



The funnel web and common spider bites



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BACKGROUND

The funnel web spiders, encompassed within the genera *Atrax* and *Hadronyche*, are the most dangerous spiders in the world. Although the incidence of envenomation is low, funnel web spiders remain a cause of considerable public concern. However, most common spider bites produce only minor effects requiring only symptomatic treatment.

OBJECTIVE

This article describes the clinical features and treatment of the funnel web spider and that of its close relative, the mouse spiders. It also covers the question of necrotising arachnidism as well as bites from other common species of spiders.

DISCUSSION

Appropriate first aid combined with the administration of specific antivenom can be life saving for funnel web spider bites. True necrotising arachnidism appears to be rare. If suspected, clinicians must first consider the very wide differential diagnoses.

Spider bites are one of the commonest types of bites or stings presenting for management in general practice and emergency medicine departments. While in most cases the responsible species is not identified and the effects self limited, certain species can inflict life threatening bites.

Funnel web spiders

More than 30 species of the highly dangerous funnel web spiders are found on the eastern seaboard of Australia including parts of South Australia and Tasmania (Figure 1). The venom appears to be particularly harmful to primates, whereas other mammals are relatively unaffected. While many of these spiders remain unnamed and the venom unstudied, all funnel web spiders belong either to the genera *Atrax* or *Hadronyche*. Identification and classification of funnel web spiders is often difficult – with some species resembling the less dangerous trapdoor spiders. Any suspicious spider that has inflicted even an apparently minor injury within the geographic distribution of these spiders should be treated as if it were a funnel web spider. If the spider is captured or killed, formal identification is encouraged – even a badly damaged spider can often be successfully identified by arachnologists.

Sydney funnel web spider

The spider responsible for the most significant bites is the Sydney funnel web spider (*Atrax robustus*), a species geographically limited to an area within 160 km radius of the Sydney (New South Wales) central business district.¹ The Sydney funnel web spider is a large spider with a glossy black cephalothorax and a dark abdomen. The female is larger and more robust than the male (Figure 2). The male has a spur on its second leg and the spinnerets (from which the spider produces silk) of both sexes are long and obvious, especially the terminal spinneret. Both sexes of this species are very aggressive. When disturbed, they will rear up ready to strike with their large, downward pointing fangs. The female spider constructs a burrow that may be 30 cm or more deep. Some use crevices in rocks or around house foundations and colonies may contain as many as 100 spiders. The male spiders tend to roam and often enter houses, particularly during the summer months and in wet weather. Bites may occur when the spider has taken up temporary residence in bedding, clothing or footwear, or when it is trodden on.

Most bites occur in the warmer months, and are predominantly sustained on the

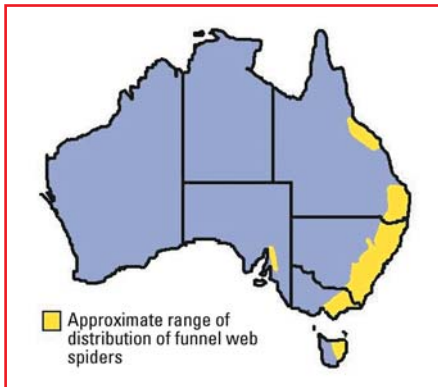


Figure 1. Geographical distribution of funnel web spiders

extremities. Children are especially at risk due to their lower body weight and the potential for multiple bites to occur if spiders are handled. However, considering the large population at risk, effective envenomation is very uncommon. The male species is considered to be the most venomous, and all 13 funnel web spider fatalities documented before the introduction of antivenom in 1980 have been attributed to the male spider.¹ Sydney funnel web spiders are usually easily identifiable to the trained eye, but any large dark spider found in the geographic distribution area should be treated with suspicion.

Other funnel web spiders

There are 12 described species and at least 20 unnamed species in the more widely distributed genus *Hadronyche*.^{2,3} They are also aggressive spiders with at least six species described as having a similar envenomation syndrome to the Sydney funnel web spider.⁴ As the potency of *Hadronyche spp* venom appears variable in relationship to sex, size, health, feeding habits and geographical distribution, all bites from these spiders should be managed as for the Sydney funnel web spider.

Pathogenesis

Although most funnel web spider bites are thought to be ineffective or 'dry', the clinical syndrome can be devastating and has been lethal in both adults and children. While the causative venom is multicomponent, the key neurotoxins are the



Figure 2. Comparison of size and appearance of male (left) and female (right) Sydney funnel web spiders Photo courtesy Vern Daffin

Tatracotoxins (TACTXs). The TACTXs act by slowing sodium current inactivation resulting in spontaneous repetitive firing of action potentials.⁷ This triggers the release of excessive – and eventual exhaustion of – predominantly sympathetic neurotransmitters leading to the characteristic biphasic clinical syndrome.

Symptoms and signs of envenomation

The initial bite is usually painful and fang marks are generally seen. The envenomation syndrome is generally characterised by two phases: the first begins within minutes of the bite, and the second when the secretions subside – typically many hours later.¹ Historically deaths have occurred in either phase of envenomation.

Phase 1 is characterised by:

Local effects:

- bite site may be painful for days to weeks because of direct trauma and acidity of venom but no local necrosis has been recorded
- local swelling, erythema and occasionally sweating.

General effects:

- numbness around the mouth and spasms/fasciculation of the tongue
- nausea and vomiting, abdominal pain, acute gastric dilatation
- profuse sweating, salivation, lacrimation, piloerection
- severe dyspnoea as a result of noncardiogenic pulmonary oedema
- mental status can rapidly progress from confusion to irrationality or coma



Figure 3. Female Northern funnel web spider Photo courtesy Vern Daffin

- hypertension, tachycardia and vasoconstriction (hypotension may occur later)
- local and generalised muscle fasciculation and spasm which may be prolonged and violent (facial, tongue or intercostal muscles, trismus) and difficult to manage.

Phase 2 is characterised by:

- hypotension
- hypoventilation and apnoea
- continuing acute noncardiogenic pulmonary oedema
- coma, and, finally
- irreversible cardiac arrest.

First aid and treatment

A summary of the recommended first aid and medical treatment for funnel web spider bite is presented in *Figure 4*. The key points are:

- ensure airway, breathing and circulation (ABCs) are maintained
- prompt application of pressure immobilisation bandage (PIB) to the affected limb
- transfer to hospital, ideally where antivenom, resuscitation equipment and monitoring is available
- intravenous access should be obtained
- PIB should be removed only in an area where appropriate resuscitation can occur and antivenom is available. (If PIB has been removed and the patient deteriorates it should be re-applied)
- local tissue enzymes may inactivate the venom, therefore the use of PIB may not only be helpful in delaying the onset of symptoms, but may allow for a degree of inactivation of the venom
- administer antivenom as per protocol in

Figure 4 if systemic signs of envenomation are present

- until antivenom is available supportive care of the envenomed patient may include:
 - supplemental oxygen
 - atropine (0.6 mg initial dose for an adult) to reduce salivation and bronchorrhoea
 - nasogastric aspiration because of gastric dilatation
 - muscle relaxants and sedatives to facilitate mechanical ventilation and control intracranial pressure
 - intubation and ventilation for respiratory failure and to reduce intracranial pressure (note: entotracheal intubation can be difficult as a result of excessive salivary secretions and violent fasciculations)
 - fluid resuscitation should be used with

caution in the event of hypotension because of noncardiogenic pulmonary oedema

- relapse is possible and may manifest as dyspnoea secondary to noncardiogenic oedema which usually responds to further antivenom (this should not be confused with iatrogenic pulmonary oedema as a result of intravenous overload, particularly in children)
 - if no symptoms or signs of envenomation have started 4 hours after the removal of first aid measures or postbite, the patient may be discharged (most patients presenting to hospital will not have been envenomed)
 - tetanus status should be assessed and prophylaxis provided if indicated.
- Since the introduction of funnel web spider

antivenom in 1980, there have been no deaths reported and time required in hospital has dramatically decreased from an average of 14 days⁹ to less than 2 days.¹ Moreover, the antivenom is extremely safe – no cases of anaphylaxis have been reported and only one case of serum sickness has been associated with the antivenom.⁹

Mouse spiders

Mouse spiders (*Missulena spp*) are medium sized and robust spiders found throughout mainland Australia. Currently there are 11 recognised species. They possess large powerful fangs and produce copious amounts of venom, but systemic envenomation has rarely been reported and bites are generally minor. The most severe case of mouse spider envenomation presented simi-

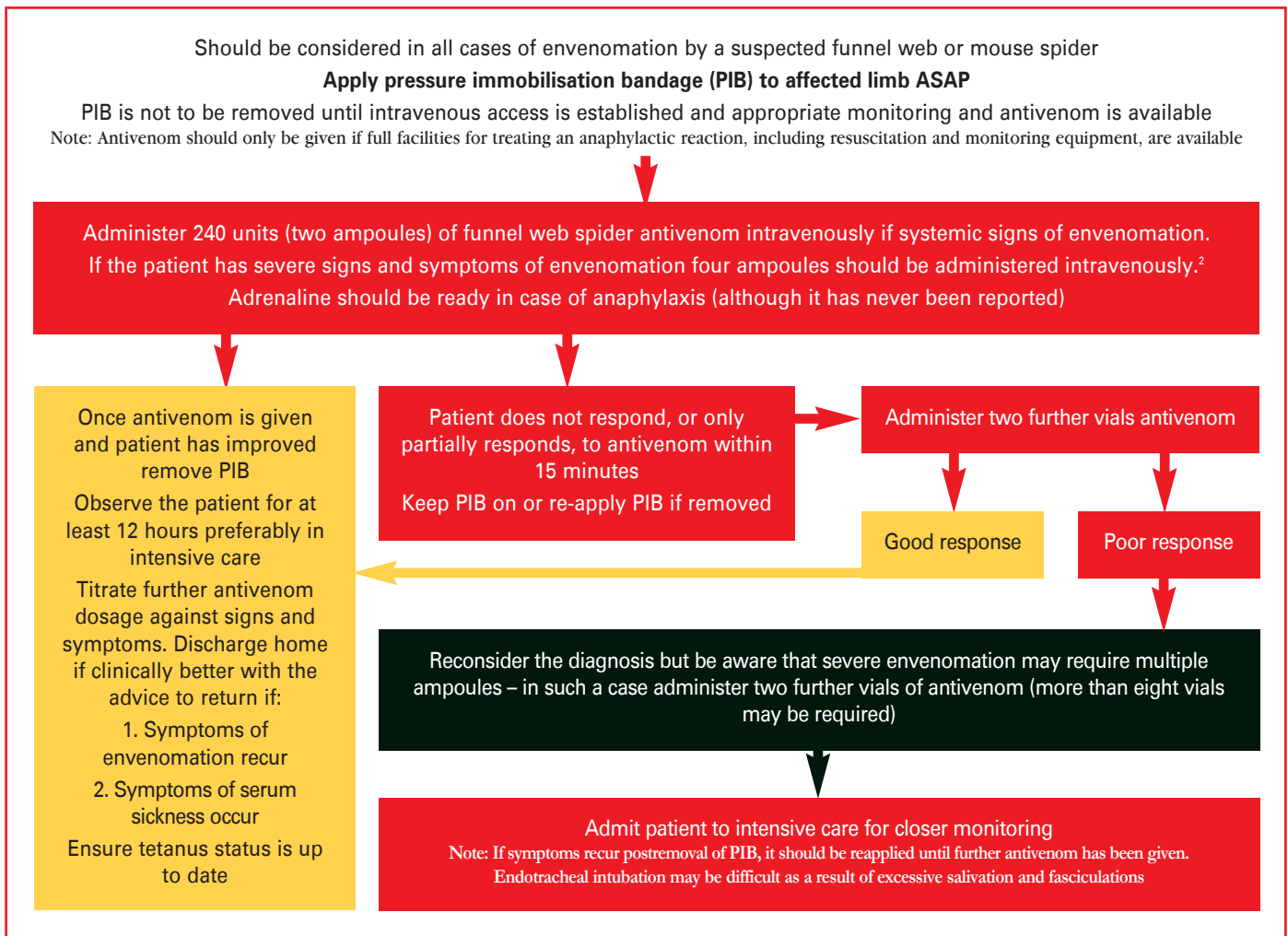


Figure 4. Management of potential funnel web spider bite



Figure 5. Male eastern mouse spider
Photo courtesy Ken Walker, Melbourne Museum

larly to that of the funnel web spider.¹ Subsequent research has shown the relevant toxin has a T- α -TX-like action and funnel web spider antivenom neutralised its effect in vitro.¹⁰ In 1985, an infant bitten in southern Queensland by a male mouse spider (*M. bradleyi*, Figure 5) was successfully treated with funnel web spider antivenom.^{1,11} However, documented clinical effects of the bite appear generally mild and self limiting and most cases don't require antivenom.¹²

Other spiders









Thousands of species of spiders inhabit

Australia. A summary of some of the more well known species is presented in Table 1 and management is shown in Figure 6.

Necrotising arachnidism

Necrotising arachnidism is the name given to a syndrome of skin blistering, ulceration and necrosis following spider bite. Although it is well recognised in many parts of the world, it remains little understood. Since the late 1970s doctors have suspected that Australian spiders may cause local tissue injury.^{15,16} The chief suspects have been the white tailed spider (*Lampona spp*), the black

Table 1. Summary of common spider bites
Photos courtesy Ken Walker, Melbourne Museum¹⁴

	Spider (family)	Adult body length	Circumstances of bite	Local reaction	Nausea/vomiting
	Huntsman (<i>Sparassidae</i>)	Over 20 mm	Handling spiders or treading on them	Immediate pain may be severe, local infection may occur	Low incidence
	Orb weaver (<i>Araneidae</i>)	10–20 mm	Bed clothes, garments left on clothesline over night	Mild pain and redness	Low incidence
	White tail (<i>Lamponidae</i>)	10–20 mm	Bedclothes, garments or shoes left on the floor	Local pain and inflammation	No
	Wolf (<i>Lycosidae</i>)	Over 20 mm	Exposure in the garden and near water	Local pain lasts approx 10 minutes	Low incidence
	Jumping (<i>Salticidae</i>)	Up to 20 mm	Exposure in the garden	Local pain lasts approx 20 minutes, local swelling may occur	Low incidence
	Black house (<i>Desidae</i>)	Up to 20 mm	Walking into web	Pain usually moderate but may be severe. Local swelling may occur	1 out of 5 cases
	Trapdoor (<i>Idiopidae</i> and <i>Nemesidae</i>)	Over 20 mm	Exposure in the garden	Mild pain, short duration, mild redness	Low incidence
	Tarantula or 'whistling spider' (<i>Theraphosidae</i>)	Over 20 mm	Exposure in the garden and handling spiders	Pain usually moderate but may be severe	Low incidence

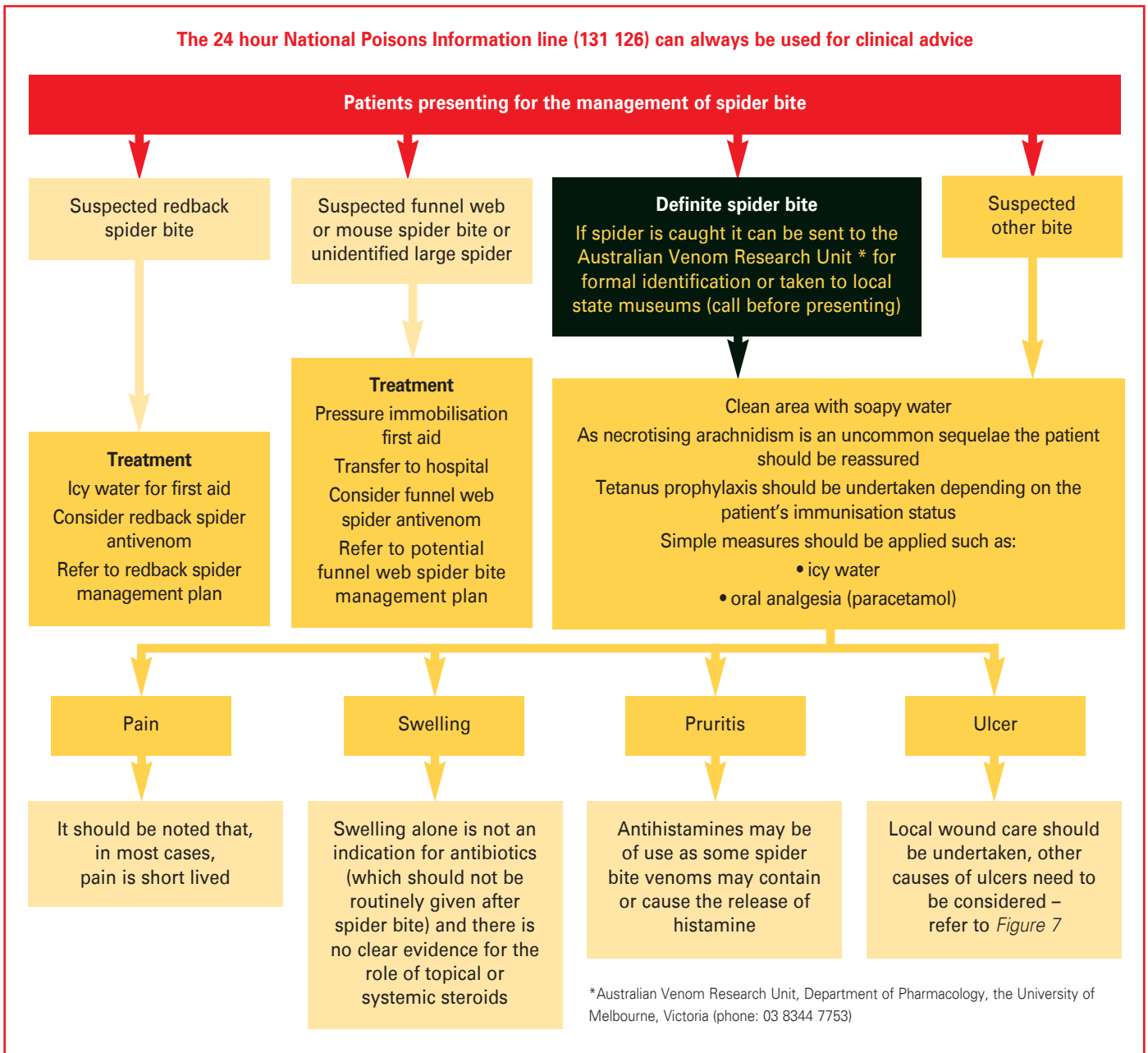


Figure 6. Guide to the management of spider bites

widow or house spider (*Badumna spp*) and the wolf spider (*Lyscosidae spp*). Thereafter, various reports of such lesions were published, mostly without the associated spider being formally identified.¹⁷⁻²¹ Due to the frequency of spider bite this issue has been of great interest to clinicians and the public alike. However, experimental studies of the suspect venoms has not revealed a clear mechanism for the proposed skin necrosis.²²⁻²³ Moreover, in a recent prospective

study of 130 bites from one species of white tailed spider (*Lampona cylindrata*) no cases of ulceration were reported.²⁴

Is necrotising arachnidism fact or fallacy?

Recent reviews have concluded that other causes of skin ulcers should be suspected ahead of spider bites as the true incidence of such lesions appears to be very low not only in Australia but also in the United States.^{25,26}

In one well publicised international example, a 7 month old child admitted to a New York hospital with the presumptive diagnosis of brown recluse spider bite was later found to have been suffering from cutaneous anthrax.²⁷ Various cases of infection, including cutaneous anthrax and sporotrichosis, have also been reported in the context of possible or definite spider bite in Australia. Therefore, a history of spider bite doesn't exclude the possibility that the true cause of skin necrosis

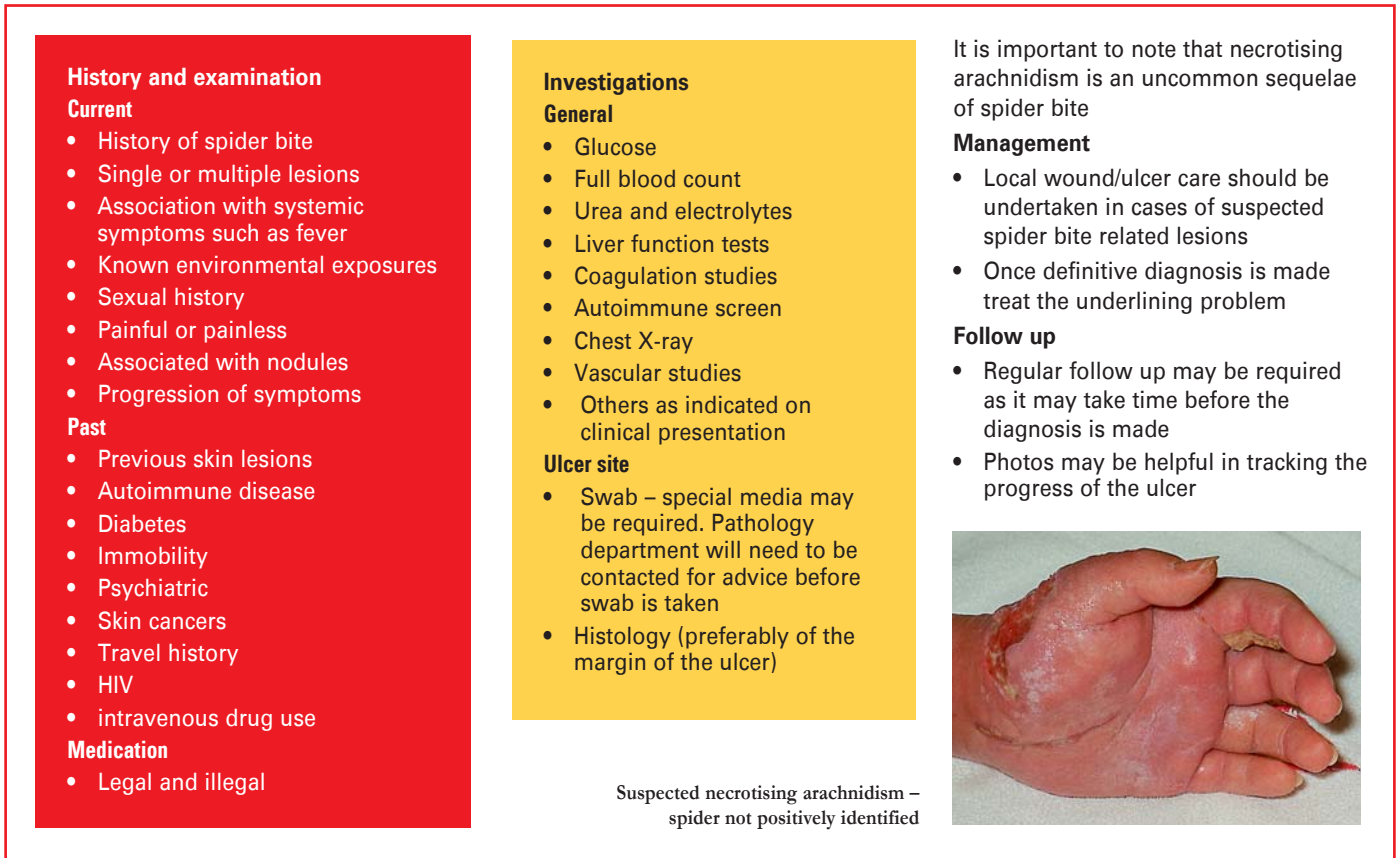


Figure 7. Guide to the diagnosis, investigation and management of possible necrotising arachnidism

Table 2. Differential diagnosis of suspected necrotising arachnidism

- Vascular ulcers: arterial or venous insufficiency
- Diabetic ulcer
- Neuropathic ulcers
- Bacterial infections
- Fungal infections
- Viral infections
- Foreign body
- Focal and general vasculitis
- Injection of toxin (accidental or deliberate)
- Drug reaction
- Physical/mechanical trauma (may be deliberate)
- Bed sores
- Burns (especially chemical burns)
- Contact dermatitis
- Pyoderma gangrenosum
- Neoplasm
- Connective tissue diseases
- α_1 antitrypsin deficiency
- Other arthropod bites or stings

in any given case is infective.

The true incidence of necrotising arachnidism in Australia is unknown and at the very least uncommon. The usual presentation for alleged 'necrotising arachnidism' is of an area of blistering or necrosis, usually on the limb, in a patient who has been outside (often in the garden), but usually without a definite bite history or, if a bite has been felt, without identification of the offending creature. The diagnosis of necrotising arachnidism is, therefore, one that must usually be considered circumstantial and care must be taken to exclude other treatable causes of necrotic lesions. A list of possible differential diagnoses is given in *Table 2*.

Managing suspected necrotising arachnidism

There remains no definitive treatment for necrotising arachnidism. It is best to view the treatment of such lesions as you would for any ulcer requiring local wound care. Specific treatment should commence once pathology of the ulcer has been established. It should be noted that the ulcer pathogenesis may take time to identify and it is best not to label the ulcer as necrotising arachnidism until an extensive examination of the possible differential diagnosis is made (*Table 2, Figure 7*).

Conclusion

Spider bites are a common cause of stress for patients and generate time consuming work for general practitioners and poison information centres. However, most cases are self limiting and can be managed symptomatically. The exception is the possibility of funnel web spiders, all of which should be

considered potential medical emergencies. Although true necrotising arachnidism is rare, putative cases of necrotising arachnidism should be managed as for any ulcer with a combination of local wound care and a search for the definite cause for definitive treatment.

Summary of important points

- Spider bite is common but usually self limiting.
- Funnel web spider bite, although potentially deadly, is readily managed with PIB and specific antivenom.
- Not all funnel web spider bites require antivenom as there is variation in venom toxicity within and between spider species.
- White tailed spider bites usually cause acute bite site pain and inflammation without frank skin ulceration.
- Skin infections, including bacterial and fungal infections, rarely occur after spider bite, therefore routine antibiotics are not recommended.

Conflict of interest: none declared.

Resources

National Poisons Information Centre 13 11 26
 CSL Antivenom Handbook:
http://www.wch.sa.gov.au/paedm/clintox/cslavh_antivenom.html
 Australian Army first aid training site on bites and stings:
<http://www.defence.gov.au/army/1stAid/bites.htm>
 Australian Venom Research Unit. Treatment of bites by venomous Australian spiders:
www.avru.org

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