Aquatic Antagonists: Jellyfish Stings

Jason S. Park, PharmD; Dirk M. Elston, MD

PRACTICE **POINTS**

- Jellyfish stings occur an estimated 150 million times annually worldwide, with numbers expected to rise due to climate change.
- Most stings result in painful self-limited cutaneous symptoms that resolve spontaneously. Box jellyfish (Cubozoa) stings carry a greater risk for causing severe systemic reactions.
- Treatment of skin reactions includes removal of tentacles and hot water immersion. Vinegar dousing for at least 30 seconds is recommended for box jellyfish stings. Supportive care and monitoring for cardiovascular collapse are key. The role of antivenin is uncertain.

Jellies, more commonly known as jellyfish, are a common cause of stings in oceans throughout the world. Most stings result in immediate painful skin reactions that can be treated with hot water immersion and careful removal of adherent tentacles. Rarely, certain jellyfish species can cause life-threatening systemic reactions that must be treated promptly and monitored in the acute care setting. Wearing a full-body stinger suit or applying a sting-inhibiting lotion are common strategies that may reduce the risk for jellyfish injuries. Avoidance of waters during jellyfish season is prudent in regions that harbor more dangerous species of jellyfish, particularly along the Australian and Indo-Pacific coastlines.

Cutis. 2022;109:20-22.

Jellyfish stings are one of the most common marine injuries, with an estimated 150 million stings occurring annually worldwide.[1] Most jellyfish stings result in painful localized skin reactions that are self-limited and can be treated with conservative measures including hot water immersion and topical anesthetics. Life-threatening systemic reactions (eg, anaphylaxis, Irukandji syndrome) can occur with some species.[2-4] Mainstream media reports do not reflect the true incidence and variability of jellyfish-related injuries that are commonly encountered in the clinic.[3]

Characteristics of Jellyfish

There are roughly 10,000 known species of jellyfish, with approximately 100 of them posing danger to humans.[5] Jellyfish belong to the phylum Cnidaria, which is comprised of 5 classes of both free-floating and sessile animals: Staurozoa (stauromedusae), Hydrozoa (hydroids, fire corals, and Portuguese man-of-war), Scyphozoa (true jellyfish), Anthozoa (corals and sea anemones), and Cubozoa (box jellyfish and Irukandji jellyfish).[1,2,6] Jellyfish typically have several tentacles suspended from a free-floating gelatinous body or bell; these tentacles are covered with thousands of cells unique to Cnidaria called nematocytes or cnidocytes containing specialized stinging organelles known as nematocysts. When triggered by physical (eg, human or foreign-body contact) or chemical stimuli, each nematocyst ejects a hollow filament or barb externally, releasing venom into the victim.[7,8]

The scyphozoan, hydrozoan, and cubozoan life cycles generally consist of a bottom-dwelling, sessile polyp form that produces multiple free-swimming ephyrae through an asexual reproductive process called strobilation. These ephyrae grow into the fully mature medusae, recognizable as jellyfish (Figure 1).[5] Additionally, jellyfish populations experience cycles of temporal and spatial population abundance and crashes known as jellyfish blooms. In 2017, Kaffenberger et al[9] reviewed the shifting landscape

Dr. Park is from Geisinger Commonwealth School of Medicine, Scranton, Pennsylvania. Dr. Elston is from the Department of Dermatology and Dermatologic Surgery, Medical University of South Carolina, Charleston.

The authors report no conflict of interest.

The images are in the public domain.

Correspondence: Dirk M. Elston, MD, Department of Dermatology and Dermatologic Surgery, Medical University of South Carolina, MSC 578, 135 Rutledge Ave, 11th Floor, Charleston, SC 29425-5780 (elstond@musc.edu).

doi:10.12788/cutis.0433

Copyright Cutis 2022. No part of this publication may be reproduced, stored, or transmitted without the prior written permission of the Publisher.

of skin diseases in North America attributable to major changes in climate and weather patterns, including the rise in jellyfish blooms and envenomation outbreaks worldwide (eg, *Physalia physalis* [Portuguese man-of-war] [Figure 2] along the southeastern US coastline, *Porpita pacifica* off Japanese beaches). Some research suggests jellyfish surges relate to climate change and human interactions with jellyfish habitats by way of eutrophication and fishing (removing predators of jellyfish).[9,10]

Clinical Presentation

Jellyfish injuries can vary greatly in clinical symptoms, but they do follow some basic patterns. The severity of pain and symptoms is related to the jellyfish species, the number of stinging cells (nematocysts) that are triggered, and the potency of the venom that is absorbed by the victim.[11-13] Most stings are minor, and patients experience immediate localized pain with serpiginous raised erythematous or urticarial lesions following the distribution of tentacle contact; these lesions have been described as tentaclelike and resembling a string of beads (Figure 3).[12] Pain usually lasts a couple hours, while the skin lesions can last hours to days and can even recur years later. This pattern fits that of the well-known hydrozoans *P physalis* and *Physalia utriculus* (bluebottle), which are endemic to the Atlantic and Indo-Pacific Oceans, respectively. The scyphozoan jellyfish causing similar presentations include *Pelagia noctiluca* (Mauve stinger), *Aurelia aurita* (Moon jellyfish), and *Cyanea* species. The cubozoan *Chironex fleckeri* (Australian box jellyfish or sea wasp) also causes tentaclelike stings but is widely considered the most dangerous jellyfish, as its venom is known to cause cardiac or respiratory arrest.[4,11] More than 100 fatalities have been reported following severe envenomations from *C fleckeri* in Australian and Indo-Pacific waters.[6]

Stings from another box jellyfish species, *Carukia barnesi*, cause a unique presentation known as Irukandji syndrome. *Carukia barnesi* is a small box jellyfish with a bell measuring roughly 2 cm in diameter. It has nematocysts on both its bell and tentacles. It inhabits deeper waters and typically stings divers but also can wash ashore and injure beach tourists. Although Irukandji syndrome usually is associated with *C barnesi*, which is endemic to Northern Australian beaches, other jellyfish species including *P physalis* rarely have been linked to this potentially fatal syndrome.[6,11] Unlike the immediate cutaneous and systemic findings described in *C fleckeri* encounters, symptoms of Irukandji-like stings can be delayed by up to 30 minutes. Patients may present with severe generalized pain (lower back, chest, headache), signs of excess catecholamine release (tachycardia, hypertension, anxiety, diaphoresis, agitation), or cardiopulmonary

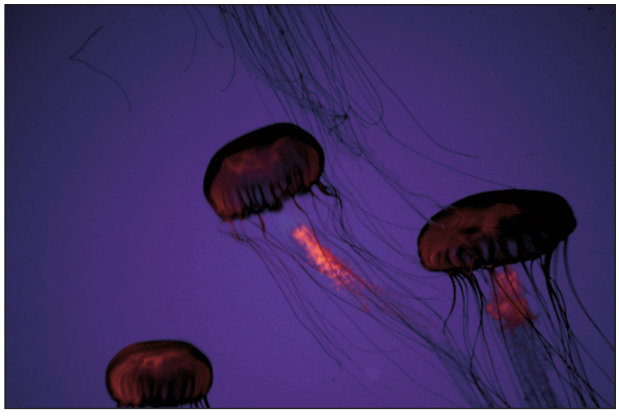

FIGURE 1. Pacific sea nettles *(Chrysaora fuscescens)* of class Scyphozoa in medusa form.

FIGURE 2. Portuguese man-of-war *(Physalia physalis).* Jellyfish often wash ashore and cause injury to unsuspecting beach travelers; footprint in upper right for size comparison.

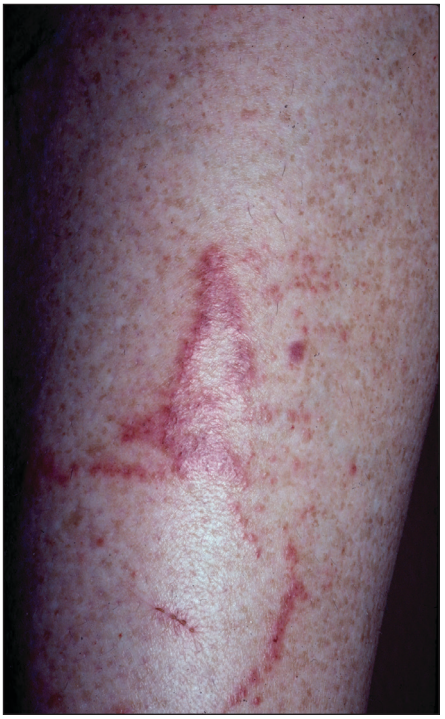

FIGURE 3. Serpiginous tentaclelike lesions following a jellyfish sting.

Copyright Cutis 2022. No part of this publication may be reproduced, stored, or transmitted without the prior written permission of the Publisher.

decompensation (arrhythmia, cardiac arrest, pulmonary edema).[6,11,14,15] Anaphylactic reactions also have been reported in those sensitized by prior stings.[16]

Management

Prevention of drowning is key in all marine injuries. Rescuers should remove the individual from the water, establish the ABCs—airway, breathing, and circulation—and seek acute medical attention. If immediate resuscitation is not required, douse the wound as soon as possible with a solution that halts further nematocyst discharge, which may contain alcohol, vinegar, or bicarbonate, depending on the prevalent species. General guidance is available to providers through evidence-based, point-of-care databases including UpToDate and DynaMed, as well as through the American Heart Association (AHA) or a country's equivalent council on emergency care if residing outside the United States. Pressure immobilization bandages as a means of decreasing venom redistribution is no longer recommended by the AHA because animal studies have shown increased nematocyst discharge after pressure application.[17] As such, touching or applying pressure to the affected area is not recommended until after a proper rinse solution has been applied. Tentacles may be removed mechanically with gloved hands or sand and seawater with minimal compression or agitation.

When acetic acid is appropriate, such as for cubozoan stings, commercially available vinegar (5% acetic acid in the United States) is preferred.[16,17] Tap water can cause discharge of nematocysts, and seawater is preferred when no other solution is available.[18] Most marine venoms are heat labile. Immersion in hot water can produce pain relief, but ice can be just as efficacious and is preferred by some patients. Prior reports of patients stung by *Physalia* species demonstrated greater pain relief with hot water immersion compared to ice pack application.[18,19]

In the setting of anaphylaxis, patients should receive epinephrine and be transported to a hospital with appropriate hemodynamic monitoring and supportive care. If the species of jellyfish has been identified, species-specific antivenin also may be available in certain regions (eg, *C fleckeri* antivenin manufactured in Australia), but it is unclear if it improves outcomes when compared with supportive care alone.[6,16]

Conclusion

Following jellyfish stings, most skin lesions will spontaneously resolve. Patients likely will present days to weeks following the inciting event with mild cutaneous symptoms that are amenable to topical corticosteroids. Recurrent dermatitis following a jellyfish sting is uncommon and is thought to be due to an immunologic mechanism consistent with type IV hypersensitivity reactions. Patients may require multiple courses of treatment before complete resolution.[20]

Patient education regarding marine envenomation and mechanical barriers such as wetsuits or stinger suits can reduce the risk for injury from jellyfish stings. Sting-inhibiting lotions also are commercially available, though more research is needed.[21] Many beaches that are known to harbor the dangerous box jellyfish provide stinger nets to direct travelers to safer waters. Complete avoidance during jellyfish season is recommended in highly endemic areas.[1]

REFERENCES

1. Cegolon L, Heymann WC, Lange JH, et al. Jellyfish stings and their management: a review. *Mar Drugs.* 2013;11:523-550.
2. Hornbeak KB, Auerbach PS. Marine envenomation. *Emerg Med Clin North Am.* 2017;35:321-337.
3. Ward NT, Darracq MA, Tomaszewski C, et al. Evidence-based treatment of jellyfish stings in North America and Hawaii. *Ann Emerg Med.* 2012;60:399-414.
4. Burnett JW, Calton GJ, Burnett HW. Jellyfish envenomation syndromes. *J Am Acad Dermatol.* 1986;14:100-106.
5. Brotz L, Cheung WWL, Kleisner K, et al. Increasing jellyfish populations: trends in large marine ecosystems. *Hydrobiologia.* 2012;690:3-20.
6. Ottuso PT. Aquatic antagonists: Cubozoan jellyfish (*Chironex fleckeri* and *Carukia barnesi*). *Cutis.* 2010;85:133-136.
7. Lakkis NA, Maalouf GJ, Mahmassani DM. Jellyfish stings: a practical approach. *Wilderness Environ Med.* 2015;26:422-429.
8. Li L, McGee RG, Isbister G, et al. Interventions for the symptoms and signs resulting from jellyfish stings. *Cochrane Database Syst Rev.* 2013;12:CD009688.
9. Kaffenberger BH, Shetlar D, Norton SA, et al. The effect of climate change on skin disease in North America. *J Am Acad Dermatol.* 2017;76:140-147.
10. Purcell JE, Uye S, Lo W. Anthropogenic causes of jellyfish blooms and their direct consequences for humans: a review. *Marine Ecology Progress Series.* 2007;350:153-174.
11. Berling I, Isbister G. Marine envenomations. *Aust Fam Physician.* 2015;44:28-32.
12. Tibballs J, Yanagihara AA, Turner HC, et al. Immunological and toxinological responses to jellyfish stings. *Inflamm Allergy Drug Targets.* 2011;10:438-446.
13. Tibballs J. Australian venomous jellyfish, envenomation syndromes, toxins and therapy. *Toxicon.* 2006;48:830-859.
14. Stein MR, Marracini JV, Rothschild NE, et al. Fatal Portuguese man-o'-war (*Physalia physalis*) envenomation. *Ann Emerg Med.* 1989;18:312-315.
15. Burnett JW, Gable WD. A fatal jellyfish envenomation by the Portuguese man-o'war. *Toxicon.* 1989;27:823-824.
16. Warrell DA.Venomous bites, stings, and poisoning: an update. *Infect Dis Clin North Am.* 2019;33:17-38.
17. Neumar RW, Shuster M, Callaway CW, et al. Part 1: executive summary: 2015 American Heart Association guidelines update for cardiopulmonary resuscitation and emergency cardiovascular care. *Circulation.* 2015;132(18 suppl 2):S315-S367.
18. Wilcox CL, Headlam JL, Doyle TK, et al. Assessing the efficacy of first-aid measures in *Physalia* sp. envenomation, using solution- and blood agarose-based models. *Toxins (Basel).* 2017;9:149.
19. Wilcox CL,Yanagihara AA. Heated debates: hot-water immersion or ice packs as first aid for cnidarian envenomations? *Toxins (Basel).* 2016;8:97.
20. Loredana Asztalos M, Rubin AI, Elenitsas R, et al. Recurrent dermatitis and dermal hypersensitivity following a jellyfish sting: a case report and review of literature. *Pediatr Dermatol.* 2014;31:217-219.
21. Boulware DR. A randomized, controlled field trial for the prevention of jellyfish stings with a topical sting inhibitor. *J Travel Med.* 2006;13:166-171.

Copyright Cutis 2022. No part of this publication may be reproduced, stored, or transmitted without the prior written permission of the Publisher.