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Case report

Successful use of heat as first aid for tropical Australian jellyfish stings

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ABSTRACT

Currently the Australian Resuscitation Council (ARC) recommends dousing with vinegar followed by ice as first aid for jellyfish stings in tropical Australia, with limited evidence to support this recommendation (Li et al., 2013). We report our successful experience in using hot water immersion as first aid in treating two people stung by venomous tropical Australian jellyfish, one by *Chironex fleckeri* and one by *Carukia barnesi*.

1. Clinical record

A 35 yo M cinematographer was filming documentary on Irukandji jellyfish at Palm Cove, Queensland. He was coming to the shore holding a camera housing, and removed his glove to lift the housing out of the water. As he placed his left hand underwater he contacted a jellyfish, where the tentacle ran from ½ way down the extensor surface of his forearm, running around the web space of his L hand across his palm and then between the ring and middle finger, and ending dorsally at the wrist joint. It was estimated to be 30 cm of tentacle, which was typical for *Carukia barnesi.*

Within 5 minutes his entire forearm and hand was immersed in hot water (as hot as he could tolerate) in a plastic container. This was left there for about 20 minutes, with the water being replaced several times as soon as the water cooled.

He was taken to the ED at Cairns Hospital, was observed for 5 hours and did not require any analgesia medication.

The jellyfish, wrapped around the victims arm, was captured and later identified as *Carukia barnesi.*

A 40yo M biologist was at Palm Cove collecting Box jellyfish (*Chironex fleckeri*). Whilst collecting one animal, he was stung across both hands and fingers on both the dorsal and palmer aspects by a *Chironex fleckeri* box jellyfish with a bell 25cm diameter. He had immediate severe pain, which the patient described 'brought him to tears'. He immediately rubbed his hands in wet sand and within 5 minutes he placed both hands in a plastic container of hot water (as hot as he could tolerate) for about 10 minutes. He had almost immediate relief of pain, and the severe pain recurred as the water temperature cooled and had the hot water replaced about four times. After ten minutes the pain had settled and was minimal, although he had marked swelling of his hands that settled over 48 hours. He required no analgesia medication. He had no permanent scarring.

As the sting occurred at the time of collecting the jellyfish, the jellyfish was kept and identified as *Chironex fleckeri*.

2. Discussion

To our knowledge we are unaware of any reports of hot water

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being used successfully in tropical Australia to treat a jellyfish sting, although we are aware of a trial being performed in the Royal Darwin Hospital, looking at the benefit of hot water in treating *C fleckeri* stings. In our cases, hot water as hot as tolerated was used. Whilst scientifically a set temperature would be ideal, in real life this may not be available. In the case stung by *C fleckeri*, the victim's symptoms significantly worsened when the water temperature cooled, only to settle when fresh hot water was used.

Whilst it is possible our sting victim stung with Irukandji jellyfish may have not developed any symptoms, we believe this was a significant sting, in part due to the length of the tentacle, would have developed major symptoms. One of the authors (JS) and a colleague both stung with < 5cm of *Carukia barnesi* tentacle required hospital admission and large doses of opiates. Video of this is freely available [Killer Jellyfish part 5.flv: www.youtube.com/watch?v=9CHshkF8GDU].

A recent review published by Li and colleagues in the Cochrane Database of Systemic Reviews, examining 'interventions for the treatment of jellyfish stings', included only seven trials involving 435 patients that met the inclusion criteria (Li et al., 2013). The authors concluded that the evidence from one study (on *Physalia* stings) suggested hot water immersion relieved pain. The review recommended further research to identify the most effective treatment for jellyfish stings.

Currently the ARC recommends as dousing with vinegar then ice for analgesia, if a patient is stung by a jellyfish in tropical Australia (Australian Resuscitation Council, 2010). Neither victim was treated with vinegar. A recent laboratory study has suggested that there is an increase in venom recovery (~60% of the initial amount of venom released) when vinegar is applied to electrically discharged *C fleckeri* nematocysts (Welfare et al., 2014). Others have criticized this study's methodology and the applicability of the study to the experiences of treating 'real life' stinging with vinegar (Yanagihara and Chen, 2014; Thaikruea and Siriariyaporn, 2016).

There is limited clinical evidence for the use of ice in Australian jellyfish stings. Currie and Jacups reported a prospective observational study from Darwin of jellyfish stings in the 'Top End' of the Northern Territory and Darwin occurring between 1991 and 2004 (Currie and Jacups, 2005). Of the 225 cases of *Chironex fleckeri* stings, 158 described the pain as "moderate or severe". Of these 225 cases, 129 were treated with ice, 108 required further analgesia and 68 required "parenteral narcotic" to treat the pain (Yanagihara and Chen, 2014). This suggested that ice failed to provide adequate analgesia in the majority of patients treated. Other authors reported no benefit using ice when they had been sting by *Chironex fleckeri* jellyfish (Exton et al., 1989).

Compared to ice as a first aid treatment for jellyfish stings, there is more evidence supporting the use of heat.

Laboratory work performed in Cairns demonstrated that the lethality of *Chironex fleckeri* venom on fresh water crayfish was lost when the venom was heated above 43 °C for 20 minutes (Carrette et al., 2002). Haemolytic activity was found to be reduced when the crude venom from *Carybdea alata* was pre incubated at temperatures above 25C (Chung et al., 2001). Other, non published data, from one of us (JS) has demonstrated a similar loss of lethality when *Carukia barnesi* venom is heated above 43 °C.

While there have been a small number of published studies looking at the role of heat as a first aid agent in Australia, none have been performed examining jellyfish stings in tropical Australia._, A prospective randomized studies in NSW both demonstrated a significant reduction in pain in treating *Physalia* sp (Blue bottle) sting using heat compared to ice (Loten et al., 2006). This effect was so effective that the study was stopped early. A small series from Bussleton (WA), demonstrated an 88% reduction in pain using heat compare to 25% for ice with the local *Carybdea* species (Taylor, 2007).

In Hawaii, two studies looking at stings due to *Alatina alata* previously reported as *Carybdea alata*), a jellyfish that has been reported to cause Irukandji syndrome, both showed significant reduction in pain scores compared to cold packs and/or placebo (Thomas et al., 2001; Nomura et al., 2002). In a retrospective chart audit of 5 years of jellyfish sting presentations to one health centre in Hawaii, heat (either hot shower or hot packs) was seen to be superior to parenteral analgesia with 23/25 reporting relief of symptoms. This study included six patients with "Irukandji like" syndrome (Yoshimoto and Yanagihara, 2002).

In one systematic review of the evidence for treating jellyfish stings by jellyfish in North America and Hawaii, the authors concluded "… hot water and topical lidocaine may be more widely beneficial in improving pain symptoms …" (Ward et al., 2012). Another more recent systematic review of the literature found the majority of studies supported the use of hot water immersion in the treatment of jellyfish stings. Importantly the review did not find any studies that showed any worsening of symptoms or poorer outcomes (Wilcox and Yanagihara, 2016).

Whilst it is difficult to draw any firm conclusions on using heat as a first aid for jellyfish stings based on these two cases, it is important to note that the heat did not appear to worsen the subjects' condition. We strongly concur with the calls by Li and others (Li et al., 2013) for additional pre-clinical and clinical studies to elucidate optimal care after serious jellyfish stings.

Ethical statement

None.

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Transparency document

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