

# Surgical Treatment of Envenomation Injuries

Surgical treatment of envenomation injuries usually falls under the supervision of a general or plastic surgeon. Patients are usually not seen in an acute setting, but are referred to the surgeon once tissue necrosis is impending or has occurred. There are many reasons why the number of surgical consultations for envenomation injuries has declined—better first aid and emergency department treatment, better antidotes, wound healing factors, etc. However, despite better initial treatment, surgery occasionally is still indicated. The most common inciting agents that cause soft tissue destruction are pit vipers and brown recluse spiders. Surgical treatment of these envenomation injuries will be discussed. Key words: *arachnidism, brown recluse spider, conservative debridement, pit viper*

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## **ETIOLOGY**

Pit vipers account for the majority of snakebites reported in the United States; this family of snakes includes the copperhead, the rattlesnake, and the cottonmouth.<sup>1</sup> It is thought that the proteolytic enzymes in the pit viper venom cause extensive local tissue necrosis. In addition, enzymatic peptides may cause systemic manifestation that may progress to coagulopathy, shock, acute renal failure, and, rarely, death.<sup>2</sup>

The other poisonous snake that causes morbidity in the United States is the coral snake. Unlike pit vipers, the coral snake releases a powerful neurotoxin but it does not cause significant tissue necrosis. The treatment of coral snake envenomation will not be discussed.

The next class of poisonous agents that may affect humans in North America is the black widow and the brown recluse spiders. The black widow spider is widely distributed in the United States and, not unlike the coral snake, produces a potent neurotoxin with subsequent systemic effects. The treatment of black widow envenomation is medicinal and is discussed elsewhere<sup>3,4</sup> (see the article in this issue by Farhat entitled "Arachnidism").

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The brown recluse spider, on the other hand, is notorious for causing tissue necrosis in the chronic setting. This spider is common throughout the southern United States and is distinguished by a fiddle-like marking on its dorsal thorax and long slender legs. The initial bite may go unnoticed at first, then proceeds with a zone of erythema and blistering at the puncture site. This may be accompanied by a small halo and a stippling rash.<sup>5,6</sup> Over the next week, central ulceration may appear and spread to the underlying fascia or adjacent structures. This tissue destruction is secondary to an intense Polymorphonucleocyte (PMN) infiltration with release of bactericidal factors that cause autodigestion of host tissue. Dapsone, in an acute setting, may be indicated to block this proliferation, and it may prevent local tissue necrosis. Although rare, systemic envenomation may occur with the brown recluse spider; it usually manifests itself in systemic coagulopathy.<sup>5,6</sup>

The medicinal and immediate treatment of pit viper snakebites and brown recluse spiders envenomation injuries will be discussed in more detail in other articles in this issue (see "Arachnidism" by Farhat and "Medical Treatment of Reptile Evenomation" by Radidis). Some authorities have recommended immediate surgical debridement to decrease the local tissue levels of toxins. This author feels, however, that urgent debridement may cause more harm than good.<sup>7,8</sup>

#### **TIMING**

Classically, the soft tissue destruction after an envenomation injury begins with a blister and erythema around the sometimes-unnoticeable bite marks. This may be immediate or delayed up to 2 or 3 days.

Radiating from this small blister is a zone of erythema of 2 to 3 cm with the bite mark

becoming the center of the "bull's eye." This erythema generally does not represent cellulitis, but a local immune response. The erythematous process may spread up to 3 to 5 cm and then, over the ensuing days, the blister will turn into a necrotic eschar (generally 5 to 7 days after the envenomation injury).

At this point surgical consultation is warranted. Generally, the biggest mistake made is overaggressive debridement.<sup>7,8</sup>

#### **TREATMENT PRIOR TO WOUND BREAKDOWN**

There are some significant maneuvers that can be performed prior to wound breakdown. As with other soft tissue injuries, oftentimes the best therapy is simply good hygiene. This would include washing the wound with a hypoallergenic soap or antibacterial soap twice a day while showering. Other commonsense modalities, such as elevation and protecting the wound from exterior trauma, are also important.

If there appears to be bona fide cellulitis, topical antimicrobials (eg, Silvadene) work well. It is important, however, that the patient remove all of the Silvadene during daily cleansing and then reapply it for optimal wound penetration. Systemic antibiotics are indicated only if there is documented cellulitis. It is the opinion of the author that ice packs and heating pads are more harmful than beneficial. The use of topical salicylates (eg, Ben-Gay) is to be discouraged.

#### **SURGICAL TREATMENT**

##### **Intermediate treatment**

The time-honored treatment for these injuries is conservative debridement. It is wise to think of the wound as being a chronic stasis ulcer. Generally, after 2 or 3 weeks post en-

venomation, the wound is "what you see is what you get." There is usually not any further impending necrosis unless secondary infection intervenes. In the past, after initial conservative debridement, the treatment of these open wounds was wet-to-dry dressings with normal saline.<sup>7</sup>

Currently, however, I think the scope of treating open chronic wounds is shifting to wound-healing factors (Santyl and Regranex). It has been my experience that these wound-healing factors expedite healing, particularly in patients with peripheral vascular disease and diabetes. The sine qua non of any treatment is appropriate judicious debridement.<sup>9</sup>

The patient should be seen at weekly intervals, and the wound should be measured and possibly photographed for appropriate documentation.

#### Chronic treatment

Approximately 90% of these open wounds will spontaneously heal simply with time,

elevation, and good wound care. As noted, necrotic tissue is one indication for conservative surgical debridement. Other surgical indications may include recalcitrant pain, failure to progress, bleeding, and spreading infection.

For the chronic non-healing wound, it may be necessary to excise the wound edges and reconstruct the defect either with a split thickness skin graft or a local advancement flap. Rarely, emergent surgical intervention may be indicated for progressive fasciitis that cannot be controlled with systemic antibiotics.<sup>7</sup>

#### Long-term treatment

Almost without exception, any time there is any soft tissue necrosis from a pit viper or brown recluse spider bite, there will be a scar. The patient may be a candidate for scar revision, but the recommendation is to wait at least a year for the scar to mature.

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