A Case of a Portuguese Man-O-War Envenomation in Southern Rhode Island

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ABSTRACT

We present the case of a 16-year-old patient who was stung by a Portuguese Man-O-War (*Physalia physalis*) in southern Rhode Island (RI) while surfing. *P. physalis* are not typically found in southern RI waters and envenomations are rare. Emergency medical services (EMS) are often the first clinicians to arrive on scene following an injury and are crucial to alleviating the immediate pain and long-term consequences of *P. physalis* envenomations. RI state decontamination and treatment protocols for *P. physalis* envenomations differ from national guidelines. Notably, RI EMS protocols recommend dousing the affected area with vinegar, contrary to national EMS protocols and research studies which indicate that the application of vinegar may increase nematocyst discharge. We examine the current literature for the decontamination and treatment of Portuguese Man-O-War envenomation and provide guidance for treatment of envenomated patients.

KEYWORDS: Marine envenomation; Portuguese Man-O-War; *Physalia physalis*; jellyfish

INTRODUCTION

It is estimated that 150 million jellyfish stings occur annually worldwide.[1,16] Portuguese Man-O-War (*Physalia physalis*) are typically found in warmer tropical and subtropical waters, and sightings and envenomations are rare in the North Atlantic.[2-5] However, recent sightings of *P. physalis* outside of its normal geographic habitat, including in Rhode Island, raises concerns about increased risk of human-*P. physalis* interactions and potential impacts this may have on the economy and public health, particularly for tourists and fishermen.[6-11] Periodic mass beach strandings can occur during seasonal blooms in August and September, months that coincide with increased tourism and beachgoers on the East Coast; an increase in these large scale strandings would significantly affect seasonal tourism.[2,12,13]

A marine invertebrate of the *Hydrozoa* order, the *Physalia* species are pleuston siphonophores, living at the sea-air interface of the ocean.[2] *P. physalis* is exposed to extreme environmental conditions such as ultraviolet light, desiccation, and rough seas.[14] Its only predators are some species of sea turtles as well as sunfish. Its habitat ranges from 55° North to 40° South, covering 71% of the earth's surface, including the North Atlantic.[2,15] *P. physalis* is a siphonophore and, therefore, is not a true jellyfish. Rather, it is a colonial organism composed of zooids that cohesively work together as morphologically and physiologically separate entities.[17] *P. physalis* are propelled along the ocean surface by wind and currents.[18] Tentacles, used to capture prey, can extend 30 meters below the surface.[19] These long tentacles contain a potent hemolysin venom, delivered by nematocysts activated by mechanical and osmotic forces.[20-22] Only a small number of nematocysts discharge on initial contact; remaining nematocysts can remain viable even after the siphonophore has washed ashore, is dehydrated, or a fragment of a tentacle is removed.[32,34-36] Cutaneous stings, as well as systemic reactions, may result from *P. physalis* envenomations.[3, 23-29] Cutaneous stings, or envenomation reactions, include linear, red, hive-like lesions with immediate pain that can dissipate over a few hours. More systemic reactions can cause hypertension, intravascular hemolysis, and acute kidney injury. Currently, numerous protocols exist to treat jellyfish stings primarily focusing on deactivating undischarged nematocysts, followed by treating local stings and pain and, in rare cases, systemic symptoms.[30-33]

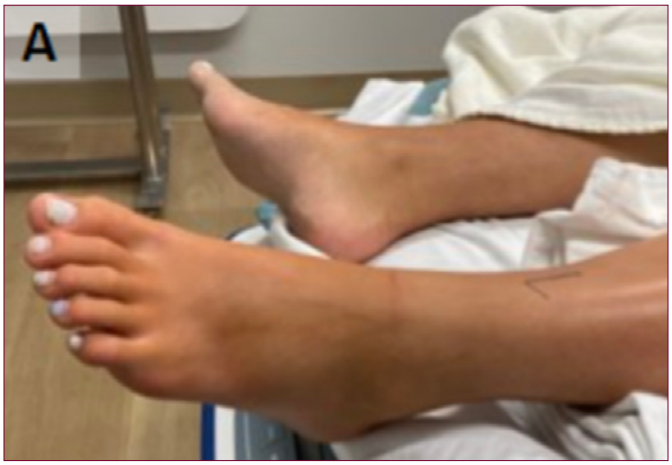
We present a case of cutaneous *P. physalis* envenomation in southern Rhode Island that occurred in July 2023, when there was an increase in *P. physalis* sightings along the shores of southern New England.[6]

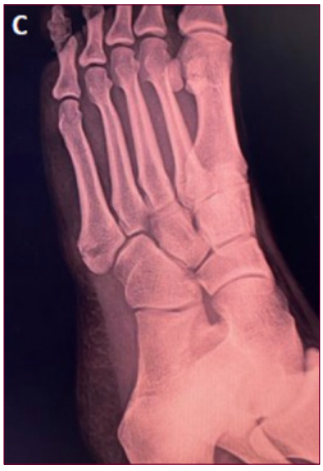
CASE

A 16-y-old patient presented to the emergency department by ambulance after sustaining a *P. physalis* sting. The patient was surfing in southern Rhode Island when she felt a sharp pain to her left ankle, turned and saw a Portuguese Man-O-War, prompting her to paddle into shore immediately. When stepping off her board, she fell due to left ankle pain.

The patient denied head strike, loss of consciousness, numbness, tingling, or any focal neurologic deficits. The patient endorsed 10/10 left ankle pain. The pain was described as "burning" and was worse with movement and palpation. The patient reported almost immediate relief with a vinegar wash in the ambulance en route to the hospital. In

Figure 1. [**A**] Lateral and [**B**] anterior aspects of the linear lesion on the left ankle. [**C**] Oblique radiograph of the left ankle.





the emergency department, 975mg of acetaminophen was administered, and the left ankle was immersed in hot water with improvement in residual pain.

Overall, the patient was non-toxic appearing, with stable vital signs, and without evidence of systemic envenomation. The patient's physical exam demonstrated a linear erythematous lesion at the anterior left ankle (**Figures 1A, B**). Swelling was most prominent surrounding the lesion and localized to the left ankle. The left leg was non-edematous with a non-tender calf. Pain limited left ankle range of motion; however, strength and sensation of the left foot were intact.

Tenderness of the anterior talofibular ligament, in conjunction with left ankle swelling, prompted radiographs (**Figure 1C**). Radiographs demonstrated no acute osseous abnormalities.

DISCUSSION

While *P. physalis* has historically favored tropical and subtropical areas of the Pacific, Atlantic, and Indian Oceans, its habitat extends into the North Atlantic.[2,15] *P. physalis* sightings have also been documented in the Mediterranean.[37] *P. physalis* stings are rarely lethal and most cutaneous envenomations include linear, red, hive-like lesions with immediate pain that can dissipate over a few hours.[23,26] Lethal envenomations have been reported when stings are concentrated in the head and neck, impacting the airway. Systemic reactions are much less common and can result in hypertension, intravascular hemolysis, rhabdomyolysis, and acute kidney injury.[23-25, 30,37] The severity of the sting can vary greatly based on the area of the sting and susceptibility of the individual, with some delayed reactions associated with a type IV hypersensitivity mechanism.[27,29] Overall, cardiotoxicity has been recorded to be the leading cause of death for *P. physalis stings*.[38]

Currently, there are numerous protocols to treat jellyfish stings, primarily focusing on deactivating undischarged nematocysts followed by treating local and, in rare cases, systemic symptoms.[30-33,35,39,40] *P. physalis* envenomations are typically included in jellyfish sting protocols. According to a summarized practical approach published by the American Red Cross Scientific Advisory Council to managing *P. physalis* stings, the most effective way to prevent nematocyst discharge is with a sea water wash preceding tentacle removal, then immersing the lesion in hot water for 20 minutes. Any residual pain can be treated with a cold pack and an aqueous solution of aluminum sulfate in conjunction with analgesia.[51] Sea water has been shown to prevent nematocyst discharge from osmotic imbalances, while hot water alleviates the pain through neuronal sensitization and decreased hemolysis.[33,39,42-46] Aluminum sulfate has also been shown to break down the toxins.[41] The notable variation in *P. physalis* treatment protocol compared to other envenomations is the use of topical vinegar, as some studies have shown it can cause nematocyst discharge and worsen pain, while others have shown the opposite effects.[22,29,34,41,52-59]

In the case presented, the patient noted the prehospital vinegar application actually alleviated some of the left ankle pain. While it is possible that vinegar may prevent nematocyst discharge and relieve toxin-induced pain, the rapid application of vinegar could also have acted as a decontaminant.

With various stimuli initiating nematocyst discharge and a wide variation between jellyfish species, recent research has proposed implementing species-specific protocols for jellyfish envenomations.[32,33] Organizations focused on the development of EMS clinical guidelines, including the National Association of State EMS Officials, have proposed implementing species-specific protocols for oceanic envenomations. For example, Rhode Island Statewide EMS protocol directs providers to wash *P. physalis* stings with vinegar.[49] This varies from the National Model EMS Clinical

Guidelines, which specifically recommend against the use of vinegar wash for *P. physalis* exposures.[47,48,50,51] The misconception that vinegar is an efficacious treatment has been disproven for P. physalis; however, the practice lives on in many places. The reasons are many, stemming from state EMS protocol variation to the misconception that *P. physalis* is a jellyfish, which it is not.

The primary aim of deactivating *P. physalis* nematocysts in small localized envenomations, as in our case above, is to prevent further pain.[32,33,35] However, in more significant exposures, such as stings involving larger body surface areas, more central locations, or on the head, it is crucial to ensure nematocysts are properly deactivated to prevent systemic complications and sensory damage such as ocular injury. This further highlights the importance of species-specific protocols that align with current evidence-based research.

This particular *P. physalis* encounter occurred during July 2023, a period of time in which Rhode Island experienced a significant increase in the number of *P. physalis* sightings across multiple beaches popular with tourists. Prior to this, the last *P. physalis* sighting was in 2021. Thus far, it is unclear if this represents a permanent increase in the *P. physalis* population in the area or if there was a specific weather or wind event that brought the hydrozoan to the New England shoreline. However, in anticipation of future envenomations, it may be beneficial for further patients to institute a more nuanced, species-specific protocol for the treatment of oceanic envenomations.

CONCLUSION

With the recent sighting of *P. physalis* in southern Rhode Island, we recommend first responder and EMS protocols be revised to incorporate species-specific recommendations to treat oceanic envenomations. However, as species identification can be difficult, it may be prudent to encourage first responders to refrain from using vinegar as standard protocol in marine envenomations. To date, the proposed *P. physalis* species-specific protocol includes removing and neutralizing nematocysts with sea water followed by hot water, avoiding vinegar. Further research is required to delineate *P. physalis*-specific protocols from other marine envenomations.

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[Email corresponding author for complete reference list.]

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