

Marine Envenomation



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KEYWORDS

- Marine envenomation • Marine antivenom • Jellyfish • Sea urchin • Sea snake
- Seabather's eruption • Crown-of-thorns • Stingray

KEY POINTS

- Know the marine organisms in your clinical practice area.
- Be prepared to treat anaphylaxis and acute life-threatening envenomations from box jellyfish, irukandji jellyfish, stonefish, cone snail, blue-ringed octopus, or sea snake.
- Know where and how to obtain antivenom.
- Decontamination is species specific and includes removing tentacles, embedded spines, and foreign bodies.
- Attempt pain control with species-specific treatments, including 5% acetic acid (vinegar), hot water immersion, and saline rinse.

INTRODUCTION

Venomous aquatic animals are hazardous to swimmers, surfers, divers, and fishermen. Most marine exposures are mild, so victims may not seek medical care. These exposures include mild stings, bites, abrasions, and lacerations. Severe envenomations from box jellyfish, irukandji jellyfish, cone snails, blue-ringed octopus, stonefish, or sea snakes can be life threatening. In these cases, rapid effective treatment improves immediate outcomes (decrease pain, stabilize systemic symptoms, treat anaphylaxis) and minimizes secondary complications (local allergic response, infection, wound complications). Treatment recommendations evolve in response to acquisition of data, clinical observations, and expert opinion. This article outlines recent management and treatment recommendations for marine envenomations. For the treatment of all envenomations, apply appropriate tetanus immunization. Consider prophylactic or therapeutic antibiotics.

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SPONGES

Epidemiology

Sponges (phylum Porifera) are acellular creatures that attach to the ocean floor. They carry spicules of silicon dioxide or calcium carbonate. Many produce dermal irritants known as crinotoxins.¹ Typical offenders include the fire sponge (*Tedania ignis*), poison bun sponge (*Fibularia nolitangere*), and red moss sponge (*Mammillaria prolifera*).²

Presentation

Spicules and crinotoxins enter the skin, causing edema, vesiculation, joint swelling, and stiffness. Mild reactions subside within 7 days. Extensive exposure may induce fever, chills, malaise, dizziness, nausea, muscle cramps, and formication. Retained spicules can result in persistent bullae that take months to heal. Delayed systemic erythema multiforme or dyshidrotic eczema may develop. In severe cases, surface desquamation may follow.³

Treatment

Remove spicules using adhesive tape, a thin layer of rubber cement, or facial peel. Apply 5% acetic acid (vinegar) soaks. Steroid cream or an oral antihistamine may provide symptomatic relief. Consider systemic corticosteroids for severe allergy, erythema multiforme, or dyshidrotic eczema. Arrange wound checks because infections may develop requiring antibiotic therapy (Table 1).⁴

CNIDARIA

The phylum Cnidaria is divided into four main groups: (1) hydrozoans, including feather hydroids, fire corals, and Portuguese man-of-war; (2) scyphozoans, such as true jellyfish; (3) anthozoans, such as soft corals and anemones; and (4) cubozoans, such as box jellyfish and irukandji.⁵

Hydroids and Fire Coral

Epidemiology

Hydrozoans are multiorganism colonies of diverse configurations. Feather hydroids are plumelike species found in tropical waters. Fire coral has an appearance similar to hard coral. An example is *Millepora*, distributed in shallow tropical waters and dangling tiny nematocyst-bearing tentacles.⁶ The stinging tentacle-bearing Portuguese man-of-war (*Physalia physalis*) and blue bottle (*Physalia utriculus*) are widely distributed.

Presentation

Feather hydroids and fire coral cause immediate pain and urticaria, sometimes progressing to hemorrhagic or ulcerating lesions. Pain usually resolves by 90 minutes and inflammation resolves by 1 week, with occasional residual hyperpigmentation.⁷ Portuguese man-of-war and bluebottle envenomations cause immediate intense pain and linear rashes, with vesiculation and necrosis. Pain improves within hours, and local symptoms resolve within 72 hours.⁸ More severe systemic symptoms include nausea, vomiting, muscle cramps, dyspnea, anxiety, abdominal pain, and headache.

Treatment

For feather hydroid and fire coral envenomations, apply acetic acid 5% (vinegar) to the skin.⁹ Consider steroid cream or an oral antihistamine for symptomatic relief; if the

Table 1
Presentation and treatment of envenomation by dermal contact

Species	Presentation	Treatment
Portuguese man-of-war; blue bottle	Local pain, skin blisters, nausea, vomiting, abdominal pain, muscle cramps, dyspnea	Remove tentacles Hot water (upper limit 45°C) immersion
Box jellyfish	Excruciating pain, hypotension, paralysis, respiratory failure, cardiac arrest, skin blisters and necrosis	Apply acetic acid 5% then remove tentacles Support airway and breathing Antivenom if severe symptoms <i>Avoid hot water immersion or pressure immobilization</i>
Irukandji jellyfish	Catecholamine release, muscle pain, abdominal pain, hypertension, troponin leak, heart failure, pulmonary edema	Remove tentacles Apply acetic acid 5% Cardiac monitoring Blood pressure control (<i>avoid β-adrenergic blockers</i>) Respiratory support
Jellyfish	Mild pain, irritant dermatitis	Remove tentacles Apply acetic acid 5%, lidocaine-containing product, or hot water (upper limit 45°C) immersion
Seabather's eruption	Pruritic papules resembling insect bites in distribution of swim suit	Treat skin with acetic acid 5%, or lidocaine-containing first aid remedy Wash swim suit with hot water and detergent, then machine or sun dry
Sea anemone	Erythema and pruritus Petechiae, blisters, and ulceration	Acetic acid 5% May require prolonged wound care
Feather hydroid; fire coral	Stinging pain, urticaria, petechiae, ulceration, residual hyperpigmentation	Acetic acid 5% May require prolonged wound care
Sponge	Pruritic irritant dermatitis, blisters, delayed desquamation	Remove spicules with tape, rubber cement, or facial peel Acetic acid 5%
Bristle worm	Painful urticarial rash	Remove bristles with tape, rubber cement, or facial peel Acetic acid 5%

reaction is eczematous or indolent, administer systemic corticosteroids. Portuguese man-of-war and bluebottle envenomation treatment is controversial. Acetic acid 5% is shown to worsen cnidocyst discharge in vitro, although some patients report symptomatic relief. A lidocaine-containing product may be equally effective. Recent research supports rinsing with seawater or saline followed by hot water (45°C) immersion.¹⁰ Consider topical steroid cream or ointment; an antihistamine; and for severe reactions, a systemic corticosteroid taper over 14 days (see [Table 1](#)).¹¹

Jellyfish

Epidemiology

Scyphozoans are single-organism jellyfish that range in size from 2 cm to 2 m across the bell and have different forms, including free-floating larva, sessile polyp, and large swimming medusa ([Fig. 1](#)).¹² Mauve stingers (*Pelagia*) are common in US Pacific



Fig. 1. Medusa form of the moon jellyfish (*Aurelia aurita*). (Courtesy of Kirsten B. Hornbeak, MD, Stanford, CA.)

Ocean coastal waters.¹³ The large lion's mane jellyfish (*Cyanea capillata*) inhabits cold Arctic and Pacific waters. Stinging larval forms of multiple species are found in warm waters; these notably include pinhead-sized larvae of the thimble jellyfish (*Linuche unguiculata*).¹⁴

Presentation

Contact with tentacles causes stinging pain and localized erythema that resolve in hours to days. Contact with the larval forms can cause seabather's eruption; pruritic papules resembling bug bites in a bathing suit distribution (within which larvae are trapped) itch and annoy for 2 to 14 days.¹⁵ Other symptoms include fever, headache, chills, malaise, vomiting, conjunctivitis, and urethritis.

Treatment

Management of scyphozoan stings is identical to that for any cnidarian sting, namely, topical acetic acid 5%, hot water immersion, and corticosteroid or antihistamine cream, and in severe cases a systemic corticosteroid.¹⁶ A lidocaine-containing product may be effective as a topical decontaminant. To minimize or prevent seabather's eruption, change swimwear on leaving the water. Use a hot water laundering scrub with detergent and full drying before reuse (see [Table 1](#)).²

Sea Anemones

Epidemiology

Sea anemones and soft corals have tentacles loaded with stinging cnidocytes and secrete mucus that may contain cytolytic and hemolytic toxins, neurotoxins, cardiotoxins, and proteinase inhibitors.^{17,18}

Presentation

Victims experience painful skin lesions with central pallor and a halo of erythema and petechial hemorrhage, sometimes progressing to vesiculation and necrosis. Rare systemic reactions include fever, chills, malaise, weakness, nausea, vomiting, muscle spasm, and syncope. Mild envenomations resolve within 48 hours. Severe reactions may become indolent, leading to hyperpigmentation, hypopigmentation, or keloid formation.¹⁷

Treatment

Treatment of anemone envenomation is similar to that for cnidarian sting (discussed previously). Severe dermatitis may require prolonged wound care with debridement and antibiotics for secondary infection (see [Table 1](#)).

Box-Shaped Jellyfish

Epidemiology

Some highly venomous box-shaped jellyfish inhabit tropical waters. These include the Hawaiian box jellyfish (*Carybdea alata*), Japanese box jellyfish (*Chironex yamaguchi*), and Australian box jellyfish (*Chironex fleckeri*).¹⁹ Each delivers potentially deadly venom.²⁰

Irukandji jellyfish are 1 cm to 2.5 cm box jellyfish and include *Carukia barnesii* and *Malo* species.²¹ The “irukandji syndrome” is local vasoconstriction and high blood pressure attributed to sympathetic nervous system stimulation.²²

Presentation

Box jellyfish stings are excruciating with rapid blistering, muscle spasm, hypotension, and sometimes paralysis. Victims collapse in 1 to 2 minutes from respiratory failure and cardiac arrest. Most deaths occur 5 to 20 minutes after the sting.²³ Skin necrosis is common.

Irukandji envenomation symptoms begin 20 to 30 minutes post sting with muscle pain, abdominal and chest pain, nausea, vomiting, and respiratory failure. Massive catecholamine release causes severe hypertension and tachycardia, leading to cardiomyopathy, pulmonary edema, cerebral edema, troponin leak, and hypokinetic heart failure.²⁴ Two deaths have occurred because of intracerebral hemorrhage.²⁵ Symptoms resolve in 6 to 24 hours.

Treatment

If box jellyfish sting is suspected, support the airway and provide artificial ventilation. Immediately flood sting sites with 5% acetic acid (vinegar) for at least 30 seconds before removing adherent tentacles. Avoid contamination of rescue personnel.¹⁶ Administer specific antivenom one vial intravenous (IV) or introsseous 5 minutes, or three vials intramuscular (IM) at three different sites.⁸ Repeat as needed every 10 minutes up to three times immediately and then once or twice every 2 to 4 hours until there is no further progression of systemic symptoms. Antivenom use is under scrutiny because of poor efficacy noted during in vitro studies.²⁶ However, until further notice it remains recommended.

For irukandji envenomation, in addition to standard cnidarian envenomation treatment measures and supportive therapy, serum troponin and cardiac monitoring should be obtained. β -Adrenergic blockers should not be used because these might contribute to unopposed α -adrenergic stimulation and myocardial ischemia (see [Table 1](#)).²⁷

ANNELID WORMS**Epidemiology**

Bristle worms (phylum Annelida, class Polychaeta) are covered with chitinous bristles that easily penetrate skin.

Presentation

Human contact causes bristles to break off into the skin, causing pricking sensation and urticarial rash with rare necrosis. Pain remits with a few hours, but urticaria may last for 2 to 3 days and skin discoloration for up to 10 days. Secondary infection and cellulitis may occur.²⁸

Treatment

Bristles should be removed with tape, facial peel, or a thin layer of rubber cement. Next, apply acetic acid 5% soaks. If the inflammatory reaction is severe, consider an oral antihistamine or corticosteroid (see [Table 1](#)).

STARFISH AND SEA URCHINS

Epidemiology

The phylum Echinodermata includes starfish and sea urchins. The crown-of-thorns starfish (*Acanthaster planci*) is particularly venomous and produces a toxic slime that coats the spines ([Fig. 2](#)). Venom is hemolytic, myonecrotic, hepatotoxic, and anticoagulant.²⁹

Sea urchins have globular bodies covered by calcified spines either rounded at the tip or hollow and venom-bearing ([Fig. 3](#)).³⁰ They may have pedicellariae (modified spines with flexible heads) that grasp to envenom. Various urchin venoms have been found to contain steroid glycosides, hemolysins, proteases, serotonin, and cholinergic substances.³¹

Presentation

Crown-of-thorns starfish cause puncture wounds with immediate pain, bleeding, and edema. Wounds become dusky and tenosynovitis may develop. Multiple punctures can cause systemic reactions with paresthesias, nausea, vomiting, lymphadenopathy, and paralysis. Pain resolves in 30 minutes to 3 hours. Retained spines can cause granulomas.³²

Sea urchins cause painful puncture wounds with severe local muscle aching lasting up to 24 hours.³³ Frequently, spines break off into the victim. A spine in a joint can cause synovitis.³⁰ Systemic symptoms include nausea, vomiting, paresthesias,

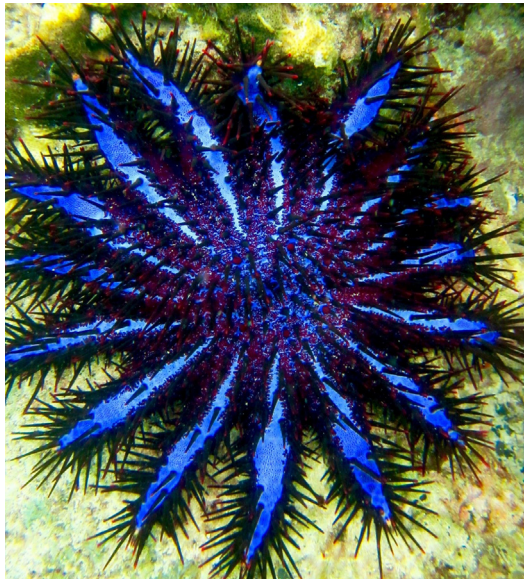


Fig. 2. Spines on the crown-of-thorns sea star (*Acanthaster planci*). (Courtesy of Kirsten B. Hornbeak, MD, Stanford, CA.)

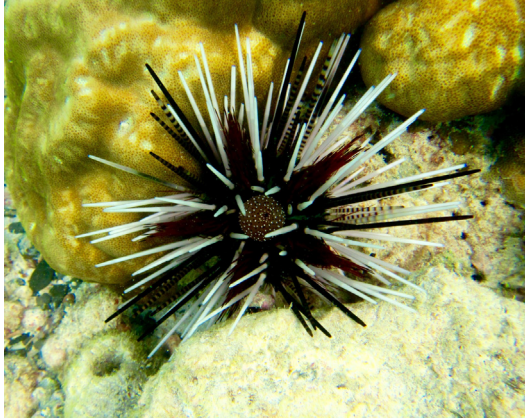


Fig. 3. Spines of the banded sea urchin (*Echinothrix calamaris*). (Courtesy of Kirsten B. Hornbeak, MD, Stanford, CA.)

weakness, abdominal pain, syncope, hypotension, and respiratory distress. Secondary infections are common. Granulomas may develop.³⁴

Treatment

The puncture wounds should immediately be immersed in hot water to tolerance (upper limit 45°C) for 30 to 90 minutes or until there is significant pain relief. Local anesthetic infiltration or a nerve block may be required. Wounds should be irrigated and explored and spines removed if they are easily reached. Dark discoloration may indicate dye in the tissues in the absence of a spine. If this is the case, the discoloration disappears in 24 to 48 hours. If spines have entered a joint or are close to neurovascular structures a surgeon should be consulted and the joint splinted.³⁵ Radiography, ultrasound, computed tomography, or MRI may be helpful in spine localization and removal.³⁰ Reactive neuropathy may respond to a systemic corticosteroid. Secondary infections are common. Granulomas from retained spine fragments may require excision or ablation, and arthritis from retained spines may require synovectomy (Table 2).³⁶

MOLLUSKS

Epidemiology

Cone snails (genus *Conus*) are shelled mollusks.³⁷ Envenomation occurs when the proboscis extends to allow a venom-containing radular tooth to stab the victim. Conotoxins target receptors and channels that mediate neuromuscular blockade.³⁸

Blue-ringed octopuses have iridescent blue rings, measure less than 20 cm, and are found in shallow waters throughout Indo-Pacific oceans. A parrot-like beak injects venom that causes paralysis.³⁹

Presentation

Cone snails cause a bee sting–like puncture wound with local cyanosis. Local paresthesias are followed by spreading paralysis that can lead to respiratory failure within 1 hour. Mild stings cause nausea, blurred vision, malaise, and weakness for a few hours. Paralysis from severe envenomation lasts 12 to 36 hours, with symptom resolution sometimes taking weeks.⁴⁰

Blue-ringed octopus bites create one or two small puncture wounds that often go unnoticed. Within 15 minutes, oral and facial numbness begin that may rapidly

Table 2**Presentation and treatment of envenomation by puncture or laceration**

Species	Presentation	Treatment
Crown-of-thorns starfish	Dusky puncture wound, pain, bleeding, edema Multiple punctures cause nausea, vomiting, paresthesias	Hot water to tolerance (maximum 45°C) for 30–90 min Local anesthetic Locate retained spines Surgical removal if spines near nerve, tendon, or joint
Sea urchin	Red, purple, or black puncture wounds; local muscle aching; edema Multiple punctures cause nausea, vomiting, paresthesias	Hot water to tolerance (maximum 45°C) for 30–90 min Local anesthetic Locate retained spines Surgical removal if spines near nerve, tendon, or joint
Cone snail	Puncture wound resembling bee sting, local cyanosis, limb paresthesias, paralysis, respiratory failure, cerebral edema, coma	Pressure immobilization Support breathing Consider edrophonium, 10 mg IV, for paralysis Consider naloxone, 2–4 mg, for severe hypotension Hot water to tolerance (maximum 45°C) for 30–90 min Local anesthetic Remove retained radula
Blue-ringed octopus	Painless small puncture wounds, facial numbness, paralysis, respiratory failure	Support breathing Supportive care
Lionfish and scorpionfish	Painful puncture wound, blistering, nausea, vomiting	Hot water to tolerance (maximum 45°C) for 30–90 min Local anesthetic or nerve block Locate retained spines Surgical removal if spines near nerve, tendon, or joint
Stonefish	Severely painful cyanotic puncture wound, necrotic ulceration, altered mentation, fever, nausea, vomiting, seizures, paralysis, heart block, heart failure, pulmonary edema	Antivenom for severe envenomation Hot water to tolerance (maximum 45°C) for 30–90 min Local anesthetic or nerve block Locate retained spines Surgical removal if spines near nerve, tendon, or joint Debride necrotic tissue
Stingray	Dusky painful laceration, local hemorrhage and necrosis, barb lodged in victim Large envenomation: nausea, vomiting, muscle cramps, syncope, arrhythmias	Hot water to tolerance (maximum 45°C) for 30–90 min Local anesthetic or nerve block Locate retained barb Surgical removal of barb Treat retained barb as stab wound if barb in thorax, abdomen, groin, or neck Serial debridement of necrotic tissue

(continued on next page)

Table 2 (continued)		
Species	Presentation	Treatment
Sea snake	Painless pinhead-sized fang marks, muscle pain and stiffness, nausea, vomiting, ascending paralysis, respiratory failure, muscle necrosis, renal failure	Pressure immobilization Maintain airway and breathing Antivenom if any symptom Monitor electrolytes and urine output Alkalinize urine if myoglobinuria Dialysis as needed for renal failure and hyperkalemia

progress to paralysis and respiratory failure.⁴¹ Cardiac arrest may follow. Other symptoms include numbness and discomfort of the affected limb, nausea, vomiting, and chest tightness.⁴²

Treatment

For cone snail envenomation, cardiovascular and respiratory support take priority. Pressure immobilization is recommended during transport. Edrophonium (10 mg IV adult dose) has been suggested for paralysis. Adverse reactions to edrophonium are treated with atropine, 0.6 mg IV. Naloxone, 2 to 4 mg, has been suggested to treat hypotension. The wound should be soaked in hot water to tolerance (upper limit 45°C) for 30 to 90 minutes. Consider local anesthetic injection. The wound should be irrigated and foreign bodies (radula) removed.

Treatment of blue-ringed octopus bite centers on cardiovascular and respiratory support. Be prepared to provide artificial ventilation. Paralysis lasts 4 to 10 hours, after which the victim who has not suffered significant hypoxia improves rapidly, with complete recovery in 2 to 4 days (see [Table 2](#)).⁴¹

SCORPIONFISH

Epidemiology

The family Scorpaenidae has members with spines and associated venom glands covered by integumentary sheaths. Lionfish (*Pterois*) are the least toxic, followed by scorpionfish (*Scorpaena*) with moderate toxicity, and stonefish (*Synanceja*) with potent toxicity.⁴³ Lionfish (*Pterois*) are beautiful, with long slender spines ([Fig. 4](#)). Venom may induce local paresthesias and paralysis.⁴⁴ Scorpionfish are camouflaged against their surroundings (ocean bottom and rocks) and have medium-length spines. In experimental animals, venom degrades connective tissue, leads to hypotension and pulmonary edema, and can cause paralysis.⁴⁵ Stonefish hide motionless and possess short stout spines. Their venom is highly toxic.⁴⁶

Presentation

Pain is immediate and peaks at 60 to 90 minutes. With serious envenomation, pain may cause delirium and persist for hours (scorpionfish) or days (stonefish).⁴⁷ The puncture wound is initially ischemic and cyanotic with progressive vesiculation, tissue sloughing, cellulitis, and necrotic ulceration.⁴⁸ Systemic effects include anxiety, headache, skin rash, fever, nausea and vomiting, diarrhea, abdominal pain, seizures, paralysis, pericarditis, atrioventricular block, congestive heart failure, and pulmonary edema.⁴⁹ Death from a stonefish sting can occur within the first 6 to 8 hours. Wounds are often indolent and may require months to heal.



Fig. 4. Spines of the common lionfish (*Pterois miles*). (Courtesy of Kirsten B. Hornbeak, MD, Stanford, CA.)

Treatment

The wound should be immersed in hot water to tolerance (upper limit 45°C) for at least 30 to 90 minutes. Consider local anesthetic infiltration or regional nerve block. The wound should be thoroughly cleansed. If the spine has penetrated deeply into the sole of the foot or hand, surgical exploration should be performed. In a case of severe systemic reaction, stonefish antivenom may be administered IV or IM.⁵⁰ As a rough estimate, one vial of antivenom should neutralize one or two significant punctures, with additional vials administered for recurrent severe pain or systemic manifestations (see [Table 2](#)).⁵¹

STINGRAYS

Epidemiology

Stingrays are flat cartilaginous fish with caudal appendages harboring bilaterally retroserrate barbs and associated venom glands ([Fig. 5](#)). Venom contains serotonin, 5'-nucleotidase, and phosphodiesterase.⁵² Toxin may induce peripheral vasoconstriction, bradycardia, tachycardia, atrioventricular block, and seizure activity.⁵³

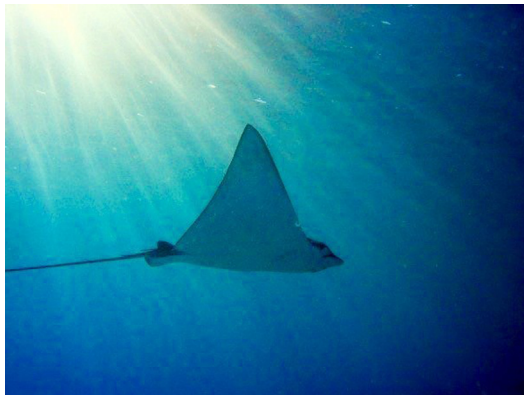


Fig. 5. Australian eagle ray (*Myliobatis tenuicaudatus*), with barb at tail base. (Courtesy of Kirsten B. Hornbeak, MD, Stanford, CA.)

Presentation

Stingray envenomations can cause large lacerations, most often on lower extremities. In rare cases the heart is punctured.⁵⁴ There is intense pain, edema, and bleeding peaking at 30 to 60 minutes and lasting up to 48 hours. The wound is initially dusky and may progress to hemorrhagic necrosis.⁵⁵ Systemic manifestations include weakness, nausea, vomiting, diarrhea, diaphoresis, muscle cramps, headache, syncope, seizures, and arrhythmias.⁵⁶

Treatment

For pain relief, soak in hot water to tolerance (upper limit 45°C) for 30 to 90 minutes.⁵⁷ Narcotics, local anesthetic infiltration, or a nerve block may be needed. The wound should be irrigated and debrided, and imaging obtained to rule out a retained spine.⁵⁸ If a spine is lodged in the chest, abdomen, or other vital structure it should be secured until surgical removal in the operating room.⁵⁹ Wounds are preferably treated with delayed primary closure and should be observed closely because ulceration, necrosis, and secondary infection are common (see **Table 2**).⁶⁰

SEA SNAKES**Epidemiology**

Sea snakes (family Hydrophiidae) inhabit tropical Pacific and Indian oceans.⁶¹ Venom is similar across species. It contains peripheral neurotoxins acting at the acetylcholine receptor, and hemolytic and myotoxic compounds that cause muscle necrosis, hemolysis, and renal tubular damage.⁶² Species implicated in serious envenomations include *Astrotia stokesii*, *Enhydrina schistosa*, *Hydrophis ornatus*, *Hydrophis cyanocinctus*, *Lapemis hardwickii*, *Thalassophina viperina*, and *Pelamis platurus*.⁶³ Because fangs are short and easily dislodged, approximately 80% of bites do not result in envenomation.⁶¹

Presentation

Sea snake bites cause minimal pain and may resemble mere pinpricks. In 30 to 60 minutes, nausea, muscle stiffness, swallowing dysfunction, blurry vision, and paralysis occur. Respiratory distress, paralysis, electrolyte disturbances, and myoglobinuria with acute renal failure contribute to the ultimate demise. If symptoms do not develop within 6 to 8 hours, there has rarely been envenomation. Mortality is 25% in victims who do not receive antivenom and 3% overall.⁶⁴

Treatment

Apply pressure immobilization during transport. Administer sea snake antivenom IV as soon as possible.⁵⁰ Anticipate respiratory failure and provide mechanical ventilation. Monitor serum electrolytes and renal function because hyperkalemia, rhabdomyolysis, and renal dysfunction are common. If myoglobinuria is detected, alkalize urine with sodium bicarbonate and administer diuretics. Acute renal failure may require dialysis⁶¹ (see **Table 2**).

TREATMENT RESISTANCE AND COMPLICATIONS**Antivenom and Anaphylaxis**

An envenomation or antivenom administration can cause anaphylaxis. Signs include hypotension, bronchospasm, facial and airway swelling, pruritus, urticaria, nausea, vomiting, and diarrhea. Most reactions occur within 15 to 30 minutes and nearly all occur within 6 hours.⁶⁵

A recipient of antivenom should be pretreated with 50 to 100 mg of IV diphenhydramine (1 mg/kg in children). The initial dose of antivenom should be administered no faster than one vial over 5 minutes. If anaphylaxis develops, 0.1- to 0.2-mL aliquots of antivenom should be alternated with 0.03- to 0.1-mg IV doses of epinephrine, or an epinephrine drip administered, titrating to maintain heart rate less than 150 beats/min.

Serum Sickness

Formation of IgG antibodies in response to antigens in antivenom causes deposition of immune complexes that induce vascular permeability, activate complement, degranulate mast cells, and trigger release of proteolytic enzymes. Symptoms present within 8 to 24 days and include fever, arthralgias, malaise, urticaria, lymphadenopathy, rashes, peripheral neuritis, and swollen joints. Serum sickness is managed with systemic corticosteroids until symptoms resolve, followed by a 2-week taper.⁶⁶

Patient evaluation overview

1. ABCs
2. Attempt to identify causative agent
 - Consider the geographic location where the injury took place
 - Wheal and flare reactions are nonspecific
 - Bug bite–type reaction located in areas of a swimsuit is classic for seabather’s eruption
 - A gaping laceration, particularly of the lower extremity, with cyanotic edges suggests a stingray wound
 - Multiple punctures in an erratic pattern with or without purple discoloration or retained fragments are typical of a sea urchin sting
 - Fang marks with weakness, respiratory paralysis, myalgias, blurred vision, and vomiting indicate a sea snake bite
 - An ischemic puncture wound with a red halo and rapid swelling and pain not relieved by hot water immersion suggests scorpionfish envenomation
 - Blisters often accompany a lionfish sting
 - Painless punctures with rapid neuromuscular paralysis suggest a blue-ringed octopus bite
 - The site of a cone snail sting is punctate, painful, and ischemic
 - Rapid (within 24 hours) onset of skin necrosis suggests an anemone sting
 - “Tentacle prints” with cross-hatching suggest a box-jellyfish envenomation
 - Hypertension, muscle aches, and vomiting suggests irukandji syndrome
 - Ocular, intraoral, or genital lesions may come from fragmented hydroids, coelenterate tentacles, or scyphozoan larvae
3. Decontaminate (specific to causative organism)
4. Stabilize and treat

Surgical treatment options

- Debridement
- Spine extraction or laser ablation
- Tendon repair, synovectomy, or granuloma removal

Evaluation of outcome and long-term recommendations

1. Prevention
 - Do not touch marine life when snorkeling, diving, or swimming. Avoid touching the bottom or grasping ledges or overhangs.
 - Wear protective gear that covers all exposed skin.
 - Shuffle feet when walking in shallow sandy areas.
 - Do not stand or walk on reefs.
2. Life-threatening envenomations benefit from rapid decontamination and cardiopulmonary support, and may benefit from antivenom administration.
3. Provide tetanus prophylaxis in all cases and have a low threshold for initiating antibiotics.
4. Marine envenomations often heal slowly and poorly, so arrange for follow-up.

Special pharmacologic treatment options

Drug	Indications	Dosage
Acetic acid 5% (vinegar)	All-purpose skin sting decontaminant	Apply topically
Lidocaine or bupivacaine without epinephrine	Local anesthetic infiltration or nerve block for pain control	Lidocaine, max dose 3 mg/kg Bupivacaine, max dose 2.5 mg/kg
Prednisone (or equivalent corticosteroid)	Severe local inflammation or allergic reaction	60–100 mg PO QD adults 2–5 mg/kg (max dose 50 mg) children PO QD Tapered over 10–14 d
Hydrocortisone 1% cream	For local inflammation and symptomatic relief	Apply BID
Antibiotics	Prophylaxis for puncture wounds and at first sign of infection Should cover <i>Staphylococcus</i> , <i>Streptococcus</i> , and microbes of marine origin, such as <i>Vibrio</i>	Ciprofloxacin, 500 mg PO BID Trimethoprim/sulfamethoazole, 160/800 mg PO BID Doxycycline, 100 mg PO BID
Stonefish antivenom	Hyperimmune horse globulin preparation used to neutralize stings of stonefish	Initial dose: 1 vial per two puncture wounds Repeat for recurrent pain
Box jellyfish antivenom	Hyperimmune sheep globulin preparation used to neutralize the stings of <i>Chironex fleckeri</i> and <i>Chiropsalmus</i>	Initial dose: 1 vial IV or 3 vials IM Repeat up to 3 times every 10 min as needed, and then every 2–4 h until no further worsening
Sea snake antivenom	Hyperimmune horse globulin preparation used to neutralize the bites of most sea snakes	Initial dose: 1–3 vials Up to 10 vials may be required

Nonpharmacologic treatment options		
Treatment	Indication	
Hot water immersion	Jellyfish Stingrays Venomous spined fish	Hot water to tolerance (maximum 45°C); immerse for 30–90 min or until pain relief; check water temperature frequently
Adhesive tape, rubber cement, facial peel	Sponge Bristle worm	Apply gently over wound and peel to remove spicules or bristles
Pressure immobilization	Cone snail Sea snake	Wrap an elastic bandage with a wide margin over the envenomation site at venous-lymphatic occlusive pressure; keep the limb immobile
Scrape with razor	Jellyfish, fire coral, hydroid, anemone	Apply a layer of shaving cream and scrape with a razor to remove nematocysts

SUMMARY

Know the marine creatures in your clinical practice area. Be prepared to act in cases of anaphylaxis or acute life-threatening envenomations from box jellyfish, irukandji jellyfish, stonefish, cone snail, blue-ringed octopus, or sea snake. Know where to obtain antivenom. Prompt topical decontamination (if available) should precede removal of tentacles. Provide adequate pain control. Secondary infection is common, so maintain a low threshold for initiating appropriate antibiotics applicable to marine bacteria.

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