

# Stonefish envenomation with acute carpal tunnel syndrome

Samuel KK Ling 凌家健  
SC Cheng 鄭思宗  
CH Yen 甄志雄

Stonefish envenomation is a common marine sting. Although stonefish injuries are commonly sustained during maritime activities, this local delicacy can also be considered a regional occupational hazard for chefs. The availability and consumption of stonefish in local restaurants has increased the risk of acute carpal tunnel syndrome after a stonefish injury. This case report describes acute carpal tunnel syndrome following stonefish envenomation. An excellent recovery was achieved after surgical decompression of the carpal tunnel syndrome. Standard management of stonefish injuries should therefore take into account the possibility that this orthopaedic emergency may complicate the injury.

## Introduction

Historically, stonefish have been treated with distaste and fear. Their unaesthetic appearance and toxic venom have earned them labels such as 'the master of deceit' and 'devil-fish'. They have become, however, a regional delicacy and pose an occupational hazard to chefs and fishermen. The *Synanceia* genus has various species characterised by 13 'hypodermic' needle-like spines that envenomate involuntarily when the loose integumentary sheath is pulled down.

## Case report

A right-handed 50-year-old chef was admitted in March 2008 to the accident and emergency department of a regional hospital 10 minutes after sustaining a stonefish injury to his left ring finger.

On admission, 10 minutes after the injury, he complained of pain and swelling over his left ring finger. He was treated initially with hot water immersion, as advised by the protocol, with immediate resolution of the erythema, pain, and swelling.

Three hours after the injury, he was admitted to the orthopaedic department. He had minimal, localised pain and was afebrile with stable vital signs. Laboratory results, including a white blood cell count, haemoglobin level, clotting times, renal (electrolytes) and liver function tests were all normal. He was commenced on intravenous augmentin and levofloxacin after wound swabs had been taken for cultures and Gram staining. All Gram stains and cultures were negative.

Sixteen hours after the injury, he had progressively intense local swelling and tenderness of his entire ring finger, which had spread to involve the dorsum of his hand. Blisters appeared on the involved finger and he had paraesthesia over the median nerve distribution (Fig 1). In response to this rapid local progression, 2000 units (1 vial) of stonefish

### Key words

Bites and stings; Carpal tunnel syndrome; Fishes, poisonous; Neurotoxins

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Department of Orthopaedics and Traumatology, Kwong Wah Hospital, 25 Waterloo Road, Kowloon, Hong Kong  
SKK Ling, MB, ChB

SC Cheng, FHKAM (Orthopaedic Surgery)  
CH Yen, FHKAM (Orthopaedic Surgery)

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Correspondence to: Dr SKK Ling  
E-mail: samuel.ling@gmail.com



FIG 1. Preoperative blisters, erythema and swelling of the ring finger

## 石頭魚毒鱗刺傷引致的急性腕管綜合徵

石頭魚（玫瑰毒鮋）毒鱗刺傷是常見的海洋生物刺傷，大多是人們進行水上活動時發生；不過，隨着石頭魚成為香港的「地道佳餚」，在供求不斷下，本地廚師也須面對相關的職業性危害，增加被石頭魚刺傷導致急性腕管綜合徵的風險。本文報告一宗因石頭魚毒鱗刺傷引致的急性腕管綜合徵病例。透過腕部減壓術，患者最終康復出院。石頭魚刺傷屬骨科急症，當局應設立治療標準，減低傷勢惡化的機會。



FIG 2. Open carpal tunnel release for acute carpal tunnel syndrome performed by incising the transverse carpal ligament

anti-venom were injected intravenously. At the same time an emergency fasciotomy of the ring finger, carpal tunnel release and exploration of the flexor tendon were performed to prevent compartment syndrome in the finger, carpal tunnel syndrome and suppurative tenosynovitis of the flexor tendons. At operation there was extensive soft tissue oedema with median nerve compression by the transverse carpal ligament leading to marked bruising of the median nerve. The oedema was relieved immediately on release of the transverse carpal ligament, followed by an improvement in the circulation of the fingers and hand. All flexor tendons and digital nerves were free of infection and healthy-looking (Fig 2). Subcutaneous tissue and flexor sheath samples taken for culture and histology showed neither bacterial growth nor infection.

One week postoperatively, he was discharged with good recovery from pain and numbness. The wound had healed and he had a full range of motion in all fingers and his wrist when followed up at 3 months.

## Discussion

### Biotoxicity

There have been several investigations into the

specific bioactive venomous properties of the stonefish toxin,<sup>1,2</sup> but exact relationships are still inconclusive. The most commonly accepted bioactive agents include the enzyme hyaluronidase, stonustoxin, and trachynilysin.

The hyaluronidase in stonefish toxin is similar to those found in snake venom but is much more concentrated; it breaks down connective tissue and is believed to be responsible for the rapid spread. Stonustoxin is another bioactive element of the venom reported to be haemolytic and vasorelaxant. Trachynilysin is a neurotoxin that depletes neurotransmitter levels at the synapses resulting in hyperstimulatory neuroblockade. Stonefish toxin has also been reported to have a histamine-independent oedema-producing activity and has been shown to be lytic for some animal erythrocytes. As yet, these findings are largely experimental and further investigations are required before definite conclusions can be drawn.

## International guidelines for management of stonefish injury

### Heat immersion

Most standard stonefish envenomation<sup>3,4</sup> management protocols include initial resuscitation, symptomatic relief with heat immersion therapy, antivenom administration for systemic or severe local symptoms, and surgical removal of spines or foreign bodies. In our case, the patient's condition was initially controlled at the accident and emergency department with hot water immersion therapy. Although Tang et al<sup>5</sup> have advised caution with heat immersion, because the warmth may create an optimal environment for the development of vibrio necrotising fasciitis, most guidelines and studies still suggest that hot water immersion therapy is an effective treatment. There are two major theories explaining the effectiveness of heat immersion: the first states that the bioactive enzymes in the venom are largely heat labile and are therefore deactivated by the heat immersion. Some authors remain sceptical about this, pointing out that scalding external temperatures are required before enzyme deactivation occurs internally. The second and more widely accepted theory is based on the pain gating theory acting via thermal modulation. Whatever the mechanism, immersion in water heated to the warmest bearable temperature is a relatively safe, easily accessible, and effective first-line management for stonefish injuries.

### Stonefish antivenom

Most studies support the use of injected antivenom as a potent tool in the management of stonefish envenomation.<sup>4-8</sup> Due to its equine origin the

antivenom could theoretically cause serum sickness or precipitate anaphylactic reactions but there is little documented evidence that these adverse effects occur in practice. Indications for the use of stonefish antivenom include systemic involvement and intense local symptoms (as in our case).

### Acute carpal tunnel syndrome: an orthopaedic emergency

Current international stonefish management guidelines revolve around heat immersion and antivenom administration. Surgery has been reserved for removal of foreign bodies, especially the fish spines, only. In our locality, there is a different type of patient—chefs who sustain a hand injury while cooking—who present differently from the more common presentations after a sting on the sole while strolling on the beach. This adds the risk of acute carpal tunnel syndrome, which requires

prompt decompression to prevent irreversible nerve damage,<sup>9,10</sup> to the clinical picture. Our patient developed rapid oedema, causing acute carpal tunnel syndrome leading to excruciating pain and numbness. The hand was grossly swollen and oedematous with blister formation due to the high subcutaneous pressure. At his latest follow-up, 3 months after surgical decompression, there was complete resolution of the pain and numbness with no intrinsic muscle weakness or atrophy.

### Conclusion

In view of our local epidemiology, monitoring for signs of acute carpal tunnel syndrome should be included in the management protocol for stonefish envenomation. Emergency carpal tunnel release in acute carpal tunnel syndrome caused by stonefish toxicity provides prompt symptomatic relief and prevents irreversible neurological damage.

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