

Medically important spider bites in southern Africa

TL Bird,^{1,2}  R van Rensburg,³  AS Dippenaar-Schoeman^{4,5} 

¹General Entomology, DITSONG National Museum of Natural History (DNMNH), South Africa

²Department of Zoology and Entomology, University of Pretoria, South Africa

³Division of Clinical Pharmacology, Department of Medicine, Faculty of Medicine and Health Sciences, Stellenbosch University, South Africa

⁴Agricultural Research Council – Plant Health and Protection, South Africa

⁵Department of Zoology, University of Venda, South Africa

Corresponding author, email: tharina@ditsong.org.za

Few spider bites are of medical significance in southern Africa. Unfortunately, unexplained lesions are often erroneously attributed to spider bites, sometimes with grave consequences for the patient.^{1,2} Correct diagnoses facilitate timely and appropriate treatment. Medically important spiders in southern Africa have either neurotoxic or cytotoxic venom. Here we provide a broad description of the most important neurotoxic and cytotoxic spiders in southern Africa, the clinical profiles of their bites, and the recommended treatment. We touch on clinical variation of bites and misdiagnoses.

Keywords: spider bites, medically important, southern Africa

Neurotoxic venom

Button spiders (“knopiespinnkoppe”), *Latrodectus* spp. (family Theridiidae), the most important spiders with neurotoxic venom in southern Africa, can be divided into the black button spider (*L. cinctus*, *L. indistinctus*, *L. karrooensis*, *L. renivulvatus*) and brown button spider groups (*L. geometricus*, *L. rhodesiensis*, *L. umbukwane*)^{3,4} (Figure 1). Button spiders include the only known potentially fatal species in southern Africa. In South Africa, however, no deaths have been reported for at least the last 60 years,⁵ roughly coinciding with the availability of antivenom against latrodectism.

Studies assessing the lethal dose of the venom of the black button spider, *L. indistinctus* (LD₅₀ studies), indicated that it is 3–4 times more toxic compared to the venom of the brown button spider, *L. geometricus*.⁶

The diagnosis of button spider bites is largely clinical,⁷ sometimes supported by the presence of the actual spider specimen.^{5,8} A detailed breakdown of the signs, symptoms, and treatment of black and brown button spider bites as provided in the literature,^{5,7,9} is briefly summarised in Table I, and supplemented with examples.

Other neurotoxic spiders

Other neurotoxic spider bites in southern Africa are rare and based on ad hoc reports. Two published reports involve the Lightfoot’s lesser baboon spider, *Harpactirella lightfooti* (family Theraphosidae)¹⁰ (Figure 2A), and an orb-weaver *Araneus apricus* (family Araneidae),¹¹ respectively.

Rain spiders, *Palystes* spp. (family Sparassidae) (Figure 2B) bites¹² are occasionally (rarely) reported to cause a systemic reaction. It is currently unknown whether it is an allergic or neurotoxic reaction, or a combination of both. Descriptions range from mild

reactions to a case of a woman becoming ‘violently ill’ shortly after being bitten, including vomiting, frothing around the mouth and feeling light-headed, and an elderly man in Pretoria that showed a drop in blood pressure and difficulty in breathing. The bite site may become red and swollen for days. Unreported neurotoxic spider bites involved a middle-aged female who felt when she was bitten on the big toe by a rain spider (identified from a photo as *Palystes superciliosus*) in the Western Cape. The patient had a rapid systemic reaction, which resulted in her stomach and face becoming red and her eyes bloodshot. The patient reported that she took an antihistamine (desloratadine), which appeared to alleviate her symptoms. In another case, a female from Pretoria had an unusual allergic reaction to the venom of *P. superciliosus*. After she was bitten on her finger, she had to be transported to hospital in an unconscious state.


Cytotoxic venom

Cytotoxic venom causes tissue damage and affects the area around the bite site. Sac spiders, *Cheiracanthium* spp. (family Cheiracanthiidae) (Figure 3), and violin spiders, *Loxosceles* spp. (family Sicariidae) (Figure 5), are the most important southern African spiders with cytotoxic venom. Six-eyed sand spiders, *Hexophthalma* spp. (family Sicariidae), are sometimes mentioned.^{9,16}

The clinical syndromes and treatment of spider bites with cytotoxic venom, as discussed in Müller et al.,⁵ are summarised in Table I, and supplemented with examples.

Cytotoxic spider bites are not that common, and necrotic arachnidism may develop as a complication thereof. Necrotic arachnidism refers to the clinical syndrome of necrotic skin ulceration caused by the bite of cytotoxic spiders. Cytotoxic bites are more difficult to diagnose accurately compared to neurotoxic button spider bites, as many medical conditions can present

Table 1: Most important spiders of medical importance of southern Africa, and a summary of the signs, symptoms and treatments of their bites

Spiders, signs, symptoms, treatment	
Neurotoxic venom	
	<p>Button (widow) spiders (<i>Latrodectus</i> spp.)</p> <ul style="list-style-type: none"> • Medium-sized spiders (body 8–15 mm long) with relatively long legs. • Characteristic rounded, ‘button-shaped’ abdomen. • Brown to black, usually with red to yellow–orange markings on abdomen. • Only females are of medical significance (females of southern African species described below). • Do not bite readily — feign death when threatened. • Seven species known from South Africa.^{3,4} <p>Black button spiders:</p> <ul style="list-style-type: none"> • Black with red to orange markings on the dorsal abdomen; none to insignificant/irregular red on the ventral abdomen. <p>Brown button spider:</p> <ul style="list-style-type: none"> • Colour varies from cream to brown to black in <i>L. geometricus</i> and <i>L. rhodesiensis</i>; geometrical patterns on dorsal abdomen — often more pronounced in the brown forms. <i>L. umbukwane</i> black with dorsal geometrical patterns. Distinct red to orange marking on ventral abdomen, in shape of an hourglass (shape itself may vary, especially in <i>L. umbukwane</i>). • Egg sacs of <i>L. geometricus</i> with distinct spiky appearance.
<p>Figure 1: Black button spiders A.) <i>Latrodectus renivulvatus</i>, B.) <i>L. karrooensis</i>, C.) <i>L. indistinctus</i> female (left) and male (right), and D.) <i>L. indistinctus</i>. Brown button spiders <i>L. geometricus</i> indicating E.) brown and F.) black of forms. Red hour-glass visible on ventral side of abdomen in <i>L. geometricus</i>. Arrows indicate egg sacs.</p>	
<p>Signs and symptoms for button spider bites</p> <p>Latrodectism refers to the systemic signs and symptoms of envenomation that is caused by <i>Latrodectus</i> spiders.⁷</p> <p>Black button spiders:</p> <ul style="list-style-type: none"> • Bite often felt as a burning pain at the bite site. • Bite site evident in about 70% of bites.⁷ • Pain spreads to regional lymph nodes. • Initial hyperactive state, including muscle pain and cramps, especially in abdominal region, sometimes described as excruciating⁵ — pain often described as a dominant symptom.⁹ • Weakness in legs; difficulty in walking. • Common signs are profuse sweating and board-like rigidity of abdominal muscles. • Young children, the elderly, and patients with cardiovascular and respiratory disease are most at risk.⁷ • Central nervous system not affected. <p>Brown button spiders:</p> <ul style="list-style-type: none"> • Clinical syndrome much less severe than that of black button spiders. • Signs and symptoms normally localised and restricted to pain at bite site. • Latrodectism may develop in children and some adults, but rare. 	
<p>Treatment for button spider bites</p> <p>Black button spiders:</p> <ul style="list-style-type: none"> • Black button spider antivenom, manufactured by the South African Vaccine Producers (SAVP), for severe latrodectism:⁵ 5–10 ml administered intravenously for adults and children; additional dose of 5 ml can be administered 4–6 hours later, but is rarely needed. As antivenom is animal serum-based, it may trigger an allergic reaction, although rare. Therefore, patients need to be kept under observation for 6–12 hours after antivenom has been administered.^{5,7} Note: Black button spider antivenom is considered effective for black and brown button spider bites in southern Africa.⁶ • Pain management: Central nervous system depressants such as opioids are considered ineffective and potentially dangerous as they may cause respiratory depression.^{6,7} The only effective agent for relief of muscular pain and cramps is intravenous calcium gluconate 10% (10 ml over 5–10 min), but relief lasts only 20–30 min. Calcium gluconate may be repeated with serum calcium monitoring. • Antihistamines are not recommended, except when administered as part of the management of allergic reactions. <p>Brown button spiders:</p> <ul style="list-style-type: none"> • Supportive; mainly focus on pain management. • Administer antivenom if patient displays signs and symptoms of latrodectism. 	

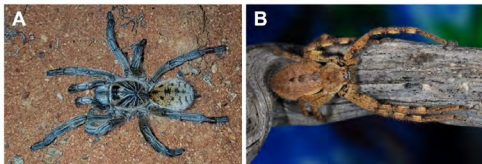


Figure 2: A.) Lightfoot's lesser baboon spider, *Harpactirella lightfooti* (Theraphosidae). B.) Rain- or huntsman spider, *Palystes superciliosus* (Sparassidae).

Other neurotoxic spider bites

- Rare in southern Africa.
- Common symptom: burning pain at the bite site, sometimes spreading through the lymph nodes, subsiding after few hours.^{10,11}
- Most reports involve baboon spiders (family Theraphosidae) and rain spiders, *Palystes* spp.¹² (family Sparassidae). Both are large spiders.
- Bite of baboon spiders may result in substantial bleeding, especially if the spider was agitated.
- With some exceptions (see text), symptoms are mostly self-limiting.

Cytotoxic venom

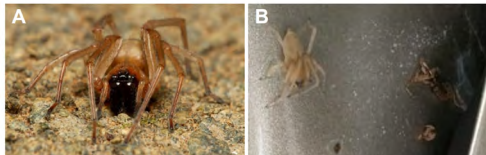


Figure 3: A.) Sac spider, *Cheiracanthium furculatum* (Cheiracanthiidae), indicating the shiny, black 'face'. B.) Photo submitted by an individual that was bitten by a sac spider on his toe while in his vehicle. The sac spider can be seen where its silken retreat were removed.

Sac spiders (*Cheiracanthium* spp.)

- Small to medium spiders (body length 4–12.5 mm); front legs distinctly longer than the rest.
- Straw coloured, often with a greenish tint; characteristic shiny-black eye region and mouth parts.
- Hides in characteristic silken sac-like retreat during the day.
- Does not hesitate to bite when threatened.
- Ten species of sac spiders exist in South Africa.⁴ *C. furculatum* is one of the most common spiders found in houses in several provinces; in Gauteng and the Free State, most sac spider bites are attributed to this species.^{13,14}

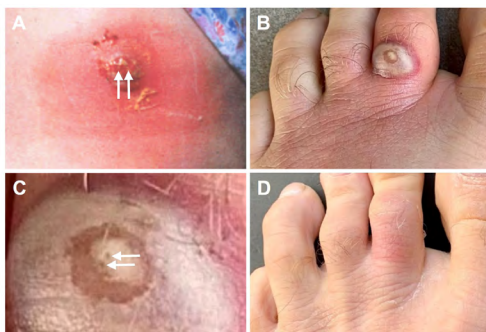


Figure 4: Typical lesion-forming sac spider bite: 'bull's eye' lesion in the form of a furuncle or carbuncle, surrounded by red swelling (A.), which often develops into a lesion B.), shown in close-up C.). Arrows indicate bite marks. D.) Complete healing with no scar formation.

Signs and symptoms of sac spider bites

- Bite at first resembles an insect bite; initial sharp pain is sometimes felt when bitten.¹
- Two fang bite marks are sometimes visible.
- A bull's eye lesion in the form of a furuncle or carbuncle may develop, and is usually surrounded by a swollen, red and painful area which is typical.
- The centre of the wound may undergo necrotic changes over the next few days, leaving an ulcerated wound.
- The severity of necrosis varies, from minimal to extensive necrosis in rare cases.⁵
- Systemic symptoms may be experienced after a few days — these may include fever and flu-like malaise.⁵
- **Note:** Medical importance of sac spiders as a group remains contentious, and clinical presentation is probably species-dependent. Bites of some species in the USA, Australia and Europe cause mild to severe pain and systemic symptoms (headache, nausea, vomiting), but no necrosis.¹⁵ Most species in southern Africa are probably of minor medical importance,¹ but the propensity of at least some sac spiders in southern Africa to cause skin necrosis is indisputable.

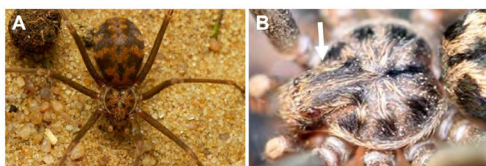


Figure 5: Violin spider, *Loxosceles* spp. (Sicariidae). A.) *L. simillima*, body, and B.) *Loxosceles* sp. prosoma close-up to show violin shape (arrow).

Violin spiders (*Loxosceles* spp.)

- Medium to large spiders (body length female 8–15 mm, leg span up to 40 mm).
- Brownish to tan in colour.
- Characteristic dark, violin-shaped marking on the dorsal surface of prosoma (head part).
- Not web-bound.
- Ten species of violin spiders are found in South Africa.⁴ Several cave species also exist, but only six species come in contact with humans.
- Southern African species do not seem to bite readily, and bites are rare.



Figure 6: Progression of violin spider bite. Approximately 2 weeks after being bitten A.) before and B.) after deroofting. C.) Approximately 3 weeks after being bitten. D.) 2.5 months after being bitten.

Signs and symptoms of violin spider bites

- Initially, the bite goes unnoticed.
- Blisters often develop.⁵
- Red swollen lesion, sometimes with a purple centre, develops a few hours after the bite.
- Over the next day or two, the centre blackens due to bleeding into the site, and is associated with significant swelling and pain at the bite site.
- Necrosis develops (can take 3–7 days before necrosis develops).
- Swelling and inflammation usually subside around day four, but cutaneous necrosis continues to spread slowly.
- Necrotic tissue sloughs off after 2–3 weeks — may leave a deep, ulcerating wound that heals slowly. Often leaves a scar.^{5,19}
- Systemic loxoscelism: Main symptom is haemolytic anaemia; no cases of severe systemic loxoscelism (coagulopathy, renal failure, multiple organ damage) have been recorded in South Africa.⁵
- **Variation:** Some bites by violin spiders have no effect, while others are self-limiting. The cutaneous form of loxoscelism (skin loxoscelism) is the most common, while systemic loxoscelism is rare.⁸ Variation in the severity of violin spider bites could be linked to the species, but other factors may play a role (see text).

Treatment for sac and violin spider bites

- No antivenom is available for cytotoxic spider bites in southern Africa.
- Treatment is aimed at preventing and treating secondary infection (wound care as first line treatment; empiric antibiotics can be added if secondary infection noted or the diagnosis is in doubt).

Sac spiders:

- Majority of lesions are self-limiting and heal spontaneously.
- Occasionally, an infected wound can develop into a rapidly spreading cellulitis which requires aggressive antibiotic therapy.

Violin spiders:

- Bites usually take longer to heal, and require more aggressive treatment to prevent and treat secondary infection.
- Surgical debridement may be necessary.
- Disfiguring scars may require corrective surgery.

with ulcerating skin lesions or sores. Confirming a bite is further compromised because bites are frequently not painful, often delivered at night, and spiders are not always seen. There is also some overlap between the clinical syndromes of sac and violin spider bites. 'Typical' clinical syndromes can, however, sometimes be recognised (Figures 4, 6), especially in the early stages of a bite. Unlike sac spider bites, a bull's eye lesion (presenting as a furuncle or carbuncle) is not known to form in violin spider bites, but more data is needed.

Sac spider bite case study

The clinical syndrome and toxicity of sac spider bites in humans remain poorly understood and verified case studies are few. Here we report on a man from Pretoria in his forties that was bitten on the second toe (Figure 4B & 4C) by a sac spider that got trapped under the straps of his 'flip-flop' sandals while driving. Arriving at the destination, about 30 min later, the toe was red and inflamed. By the evening, the bite-site started to get more painful and inflamed. He consulted his GP the following day. The latter recognised two bite marks (Figure 4C, arrow). The patient also described feeling lightheaded and feverish. He completed a course of antibiotics, and applied a topical antibiotic cream. After about two days, the infection started to clear up (Figure 4B). The wound deroofed spontaneously after about five days. It healed well with no visible scarring (Figure 4D). Prior to the bite, a sac spider was discovered in its sac retreat in the vehicle, together with evidence that the spider had settled there for some time (Figure 3B), which indicate that a vehicle may provide suitable habitat for sac spiders.

Violin spider bite case study

Violin spider bites seem to vary with species, but the species is seldom verified by a specialist, and the species linked to a particular clinical syndrome remains unknown. Here, however, we illustrate the progression of a lesion (Figure 6), and describe the clinical syndrome resulting from a violin spider bite in Botswana. The clinical syndrome of the lesion, termed loxoscelism, is similar to that provided in the literature for other verified violin spider bites.^{17,18} A violin spider bite was therefore confirmed by the clinical profile of the wound and by a violin spider collected under the bed mat in the bedroom about a week after the estimated day of the bite. The spider was deposited as a specimen in DNMNH (TM25000). Given the site of the bite, on the waistline of the left-side of the abdomen, the

spider was probably trapped in the clothing of the patient. The patient, a female in her forties, described the generalised pain as 'unbearable'. The patient was initially unaware of being bitten. Her initial focus was on her systemic symptoms, and the time of bite was estimated, and calibrated based on when her symptoms started. When she noticed the bite, she initially thought it was a boil, or a burn mark due to rubbing of a piece of clothing on her skin. The bite site itself was painful, and the area around it sensitive. The majority of the pain, however, was centered around the inguinal lymph nodes, which were swollen and 'extremely painful'. This caused her left leg to feel numb, and thus an inability to walk properly. Distal lymph nodes, including her neck, also became swollen and painful. Her symptoms were initially flu-like (fever, body-ache, rigours). Attributing the symptoms to flu, and later malaria, which the patient had experienced several times, she consulted her GP only a few days later when her symptoms persisted irrespective of self-medicating with flu medicine. Her GP identified the cause as 'a bite'. She received combination antibiotics, anti-inflammatories, and kept the lesion closed for three weeks while applying a topical antiseptic cream to keep the wound moist. The wound took 3–4 weeks to heal dermally, but remained sensitive when pressed, up to two months later. Complete resolution only occurred after approximately three months, but a visible scar remained. It should be noted that systemic symptoms are unusual for southern African violin spider bites.¹⁹

Other cytotoxic spiders

Reports of other cytotoxic bites in southern Africa involve one self-limiting case of a running spider, *Philodromus* sp. (family Philodromidae), that bit a 23-year-old patient,²⁰ and one positively verified report of a bite by a six-eyed sand spider, *Hexophthalma* sp. The toxicity of the latter was predicted based on its close relationship to violin spiders, and on subsequent studies done on rabbits.^{19,21} Six-eyed sand spiders are not aggressive and rarely come in contact with humans due to their restricted habitat and behavioural preferences. Most species are also restricted to arid areas. Bite treatment should be similar to that of other cytotoxic bites.

Understanding necrosis

To understand the seemingly inconsistent ways in which patients react to spider bites in regarding the formation and severity of necrosis, and to the treatment thereof, it is useful to understand

the causes of necrosis due to envenomation. Dunbar et al.²² list three independent, albeit often overlapping, reasons: The venom itself, secondary bacterial infection, and/or immune-mediated responses to the venom. Spider venom in itself has been shown to induce tissue damage.²³ However, the probability that the venom or the spider bite itself acts as a vector for bacteria is seen as highly unlikely, as spider venom has antibacterial properties.²⁴ Superimposed bacterial infection is, therefore, the more likely contributor, and preventing secondary infection is an important step in preventing further necrosis. Appropriate wound care is the most important first step in a case of a verified spider bite. Directed antibiotics may be added when a secondary infection is noted, but empiric antibiotics for a confirmed spider bite should be discouraged, unless the diagnosis is in doubt. Spider venom may also activate immune-mediated responses in the body, inducing an inflammatory cascade that under certain circumstances may produce necrotic lesions independently from the direct action of the venom itself.²² Dunbar and colleagues²² stress the importance of considering the patient's immune response as an integral part of the envenomation syndrome.

Clinical variation in bites

The clinical syndrome of bites varies and is largely influenced by the i) age and condition of the patient; ii) area where the patient is bitten (a bite near the head is more problematic than a bite near the extremities); iii) species of spider; iv) amount of venom injected;^{9,25} v) variation in allergic response or natural tolerance to venom between individuals; and vi) intraspecies variation in venom composition. Difference in tolerance to venom is illustrated by the different reactions seen in two healthy females that were bitten by similar-sized social spiders, *Stegodyphus dumicola* (family Eresidae), a species that is generally considered harmless: In patient 1, a female in her thirties – who is reportedly prone to react to, for example, bites, stings – the bite on the inner thigh elicited a red, itchy swelling of 30 mm in diameter at the bite site, which started to subside only after about four days; some red swelling and itching remained for more than a week. In patient 2, a female in her fifties who is prone to allergic rhinitis but with no other major history of allergies, the bite on the medial aspect of the arm was uneventful, except for being red at the bite-site for a few minutes; patient 2 was since bitten twice by social spiders, both times being uneventful.

Misdiagnoses

Numerous medical conditions cause necrotic skin lesions that mimic necrotic arachnidism.⁹ Swelling, redness and pain, which are the common symptoms of early necrotic arachnidism, are also common symptoms of many other conditions. Alternative causes of necrotic skin lesions should be actively sought before the diagnosis of necrotic arachnidism is made. These conditions should also be considered when presented with necrotic skin lesions when a spider bite cannot be confirmed.⁹ Based on at least 20 years of data and experience garnered from the Tygerberg Poisons Information Centre (TPIC) in the Western Cape, Müller et al.² concluded that necrotic arachnidism is an over-diagnosed

clinical entity and is often a convenient diagnosis for unexplained local tissue injury/dermal necrosis.

Although not to be ignored, actual spider bites with severe consequences are not very common in southern Africa. In South Africa, for example, of the 2 253 species of spiders that are currently known,²⁶ only 31 species grouped into four genera are theoretically recognised as of medical importance (neurotoxic venom in button [*Latrodectus*] spiders; cytotoxic venom in sac [*Cheiracanthium*], violin [*Loxosceles*], and six-eyed sand [*Hexophthalma*] spiders). However, i) within these genera, toxicity seems to differ considerably between species, with some species having venom of lower toxicity; ii) some species are unlikely to encounter humans (based on their habitat and/or distribution); and iii) some species are reluctant to bite. Indeed, with the exception of areas in Gauteng and the Free State with a high number of sac spiders in houses and thus a relatively high incidence of sac spider bites (the bites of which are usually self-limiting), South Africa, and probably southern Africa, seem to be areas of low risk to spider bites given their high spider diversity. Ultimately, only a handful of the 31 species might prove to be of clinical medical importance.

The need for more evidence on spider bites in southern Africa is apparent. A documented (verified) bite requires that a spider is immediately collected and positively identified by an expert.¹⁷ A typical clinical syndrome together with strong circumstantial evidence (such as the presence of the spider) could, however, verify a bite. For example, a typical violin spider bite clinical presentation and lesion (Figure 6), combined with the subsequent discovery of a violin spider in the bedroom, and no other possible explanation in an otherwise healthy individual, can be taken as strong (documented) evidence that it was a violin spider bite.

Documented cases would not only assist with refining the clinical syndrome of spider bites and their treatment, but also reduce the overdiagnoses of bites, in turn ensuring that the patient receives timely and appropriate treatment, and avoids unnecessary interventions. Unfortunately, many bites remain undocumented, and the clinical syndrome of the bites of most of the spiders in southern Africa is not completely understood. General practitioners are in an optimal position to contribute to the documentation of the clinical syndrome of spider bites and the species associated with each bite by documenting the clinical syndrome observed, the treatment provided,⁹ and, where the spider was presented to the doctor, specialist identification and preservation (in > 70% ethanol) of the spider associated with the bite to deposit as a voucher specimen in a scientific collection.

24-hour helpline

The Poisons Information Helpline of the Western Cape (PIHWC) was established in 2015 as a combined 24/7 consultation-based hotline (**Poisons Information Helpline, Western Cape: 0861555777**) to medical professionals and the general public, available to South Africa and neighbouring countries. It is

a combination of the TPIC and the Red Cross War Memorial Children's Hospital Poisons Information Centre (RXHPIC).⁹

Summary

Spider bites of significant medical importance are rare in southern Africa. In South Africa, these seem to be attributed predominantly to button spiders (neurotoxic venom) in the Cape Provinces, and sac spiders (cytotoxic venom) in Gauteng and the Free State Provinces. Antivenom is recommended for neurotoxic bites when signs and symptoms indicate the latrodectism syndrome. Most cytotoxic spider bites are self-limiting, and treatment should focus primarily on wound care and preventing secondary infection. A tetanus booster is recommended for all confirmed spider bites. Much still remains unclear regarding medically important spider bites, and the species that cause them. Many medical conditions may mimic spider bites, and should be strongly considered in the differential diagnosis when a spider bite cannot be clearly established. Physicians can play a significant role towards our understanding of spider bites in southern Africa.

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Conflict of interest

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ORCID

TL Bird  <https://orcid.org/0000-0003-4409-8866>

R van Rensburg  <https://orcid.org/0000-0002-6464-4257>

AS Dippenaar-Schoeman  <https://orcid.org/0000-0003-1532-1379>

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