



# STATE TOXINOLOGY SERVICES

Toxinology Dept., Women's & Children's Hospital, North Adelaide SA 5006 AUSTRALIA

## SNAKEBITE MANAGEMENT OVERVIEW DOCUMENT

### SNAKEBITE MANAGEMENT OVERVIEW DOCUMENT (continued)

*Sistrurus catenatus catenatus*

#### First aid

1. After ensuring the patient and onlookers have moved out of range of further strikes by the snake, the bitten person should be reassured and persuaded to lie down and remain still. Many will be terrified, fearing sudden death and, in this mood, they may behave irrationally or even hysterically. The basis for reassurance is the fact that many venomous bites do not result in envenoming, the relatively slow progression to severe envenoming (hours following elapid bites, days following viper bites) and the effectiveness of modern medical treatment.
2. The bite wound should not be tampered with in any way. Wiping it once with a damp cloth to remove surface venom is unlikely to do much harm (or good) but the wound must not be massaged.
3. All rings or other jewellery on the bitten limb, especially on fingers, should be removed, as they may act as tourniquets if oedema develops.
4. The bitten limb should be immobilised as effectively as possible using an extemporised splint or sling; if available, crepe bandaging of the splinted limb is an effective form of immobilisation.
5. If there is any impairment of vital functions, such as problems with respiration, airway, circulation, heart function, these must be supported as a priority. In particular, for bites causing flaccid paralysis, including respiratory paralysis, both airway and respiration may be impaired, requiring urgent and prolonged treatment, which may include the mouth to mask (mouth to mouth) technique of expired air transfer. Seek urgent medical attention.
6. Do not use Tourniquets, cut, suck or scarify the wound or apply chemicals or electric shock.
7. Avoid peroral intake, absolutely no alcohol. No sedatives outside hospital. If there will be considerable delay before reaching medical aid, measured in several hours to days, then give clear fluids by mouth to prevent dehydration.
8. If the offending snake has been killed it should be brought with the patient for identification (only relevant in areas where there are more than one naturally occurring venomous snake species), but be careful to avoid touching the head, as even a dead snake can envenom. No attempt should be made to pursue the snake into the undergrowth as this will risk further bites.
9. The snakebite victim should be transported as quickly and as passively as possible to the nearest place where they can be seen by a medically-trained person (health station, dispensary, clinic or hospital). The bitten limb must not be exercised as muscular contraction will promote systemic absorption of venom. If no motor vehicle or boat is available, the patient can be carried on a stretcher or hurdle, on the pillion or crossbar of a bicycle or on someone's back.
10. Most traditional, and many of the more recently fashionable, first aid measures are useless and potentially dangerous. These include local cauterization, incision, excision, amputation, suction by mouth, vacuum pump or syringe, combined incision and suction ("venom-ex" apparatus), injection or instillation of compounds such as potassium permanganate, phenol (carbolic soap) and trypsin, application of electric shocks or ice (cryotherapy), use of traditional herbal, folk and other remedies including the ingestion of emetic plant products and parts of the snake, multiple incisions, tattooing and so on.

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*Sistrurus catenatus catenatus*

#### **Clinical summary**

This most northern *Sistrurus* species possesses highly toxic venom with a yield that seems out of proportion with its size. Although now uncommon in most of its rapidly shrinking range, specimens are showing up in private collections with greater frequency. Therefore, a large specimen might cause quite major envenoming.

In general, bites by pygmy rattlesnakes and massasaugas are less severe than other rattlesnake bites. They cause local pain, swelling, usually only mild to moderate, though more severe swelling can occasionally occur. Blisters can develop, though probably only in the minority of cases and local bruising can occur. Necrosis is uncommon to rare. Major fluid shifts with secondary hypovolaemic shock, though possible, are uncommon to rare. General symptoms occur only in more severe cases and can include nausea, but rarely vomiting. Coagulopathy and pathologic bleeding is not a feature, though at least one species (*Sistrurus miliarius barbouri*) has a haemorrhagin in its venom. Lethal envenoming, though probably possible with a severe bite in a small child, is not a likely outcome.

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*Sistrurus catenatus catenatus*

#### Treatment summary

Massasauga and pygmy rattlesnake bites are usually mild, but can be severe, especially in children, therefore it is advisable to admit and fully assess all cases and observe for 18-24 hrs. However, if there has been no local reaction, nor systemic symptoms, by 1 hr post bite, it is most likely a dry bite, unlikely to develop further problems. In this situation it is reasonable to consider earlier discharge, in consultation with the patient/relatives, particularly if they live in reasonable proximity to the hospital and will be in the care of a responsible adult. In such cases, it may be acceptable to discharge after 6hrs observation.

For cases showing clear evidence of local effects, ± systemic symptoms, insert an IV line and give an initial IV fluid load. If there is evidence of major local swelling, with the potential for fluid shifts and shock, monitor BP closely and consider giving further IV fluids to maintain adequate BP and renal perfusion. In such cases, beware later resolution of the swelling resulting in circulatory overload and pulmonary oedema, especially in children.

Local necrosis is unlikely, compartment syndrome very unlikely to develop. If clinically it appears there may be a developing compartment syndrome, confirm this with pressure measurement before considering fasciotomy, otherwise unnecessary long term limb dysfunction and deformity may well result. Fasciotomy is rarely justified for snakebite.

In cases with significant local or systemic effects, consider antivenom therapy. Not all cases of envenoming by *Sistrurus* species will require antivenom therapy.

In North America it is common practice to grade the degree of envenoming and use this to determine the need for intervention (antivenom etc). While this process is not accepted by all, it does form a basis of common care guidelines and therefore its use should be considered, at least by those working in the USA. The grading is based on experience with rattlesnake (*Crotalus*) bites and any grading should be subject to reassessment, in a dynamic fashion, reflecting the dynamic nature of envenoming. It should be emphasised that this grading is for North American rattlesnake bites (excluding neurotoxic *Crotalus scutulatus* bites) and is not specific for *Sistrurus* species bites.

Grade 0: Non-envenoming (a dry bite); there may be fang puncture marks, but no other local effects or systemic effects.

Grade 1: Mild envenoming; local effects (pain, swelling) limited to bite area, no systemic effects or blood test abnormalities.

Grade 2: Moderate envenoming; local effects extend beyond the bitten area, but not the whole bitten limb, systemic effects present (such as nausea, vomiting, abdominal pain, metallic taste in mouth, fasciculations of isolated muscle groups, especially the face), blood tests abnormal (may include thrombocytopenia, hypofibrinogenaemia, prolonged prothrombin time, elevated CK).

Grade 3: Severe envenoming; rapidly evolving swelling, blistering or ecchymosis or swelling extending to involve the whole bitten limb or beyond, potential for compartment syndrome, major systemic effects (including those seen in moderate envenoming, plus some or all of shock, widespread or severe bleeding, renal failure, respiratory problems, altered conscious state) and blood test abnormalities (severe thrombocytopenia, abnormal coagulation tests, myolysis with grossly elevated CK, myoglobinuria/anaemia, renal failure).

Antivenom would not be required or appropriate for Grade 0 cases, would not necessarily be required for Grade 1 cases, but if used would be at a low dose, while all Grade 2 & 3 cases require antivenom. Grade 3 cases will require a higher initial dose, and often require larger subsequent doses of infusions.

At least in North America (USA) the only approved antivenom for *Sistrurus* species envenoming is the new ovine F(ab)' "Crofab". This expensive, but effective antivenom has only a short half life, owing to the small molecular size, compared to IgG antivenoms, so repeat doses or infusions are often required. The initial dose is usually suggested as 4-6 vials, followed by a further 6+ vials, either stat or, preferably, as an infusion. The common regime suggested is 4-6 vials (each vial is reconstituted with 10mls sterile water) diluted in normal saline (250mls), given IV, initially at a slow rate (20-60ml/min) until it is clear no adverse reaction is occurring, then increase the rate to around 250ml/hr, until the whole initial dose is given. A slower rate or less volume might be required in small children, but still the same dose of antivenom. On completion, reassess to determine if antivenom has been effective. If there is still significant envenoming (eg advancing swelling, major systemic symptoms etc), consider further antivenom, at a similar dose and rate. Thereafter, it is often advisable to maintain antivenom levels by a continuous infusion, at a rate of 2 vials every 6hrs, up to 18+hrs, longer if major envenoming present. Higher doses may be justified in severe cases. Always have epinephrine & resuscitation equipment readily available prior to commencing antivenom therapy, in case of adverse reactions. In the past in the USA it was common practice to perform a skin sensitivity test prior to starting antivenom. This dangerous and ineffective procedure is not appropriate and is not advocated by the producer of Crofab; DO NOT USE SKIN SENSITIVITY TESTING!

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#### **Available antivenoms**

Antivipmyn  
Instituto Bioclon  
Calzada de Tlalpan No. 4687  
Toriello Guerra  
C.P. 14050  
Mexico, D.F.,  
Mexico  
Phone: ++525-488-3716  
Fax: ++525-688-2074  
Email:  
Website:

Polyvalent crotalid antivenom ( CroFab ), Ovine, Fab  
Protherics Inc. (US)  
1207 17th Avenue South  
Suite 103, Nashville  
Tennessee 37212  
U.S.A.  
Phone: ++1-615-327-1027  
Fax: ++1-615-320-1212  
Email: [info@protherics.com](mailto:info@protherics.com)  
Website: [www.protherics.com](http://www.protherics.com)

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#### Management Flowchart

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#### PROTOCOL FOR MANAGING A BITE BY *Sistrurus catenatus*

