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REVIEW ARTICLE

Lionfish envenomation: clinical aspect and management

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Abstract

Lionfish (*Pterois* spp.) which is native to Indo-Pacific region has been invading the Turkish coastal region and propagating rapidly as a Lessepsian species in the last years. Envenomation is expected to be encountered more frequently by divers due to its noteworthy appearance and by fishermen due to its novelty in the region. Lionfish sting is mostly seen at hands and results in pain, local edema, erythema and heat at site. Sometimes, cyanosis, pallor, vesicles and tissue necrosis can occur. The systemic signs and symptoms are rare and can be hypo/hypertension, nausea, abdominal pain, fever, dyspnea, convulsions, fainting, paralysis and cardiac failure. Death related to envenomation has not been reported although it is possible. The primary approach in the management of lion fish envenomation is removal of the remaining spines and immersion of the stung part in hot (35-40°C) water. Bleeding should be controlled if present and wound should be cleaned and disinfected. Analgesics are almost always necessary. Tetanus prophylaxis is required for all cases and antibiotics can be administered in case of infection. Imaging techniques can be used to search remaining spine fragments. Lionfish envenomation can be avoided generally by raising awareness and using protective gloves during hunting and cleaning of the fish.

Keywords: Lionfish, *Pterois volitans*, *Pterois miles*, venomous fish

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Lionfish (*Pterois* spp.) is native to Indo-Pacific region and has venomous spines like the rest of Scorpaenidae it belongs to. This family consists of stone fish (Synanceia), scorpionfish (Scorpaena) and lionfish (*Pterois*) in order of venom potency (Garyfallou 1996; Diaz 2015). The common lionfish, *Pterois miles*, is rather confined to the Indian Ocean and Red Sea. However, it has entered to the Mediterranean Sea as a Lessepsian species. It was first encountered at Haifa Bay in 1991 (Golani and Sonin 1992). Around Turkish coasts, it was first seen at Iskenderun Bay in 2014 (Turan *et al.* 2014) and then near Dalyan area in the Aegean Sea in 2015 (Turan and Öztürk 2015).

Lionfish envenomation can occur in their native habitats. However, they do not pose a significant problem since the lionfish population is ecologically limited in these areas and local people are familiar with the species. Even though risk of local scorpion fish envenomation is more severe in the Mediterranean Sea and Turkish coasts, lionfish is a potential threat for divers due to its noteworthy appearance and for fishermen due to its novelty in the area. Up to date, most of the reported lionfish envenomations in the Mediterranean basin and Europe are related to aquarium handling (de Haro and Pommier 2003; Schaper *et al.* 2009). However, envenomations in natural setting are expected to increase since lionfish population and distribution is growing.

P. miles has 12-13 dorsal, 2 pelvic and 3 anal spines which are covered with loose integument. Each spine has a pair of venom glands at the base. When the fin pierces the victim's flesh, the venom is injected through the bilateral grooves connected to the glands (Vetrano 2002). The venom is composed of high molecular weight proteins that have acetylcholine and antigenic character. These proteins are heat-labile and lose their structure in 50-60°C. The venom can retain full potency up to 48 hours even after animal's death (Resiere *et al.* 2016). Acetylcholine is thought to be responsible for muscle fibrillation (Cohen and Oleg 1989). Toxins in the venom cause weakness and transient muscle paralysis by disturbing neuromuscular conduction; muscle contractions, cell necrosis, and serum CPK and AST elevations by increase of intracellular calcium levels (Church *et al.* 2003). Toxins are also shown to cause pain through bradykinin receptors and alterations in heart rate (tachy and bradicardia) and blood pressure (hypo and hypertension) through adrenergic and muscarinic receptors. Besides, it is considered that they have citotoxic, proinflammatory and prothrombotic effects (Cohen and Oleg 1989; Church and Hodgson 2002; Church *et al.* 2003).

Clinical manifestation

The most common symptom in lionfish envenomation is immediate and intense pain which extends proximally to the injured extremity. Pain increases in the first 1-2 hours after the injury and continues about 6-12 hours. Rarely, subsequent pain may persist for weeks (Haddad *et al*. 2015; Resiere *et al.* 2016).

Localized inflammatory edema is the second most common symptom. Sometimes erythema and local heat at injury site change into pallor and cyanosis. Vesicles, bullae and rarely tissue necrosis at puncture area can occur. A grading system has been developed regarding these local symptoms. According to this system, erythema and edema is Grade 1; occurrence of vesicles and blisters is Grade II and tissue necrosis is Grade III (Patel and Wells 1993). Other than these local symptoms, paralysis, muscle contractions and weakness can occur at the injured extremity. There is also a risk of serious necrotizing soft tissue infections at injured area especially for immune-compromised people; local infections may rapidly advance to cellulites,

necrotizing fasciitis, myositis and gas gangrene which then result with severe sepsis. Special attention should be paid to marine infection agents, *vibrio* and *aeromonas*, whose sepsis are reported have high mortality.

Systemic symptoms are not very common in lionfish envenomations. Some cardiac symptoms; hypo/hypertension, tachy/bradycardia and very rarely cardiac failure have been reported. Fever, cold sweating, syncope, nausea, vomiting, dyspnea, convulsions are other possible symptoms. Hypersensitivity to the venom may develop anaphylactic reactions which can be seen on subsequent envenomations. Death related to lionfish envenomation has not been reported, however it is theoretically possible (Haddad *et al*. 2015; Resiere *et al.* 2016).

Unspotted spines that remain embedded in the tissue can cause pain, itching and loss of mobility when close to joints.

Management
Injured area should be irrigated with warm saline or antiseptic solutions. Bleeding should be stopped if present. Visible spines or any other foreign bodiesshould be removed carefully. Possible constriction bands like watch, ring, and bracelet should be removed from the injured extremity.

Anaphylactic reactions should always be considered and antihistaminics or adrenalin should be applied rapidly if necessary. The rare possibility that CPR can be needed on-site and during transportation to hospital should not be ignored.

Pain control is the cornerstone of the management. Immersion of the injured area in non-scalding hot water is the most common method. The claim that heat-labile components of the venom would be deactivated (and so the venom) in hot water is questionable (Atkinson *et al.* 2006). Heat up to 50-60˚C is needed to denature the proteins however it is far hotter than a human can tolerate and would cause burns by denaturizing also tissue proteins. Deterioration of pain when hot water immersion is suspended is a proof that proteins are not deactivated (Haddad *et al.* 2015). Nevertheless, heat application is proven to be effective in pain control. The mechanism of this effect is still not very clear but is thought to be vasodilatation that reverses the vasoconstriction caused by the venom. In this regard, not very high temperatures but temperatures that won't damage tissue (around 40˚C) should be aimed and 45˚C should never be exceeded. Hot water immersion can be applied for 30-90 minutes. If immersion is not possible showering or hot compress can also be applied.

Local or regional anesthesia can be applied if pain is unresponsive to hot water immersion. Bupivacain is preferred due to its long-acting and increased pain

threshold effects. Also oral or intravenous analgesics including opioids are indicated for unresponsive pain.

Some researchers argue that local toxin infiltration in dermis causes the vesicles in puncture sites and drainage of these vesicles can prevent tissue necrosis (Auerbach *et al.* 1987; Patel and Wells 1993). However, this intervention should be performed in appropriate health care centers instead of on-site.

Radiographs, ultrasound or MR imaging can be used to visualize the retained foreign bodies like spine tips or integument in wound site (Diaz 2015). Local anesthesia may be needed to remove these from deep tissue.

In lionfish envenomation, antibiotics are indicated only in case of infection. Prophylactic use is not offered unless the wound is deeply penetrated and contaminated and the patient is immunsupressed. Nevertheless, antibiotherapy should be planned according to culture-sensitivity tests for all puncture wounds and infections. In such a case, it would be reasonable to notify a microbiology laboratory in advance because special culture media can be needed for marine bacteria. Likewise, antibiotherapy should be chosen considering distinctive properties of these marine agents (Diaz 2014; Diaz and Lopez 2015).

Clostridium tetani, tetanus agent, is normally a soil-based bacterium but it can exist in coastal shorelines and tidal waters. Therefore, all cases must receive tetanus prophylaxis.

There is no specific antivenom for lionfish envenomation. Stonefish antivenom has been shown to cross-react with lionfish venom but it is rarely indicated since lionfish envenomation is milder and usually responds to conventional treatments (Diaz 2015).

Recording is also very important for lionfish envenomation. Progression from the initial injury to total healing should be observed objectively so all stages must be photographed.

Prevention

The best strategy for prevention in Mediterranean and Turkey where lionfish is less recognized by divers and fishermen is to create awareness. Divers should be informed that neoprene gloves are not protective in case of handling and most booties or soles are not enough in case of stepping on the fish. Local fishermen and possibly cooks should be trained to recognize the fish and to cut spines immediately.

Even though no fatality has been reported yet, lionfish envenomation should be taken seriously since some of the systemic symptoms and some complications may advance to death. Victims are encouraged to apply to a health care center.

In case of lionfish envenomation, contact with Turkish Marine Research Foundation (TUDAV) or Istanbul Faculty of Medicine, Underwater and Hyperbaric Medicine Department (U&HM) are recommended.

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Aslan balığı zehirlenmesi: klinik görünüm ve tedavi yaklaşımı

Öz

Indo-pasifik bölgelerine özgü bir balık olan aslan balığı, Lesepsiyen bir tür olarak Türkiye kıyılarında da invaziv bir yayılım göstermekte ve sayı ve sıklığı giderek artmaktadır. Bu balıkların güzelliği nedeniyle dalgıçlar ve az tanınır olmaları nedeniyle balık avcıları arasında sokulma olgularına daha sık rastlanmaktadır. Sokulma daha çok ellerde görülmekte ve başlıca ağrı, şişlik, kızarıklık ve ısı artışı bazı olgularda ise siyanoz, solukluk, veziküller ve doku nekrozu gibi yerel belirtilerle seyretmektedir. Belirti ve bulgular daha nadir olarak hipo/hiper tansiyon, taşi/bradikardi, bulantı, kusma, karın ağrısı, soğuk terleme, ateş, soluk darlığı, konvülsiyonlar, senkop, paralizi ve kardiyak yetmezlik gibi sistemik bulgulardır. Sokulmaya bağlı ölüm olayı mümkün olsa da henüz bildirilmemiştir. Aslan balığı zehirlenmesinde temel tedavi yaklaşımı batılı kalan dikenlerin çıkarılması, yara temizliği ve kanamanın durdurulması, görüntüleme yöntemlerinin kullanımı, etkilenen bölgenin 35-40˚C sıcaklığındaki suya sokulması, ağrı kesici, tetanus profilaksisi ve antibiyotik tedavisinden oluşmaktadır. Aslan balığı sokmasından, bu balık hakkındaki bilgi düzeyinin artması ve avlanması ve temizlenmesi aşamasında koruyucu eldiven kullanılması ile korunulabilir.

Anahtar Kelimeler: Aslan Balığı, *Pterois volitans*, *Pterois miles*, zehirli balık

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