to describe the presenting features, clinical course and current management of this series of patients.

METHODS

This was a retrospective study of suspected stonefish envenomation presenting to the Singapore General Hospital emergency department (ED) over a two-year period from October 2004 to September 2006. All cases coded as "sea creatures; marine creatures; stonefish" and "bites; stings and envenomation" were retrieved from the ED Emerge Version 3.7.6 database. A descriptive analysis was carried out on the data collected. Information, such as the patients'

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Table I. Patient demographics.

Demographics	No. (%) of patients
Total no. of cases	30 (100)
Median age (years)	28
Gender	
Male	24 (80)
Female	6 (20)
Nationality	
Locals	
Malays	8 (26)
Chinese	8 (26)
Foreigners	14 (47)
Day of occurrence	
Weekends/public holidays	23 (77)
Weekdays	7 (23)
Site of injury	
Foot	25 (83)
Hand	5 (17)

demographics, date and location of the incident, identity of the fish, local or systemic effects, pain score (upon arrival and after treatment), investigations and treatment as well as the outcome of the patients, was evaluated.

RESULTS

30 patients were identified during the study period. Only two patients had a positive picture identification of the offending fish. However, others were selected based on the location of the incident and the history of “stepping on something hard”, “wading” or “swimming” in the sea. Most patients were relatively young, as the median age was 28 (range 9–52) years. Only one patient was more than 50 years of age. Table I shows the demographics of cases presented to the ED. There were more male patients, and foreign nationalities made up slightly less than half of the cases. Those with foreign nationalities included patients from countries such as China, India, Korea and Myanmar. The majority of cases (23, 77%) occurred during the weekends (Saturday or Sundays) or on public holidays. The foot was the most common site of injury. Other than the feet and hands, no one presented with an injury to the other parts of the body. Two patients had more than one site of injury—both patients had picked up and handled the stonefish—one was injured on the right index and ring fingers, and the other was injured on both hands. Most of the patients (24, 80%) presented to the ED within two hours of envenomation (Table II).

All patients reported pain around the site of the injury. The mean pain score was 7.4 (range 0–10, with 0 for no pain and 10 for extreme pain). 15 cases (50%) reported a pain score of 9 or 10 when they arrived at the ED. The pain was described as “severe burning” in nature. Two patients

Table II. Elapsed time between envenomation and presentation at the emergency department.

Hours before presentation	No. (%) of patients
< 2	24 (80)
2–6	3 (10)
7–24	1 (3.3)
Unknown	2 (6.7)

reported that there was radiation of the pain up the affected limb with a sensation of numbness. Other symptoms included swelling and redness (Table III). Most patients (27, 90%) were given analgesics (either intramuscular pethidine or diclofenac) on presentation to the ED. Of these 27 patients, nine patients (30%) required additional analgesics. Four patients were given diclofenac and five patients were given pethidine. 24 patients (80%) were treated with a hot water soak of the affected limb and 26 patients (87%) had their tetanus status updated. Of the three patients who did not receive intramuscular injections initially, one patient’s pain was relieved with oral anarex, another patient presented late, seeking treatment for prolonged swelling and itch, while the third patient’s pain was relieved with a hot water soak alone. 12 patients had radiographs done, of which three of the radiograph results showed the possibility of foreign bodies at the site of envenomation. Two of these patients were given outpatient appointments, of which both patients defaulted. The third patient was admitted for further pain management and was treated conservatively with hot water.

17 patients (58%) were treated and discharged. Eight patients (26%) were referred to specialists for follow-up and five (16%) were warded. Of the 25 patients who were discharged from the ED, 13 (40%) were discharged with oral antibiotics even though there was no clear documentation of cellulitis in some of the patients. Reasons for hospitalisation included significant oedema of the limb, cellulitis, inadequate pain relief and duskiness over the injury site with a fear of vascular compromise (Table IV). The average length of hospital stay was three (range 1–7) days. Only one patient underwent surgical debridement for the stonefish wound. This patient developed persistent pain complicated by progressive cellulitis despite intravenous antibiotics and hot water soaks. His radiograph was normal and despite an initial incision and drainage of the puncture wound to remove any foreign body, he developed a necrotising wound that required further wound debridement and secondary suture. The rest of the patients improved after a period of observation, analgesia and symptomatic treatment, and were discharged. One patient complained of persistent pain and hyperalgesia five months post-envenomation.

Table III. Signs and symptoms.

Presenting signs and symptoms	No. (%) of patients
Pain	30 (100)
Erythema	21 (70)
Oedema	20 (67)
Sting mark(s)	17 (57)
Numbness	3 (10)

Table IV. Reasons for hospitalisation.

Patient	Site of injury	Reason for hospitalisation
1	Hand	Significant oedema
2	Hand	Cellulitis
3	Foot	Admitted for analgesia and pain relief
4	Foot	Duskiness/infection requiring antibiotics
5	Foot	Duskiness over injury site

DISCUSSION

Over the past 40 years, the Singapore demographics have changed significantly. The majority of victims are no longer fishermen wading in shallow waters in search of fish, stepping barefoot on or off a rowing boat or pushing the boat in shallow water.⁽²⁾ The majority of our victims were holiday-makers and tourists, with the majority of the encounters occurring over weekends and on public holidays. The predominance of young male victims likely reflects the gender's higher participation in beach activities as compared to their female counterparts. The predominance of local Malay patients (although they only make up 15% of the total population of the country) may be due to their community's stronger affinity for activities at the coastal areas, resulting in a higher exposure rate to such marine envenomations. This age and gender predominance is similar to another report of marine animal injuries.⁽³⁾

The excellent stonefish camouflage compounded by ignorance among the general public with regard to marine envenomation made fish or suspect identification difficult. Although not all the patients had direct confirmatory visualisation of the stonefish, it was highly probable, as in most of the cases, the location where they were stung was well known to be widely inhabited by the stonefish, *Synanceia horrida*. As beach activities are one of the main tourist attractions in Singapore, it is not surprising to find that half of the victims were foreigners. The majority of victims managed to arrive at the ED for treatment within two hours of envenomation, due to the close proximity of the public hospital to the coastal line. Each stonefish has 13 dorsal spines and each spine is connected to a pair of venomous glands. The pressure of the victim's body weight thrusts the dorsal spines into the skin and facilitates venom injection.⁽³⁾ Therefore, its common victims, swimmers and beachcombers, are usually injured by accidentally treading on the fish. With a tropical climate and sandy beaches, beach activities are a common pastime in Singapore. Thus, such injuries are often presented to the local hospitals.

Although there have been case reports of deaths resulting from stonefish envenomation,^(2,4-6) there were no deaths reported in this study. There were also no known prehospital mortality cases known to the ED. Some

authors think that the primary source of fatalities after stonefish envenomation may be the initial risk of drowning secondary to the typical extreme pain and later because of septicaemia.⁽⁷⁾ All of our victims were not far out at sea and the majority sought medical help within two hours of envenomation. The signs and symptoms of stings from our study concurred with previous case reports, case series and studies on stonefish stings,^(2,7,8) where symptoms are limited to severe local manifestations in the involved extremity. All the patients in our series complained of pain, with swelling and erythema present in the majority of the victims. Some patients also complained of numbness of the extremities in the affected limb. No systemic effects were reported in this study. Cases of pulmonary oedema,⁽³⁾ necrotising fasciitis,⁽⁴⁾ and severe tissue necrosis⁽⁹⁾ have been reported in the literature, but these reports remain isolated and anecdotal.

Hot water soaks, analgesia and tetanus immunisation updates were the mainstay of treatment in our series. The stonefish venom is an unstable protein, with a pH of 6.0 and a molecular weight of 150,000.⁽¹⁰⁾ It can be denatured by heat, which may result in a loss of toxicity.⁽¹⁾ Thus, due to the venom's heat labile nature, it is recommended that the affected limb be immersed in non-scalding hot water (45°C) for 30–90 minutes or until the pain subsides.⁽⁸⁾ However, it has also been reported that the immersion of the affected limb in hot water did not provide relief to some patients and thus, the benefits of this treatment remain doubtful.⁽⁷⁾ Another study concluded that hot water soaks were effective in controlling the pain in 74% of cases. The authors suggested that in cases where hot water soaks did not control the pain, analgesics and/or local or regional anaesthesia should then be recommended.⁽¹¹⁾

In our series, it was difficult to conclude if using hot water soaks alone was effective, since most victims were also given intravenous or intramuscular and/or oral analgesics concomitantly. Some of our patients also required additional analgesics, despite having hot water soaks and prior analgesics. The requirement for an additional analgesic did not differ between pethidine and diclofenac. However, as the overall risk of mortality and morbidity appears to be low, with a good outcome in most patients, outpatient care by primary healthcare providers is feasible. The need

for anti-venom, which is not available in Singapore, also seems to be less pertinent in our local setting although it is available in other countries. There were inconsistencies as to whether blood investigations should be performed in these patients. Where it was performed, the blood results were unhelpful in the management of the patient in the ED and did not offer additional information. Other inconsistencies of management among the physicians include prescribing steroids and antibiotics to the patient even where there was no clear infection of the affected site.

As marine injuries are at risk of secondary infection, necrosis and ulceration, broad-spectrum prophylactic antibiotics can be considered. However, if there are visible foreign material, forceps removal should be performed to prevent continued envenomation, chronic inflammation, granuloma formation or secondary infection.⁽⁸⁾ However, in our series, the patients who were not discharged with antibiotics did not report having an infection or a worse outcome on their review compared to those who were discharged with antibiotics. This study was limited by its retrospective nature spanning a duration of two years. There were a small number of patients in our series with a paucity of documentation in the charts, many of whom could not confirm identification of the stonefish. Also, the data was collected in a single centre and may not be representative of the general population.

In conclusion, cases with stonefish envenomation that presented to our hospital showed that the majority of patients were young male adults. As more people visit beaches on weekends and public holidays, this is consistent with the increase in the occurrence of envenomations. Stonefish envenomation, though it rarely kills, can cause extreme

pain, swelling and erythema, which can be managed with hot water soaks and analgesia.

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