



MICHU-T-79-007

c. 3

CIRCULATING COPY
Sea Grant Depository

Reference Report

LOAN COPY ONLY

Management of Injuries Caused by Marine Organisms

by

Lee H. Somers

and

Martin J. Nemiroff

NATIONAL SEA GRANT DEPOSITORY
PELL LIBRARY BUILDING
URI, NARRAGANSETT BAY CAMPUS
NARRAGANSETT, RI 02882

October 1979

MICHU-SG-79-604

MICHU - T-79-007 C3

MANAGEMENT OF INJURIES
CAUSED BY
MARINE ORGANISMS

LOAN COPY ONLY

by

Lee H. Somers, Ph.D.
Associate Research Scientist
Department of Atmospheric and Oceanic Science
University of Michigan

and

Martin J. Nemiroff, M.D.
Assistant Professor
Department of Internal Medicine
University of Michigan Medical Center

NATIONAL SEA GRANT DEPOSITORY
PELL LIBRARY BUILDING
URI, NARRAGANSETT BAY CAMPUS
NARRAGANSETT, RI 02882

MICHU-SG-79-604

This work is a result of research sponsored by NOAA Office of Sea Grant,
Department of Commerce, under Grant No. 04-M01-134; and from
appropriations made by the Legislature of the State of Michigan.
Funds were disbursed through the Michigan Sea Grant Program.

MANAGEMENT OF MARINE LIFE INJURIES

Lee H. Somers, Ph.D.*
Martin J. Nemiroff, M.D.**

INTRODUCTION

According to a survey conducted by the Michigan Sea Grant Program, it is estimated that nearly 40% of the divers in Great Lakes states travel to the Bahamas, Caribbean, or the Florida Keys annually. An increasing number of recreation divers are also vacationing in the South seas. Consequently, recognition of hazardous forms of tropical marine life and proper first aid management of injuries resulting from contact with these animals must be included in all basic scuba diving courses.

Unfortunately, the procedures for managing tropical marine life injuries are unclear or incomplete in many diving texts and manuals. This is especially true for animals common to Australia and the South Sea islands. Some instructors and guides emphasize "local" or "personal" remedies that have little or no medical validity. Others recommend use of seemingly unorthodox first aid "substances" without explaining the basis for their use; i.e., meat tenderizers. The instructors presentation of "acceptable" first aid procedures is further complicated by "lack of agreement" among tropical marine life authorities and authors. For this paper we have selected the following six books or pamphlets as our principle resources:

- (1) Anonymous, Danger: Stingers, (Queensland State Centre: Queensland Surf Life Saving Association, 1975).
- (2) Anonymous, The NOAA Diving Manual (Washington: U.S. Government Printing Office, 1975).
- (3) Edmonds, C., Lowry, C., and Pennefather, J., Diving and Subaquatic Medicine (Mosman, N.S.W., Australia: Diving Medical Centre, 1976).
- (4) Halstead, B., "Hazardous Marine Life," pp. 227-256 in Strauss, R., Diving Medicine (New York: Grune and Stratton, 1976).

*Department of Atmospheric and Oceanic Science and Department of Physical Education, University of Michigan, Ann Arbor, Michigan, 48109. August 1979.

**Department of Internal Medicine, University of Michigan Medical Center, Ann Arbor, Michigan, 48109.

- (5) Somers, L., Research Diver's Manual, (Ann Arbor, Michigan: University of Michigan Press, 1972).
- (6) Williamson, J., Some Australian Marine Stings and Envenomations, (Queensland State Centre: The Surf Life Saving Association of Australia, 1974).

In the text of this paper reference to information sources will be indicated by the numbers given above.

I have not attempted to discuss marine life recognition and injury prevention techniques. Such information is readily available in diving manuals (5). Rather, I have limited my discussion to first aid and injury management.

STINGS

Most marine animals that inflict injury by stinging belong to the phylum Coelenterata. This phylum includes about 10,000 species in three major classes: Hydrozoa (hydroids, fire coral, and Portuguese Man-of-War), Scyphozoa (jellyfish), and Anthozoa (anemones and corals). Although all coelenterates have stinging tentacles, only about 70 species have been involved in human injuries. However, over 90 percent of the venomous wounds and stings suffered by divers are from this phylum.

Coelenterates are characterized by their unique stinging cells, or nematocysts, which are situated in the outer layer of tentacle tissue. This apparatus consists of a trigger hair, which, when touched, activates a spine, followed by a hollow thread through which a paralyzing drug is injected into the victim. When a diver brushes against or becomes entangled in the tentacles of some coelenterates, thousands of tiny nematocysts may release their stinging mechanism and inject venom.

Symptoms produced by these stings will vary according to species and specimen size, locality, extent and duration of contact, and individual reaction variations. Symptoms may range from a mild prickly or stinging sensation to a throbbing pain which may render the victim unconscious and induce respiratory arrest. The pain may be localized or radiate to the armpit, groin, or abdomen. Local redness may be followed by inflammatory swelling, blistering, or minute skin hemorrhage. There may be shock, muscular cramps, loss of sensation, nausea, vomiting, severe backache, frothing of the mouth, constriction of the throat, loss of speech, breathing difficulty, respiratory/cardiac arrest, paralysis, delirium, convulsions, and possibly, death. Please note that these severe symptoms are generally limited to encounters with only a few species such as the "Box Jellyfish" or "Sea Wasp" (Chironex fleckeri) or extensive exposure to tentacles of

others such as the Portuguese man-of-war. However, an encounter with any jellyfish may cause discomfort.

Common Non-Fatal Jellyfish Stings

Jellyfish commonly encountered by swimmers and divers include:

Sea nettle (Dactyloentra quinquecirrha)
Sea blubber or hair jelly (Cyanea sp.)
Carybdeid medusea (Carybdea sp. and Carukea barnesi)
Little mauve stinger (Pelagia sp.)

These and similar species are considered as non-life threatening in healthy individuals, but are capable of producing unpleasant constitutional disturbances, especially in the elderly. Most diving instructors also include the Portuguese man-of-war (Physalia physalis) and purple sail (Velella velella) in the discussion of jellyfish. Technically, these species belong to a different class of animals (Hydrozoa instead of Scyphozoa) along with fire coral (Millepora sp.). However, management of the hydrozoan stings is basically the same as that for jellyfish stings.

The basic first aid procedures for common jellyfish and hydrozoan stings is as follows:

1. Inflate the victim's buoyancy unit and remove the victim from the water immediately.
2. Immediately douse the area of the sting with liberal amounts of alcohol (common rubbing alcohol or methylated spirits); avoid splashing into eyes, nostrils, mouth or other mucus membrane (genital area, anus, etc.). Do not wash a jellyfish sting with water. Freshwater has an osmotic effect on the nematocysts causing them to discharge. Do not use petroleum products (gasoline, kerosene, etc.) or beer. Beer has the same effect as water.
3. Lay the victim down and keep him as quiet and as motionless as possible. Be alert for symptoms of shock (glassy eyes; dilated pupils; wet, clammy skin; weak and rapid pulse; pale or ashen gray skin; sensations of coldness; etc.) and take appropriate measures as indicated by the victim's condition. Maintain a calm, confident manner and reassure the victim frequently.
4. Using a blunt edge (e.g., a piece of wood) lift or scrape off any adhering tentacles, but only after application of the alcohol. Do not rub the sting area with wet sand. This will bring more stinging cells into contact with the skin and stimulate blood circulation in the area ensuring more rapid absorption of the venom. Also, avoid personal contact with the tentacles.

5. Some authorities recommend the use of meat tenderizer to denature the poisonous protein. The meat tenderizer may be liberally sprinkled on the alcohol moist sting area for several minutes; rinse with alcohol and allow to dry.
6. If available, apply an anesthetic and/or antihistamine cream or spray gently, with minimal rubbing.
7. Use simple pain relief measures, e.g., aspirin tablets or equivalent (see dosage directions on container).
8. Pain relief may require qualified medical aid. Contact a physician if the sting is extensive or the victim is severely distressed.

Some authorities recommend the use of dilute ammonia, various non-irritant fluids having a high alcohol content (e.g., after shave lotion), weak formalin solution (5 to 10 percent), sodium bicarbonate, etc., as acceptable substitutes for, or instead of, alcohol. Alcohol is the fluid of choice because of its inexpensiveness, general availability, and acknowledged effectiveness for the purpose. Alcohol is also an excellent diver's multi-purpose substance being useful as an ear rinse, general disinfectant, and rinsing agent for seawater flooded cameras or strobes.

Some manuals recommend thorough cleansing of the sting area with antibacterial soap and water (2,5). However, Australian authorities specifically state that the affected area must not be washed with soap or water for 24 hours (1,6). The liberal use of alcohol should provide sufficient cleansing of the wound area. I recommend that diving instructors follow those procedures recommended by the Australians in this respect.

Naturally, all stings will not result in severe reactions or require considerable first aid. For example, fire coral stings do not involve tentacle removal and some small jellyfish stings may give only minor, momentary irritation. After minor encounters the diver may continue the dive. However, divers and their buddies must maintain an "awareness" for more serious reactions. In rare cases, respiratory/cardiac arrest may occur and require immediate life saving action.

Potentially Fatal Jellyfish Stings

The Box Jellyfish or Sea Wasp (Chironex flecheri) is the most dangerous known stinging animal in Australian and South East Asian waters. Although records are far from complete,

at least forty fatalities have been recorded on Australian beaches(6). Examination of records shows that one third of the fatal cases are said to have died within three minutes or less of the sting. However, this historical "death within seconds" phenomenon is now questioned by modern authorities. The fact remains that death can occur within minutes and immediate first aid is required. A specimen 7 cm in diameter is capable of killing a healthy child, while a specimen 10 cm or larger in diameter may kill an adult. The following first aid procedure is recommended (1,3,4,6):

1. Remove the victim from the water immediately. Avoid personal contact with any adhering tentacles. If at all possible, do not allow injured area and tentacles to come into contact with sand or boat surfaces. Such contact may bring more sting cells in contact with the skin and cause the release of more venom.
2. Immediately and thoroughly douse the sting area and tentacles with liberal amounts of alcohol (methylated spirits).
3. Isolate the envenomed part, if on limbs, from general circulation as soon as possible. A tourniquet should be applied in the middle of the upper arm or thigh above the injury using the most suitable form of binding applied at a pressure sufficient to stop the flow of blood (pulse). This should be kept in place for 1½ hours or until anti-venin has been given, medical attention received and/or the patient is conscious and breathing normally (1). Most United States authorities on first aid maintain that once applied, the tourniquet should be removed only by medical personnel. Tourniquet shock caused by loosening a tourniquet, can be fatal in itself. Note time of day that tourniquet is applied.
4. Give mouth-to-mouth artificial respiration if the victim has stopped breathing. Cardiopulmonary resuscitation is needed when no obvious pulse is detected. Proceed immediately with routine resuscitation procedures, as indicated. Do not interrupt or delay this aspect of the first aid for any reason if an unconscious patient requires it. requires it. Do not give up on resuscitation procedures until advised to do so by a physician or qualified medical personnel, you are physically unable to continue or the victim recovers. Apply tourniquets concurrently, if not working alone.

5. Remove any remaining tentacles by irrigating the area with more alcohol. Do not handle or rub the tentacles unless removal by irrigation technique is unsuccessful.
6. Oxygen breathing is recommended if equipment is available.
7. Send for medical aid and antivenin equipment. The Australians emphasize not moving a seriously affected victim.
8. Maintain constant observation and keep the victim quiet even if his or her condition improves significantly.
9. Transfer responsibility for patient to qualified medical or ambulance personnel upon

A Sea Wasp antivenin has been developed by the Commonwealth Serum Laboratories, Melbourne, Australia. Antivenin should be administered to any victim of suspected Sea Wasp envenomation who, following the above first aid measures, continues to have difficulty in breathing, swallowing, or speaking, or is in severe pain. The antivenin should not be used for minor stings (4). The decision to use antivenin and the injection must be made by medically qualified/specifically trained persons.

Sponge Injuries

Some sponges will produce skin irritation and, in some cases, symptoms similar to non-fatal jellyfish stings. If symptoms appear after handling sponges, follow the same procedure as for non-fatal jellyfish stings. There appear to be no specific instructions in the literature for management of sponge "stings."

VENOMOUS PUNCTURE WOUNDS

Venomous puncture wounds may be inflicted by sting rays, cat fish, weeverfish, and scorpionfish (Zebrafish, Scorpionfish proper, and Stonefish) and numerous other kinds of venomous fish. The common sting ray and Scorpionfish (Scorpaena sp.) are probably the kinds most commonly encountered by Caribbean divers

In general, the venom apparatus of the sting ray consists of a serrated spine with an enveloping sheath of skin and the caudal (tail area) appendage to which the spine is attached. The spine is edged on either side by a series of sharp retrorse (bent downward) teeth. Along either edge, on the underside of

the spine, there is a deep groove. These grooves contain venom glands which are covered by the skin sheath.

Sting ray wounds are of either the puncture or laceration type. The menace is most serious to persons wading or crawling on the bottom in shallow, protected, sand bottom waters. When contacted, the ray strikes upward with its tail and may drive the spine deeply into the foot or leg. This usually produces a ragged, dirty wound or puncture wound. The wound usually causes immediate and severe pain. Swelling of the wound area is accompanied by an ashy appearance which later turns red. Symptoms of shock along with fainting, nausea, and weakness may follow, depending upon the severity of the injury and the species of sting ray.

Anatomically, the venom organs of venomous fish differ from one group to the next. Generally, the venom organs consist of the dorsal, pelvic, and anal fins, and their associated venom glands. Venom glands are located in the outer skin or sheath of the spine.

The pain from venomous fish stings is usually described as immediate, intense, sharp, shooting, or throbbing, and radiates from the affected part. The pain may be so severe from some species that the victim will lose consciousness. A large spectrum of symptoms including headache, fever, chills, delirium, nausea, vomiting, sweating, convulsions, respiratory distress, and cardiac failure have been noted in the literature.

Every species of the genus Conus (cone shells) produces a venom and most have a fully developed venom delivery apparatus near the shell opening. The venom varies considerably with species and only about 6 of the 500 species are considered deadly to man. The sting of a Conus usually produces a numbness, tingling, or burning sensation which may spread rapidly and become particularly pronounced about the lips and mouth. In severe cases, paralysis and coma may be present. Deaths are believed to result from cardiac failure.

Tetanus bacteria are often found in marine organisms and may infect a victim's wound, particularly deep punctures. Divers should be certain to have not only tetanus, but other immunizations as well up-to-date.

Basic first aid for venomous fish injuries includes the following:

1. Provide immediate surface flotation and remove the victim from the water as soon as possible.
2. Pain will be severe. Have victim lie down and apply measures to prevent/manage shock. Keep affected limb level with the body and as still as possible to minimize spread of the venom.

3. Irrigate open wound areas with sterile saline solution, if available, or cold salt water or fresh water. Remove spine and debris, if visible.
4. Puncture wounds are small in size and removal of venom is difficult. Several authors state that the use of a ligature (tourniquet) is of questionable value (3,4). The use of the ligature is generally discouraged for basic first aiders.
5. Although many diving manuals recommend that first aiders should make a small incision across the wound in order to promote bleeding and irrigate it satisfactorily, Halstead (4) indicates that the incision may be of "limited" value and Edmonds (3) doesn't even refer to it in his discussion of first aid. Other authors (2,6) recommend making a small incision at the site of the wound and use of suction (suction device like the one found in snake kits, not by mouth). In light of modern trends in first aid, and the "potentially limited value" of the incision method indicated by physicians (3,4), I am inclined to not recommend this procedure unless future evidence supports its benefit.
6. Immerse the affected area in as hot of water as the victim can tolerate (up to 50°C/122°F) for 30 minutes. This may produce rapid pain relief and neutralize the venom. Be careful not to scald the tissue; immerse adjacent unaffected skin. Use hot compresses if immersion is impractical or impossible. Immersion in hot water appears to be the most important first aid procedure universally agreed upon by authors/authorities.
7. Qualified medical assistance should be obtained as soon as possible.

Some manuals suggest that cone shell injuries be managed the same as venomous fish stings (2). Edmonds (3) suggests that use of a ligature with incision and removal of venom, as in treatment of snake bite, may be of value if performed early. This procedure is also supported by Williams (6). In light of recommendations in the literature the following procedure should be considered for managing cone shell injuries:

1. Provide immediate surface flotation and remove the victim from the water as soon as possible.
2. Lay the victim down and take appropriate measure to prevent/manage shock. Elevate the affected limb if possible.
3. Apply a tourniquet above the wound site (see instructions under Sea Wasp stings).

4. Sterilize area (and instrument) and make a small incision over the wound. Apply suction with a suction device (like snake bite kit), not by mouth, to encourage bleeding. This procedure should be started as soon as possible.
5. Paralysis and respiratory failure may occur. Make routine observations of respiration and circulation continuously. Employ mouth-to-mouth resuscitation or CPR if and when indicated.
6. Obtain medical assistance as soon as possible.

VENOMOUS BITES

Venomous sea snakes and the blue-ring octopus are a particular threat to divers in Australian and Indo-Pacific waters. At present, there are no reports of sea snakes in the Caribbean or Florida Keys. However, at least one species can be found in the Gulf of California. No fatalities have been associated with octopus species found in the Caribbean and Florida Keys. Since octopus bites are extremely rare, little or no reference to specific first aid is given in the literature except for the blue-ring octopus.

Sea Snake Bites

Sea snake venom is approximately 2-10 times as toxic as that of land snakes. However, they deliver less of it and only about one-quarter of those bitten by sea snakes show signs of poisoning. Only a few of the some 50 species are considered of significant danger to humans.

There may be no pain or reaction at the site of the bite. Symptoms onset progresses from mild to severe, generally beginning with an ill feeling or anxiety, thickening of the tongue, muscular stiffness, and aching. Late symptoms include shock, general weakness, paralysis, thirst, muscle spasms, respiratory difficulties, convulsions and unconsciousness. Deaths have been reported. Sea snake venom appears to block neuromuscular transmission, inducing a generalized and painless skeletal paralysis.

Modern trends in first aid for venomous snake bites exclude the use of the tourniquet-incision-suction procedure (American Red Cross). However, most authorities still recommend the use of a constricting bandage above the bite (2,3,4,6). Halstead (4) states that a tourniquet should be applied tightly enough to occlude the superficial venous and lymphatic return. It should be released 90 seconds every 10 minutes. The constricting band must be applied early, less than 30 minutes

following the bite. Do not apply tightly enough to interrupt arterial flow (2). Incision and suction are of value only if applied within the first few minutes (3) and only Williamson (6) specifically states that first aid should include the procedure. The following first aid management for a sea snake bite is suggested:

1. Immediately provide surface flotation and remove the victim from the water as soon as possible.
2. Lay the victim down and take appropriate measures to prevent/manage shock.
3. Immobilize the affected limb and avoid all exertion.
4. Apply a constricting bandage above the wound site to restrict superficial venous and lymphatic return, not arterial flow. Release 90 seconds every 10 minutes and do not use for more than 4 hours (4).
5. Maintain victim under constant observation. Mouth to mouth respiration/CPR must be started immediately if indicated.
6. Acquire medical assistance as soon as possible. Antivenin is available for some species.
7. If possible, capture the snake or make positive identification of species by recording an accurate description.

Blue-Ringed Octopus Bite

The blue-ringed octopus (Octopus maculosa or Hapalochlaena maculosa) is found only in the Australian and Central Indo-Pacific region. The venom of this octopus is a neurotoxin and a neuromuscular blocker, resulting in painless muscular paralysis. Other symptoms include dryness of the mouth; abnormal sensations around mouth, neck and head, respiratory distress; nausea and/or vomiting and so on.

The following first aid procedures are recommended:

1. Provide immediate surface flotation and remove the victim from the water as soon as possible.
2. Lay the victim down and take appropriate measures to prevent/manage shock. Place victim on side in case of vomiting.
3. Apply a constricting bandage between the wound site and the heart (2,3).
4. Make a small incision over the wound and encourage bleeding (3,6).

5. Maintain the victim under constant observation. Immediately start artificial respiration/CPR if indicated.
6. Do not leave victim unattended for any reason.
7. Reassure the patient who may hear but cannot communicate.
8. Obtain medical assistance as soon as possible.

The bite of the common octopus should be managed as a venomous puncture. The heat should be beneficial in reducing pain.

NON-VENOMOUS BITES

The moray eel, barracuda, and shark can inflict tearing, jagged type lacerations. The shark bite is generally most serious and often requires dramatic first aid procedures to save the victim's life. Relatively minor bites, such as those of the moray eel and barracuda, require first aid procedures for lacerations. Consider the following:

1. Provide immediate flotation and remove the victim from the water as soon as possible.
2. Lay victim down and take appropriate measures to prevent/manage shock.
3. Elevate the affected limb and apply direct pressure to the wound to control bleeding. Use a sterile dressing, if available.
4. Obtain medical assistance as soon as possible.
5. If there is a delay in medical care and bleeding is controlled, scrub the wound with warm water and antibacterial soap and cover with a sterile dressing.

Shark bites are frequently much more severe with massive tissue damage and profuse bleeding. In many cases immediate application of a tourniquet will be required to stop life-threatening blood loss.

ABRASION, LACERATION AND PUNCTURE WOUNDS

Abrasions and lacerations are common among divers. Such injuries may result from careless contact with beach rock, boat hardware, docks, corals, barnacles and so on. Puncture wounds

resulting from contact with sea urchins are probably responsible for the largest percentage of marine life associated diver injuries.

Cuts and Abrasions

First aid management of cuts and abrasions is extremely important, especially in tropical areas. Secondary infection is a major concern in marine life injuries. Often wounds are ragged and dirty. Diving and life styles in the tropics promote continuous contamination of the wound and retard healing. The following first aid measures should be considered:

1. Immediately cleanse wound with hot water and anti-bacterial soap. Specific antibacterial soaps may be obtained using a prescription from your physician. Dial soap has been recommended as an "off the shelf" substitute.
2. Promote free bleeding.
3. Remove all visible debris; excessive probing can cause unnecessary tissue damage. Deeply embedded materials may require medical removal.
4. Cleanse wound area again, rinse with sterile water and gently dry with a sterile pad (or air dry).
5. Keep the wound dry, at least when not diving. Cleanse and change dressing as soon as possible upon returning from a dive. Even minor wounds can become seriously infected.
6. The use of antiseptic creams, disinfectants, etc. is a matter of personal preference.
7. Medical attention may be required to cleanse and close serious cuts and/or to arrest infection. Tetanus is a possibility in marine environment wounds.

Sea Urchin Spines

The common sea urchin of the Florida Keys and Caribbean has long, brittle spines and produces a painful puncture-type wound with redness and swelling. The fragments of the spines will produce a purple skin discoloration in the area of the wound. In minor injuries, the spines will dissolve with few complications besides minor pain. However, most spines will cause irritating discomfort of long duration if not removed. Superficial spines can be removed with fine tweezers or a small needle (sterilized), the area thoroughly scrubbed with soap and water, and a sterile dressing applied. Medical services will be required to remove numerous and/or deeply embedded spines. Also, consult a physician if symptoms of infection or other complications appear.

Bristleworm Injuries

Contact with the bristles of the bristleworm may produce inflammation, swelling, and numbness. Bristles can be removed from the skin of the victim using adhesive tape and alcohol should be applied to the area to alleviate discomfort.

CONCLUSION

Prevention of injuries is the best policy. Through proper diving techniques, buoyancy control, environment familiarity, and common sense precaution most diving injuries can be prevented. Carelessness and improper diving techniques lead to injury. Do not handle marine organisms that you are unfamiliar with and do not take chances with those which you know can inflict injury.

Most divers are unprepared to administer proper first aid. Generally, they simply lack the proper "tools." A review of the procedures given in this paper indicates that a properly equipped tropical diver should include the following items in a personal or group kit:

1. Large bottle of alcohol (at least one pint);
2. Antibacterial soap;
3. Tweezers/needles/surgical blade;
4. Constricting band;
5. Sterile dressings and band aids (ample supply of assorted sizes);
6. Metal first aid kit container (with a water-tight cover) that can be used for heating water and large enough to allow immersion of an injured hand or foot;
7. Canned heat and waterproof matches for heating water;
8. Aspirin;
9. Adhesive tape;
10. Meat tenderizer;
11. Anaesthetic and/or antihistamine cream; and
12. Snake bite kit suction device.

All divers should complete a basic/advanced first aid course. Whenever diving in an unfamiliar area, the diver must consult with local divers, professional lifeguards, diving instructors or other knowledgeable authorities regarding potentially hazardous marine life and first aid for specific marine life injuries.

There is still much to be learned regarding first aid for marine life injuries. Changing trends in modern basic first aid practices raise questions regarding "acceptable" procedures for managing a marine life injury. For example, authorities now disagree on the use of a tourniquet as a first aid procedure for venomous land snake bites. Several marine life/diving medicine authorities specifically emphasize the use of a tourniquet. There are also discrepancies in the tourniquet management. Who is right?

Some diving instructors in the United States are quick to condemn the first aid procedures specified by Australian authorities. However, North American divers do not live daily with the potential serious consequences of injuries inflicted by such animals as the sea wasp, the blue-ringed octopus and sea snakes. We must acknowledge the opinion of those persons who deal with these animals on a routine basis. Diving instructors and divers must remain abreast of new developments in first aid. Efforts must be made to establish universally accepted procedures. In the meantime, United States divers must know what first aid practices to expect when working with divers from foreign countries.