

AfriTox Guidelines Scorpion Sting in Southern Africa

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DO NOT ARCHIVE

Treatment protocols are current only on the day of issue. They are frequently revised and rapidly become outdated. Do not store them for future reference.

Overview

All scorpions are venomous and capable of delivering a sting that invariably causes local pain, which may be severe. However, less than 3% of the 2000 known species world-wide are capable of producing severe systemic toxicity. Of the four scorpion families identified in southern Africa, the two most abundant are the potentially dangerous Buthidae family (thick-tailed scorpions), of which the most important genera are *Parabuthus*, *Hottentotta*, *Uroplectes* and *Pseudolychas* (in descending order of toxicity), and the far less venomous Scorpionidae family (thin-tailed scorpions). Only two species of the *Parabuthus* genus have been associated with severe envenomings in South Africa: *Parabuthus granulatus*, the most venomous, found predominantly in the Western and Northern Cape, and the marginally less venomous *Parabuthus transvaalicus*, found mainly in the north eastern areas of the country.

Scorpions are mainly nocturnal and active during the summer months, which is when most human encounters occur. Although the majority of stings are relatively harmless to humans, apart from local pain, a few *Parabuthus* species (thick-tailed scorpions) can cause serious and potentially life-threatening envenomation. As most people cannot accurately identify the scorpion species, the major distinguishing feature of a scorpion with potentially life-threatening venom is one with a thick tail and small pincers. Children are at particular risk and need to be carefully managed. Scorpion antivenom may be used in serious cases of systemic envenomation. With timely supportive treatment and administration of antivenom, if indicated, recovery is anticipated.

Mode Of Toxicity

Potentially life-threatening scorpion venom contains neurotoxins which cause neuronal excitation and massive release of endogenous neurotransmitters (adrenaline, noradrenaline and acetylcholine). The neurotoxin acts on the peripheral nervous system resulting in autonomic excitability, skeletal, cardiac and cranial nerve dysfunction. It does not cross the blood brain barrier; therefore central nervous system effects are uncommon and mostly related to the effects of severe envenomation.

Clinical Features

Local Effects

Immediate local excruciating pain occurs; it is often burning in nature, radiates up from the sting site, and may last for hours. Local paraesthesia and hyperaesthesia may develop within 1-4 hours and persist for a few days or even up to two weeks. The sting mark is mostly not visible, but there may be some mild local inflammation.

Systemic Effects

Scorpionism describes the presence of symptoms and signs of systemic envenomation.

Most common are generalised paraesthesia, hyperaesthesia, muscle pain/cramps, tremors, involuntary movements and fasciculations. Paraesthesia is often experienced in the scalp, around the mouth and on the face, before becoming generalised. Patients may have a passive facies or have marked neuromuscular activity resulting in grimacing, lip smacking or chewing movements.

Sympathetic effects include sweating, hypertension, tachycardia, cardiac arrhythmias, fever and hyperglycaemia. Parasympathetic over activity results in hypersalivation, bradycardia, hypotension, gastric distension, vomiting and diarrhoea, priapism and urinary retention. Some patients may experience visual disturbances.

In children there is often a unique form of marked restlessness and agitation. They may cry and scream hysterically and thrash around the bed with arms and legs flailing about. This is indicative of severe envenomation and not just a reaction to severe pain.

After the **neurological excitation**, there may be a phase of inactivity due to relative depletion of neurotransmitters. This results in generalised muscle weakness. Patients may be unable to walk or even move. They can have difficulty in breathing and bulbar paralysis with dysarthria, dysphagia and drooling.

Respiratory depression may supervene with serious consequences and even

death. Both bulbar paralysis and respiratory difficulty are more common in children. Respiratory failure in children can develop quickly within 1-2 hours.

Cardiotoxicity and pulmonary oedema are not as prominent a feature of scorpion stings in South Africa as compared to other parts of the world.

Some scorpions may squirt venom. If this comes in contact with the nose, eyes or mouth it causes intense burning and irritation.

Fatalities

Fatalities in adults may be due to sudden cardiac arrest whereas in children, who are at higher risk, respiratory distress is more likely to be lethal.

Differential Diagnosis

The diagnosis of scorpionism can be difficult in the absence of a history of scorpion sting, especially in children. It is important to consider alternatives such as:

- Neurotoxic spider (latrodectism) or snake bites.

Other possible diagnoses include:

- Cholinesterase inhibitor toxicity (e.g. organophosphate poisoning),
- Drug overdose.
- Guillain-Barre syndrome.
- Tetanus.

Less commonly:

- Poliomyelitis.
- Botulism.
- Myasthenia gravis.
- Encephalitis.
- Meningitis.
- Subdural haematoma.
- Diphtheria.

Scorpion Identification

Identification of the scorpion type is important for management, but few people are expert in identifying a scorpion at species level.

The following general rules are useful guidelines to enable the clinician to assess the risk of serious envenomation:

- **Tail and pincers** - A thick tail, often with a very prominent sting, and slender pincers are characteristic of the dangerous Buthidae species, whereas the Scorpionidae have slender tails and large pincers, that are used to crush their prey. If the scorpion has been killed or caught it is important to bring the specimen along for identification. For images comparing thick- and thin-tailed scorpions, see Scorpion Identification, in Standard Guidelines.
- **Size of scorpion** - Scorpions less than 40 mm in length very rarely if ever cause serious envenomation. The size of the scorpion is measured from the head to the end of the uncurled tail.
- **Geographical Distribution** - Serious envenomation more commonly occurs west of a longitudinal line passing through Bloemfontein, and north of Gauteng in areas of Limpopo province and the north eastern part of Mpumalanga.
- **Ability to squirt venom** - Certain species of Parabuthus (thick-tailed scorpions) have the ability to squirt or spray venom up to a distance of about one metre. None of the Scorpionidae (thin-tailed scorpions) are capable of spraying venom.

For help with scorpion identification, please consult Identification Experts in the Standard Guidelines.

Treatment

If the scorpion is not able to be identified, treat as outlined in the treatment protocol, “Scorpions - Unidentified”.

If the scorpion is positively identified as a thick-tailed scorpion, treat as follows.

Additional advice on management can be obtained from medical scorpion sting experts. For contact details, see Antivenom and Expert Advice in Standard Guidelines.

First Aid

Check for respiratory inadequacy and support breathing with oxygen and assisted ventilation as required. Clean the sting site with soap and water.

Apply ice or cold compresses, if tolerated.

Do not interfere with the sting site. There should be no cutting, sucking or application of tourniquets or compression bandages.

Immobilise the patient or envenomed limb.

Wash off any venom on the skin or in the mouth or eye with copious amounts of water or any other bland fluid.

Triage

In most cases, the degree of severity of the envenoming is evident quite soon after the sting, within 15-60 minutes. However, in some adults the onset of scorpionism may be delayed up to 12 hours.

All patients should be closely observed for 12-24 hours for the development of neurotoxic features.

Healthy adults with local symptoms only may be observed at home. However, if they develop any systemic symptoms, they are to be urgently admitted to hospital for further monitoring and consideration for antivenom administration.

Admit:

- All children, irrespective of symptoms.
- All high risk adults (elderly, adults in poor general health or with heart or respiratory pathology), irrespective of symptoms.
- All patients with signs of systemic envenomation.

Supportive Treatment

- Support respiration and ventilation. If intubation is required, the paralyzing agent suxamethonium may theoretically have a prolonged effect as interactions between scorpion venom and acetylcholine may delay metabolism.
- If required, intravenous fluids must be given cautiously to prevent fluid overload.
- Tetanus booster should be given if immunity is not up to date.

Monitor

- Airway and breathing (including oxygen saturation) Heart rate and blood pressure
- Gag reflex
- ECG
- Blood gas
- Electrolytes and renal function

Analgesia

Nearly all scorpion stings are painful and most will require analgesia. Pain may be severe, where even minor movements such as contact with bed sheets are described as excruciating (hyperaesthesia).

Application of ice or cool compresses has its best benefit when done as soon as possible after the sting. Once hyperaesthesia develops, it will likely not be tolerated.

Simple analgesia (paracetamol or ibuprofen) may be sufficient.

For more severe pain, infiltration of the site with a local anaesthetic agent is the preferred method. A regional nerve block may even be required.

If opioids or other analgesics with sedative effects are required, they should be used CAUTIOUSLY, as they may significantly increase the risk of respiratory depression.

Muscle Cramps

- Generalised muscle cramps can be alleviated temporarily (for about 20-30 minutes) by the IV administration of calcium gluconate.
- Give 10% calcium gluconate by slow intravenous injection.
- Adult 10 ml (1 g or 2.2 mmol)
- Child 0.5 ml/kg (50 mg/kg or 0.13 mmol/kg)
- Both adults and children may have repeated doses several minutes apart up to a maximum total dose of 2 g. Due to this limitation in repeat dosing, the efficacy of calcium gluconate may be short-lived.

Sedation

In adults, agitation and involuntary muscle jerking may require cautious use of sedation with benzodiazepines. The patient's respiratory function must be continuously monitored due to possible respiratory depression.

In children, any use of sedation is contraindicated, unless required for intubation and ventilation should respiratory failure supervene.

Hypersalivation

Due to the possibility of atropine to potentiate sympathetic effects, including hypertension, its use for the treatment of excess secretions is not advised.

Scorpion Antivenom

Monovalent scorpion antivenom to *Parabuthus transvaalicus* is available in South Africa. (The antivenom has been developed against *Parabuthus transvaalicus* and may not be as effective against *P. granulatus* which is responsible for serious envenomation in the Western and Northern Cape regions). Even though cross-reactivity

has not been well demonstrated, it is recommended that the monovalent antivenom be given to all patients with severe scorpionism.

When indicated, scorpion antivenom should be given as soon as possible. Antivenom is effective whilst venom is active and therefore can be given as long as envenomation is progressing. The response to scorpion antivenom may be slow and undramatic, as it can take 2-6 hours to reach its maximum

effect.

Indications

All children and adults with scorpionism, i.e. systemic symptoms and signs of envenomation

How to administer scorpion antivenom

INTRAVENOUS ADMINISTRATION of antivenom is the preferred route. If it is not possible, intramuscular injection can be used. Local injection at the site of the bite is NOT INDICATED.

Allergic reactions to antivenom may occur and facilities to treat anaphylaxis must be available BEFORE antivenom is administered. Antivenom should be given in a setting where the patient can be continuously monitored during administration and for at least 6-12 hours after the infusion has been completed.

Low dose adrenaline pre-treatment has been shown to reduce the risk of severe reactions to snake antivenom. However, in scorpion envenomation, prophylactic adrenaline may increase the sympathetic effects of scorpion venom. Therefore, the use of pre-treatment adrenaline is not routinely indicated for scorpion envenomations requiring antivenom.

Prophylactic hydrocortisone and antihistamines have NOT been shown to reduce the risk of reaction to snake antivenoms and therefore should NOT be given routinely. However, if a patient has known or suspected hypersensitivity and needs antivenom, give promethazine (Adult 10-25 mg IV, Child 0.2 mg/kg IV) and hydrocortisone (2 mg/kg IV) before antivenom administration. This however does not always prevent anaphylaxis.

There is no need to give a test dose (hypersensitivity reaction test) of antivenom as this is unreliable in predicting who will develop an allergic reaction and delays the administration of antivenom.

Dose

Give 5-10 ml South African Vaccine Producers (SAVP) Monovalent scorpion antivenom intravenously to both adults and children if indicated.

NB Children require the same dose of antivenom as adults.

Intravenous antivenom can be given quickly and does not need to be diluted. Neat antivenom given over 10- 15 minutes has the same risk of reaction as when given diluted over 30-60 minutes. This is useful in children where fluid volumes need to be carefully controlled. However, the antivenom may be quite thick in consistency and therefore some medical practitioners prefer to dilute it in 100-200 ml saline.

All patients should be carefully monitored in hospital for at least 6-12 hours after antivenom has been administered. The response to scorpion antivenom may take 2-6 hours to reach its maximum effect. An additional dose of 5 ml may be given after 6 hours if the first dose is not sufficiently effective.

Reactions to antivenom

Allergic reactions to scorpion antivenom may occur, but these have seldom been reported in the medical literature (2017). Early reactions to antivenom can be mild and include pallor, vertigo, rigors, pain, extensive urticaria, nausea, vomiting and headache. Severe reactions include hypotension, bronchospasm and angioedema. As anaphylaxis can occur early (within a few minutes), facilities to treat it must be available BEFORE antivenom is administered. For Anaphylaxis Management, see Standard Guidelines. If antivenom is assessed as an essential part of management it should be restarted as soon as possible. Co-administration of an adrenaline infusion may be required for refractory hypotension.

Pyrogens may contaminate antivenom during the manufacturing process, resulting in early pyrogenic reactions when administered. Patients should be managed symptomatically and given antipyretics, such as paracetamol.

A type of serum sickness, characterised by fever, urticaria and polyarthritis may occur in patients about 5-24 days after treatment. It is a type III or immune-complex mediated hypersensitivity response to the horse-derived antivenom. There is no consensus on how to treat it; some suggest antihistamines and oral steroids if symptoms arise.

Availability of scorpion antivenom

Antivenom is available from South African Vaccine Producers. For contact details, see Antivenom and Expert Advice, in Standard Guidelines.

Topical Exposure

Eye, mouth, nose and skin contact with the venom results in intense burning pain followed by a severe inflammatory response. Antivenom is not indicated. Treat by immediate decontamination.

For details on Eye Decontamination, see Standard Guidelines. For details on Skin Decontamination, see Standard Guidelines.