

SNAKE, SPIDER AND SCORPION BITES AND STINGS

Chapter

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For assistance, please contact the Tygerberg Hospital Poison Information Centre on the 24-hour emergency number: 0861 55777.

Antivenoms are produced by the South African Vaccine Producers. They can be contacted on telephone number 011-386 6000. For further information please refer to their website at <http://www.savp.co.za/>.

SNAKE BITES

There are approximately 180 species of snakes in South Africa with only approximately 25 being medically significant. Snake bites cause, on average, 15 deaths per year in South Africa. Prompt and appropriate action is required and can save the life of a snake bite victim. The purpose of this chapter is to give a brief overview of the approach to the diagnosis and management of snake bites in South Africa.

Venomous snakes can be broadly divided into three groups based on the action of their venom: cytotoxic, neurotoxic and haemotoxic effects. Certain snake venom can result in more than one effect such as both cytotoxic and haemotoxic effects. Refer to Table 1 for the classification of common venomous snakes responsible for bites in South Africa. Further information on specific snakes and photographs can be found on the website of the African Snakebite Institute at: <http://africansnakebiteinstitute.com>.

Identification of the snake responsible for the bite is often not clear from the history unless the dead snake is brought to hospital with the patient. A syndromic approach is thus required relying on the clinical presentation, along with epidemiological and laboratory findings. Three main clinical envenomation syndromes should be identified and the syndromic management should follow these presentations:

- **Painful progressive swelling:** effects of the cytotoxins
- **Progressive weakness and paralysis:** effects of the neurotoxins
- **Bleeding:** effects of the haemotoxins

Overlap of these presentations can occur as certain snakes produce both cytotoxic and neurotoxic venom such as the berg/mountain adder. Mild local swelling can occur with most snake bites in the absence of cytotoxin envenomation. Also note that not all snake bites are by venomous snakes and between 10–50% of venomous snake bite patients are not envenomed; the so-called 'dry bites'.

FIRST AID AND INITIAL MANAGEMENT

- Move the patient away from the snake.
- Do not waste time confronting the snake or trying to kill it. If possible, take a photo of the snake for identification.

- Reassure the patient and keep the patient seated or lying and immobilised. Movement will cause the venom to spread more quickly.
- Call for help in order to get the patient to hospital as soon as possible.
- Venom on the skin should be washed or wiped away.
- Where venom has been spat into the eye or other mucous membrane, wash away with copious amounts of water or any other available bland fluid. An ophthalmologist will be required to assess and treat all patients with snake venom ophthalmia.
- Remove any constricting clothes and jewellery.
- Do not perform harmful procedures such as incising, sucking or applying ice to the bite wound.
- An arterial tourniquet should never be used.
- Apply a tight crepe bandage proximal to, and over the bite. This is particularly important with a neurotoxic cobra or mamba bite. If the bite is known to be caused by a cytotoxic snake then avoid bandaging due to the swelling that will ensue.
- In suspected neurotoxic snake bites CPR may be needed as respiratory failure may occur. Paralysis and respiratory failure may occur within one to eight hours of a bite. Constant monitoring of these patients is essential. First aid measures include clearing the airway and administration of oxygen and intravenous fluids if these are available before hospital admission.
- Give analgesia to all patients. Paracetamol or paracetamol plus codeine is preferred in the non-hospital setting.

HOSPITAL MANAGEMENT

- For all envenomated patients, hospital care with intensive care facilities is required. Enlist the help of a clinician experienced in the management of snake bite patients.
- Laboratory investigations should include a full blood count, INR and PTT, D-dimer, urea and electrolytes and urinalysis.
- Antibiotics are not required unless there has been iatrogenic manipulation of the bite wound or if there is bite site necrosis.
- Supportive management with a focus on respiratory function, fluid and electrolyte management, analgesia, correction of haemostatic abnormalities and monitoring of compartment pressures.
- Antivenom treatment
 - Antivenom should only be given if serious manifestations of envenomation are present and should only be administered in hospital or within a health care setting with resuscitation facilities. Serious manifestations mean either life or limb threatening complications are present or anticipated.
 - A polyvalent antivenom and boomslang monovalent antivenom are available.
 - Polyvalent antivenom is supplied in 10 mL ampoules and contains antibodies to the venom of the following snakes: puff adder, gaboon adder, rinkhals, green mamba, Jameson's mamba, black mamba, Cape cobra, forest cobra, snouted cobra and Mozambique spitting cobra. Polyvalent antivenom is not effective and should not be used for the treatment of bites caused by the berg/mountain adder, other dwarf adders, night adders, boomslang and vine snakes.
 - Boomslang antivenom is supplied in 10 mL ampoules and is only effective against the venom of the boomslang.

- Antivenom neutralises a fixed dose of venom. The same dose is given to children and adults as snakes inject the same amount of venom into their victims.
- Antivenom is most effective when given early, however, can be given after 24–48 hours or even later when severe envenomations occur.
- Antivenom may result in acute life-threatening reactions (anaphylaxis), pyrogenic (feverish) reactions or late immune complex disease (serum sickness). Most severe reactions happen in the first hour and patients need to be continually monitored. Adverse reactions are common and should be expected in more than one third of patients given antivenom.
- Premedication with antihistamines may dampen minor reactions but will not prevent anaphylaxis or anaphylatoid reactions.
- Slow infusion over 30–60 minutes of the antivenom diluted in 200 mL isotonic fluid is recommended to reduce adverse reactions. Some advocate giving undiluted antivenom over 10 minutes as there is some evidence that this is as safe as slower administration and ensures that the doctor is at the patient's bedside to watch for acute adverse events. Intramuscular injection of antivenom or injection into the wound is not recommended.
- The recommended intravenous dose of polyvalent antivenom in severe cytotoxic bites is 50–100 mL (5–10 ampoules). In neurotoxic snake bites 80–120 mL is recommended. Additional doses (10–40 mL) may be required depending on the clinical response.
- Anaphylactic reactions must be treated with parenteral adrenalin and antihistamines. Late serum sickness reactions can be managed with antihistamines, and if severe, a short course of oral prednisone.
- Wounds may become infected and should be managed accordingly with antibiotics and surgery if indicated.

TABLE 1. COMMON VENOMOUS SNAKES IN SOUTH AFRICA (ADAPTED FROM MÜLLER ET AL., 2012)

COMMON NAME	DISTRIBUTION	TOXINS AND CLINICAL EFFECTS
HAEMOTOXIC SNAKES		
Boomslang ('tree snake')	Found throughout most of the country except the Northern Cape and western part of the Free State	Venom is haemotoxic, containing enzymes that activate prothrombin and factor X and cause consumptive coagulopathy. Monovalent antivenom available.
Vine snake	Trees and shrubs in lowland forest to moist and dry savanna regions in KZN and northern South Africa	Same as for boomslang. No antivenom is available.
NEUROTOXIC SNAKES		
Black mamba	Found in the northern parts of South Africa	Potently neurotoxic. Nausea, vomiting, muscle contractions. Early onset respiratory paralysis. Polyvalent antivenom contains specific antibodies.

Cape cobra	Found throughout the Cape provinces, Free State and south western regions of the Eastern Cape	Potently neurotoxic. Causes flaccid paralysis and respiratory failure. Polyvalent antivenom contains specific antibodies.
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CYTOTOXIC AND NEUROTOXIC SNAKES

Berg/mountain adder	Found on mountain ranges from the Cape Fold Mountains into the Drakensberg Mountains of Lesotho, KZN, Mpumalanga, and in the Limpopo	Cytotoxic and neurotoxic. Local swelling and pain. Ophthalmoplegia and respiratory depression in some cases. Can cause hyponatraemia. Polyvalent antivenom does not contain specific antibodies.
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Green mamba	Found along the coast of KwaZulu-Natal and the Eastern Cape	Local pain and swelling. Mild neurotoxicity. Polyvalent antivenom contains specific antibodies.
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CYTOTOXIC SNAKES

Mozambique spitting cobra ('m'Fesi')	Found in the northern areas of South Africa	Potently cytotoxic. Spits and bites. Extensive swelling and pain. Eye envenoming common. Polyvalent antivenom contains specific antibodies.
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Night adder	Typically found all along South Africa's east coast (except in the Western Cape)	Local pain, swelling and local necrosis. Polyvalent antivenom does not contain specific antibodies.
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Puff adder	Found widely throughout South Africa	Potently cytotoxic. Severe swelling and pain with possible blistering and necrosis. Often blood coagulation abnormalities. Polyvalent antivenom contains specific antibodies.
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Rinkhals	Found in the Southern Cape, Eastern Cape, Free State and parts of KwaZulu-Natal	Spits and bites causing local swelling. Can be mildly neurotoxic. Polyvalent antivenom contains specific antibodies.
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SPIDER BITES

Few spiders are potentially harmful to man. Many spider bites go unnoticed and thus the diagnosis of a spider bite is often difficult. The medically important spiders in South Africa can be divided into cytotoxic and neurotoxic groups. Sac spiders and violin (recluse) spiders cause most cytotoxic bites and button (widow) spiders are responsible for most neurotoxic bites. Both spiders are found throughout South Africa.

For further information on spiders, including colour photographs, please refer to the Agricultural Research Council's website at: <http://www.arc.agric.za/>

CYTOTOXIC SPIDER BITES

Cytotoxic venom can cause considerable tissue damage up to 10 cm around the bite. Violin and sac spiders are the two medically important spiders causing cytotoxic bites in South Africa. The crab spiders are also considered cytotoxic, however there have been no human cases of envenomation in South Africa.

Most bites go unnoticed and often happen at night with the patient not aware of being bitten. There may be some redness and itchiness at the site of the bite initially. Over the next 24–48 hours the bite becomes a red, painful, haemorrhagic lesion. After a few days the bite may resemble a carbuncle and the necrotic tissue may slough off leaving an ulcerating wound. Cellulitis may complicate the bite wound. This clinical syndrome is known as necrotic arachnidism.



TREATMENT: CYTOTOXIC SPIDER BITES

The management of cytotoxic bites is supportive, aimed at preventing and treating bacterial infections and promoting healing.

No antivenom is available and a tetanus toxin booster should be given. Surgery may be required for an abscess or to remove necrotic tissue and for skin closure.

Dapsone treatment has been used with moderate success to control the spread of the necrotic lesions or with chronic necrotic lesions.

Laboratory investigations should include a full blood count, liver and renal function and wound cultures. Additional laboratory investigations may be required if the diagnosis of a spider bite is in doubt as other infective and non-infective causes may result in similar skin lesions.

NEUROTOXIC SPIDER BITES

In South Africa the button spiders (black and brown widow), which belong to the genus *Latrodectus*, are neurotoxic causing the signs and symptoms of envenomation known as latrodectism. The black button spiders cause a more severe form of envenomation than the brown button spiders which typically only present with local symptoms. The neurotoxin does not cross the blood-brain barrier but acts peripherally causing stimulation of somatic and autonomic nerve endings. Patients will experience acute local pain shortly after the bite, and with black button spider bites, this will progress to generalised muscle pain and cramps, stiffness of the abdomen, weakness of the legs, profuse sweating, restlessness and raised blood pressure. Fortunately, deaths as a result of black button spider bites have not been reported for many years.



TREATMENT: NEUROTOXIC SPIDER BITES

Black widow antivenom is available for the treatment of severe latrodectism and should be administered in patients with severe signs and symptoms. Without the antivenom, the effects of the venom may last more than a week and the patient may become exhausted and dehydrated.

Standard dose is 5–10 mL intravenously and the patient should respond within 30 minutes. An additional dose of 5 mL may need to be given after four to six hours.

Anaphylactic/anaphylactoid reactions can occur and the patient should be monitored for 24 hours after administration. Management of these reactions is as for snake bites.

Intravenous fluids should be given to keep the patient hydrated and intravenous calcium gluconate 10% (10 mL over five to ten minutes) can be administered for short-term relief of muscle pain and cramps.

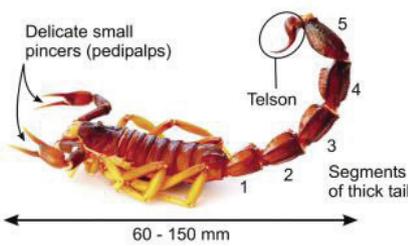
Opioids and benzodiazepines should not be given.

A tetanus toxoid booster is recommended.

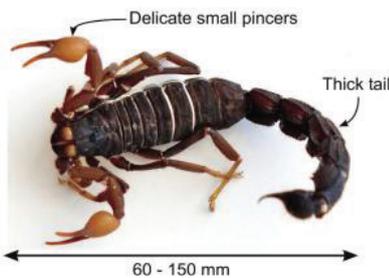
SCORPION STINGS

Most scorpions in South Africa are relatively harmless, however, a few can cause life-threatening stings due to their neurotoxic venom. The dangerous scorpions in South Africa are *Parabuthus granulatus* and *Parabuthus transvaalicus* and can be identified by their thick tails and thin pincers, they range in length from six to 15 cm (Müller *et al.*, 2012). The venom is contained in the terminal segment of the tail known as the tenson and is injected by means of a stinger. *P. granulatus* is three times more venomous than *P. transvaalicus* and causes more severe effects and mortality

Parabuthus granulatus



Parabuthus transvaalicus



rates of close to 20% in children, who, as with snake and spider bites, are more vulnerable to severe envenomation. *P. granulatus* is predominantly found in the Western and Northern Cape and *P. transvaalicus* in the North West, Limpopo and Mpumalanga provinces.

Scorpion envenomation causes clinical signs and symptoms known as scorpionism due to its neurotoxic effects which cause sympathetic and parasympathetic neurons to fire spontaneously and repetitively. Bulbar paralysis and respiratory failure is usually the primary cause of death.

Most scorpion stings occur on the foot after sundown. The pain is typically severe and can last for more than 24 hours. Paraesthesia and hyperaesthesia of the hands and feet becoming generalised then follows. Generalised weakness, visual disturbances, difficulty breathing and autonomic dysfunction can occur. Children can appear extremely restless with uncontrollable jerking of the extremities and unnatural posturing due to the excessive neuromuscular activity. Bulbar paralysis and death is more common in children.

The diagnosis of a scorpion sting is often difficult as there is often not a clear history of being stung. The differential diagnosis includes, amongst others, spider and snake bites, organophosphate poisoning, drug overdose and tetanus.



TREATMENT: SCORPIONISM

Scorpionism is a medical emergency and respiratory failure can occur within one to two hours after a sting. First aid must focus on respiratory support.

Patients must be transported to hospitals with intensive care facilities as rapidly as possible, and where available, the scorpion taken to hospital for identification.

Pain at the sting site can be managed by injecting local anaesthetic. Intravenous calcium gluconate is moderately effective but short lived.

Scorpion antivenom must be given to patients with systemic envenomation.

The dose of antivenom is 5–10 mL intravenously for both children and adults and can take between two and six hours to be effective during which respiratory support must be continued.

An additional dose may be needed after six hours, and as with other antivenoms, anaphylactic and anaphylactoid reactions may occur.

REFERENCES

Müller GJ, Modler H, Wium CA, & Veale DJH. 2012. Scorpion sting in southern Africa: diagnosis and management. *Continuing Medical Education*, Vol. 30(10): 362-381.