

# Aquatic Antagonists: Lionfish (*Pterois volitans*)

Henry Tomlinson, MD; Dirk M. Elston, MD

## PRACTICE POINTS

- Lionfish are now found all along the southeastern coast of the United States. Physicians may see an increase in envenomation injuries.
- Treat lionfish envenomation with immediate immersion in warm water (temperature, 40°C to 45°C) for 30 to 90 minutes to deactivate heat-labile toxin.
- Infected wounds should be treated with antibiotics for common skin flora and marine organisms such as *Vibrio* species.

Lionfish (*Pterois volitans*) are an invasive species originally from the Indian and Pacific oceans and the Red Sea that now are found all along the southeastern coast of the United States. Prompt and comprehensive treatment provides benefit to the patient. As lionfish numbers continue to increase, physicians across multiple specialties and regions may see an increase in envenomation injuries. It is important that physicians are aware of how to recognize and treat lionfish stings.

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The lionfish (*Pterois volitans*) is a member of the Scorpaenidae family of venomous fish.<sup>1-3</sup> Lionfish are an invasive species originally from the Indian and Pacific oceans and the Red Sea that now are widely found throughout tropical and temperate oceans in both hemispheres. They are a popular aquarium fish and were inadvertently introduced in the Atlantic Ocean in South Florida during the late 1980s to early 1990s.<sup>2,4</sup> Since then, lionfish have spread into reef systems throughout the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico in rapidly growing numbers, and they are now found all along the southeastern coast of the United States.<sup>5</sup>

## Characteristics

Lionfish are brightly colored with red or maroon and white stripes, tentacles above the eyes and mouth, fan-shaped pectoral fins, and spines that deliver an especially painful venomous sting that often results in edema (Figure 1). They have 12 dorsal spines, 2 pelvic spines, and 3 anal spines.

## Symptoms of Envenomation

As lionfish continue to spread to popular areas of the southeast Atlantic Ocean and Caribbean Sea, the chances of human contact with lionfish have increased. Lionfish stings are now the second most common marine envenomation injury after those caused by stingrays.<sup>4</sup> Lionfish stings usually occur on the hands, fingers, or forearms during handling of the fish in ocean waters or in maintenance of aquariums. The mechanism of the venom apparatus is similar for all venomous fish. The spines have surrounding integumentary sheaths containing venom that rupture and inject venom when they penetrate the



FIGURE 1. Lionfish (*Pterois volitans*).

From the Department of Dermatology, Medical University of South Carolina, Charleston.

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Correspondence: Henry Tomlinson, MD, 2194 Parkway Dr, Charleston, SC 29412 (tomlinson.henry@gmail.com).

skin.<sup>6</sup> The venom is a heat-labile neuromuscular toxin that causes edema (Figure 2), plasma extravasation, and thrombotic skin lesions.<sup>7</sup>

Wounds are classified into 3 categories: grade I consists of local erythema/ecchymosis, grade II involves vesicle or blister formation, and grade III denotes wounds that develop local necrosis.<sup>8</sup> The sting causes immediate and severe throbbing pain, often described as excruciating or rated 10/10 on a basic pain scale, typically radiating up the affected limb. Puncture sites may bleed and often have associated redness and swelling. Pain may last up to 24 hours. Occasionally, foreign material may be left in the wound requiring removal. There also is a chance of secondary infection at the wound site, and severe envenomation can lead to local tissue necrosis.<sup>8</sup> Systemic effects can occur in some cases, including nausea, vomiting, sweating, headache, dizziness, disorientation, palpitations, and even syncope.<sup>9</sup> However, to our knowledge there are no documented cases of human death from a lionfish sting. Anaphylactic reactions are possible and require immediate treatment.<sup>6</sup>

A study conducted in the French West Indies evaluated 117 patients with lionfish envenomation and found that victims experienced severe pain and local edema (100%), paresthesia (90%), abdominal cramps (62%), extensive edema (53%), tachycardia (34%), skin rash (32%), gastrointestinal tract symptoms (28%), syncope (27%), transient weakness (24%), hypertension (21%), hypotension (18%), and hyperthermia (9%).<sup>9</sup> Complications included local infection (18%) such as skin abscess (5%), skin necrosis (3%), and septic arthritis (2%). Twenty-two percent of patients were hospitalized and 8% required surgery. Local infectious complications were more frequent in those



**FIGURE 2.** Edema of the right hand from a lionfish sting.

with multiple stings (19%). The study concluded that lionfish now represent a major health threat in the West Indies.<sup>9</sup> As lionfish numbers have grown, health care providers are seeing increasing numbers of envenomation cases in areas of the coastal southeastern United States and Caribbean associated with considerable morbidity. Providers in nonendemic areas also may see envenomation injuries due to the lionfish popularity in home aquariums.<sup>9</sup>

### Management

Individuals with lionfish stings should immerse the affected area in hot but not scalding water. Those with more serious injuries should seek medical attention. Home remedies that are generally contraindicated include application of topical papain or meat tenderizer.<sup>10</sup> Data on ice packs are mixed, but because the toxin is heat labile, the most effective initial step in treatment is immersion of the affected area in water (temperature, 40°C to 45°C) for 30 to 90 minutes.<sup>6</sup> The hot water inactivates the heat-labile toxin, leading to near-complete symptomatic relief in 80% of cases and moderate relief in an additional 14%. Immersion time more than 90 minutes considerably increases the risk for burns. Children should always be monitored to prevent burns. If a patient has received a nerve block for analgesia, the wound should not be immersed in hot water to avoid burns to the skin. The wound should be meticulously cleaned with saline irrigation, and radiography or ultrasonography should be performed as deemed necessary to look for any retained foreign bodies.<sup>8</sup> Patients may require parenteral or oral analgesia as well as careful follow-up to ensure proper healing.<sup>9</sup> Systemic symptoms require supportive care. Venomous fish wounds typically are small and superficial. Empiric antibiotic therapy is not advised for superficial wounds but may be required for clinically infected wounds.<sup>8</sup> Tetanus prophylaxis should be given as appropriate to all affected patients. It has been noted that blister fluid contains high concentrations of lionfish venom, and when present, it increases the likelihood of converting the injury from a grade II to grade III wound with tissue necrosis; therefore, blisters should be drained or excised to decrease the chances of subsequent tissue necrosis.<sup>11,12</sup> If secondary infection such as cellulitis develops, antibiotics should be chosen to cover likely pathogens including common skin flora such as staphylococci and marine organisms such as *Vibrio* species. Wounds showing signs of infection should be cultured, with antibiotics adjusted according to sensitivities.<sup>5</sup> Deeper wounds should be left open (unsutured) with a proper dressing to heal. Any wounds that involve vascular or joint structures require specialty management. Wounds involving joints may on occasion require surgical exploration and debridement.

### Public Health Concerns

In an attempt to slow the growth of their population, human consumption of the fish has been encouraged.

The lionfish toxin is inactivated by cooking, and the fish is considered a delicacy; however, a study in the Virgin Islands found that in areas with endemic ciguatera poisoning, 12% of lionfish carried amounts of the toxin above the level considered safe for consumption. This toxin is not inactivated by cooking or freezing and can lead to ciguatera fish poisoning for which there is no antidote and can be associated with prolonged neurotoxicity.<sup>13</sup>

## Conclusion

As lionfish numbers continue to increase, physicians across multiple specialties and regions may see an increase in envenomation injuries. It is important that physicians are aware of how to recognize and treat lionfish stings, as prompt and comprehensive treatment provides benefit to the patient.

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