BRIEF COMMUNICATIONS

A Probable Case of Irukandji Syndrome in Thailand

Anna M.G. de Pender, MD,* Kenneth D. Winkel, MD, PhD,† and Robert J. Ligthelm, MD*

*Department of Internal Medicine, Harbour Hospital and Institute for Tropical Diseases, Rotterdam, The Netherlands; †Australian Venom Research Unit, Department of Pharmacology, University of Melbourne, Melbourne, Victoria, Australia

DOI: 10.1111/j.1708-8305.2006.00041.x

The Irukandji syndrome is a jellyfish envenomation caused by *Carukia barnesi* or related jellyfish. In literature, the distribution of "Irukandji-like" syndromes is restricted to Australia. We report a case of probable Irukandji syndrome in Thailand. With this report, we hope to promote awareness to aid sting prevention and stimulate research.

Venomous bites and stings are one of the many hazards faced by travelers to coastal tropical regions. The Irukandji syndrome, a potentially lethal jellyfish envenomation caused by *Carukia barnesi* or related jellyfish[1–3] is one such hazard. Until a recent report from Florida,[4] only minimally documented anecdotes of "Irukandji-like" syndromes after presumed jellyfish stings had been reported outside of Australia. Consequently, it was thought that this envenomation was almost entirely restricted to northern Australia. We now report (after retrospective audit of the records of our travel medicine clinic) a case of probable Irukandji syndrome in a Dutch tourist, stung while swimming off coastal Thailand. To our knowledge, this is the first description of this type of marine envenomation in Southeast Asia. Thus, the Irukandji syndrome should always be considered in the differential diagnosis of a person becoming ill after swimming in tropical waters. We also hope that travel medicine clinics will warn intending travelers to the tropics of the risks of significant jellyfish stings.

Corresponding Author: Robert J. Ligthelm, MD, Havenziekenhuis & Instituut voor Tropische ziekten, Afd. Interne geneeskunde, Haringvliet 2, 3011 TD Rotterdam, The Netherlands. E-mail: rjligthelm@cistron.nl

Case Report

A 46-year-old woman was seen at the outpatients Department for Tropical Diseases at the Harbour Hospital, Rotterdam, 4 weeks after her return from a holiday. She had been vaccinated before travel and had taken antimosquito measures. Her prior medical history was unremarkable, and she was not taking any regular medications. One afternoon in February 2001, at the beginning of her third week in Thailand, while swimming in the sea at Ban Koong i Tham, she experienced an acute burning sensation on the inside of her left arm. The pain became so intense that she had to leave the water. Although she did not notice any jellyfish before or after the sting, a bystander later removed something from her left arm with tweezers. The pain initially subsided but returned in waves after 20 minutes involving her whole left arm. In addition, she suffered severe head, shoulder, lower back, and limb pain associated with heavy perspiration, repeated vomiting, and, eventually, collapse. At the beach, a lifeguard repeatedly recorded blood pressures of 180/140 mm Hg. On admission to the local emergency ward, 1 hour after the initial event, she was alert and orientated, and complaining of severe generalized muscular pain. She had a sinus tachycardia of 180 beats per minute (bpm) and a blood pressure of 100/70 mm Hg. Her electrocardiogram

(ECG) showed a tachycardia of about 160 to 180 bpm, with very mild ST depression from leads V1 to V6. There were no dermatological abnormalities noted. She was treated with morphinomimetica for the pain and admitted to hospital. That first day, there was a minimal rise in Creatinine phosphokinase, with a normal CPK cardiac isoenzymes CK-MB. No other laboratory abnormalities were detected, but troponins were, unfortunately, not assessed. She was admitted to the Coronary Care Unit of a nearby hospital, where she quickly recovered except for persisting generalized myalgia. She was diagnosed as having a non–Q wave myocardial infarction, discharged after 2 days, and flew to the Netherlands 2 days later. She was seen at her local hospital where no evidence of cardiac damage could be found; an echocardiogram and an exercise stress ECG were both normal. Her ECG from Thailand was reassessed and considered to show depression in the ST segment due to the tachycardia. She was then seen at the travel clinic because of persistent left arm symptoms, described as "an electric pain." This pain had slowly improved over the preceding 3 weeks. A very slight erythema was observed exactly where she had experienced the first sting. Neurological examination was unremarkable except for mild hyperesthesia on the inside of the lower left arm. Six weeks later she had fully recovered.

Discussion

The Irukandji syndrome was first named in 1952 after an Aboriginal tribe that lived on the coast of northeastern Australia,[5] the geographical "hot spot" for this marine envenomation. The major causative jellyfish in northern Australia, *C barnesi*, is a remarkably small, yet potent, four-tentacled box jellyfish.[1,2,6] It has a translucent medusa with a diameter of 1 to 2 cm, with a single tentacle extending from each corner of the bell. The tentacle may extend up to 1 m in length (Figure 1). Evidence suggests that additional species may be responsible for cases of differing severity and stings at differing locations.[4,7,8]

The venom of *C barnesi* triggers massive sympathetic nervous system activation leading to the release of catecholamines.[6] Ischemia from widespread small vessel vasoconstriction resulting from noradrenalin release and afferent pain fiber activation are postulated mechanisms for the characteristic pain.[9]

The clinical features of the Irukandji syndrome vary but must include (1) contact with sea water in the last 60 minutes, (2) a delay of 5 to 60 minutes between a relatively mild sting and the onset of

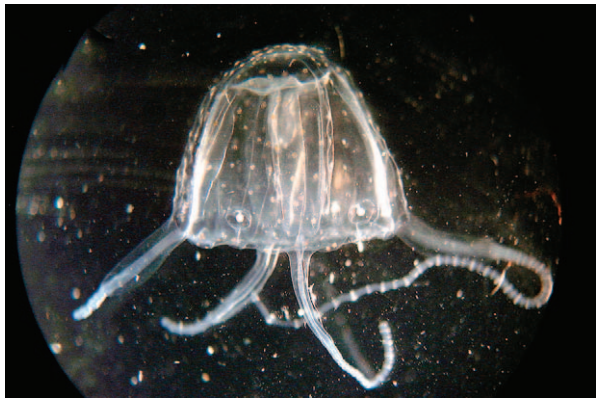

Figure 1 Light microscopic view of the Irukandji jellyfish (*Carukia barnesi*) (10 mm diameter at base). Photograph taken by Lisa-Ann Gershwin.

constitutional symptoms, and (3) at least three of the following systemic clinical symptoms: nausea; vomiting; headache; sweating; anxiety; restlessness; muscle cramps in all four limbs, the abdomen, and chest; or severe low back pain.[1,2,4,5,8,10] While skin welts are observed in most cases,[8] skin necrosis is not present, unlike stings from larger multitentacled box jellyfish.[5,11,12] Additional important features are hypertension and tachycardia and, less commonly, cardiopulmonary decompensation or intracerebral hemorrhage. Myocardial damage, as measured by elevated troponin levels, has been described in 22% of patients suffering from Irukandji syndrome in northern Australia.[2] The same study documented nonspecific ECG abnormalities, most involving T-wave inversion and ST-segment depression in about 10% of such cases. Echocardiograms were performed on patients with elevated troponin levels and showed mild to severe myocardial dysfunction that normalized over time.

Symptoms may last from hours to several days with many patients (20%–50%) being admitted to hospital for pain control. The sting usually occurs while wading or swimming in coastal areas of northern Australia and the Caribbean.[1–3,5,8] The Irukandji syndrome has now been documented during the summer and autumn months in both hemispheres.[1–3,5,8]

Stings, including fatalities, from larger multitentacled box jellyfish, like *Chironex fleckeri* and *Chiropsalmus* spp, have been previously recorded amongst tourists swimming offshore Thailand and Malaysia.[11,12] Clinical features at these sting sites include multiple wide erythematous lines with transverse bars, which are frequently accompanied by vesiculation and necrosis. Most of these cases

only suffer local pain, requiring analgesia and wound care to avoid necrosis—only a minority of cases present with systemic features. However, such symptoms start almost immediately and include confusion, agitation, collapse with respiratory failure, and cardiac arrest. Death is typically rapid,[11,12] whereas fatal complications after Irukandji stings take hours to evolve.[3]

Other well-recognized marine envenomations reported in Southeast Asia include sea snake bites and fish stings. Puncture marks are usually evident in cases of sea snake bite, and the envenomation is characterized by neurotoxicity and/or myotoxicity.[13] Fish stings can cause severe localized pain in association with some nonspecific constitutional effects but are distinguished from jellyfish stings by the presence of a puncture wound from contact with a venomous barb (typically affecting the foot or ankle). Moreover, fish sting pain is usually associated with puncture site and regional, rather than generalized, pain.[13]

Overall, considering the alternative marine envenomation syndromes, the clinical features of this case fit best with the case definition of the Irukandji syndrome. In particular, after a delay of about 20 minutes and after the initial sting site pain subsided, the syndrome complex of waves of generalized muscular pain, perspiration, vomiting, tachycardia, and collapse occurred, characteristic of the Irukandji syndrome. However, it is apparent that not all the clinical features were classical for this sting type. For example, although the blood pressure was initially elevated, our patient appeared to become hypotensive in hospital. This possibly may have been due to transient myocardial dysfunction,[2,8,10] a known complication of the syndrome. Also, the local symptoms were more prominent and persisted for an unusually long time. A sting by a large multitentacled box jellyfish is unlikely due to the delay in onset of constitutional features combined with the absence of characteristic sting site welts and blistering. This raises the possibility that the responsible "Irukandji" jellyfish is not *C barnesi*, perhaps another small, as yet unidentified, carybdeid. Indeed, this issue is well recognized in the literature and has been described for other cases accepted to otherwise meet the case definition of the Irukandji syndrome.[4,7,10]

The causative jellyfish may be ascertained by examining nematocysts sampled from the sting site, most commonly by skin scraping or sticky tape sampling (Figure 2).[2] Although something was removed from the arm of our patient with tweezers, this material unfortunately was not investigated. In the case of a *C barnesi* sting, discharged, harpoon-like ellipsoid tentacular nematocysts with shaft and spines may have been seen by microscopy.

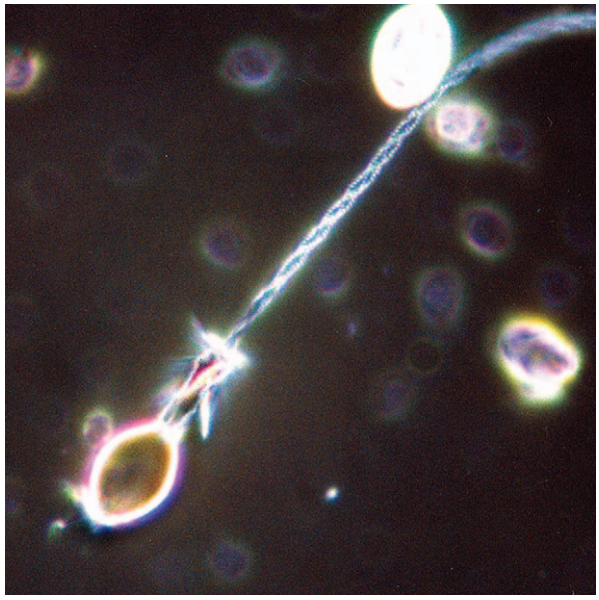

Figure 2 The discharged, harpoon-like ellipsoid tentacular nematocyst with shaft and spines (25–18 μm wide). Photograph taken by Lisa-Ann Gershwin.

Suspected Irukandji syndrome cases should be taken to hospital for assessment and treatment. First aid measures include the immediate application of vinegar (a nematocyst inhibitor) to the sting site to prevent further envenomation. The use of compressive bandage as first aid remains controversial and is not currently recommended. Although unproven, immersion in hot, but not scalding, water has also been advocated by some as first aid for box jellyfish stings[14]—this technique is currently recommended for venomous marine fish stings,[13] and its place in box jellyfish stings is currently subject to clinical trial in Australia. Sublingual nitroglycerine spray has been suggested to help control hypertension prehospital but is also contentious.[15] In hospital, control of hypertension, narcotic analgesia, and supportive care are the mainstays of management. No specific antidote is available, and *C fleckeri* box jellyfish antivenom does not appear effective in the treatment of Irukandji syndrome.[6,16] While initial clinical studies suggest that intravenous magnesium sulfate infusion may reduce the pain and hypertension seen in this syndrome, the place of this drug remains to be determined.[9]

In conclusion, our patient presented with features consistent with the Irukandji syndrome from a region outside of its previously known distribution. With this report, we hope to promote awareness of

this marine envenomation to aid sting prevention and to stimulate further research.

Declaration of Interests

The authors state that they have no conflicts of interest.

References

1. Barnes J. Cause and effect in Irukandji stingings. Med J Aust 1964; 24:897–904.
2. Huynh TT, Seymour J, Pereira P, et al. Severity of Irukandji syndrome and nematocyst identification from skin scrapings. Med J Aust 2003; 178:38–41.
3. Fenner PJ, Hadok JC. Fatal envenomation by jellyfish causing Irukandji syndrome. Med J Aust 2002; 177:362–363.
4. Grady JD, Burnett JW. Irukandji-like syndrome in South Florida divers. Ann Emerg Med 2003; 42: 763–766.
5. Flecker H. Irukandji sting to North Queensland bathers without production of wheals but severe general symptoms. Med J Aust 1952; 2:89–91.
6. Winkel KD, Tibballs J, Molenaar P, et al. The cardiovascular actions of the venom from the Irukandji (*Carukia barnesi*) jellyfish: effects in human, rat and guinea-pig tissues in vitro and in pigs in vitro. Clin Exp Pharmacol Physiol 2005; 32:777–788.
7. Cheng AC, Winkel KD, Hawdon GM, McDonald M. Irukandji-like syndrome in Victoria. Aust N Z J Med 1999; 29:835.
8. Macrokanis CJ, Hall NL, Mein JK. Irukandji syndrome in northern Western Australia: an emerging health problem. Med J Aust 2004; 181:699–670.
9. Corkeron MA, Pereira P, Makrocanis C. Early experience with magnesium administration in Irukandji syndrome. Anaesth Intensive Care 2004; 32:666–669.
10. Little M, Mulcahy RF, Wenck DJ. Life-threatening cardiac failure in a healthy young female with Irukandji syndrome. Anaesth Intensive Care 2001; 29: 178–180.
11. Suntrarachun S, Roselieb M, Wilde H, Sitprika V. A fatal jellyfish encounter in the Gulf of Siam. J Travel Med 2001; 8:150–151.
12. Fenner PJ, Williamson JA. Worldwide deaths and severe envenomation from jellyfish stings. Med J Aust 1996; 165:658–661.
13. Nimorakiotakis B, Winkel KD. Marine Envenomations Part 2—other marine envenomations. Aust Fam Physician 2003; 32:975–979.
14. Watters MR, Stommel EW. Marine neurotoxins: envenomations and contact toxins. Curr Treat Options Neurol 2004; 6:115–123.
15. Fenner PJ, Lewin M. Sublingual glyceryl trinitrate as prehospital treatment for hypertension in Irukandji syndrome. Med J Aust 2003; 79:655.
16. Nimorakiotakis B, Winkel KD. Marine Envenomations Part 1—jellyfish. Aust Fam Physician 2003; 32:969–974.