Fatal Portuguese Man-O'-War (*Physalia physalis*) Envenomation

A fatal case of Physalia physalis *(Portuguese man-o'-war) envenomation occurred on the Florida Atlantic coast in 1987. Despite appropriate beachside first aid, the patient was conscious only several minutes before having primary respiratory arrest and, later, cardiovascular collapse that resulted in death. Discharged nematocysts were still visible on the injured stratum corneum five days after envenomation. Additional treatment maneuvers suggested by this case include testing the tentacle fragments found on the victim's skin before their removal to ensure that nematocyst firing has been counteracted. We document the first human fatality caused by* P physalis *envenomation. [Stein MR, Marraccini JV, Rothschild NE, Burnett JW: Fatal Portuguese man-o'-war* (Physalia physalis) *envenomation. Ann Emerg Med March 1989;18:312-315.]*

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INTRODUCTION

Although Portuguese man-o'-war envenomations are common occurrences along continental US waters, no fatal cases have been reported.[1] This animal, *Physalia physalis*, is classified in the coelenterate phylum and hydroid subphylum but regarded by most physicians as a "jellyfish." All other jellyfish are in another subphyla of the coelenterates. Injury to human beings is a result of toxic or allergic reactions to jellyfish venom. The most common reaction is a toxic one with the immediate appearance of a linear, papular-urticarial eruption at the area of tentacle contact. This lesion is produced by the injection of a polypeptide containing venom into the dermis where release of several inflammatory mediators then occurs.[2,3] Cutaneous lesions resulting from hypersensitivity to any jellyfish venom are rare, and no person immune to the painful sting has been identified.[4,5]

Death from jellyfish envenomation is common in Indo-Pacific waters. There, the box jellyfish (*Chironex fleckeri* and *Chiropsalmis quadrigatus*) produce a few fatal cases annually by a toxic reaction to their venom. Deaths from anaphylaxis after jellyfish envenomations can occur but are extremely rare.[4]

Deaths from toxic reactions to jellyfish venom occur by actions on the heart, central nervous system, or kidney.[5] Human fatalities presumably could also occur by drowning, secondary to incapacity following painful jellyfish envenomations. Because of its abundance, the length of its tentacles, and the significant pain produced by its sting, the Portuguese man-o'-war has been regarded as dangerous. We document the first fatal human case of envenomation by this animal.

CASE REPORT

A 67-year-old obese (95 kg) woman was swimming in waist-deep water. She was 30 ft offshore at Riviera Beach in an inlet of the Atlantic Ocean near Palm Beach, Florida. Suddenly, she came out of the water with the blue float and tentacles of a Portuguese man-o'-war wrapped around her right midarm and lower arm to the wrist and the left lower arm.

The lifeguards and two friends sprayed a papain solution on the area of contact and removed the tentacles with paper towels. Some of the rescuers received minor stings as they were removing the tentacular fragments. Within minutes, the patient, who was in extreme pain, became dyspneic

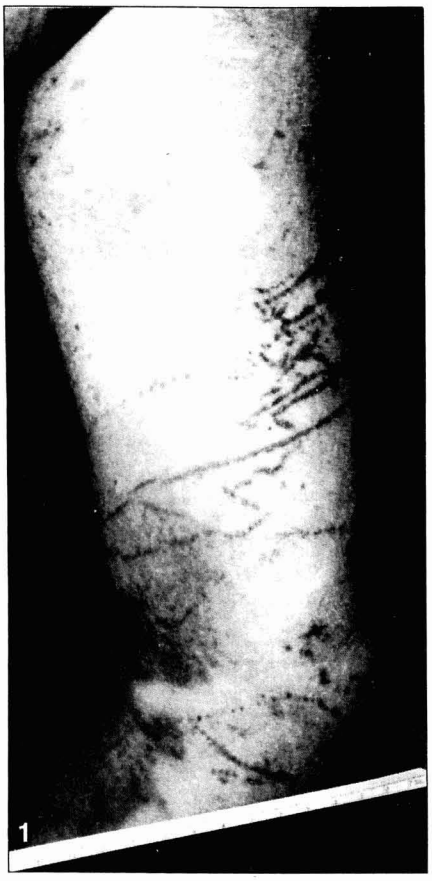

FIGURE 1. *Numerous erythematous linear tentacle marks on the right arm above the elbow. The photograph was taken at postmortem examination five days after the sting.*

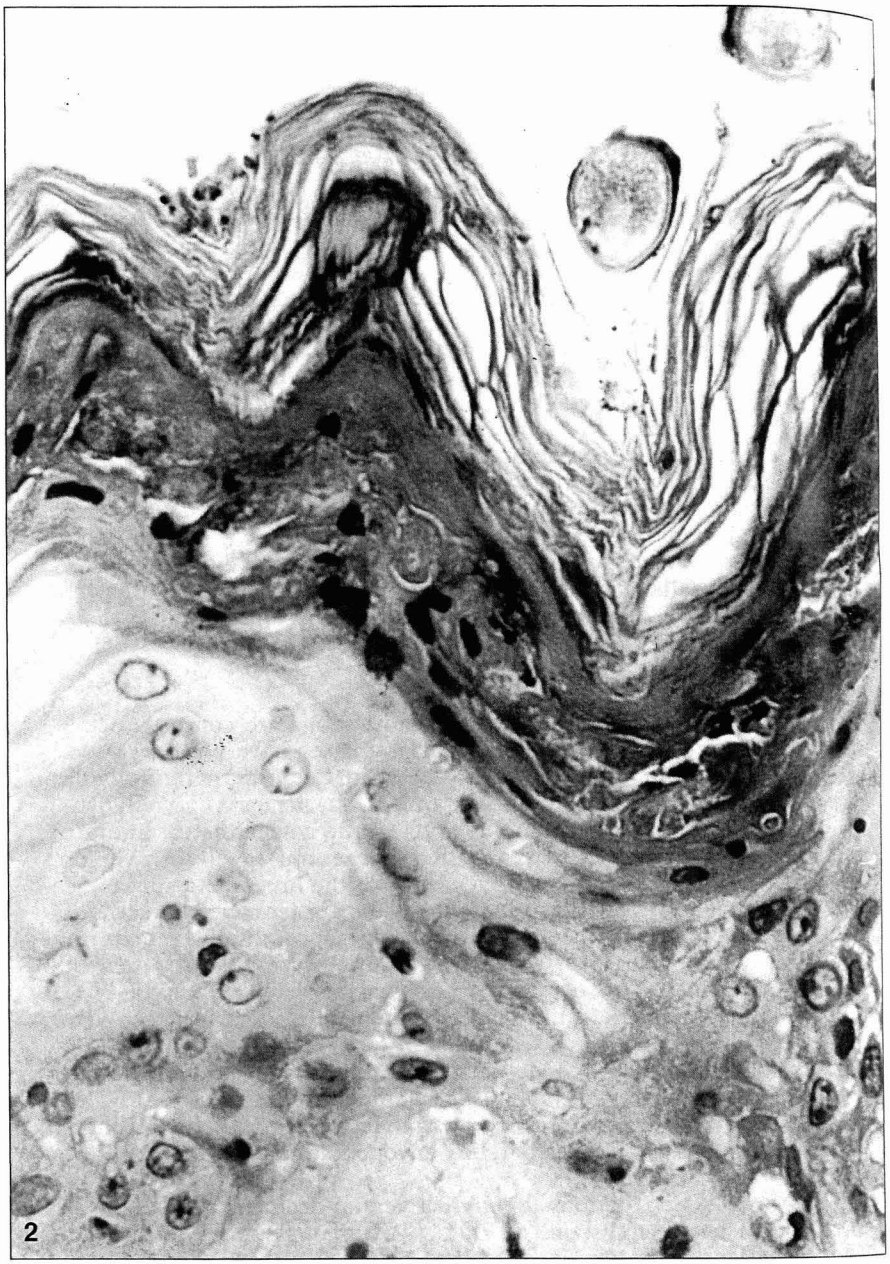

FIGURE 2. *Photomicrograph of lesional skin showing an elongated discharged nematocyst and a barbed, circular empty nematocyst.*

and comatose. On ambulance arrival, an ECG at the beachside three minutes after the sting showed normal sinus rhythm with a rate of 80. There were no respirations; within two more minutes, the pulse decreased to 15. CPR was immediately started, and endotracheal intubation was accomplished within seven minutes after envenomation. Atropine and epinephrine were administered parenterally, and an IV line was started. The patient was cyanotic, cool, and moist as she was transported to a local hospital where she was found to be pulseless and without blood pressure or spontaneous respirations.

An ECG taken at the hospital, 26 minutes after the sting, showed asystole. IV administration of diphenhydramine, methylprednisolone, sodium succinate, sodium bicarbonate, calcium, isoproterenol, and epinephrine was completed. A normal sinus rhythm was achieved after an hour of continuous CPR. At that time, the patient's ECG was consistent with myocardial ischemia, and serial cardiac enzymes (creatine phosphokinase) were elevated. She then developed aspiration pneumonia with respiratory failure and fever.

The patient had been a borderline diabetic with mild hypertension for years. Although she had previously received numerous minor jellyfish stings, she had no history of unusual allergies or abnormal reactions to envenomations and was taking no medication at the time of the accident.

Her physical examination at the time of presentation to the emergency department showed fixed dilated pupils and extensive cutaneous erythema and swelling of the right upper extremity at the site of the envenomation. The patient succumbed after five days of ventilator support without regaining consciousness.

At least 23 separate linear ery-

thematous lesions were seen on the right lower humeral area above the elbow. These lesions ranged in length from 5 to 15 cm and were 1 to 2 mm in diameter. The linear lesions were composed of confluent, erythematous, urticarial, and vesicular components and were estimated to be 275 to 350 cm in total length. These marks were superimposed on a background of diffusely erythematous skin of the midarm (Figure 1).

Microscopic examination of the involved skin showed numerous elongated or oval discharged nematocysts on top of the keratin layer. Threads were found to protrude from the former structure, whereas small barbs were detected on the exterior surfaces of the latter (Figure 2). Subepidermal separations were visible in the skin at the dermoepidermal junction. Patchy areas of necrosis with neutrophils and lymphocytes were present in the epidermis, and extravasation of erythrocytes was seen in the dermis. Focal areas of arteriosclerotic cardiovascular disease and evidence of a coagulopathy but no myocardial death were found on postmortem examination five days after the sting.

Examination of the patient's serum for antibodies against jellyfish venoms was performed on serum drawn five days after envenomation. Significant titers of IgG antibody were obtained against *Physalia* venom and low levels of cross-reactive antibodies to that of the sea nettle *(Chrysaora quinquecirrha)*.[6]

DISCUSSION

Correct therapy for envenomation syndromes requires both an adequate diagnosis of the disorder and identification of the offending species. In our patient, species identification was obvious because the colored tentacles and float were seen on the patient. At that beach location, *Physalia* is commonly present during that season.

The differential diagnosis between anaphylaxis and severe systemic toxicity to jellyfish venom is difficult, especially when a patient is suffering with pain and deteriorating rapidly. However, hypersensitivity reactions including anaphylaxis are rare in jellyfish envenomation, whereas toxicity is common.[5] The treatment of syndromes caused by these two pathogenic mechanisms is different. Reactions of both types require maintenance of the blood pressure and respiration along with oxygenation and analgesia. Recent investigations in mice and rats have shown that IV verapamil is effective in delaying death from cardiotoxicity after serious jellyfish envenomations by several species, including *Physalia*.[7,8] The beneficial effect of the experimental use of this drug is thought to be through its effect on calcium transport, a system altered by coelenterate venoms.[3] We believe that verapamil administration should be considered in patients exhibiting cardiac abnormalities subsequent to jellyfish stings.

Death from jellyfish envenomations may be due to cardiovascular collapse (high dose of venom) or respiratory arrest (lower doses of venom).[9] Until recently, most of the lethal reactions found in the Indo-Pacific region were considered to be due to central respiratory arrest.[9] This conclusion was based on the fact that clinical recovery sometimes occurred after bag respiratory support on the beach. Recently, however, the death of a 5-year-old boy from *Chironex* envenomation in northeastern Australia occurred while he was continuously under the surveillance of trained observers.[10] It was thought that this patient's death was due to cardiovascular collapse similar to that seen in experimental animals. This case was most unusual because the child died with evidence of only 5 ft of tentacle contact, whereas previous reports had indicated that 50 ft of tentacular contact from that animal would be required to result in human death.

While it is not known exactly how many feet of *Physalia* tentacles contacted our 95-kg patient, it is estimated that she touched only 10 to 20 ft because the sting was restricted to the right arm and left wrist. The reason our patient and the 5-year-old boy succumbed to stings covering relatively small areas of their body surface may be due to the fact that both accidents occurred early in the jellyfish season. While a quantitative or qualitative variation in the venom of the jellyfish within a given season has never been demonstrated, it is the clinical opinion of one of the investigators that the more healthy and venomous animals appear early in the season during maturation of the medusae.

In our patient, death may have resulted from primary respiratory failure because a normal ECG was seen when the patient was apneic. Indeed, no evidence of myocardial cell death was seen five days later at postmortem examination.

The pain and injury from jellyfish envenomation can result in another fatal event, such as a myocardial infarction or cerebrovascular accident.[11] This possibility cannot be totally excluded in our case but, as emphasized in an earlier medical editorial, the significant medical point is that man-o'-war stings should not be regarded lightly, especially in the case of an elderly patient.[12]

When treating jellyfish stings, the envenomated patient should be reassured and kept quiet to reduce the uptake of the venom into the circulation. Hot compresses are contraindicated because they increase systemic uptake of the venom. In one incident, visible erythematous lymphangitic spreading of the venom up an extremity was observed after hot compresses. Cold compresses appear to be ineffective. Antivenom therapy, currently unavailable against the man-o'-war venom but prepared for the box jellyfish venom in Australia, is effective for both systemic symptoms and cutaneous pain.[10]

The papain solution used by the beach patrol on this patient was an appropriate maneuver to inactivate undischarged nematocysts still present on skin. In cases of *Physalia* sting, the use of vinegar is an acceptable alternative.[13] Manual removal of tentacles from the victim's skin can be undertaken once the nematocysts have been inactivated. In our patient, secondary stings were experienced by the rescuers who were removing the tentacular fragments. It might be advisable for the first-aid physicians to test these fragments for viable nematocysts on limited areas of their lips before undertaking tentacle removal. This manual process will be difficult as well as time consuming and should never interfere with any necessary CPR.

Patients who recover from severe jellyfish envenomations should be evaluated for possible allergy. Investigations with skin testing and IgE determinations are now under way.[5] Sensitive patients should be cautioned to avoid waters in the habitat

of the animal to which they are sensitive. Should these swimmers insist on continued activity in these waters, they should carry injectable epinephrine and possibly use H_1 and H_2 antihistamines before entering the water.

Nematocyst fragments could be detected on the surface of the involved stratum corneum five days after envenomation in our patient. These structures were present despite all the manipulation that patient must have undergone during a five-day hospitalization. This observation underscores the value of a diagnostic skin biopsy in cases of unknown linear inflammatory eruptions occurring at the beachside, such as phytophotodermatitis, where the differential diagnosis for a reaction to a jellyfish sting can be difficult.[14]

SUMMARY

We report the first fatal case of *Physalia physalis* envenomation. The patient, a 67-year-old woman, died of cardiovascular collapse despite appropriate treatment.

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