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Spider bites

Assessment and management

Background
Spider bite is common, but most species cause minimal or no effects. Patients may be misinformed regarding the nature and consequences of a bite. Understanding the current literature can assist the physician in the management of spider bite patients.

Objective
This article reviews the current literature on spider bites and describes the clinical assessment and management of the medically important spider bites.

Discussion
Most spider bite is minor and causes nothing more than local irritation. Some spiders can cause significant morbidity and rarely, mortality. Lay identification of the spider has not been shown to be reliable. Latrodectism (red back spider envenomation) is characterised by pain (local, radiating, and regional); systemic symptoms occur less commonly. Funnel web spider bite is a medical emergency; a pressure immobilisation bandage should be applied and the patient transferred to a hospital with available antivenom and resuscitation facilities. Clinicians must consider spider bite in the differential diagnosis of unexplained autonomic and neurological dysfunction, particularly in children. In Australia, skin ulceration is more likely to be an infective, inflammatory or traumatic cause than a case of necrotising arachnidism.

We live in a world full of spiders. Of the 40 000 species that have been identified there are probably four times as many that have not been classified.[1] In Australia, spiders are the most widely distributed venomous creatures with an estimated 10 000 species.[2]

While most spider bite is minor and causes nothing more than local irritation, medical practitioners must be aware that some spider bites can cause significant morbidity and rarely, mortality.

Incidence

Table 1 lists telephone calls over 1 year to the Victorian Poisons Information Centre for spider bite and the action recommended based on these calls (1 July 2008 to 30 June 2009).[3] Telephone calls about red back spider (Latrodectus species) bite constituted 69% of hospital referral or enquiry, and calls about white tailed spider bite, 26%. This is surprising given that recent research has shown that white tailed spider bites cause minor effects in most cases and are very unlikely to cause necrotic ulcers (*Table 2*).[4] The 'unknown' spider group is the largest, but this group only constitutes 5% of referral to, or enquiry from, hospitals. As with all self reporting databases, the true incidence is expected to be much higher. Absence of funnel web spider bite enquiries in this Victorian sample is consistent with the distribution of the funnel web spider in Australia.

Spider identification vs. 'toxindrome' recognition

Spider identification is problematic and the clinician is better off recognising the 'toxindrome' (ie. signs and symptoms associated with medically significant spider bite) than attempting to identify the spider responsible for the bite. Incorrect spider identification is likely to be responsible for the myth that white tailed spider bites commonly result in necrotising arachnidism (*Table 2*).[4]

The term for systemic effects resulting from spider bite is 'araneism', or 'arachnidism'. In addition, there are terms to describe the effects of specific spiders such as 'latrodectism' (red back spider) and 'loxoscelism' (recluse spider). The two main types of spider venom are:

Table 1. Spider bite calls to the Victorian Poisons Information Centre 1 July 2008 to 30 June 2009[3]

	Stay home	Go to hospital	In hospital	Go to GP	At GP	Total
Red back spider	117	18	33	7	9	184
White tailed spider	91	1	3	15	3	113
Spider bite: other/unknown	307	5	14	35	5	366
Total	515	24	50	57	17	663

- neurotoxic (affects the nervous system) – released by Latrodectus species (red back spider, widow spider) and Atrax species (funnel web spider), and
- cytotoxic or necrotic (causing damage to tissue) – released by Loxosceles species (recluse spider).

Latrodectism (red back spider bite envenomation)

Red back spider (Latrodectus hasselti) (*Figure 1*) bites are the most common cause of significant spider envenomation in Australia. The systemic clinical effects are caused by the release of a neurotoxin called 'A-latrotoxin' (a-LTx).[5,6] A-latrotoxin causes synaptic vesicle exocytosis from the presynaptic terminal via a calcium dependant mechanism leading to the release of catecholamines and acetylcholine.[7–9] Before the use of antivenom, patients were treated with muscle relaxants, analgesics and intravenous calcium for symptomatic relief.[10]

Clinical presentation

Red back spiders live in dry or dark areas and bites occur in the warmer months. Red backs are small spiders; the bite may not be felt and rarely leaves fang marks. Erythema is not always present. Localised sweating and piloerection occurs in 25% of patients.[11]

Latrodectism is characterised by pain (local, radiating, regional) that typically increases over about an hour and may radiate proximally along the affected limb, or less commonly the trunk.[12–14] While such local effects are common, systemic effects are less common. In one series, 76% of patients only had local symptoms.[15] If systemic effects occur, they may include hypertension, agitation, fever, priapism, patchy paralysis, paraesthesia, fasciculations, and cardiac effects.[15]

In a prospective study of 68 patients with confirmed red back spider bites, the median duration of effect was 48 hours.[16] Almost all cases resolved within 1 week. There have been no deaths since the 1950s.[14] However, there are case reports of chronic pain that persisted after several days, and weeks, after successful treatment with antivenom.[17–20]

Diagnosis is based on history, but can be difficult in young children who may present with undifferentiated pain or distress. Trethewy et al[21] found the three most common systemic features in children were irritability, hypertension and sweating.

Treatment

Treatment of red back spider envenomation is not without controversy. The decision to administer antivenom tends to be based on the risk-benefit profile of treatment.

Figure 1. Red back spider

In the United States, antivenom is not used routinely because of concern regarding allergic reaction.[22] However, in Australian studies, allergic reactions to the antivenom are rare (<2%).[14] In an Australian series, 21% of patients who presented to an emergency department with red back spider bite received antivenom.[23] Those with severe or systemic symptoms and patients at greater risk such as children, pregnant women, and the elderly, are more likely to receive antivenom.[14,23]

In Australia, antivenom is recommended for patients with signs of systemic envenomation, pain not controlled with simple analgesia, or for those who require repeated doses of opiates.[24] Premedication is not recommended.

Intravenous versus intramuscular antivenom

Currently, Commonwealth Serum Laboratories (CSL) Ltd recommend that red back spider antivenom be given intramuscularly (IM).[25] The dose is based on quantitative venom measurement.[26,27] Intramuscular injection was initially recommended in the belief that it reduced the risk of anaphylaxis following reports of a higher rate of immediate type hypersensitivity reactions when antivenom was given as an undiluted intravenous (IV) bolus.[28] This has now been challenged on two fronts: the assumption that IM injection is safer, and that one route is more efficacious than another.

Isbister and Gray[16] determined that only 17% of patients treated with IM red back spider antivenom were pain free after 24 hours, compared with 12% of untreated patients. (The expected

antivenom treatment outcome is 80–90% pain free after 24 hours.) In a randomised, double blind study of patients with red back spider envenomation, Ellis et al[11] showed that both routes were initially equally effective, but a significant difference in pain scores at 24 hours favoured IV administration. While this study included only 18 patients, there were no significant adverse effects in either group.[11] In theory, as long as the antivenom is not given in a bolus undiluted form, the IV route may actually improve safety as the antivenom could be stopped immediately in the setting of an allergic reaction.

Another study revealed no detectable antivenom levels in patients treated with IM antivenom for up to 2 hours postinjection, while patients who received IV antivenom had detectable levels within 20 minutes of administation.[29]

In the RAVE study, 126 patients were randomly allocated to receive antivenom IV or IM. This study did not detect a statistically significant difference in pain resolution. However, in the IV group there was a trend toward better improvement (62% compared to 53%), and a nonsignificant reduction in adverse effects such as serum sickness (11% compared to 16%).[30]

Larger studies will further clarify the best method of administration of red back antivenom. Until then, the current CSL recommendation of IM administration is recommended.

Discharge

Once symptoms are under control, patients may be discharged and told to return if they require further treatment for pain or systemic effects. Although uncommon, all patients who have received antivenom should be warned about the possibility of serum sickness. The authors recommend that those who receive more than three vials of antivenom be provided with a prescription for a short course of prednisolone (1 mg/kg/day for children to a maximum of 50 mg/day [the adult dose] titrated according to severity) to be started should they develop symptoms such as fever, malaise, urticaria and joint pain.

Practice note

Two other spiders, the 'cupboard' or 'false widow' spider (Steatoda grossa or S. capensis, *Figure 2*) and the grey house spider (Achaearaneaetrepidariorum, *Figure 3*) may be mistaken for the red back spider. The grey house spider only causes local pain. However, S. grossa and S. capensis have been implicated in a small number of cases of systemic envenomation in humans, also called 'steatodism'. This causes similar (though generally less severe) effects to lacrodectism and is worth considering as a differential diagnosis in patients who fail to respond to red back spider antivenom.[5]

Funnel web spider envenomation

Native to Australia, the funnel web spider (*Figure 4*) is the most venomous spider in the world. The name 'funnel web' refers to a group of large, aggressive, nocturnal spiders, classified into two genera: Atrax and Hadronyche. The venom of the funnel web spider

Figure 2. False widow spider

Figure 3. Grey house spider

contains a neurotoxin called delta-atracotoxins (delta-ACTXs). Delta-atracotoxins act by slowing sodium current inactivation resulting in spontaneous repetitive firing of action potentials. This leads to the excessive release and eventual exhaustion of neurotransmitters.[31]

Between 1927 and the introduction of an antivenom in 1980, 14 deaths were reported.[32] In a study of 138 funnel web spider bites, the species with the highest envenomation rate was Hadronyche cerebrae (75%), while the Sydney funnel web, Atrax robustus, accounted for only 17% (or 1% of all spider bites).[33,34]

Severe envenomation has been reported from southern Queensland to southern New South Wales.[33,35] Despite the availability of effective antivenom, the severity and rapidity of systemic envenomation dictate that bites from this spider should be considered a life threatening medical emergency.

Clinical presentation

Isbister et al[34] observed the following clinical effects of funnel web spider envenomation:

Table 2. Necrotising arachnidism

There has been much debate by lay press and scientific literature about the phenomenon of necrotising arachnidism in Australia. The white tailed spider (Lampona cylindrata and L. murina) (*Figure 6*) was thought to be responsible for causing the condition. The public debate is illustrated by the following quote:

"My partner was a victim of those nasty things. He had to have his little and big toe amputated 'cos he had gotten bitten three times in the foot. I was 3 months pregnant at the time and he just came into our room one night with tears in his eyes and said he had a burning pain in his foot."[41]

Figure 6. White tailed spider

Early retrospective studies hypothesised the spider caused tissue destruction. However, studies on the cytotoxic effects of the lampona venom showed little potential to cause necrosis in human cell cultures.[42] Isbister conducted a study of 130 patients with a definite white tail spider bite and found pain or discomfort in all cases and severe pain in 27%. Systemic effects (nausea, vomiting, malaise and headache) occurred in 9% and there were no cases of necrotic ulcers or confirmed infections.[4]

Overseas, spiders such as the recluse (Loxosceles spp.) (*Figure 7*) have been shown to cause necrotising arachnidism.[43] These spiders have been found in Australia.[44] Investigation of the domestic black house spider (Badumna spp.) (*Figure 8*), wolf spider (Lycosidae) (*Figure 9*), and sac spider (Cheiracanthium spp.) (*Figure 10*) have failed to show evidence that they cause necrotic arachnidism.[45]

Figure 7. Recluse spider

Current evidence suggests that in Australia, spider bites are very unlikely to cause necrotic lesions and such cases presenting as suspected spider bites should be thoroughly investigated for other causes including infectious, inflammatory, vascular and neoplastic conditions.

Figure 8. Black house spider

Figure 9. Wolf spider

Figure 10. Sac spider

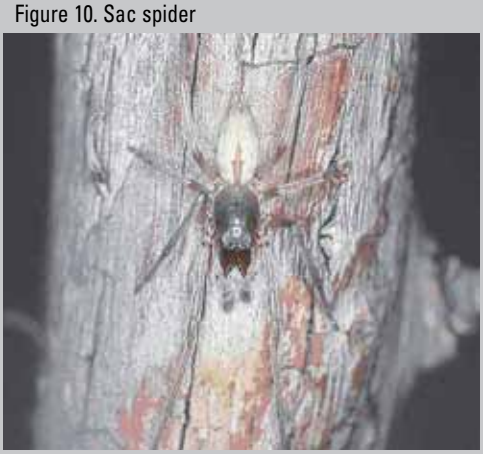

Figure 4. Funnel web spider

Table 3. Treatment of funnel web spider envenomation[35]

1. Ensure airway, breathing and circulation (ABCs) are maintained
2. Supplemental oxygen (if available) should be started
3. Prompt application of a pressure immobilisation bandage (PIB) to the affected limb to retard lymphatic spread of venom and promote local destruction or inactivation of the venom
4. Transfer to hospital where antivenom and advanced life support is available
5. PIB removal should only be performed in an appropriate resuscitation area with antivenom on hand
6. If PIB has been removed and the patient deteriorates, it should be reapplied
7. At the first sign of systemic envenoming due to suspected funnel web spider bite, it is advisable to give two vials of CSL funnel web spider antivenom (be prepared to give another 2–4 vials). If envenoming is already severe, start with four vials[40]

Additional measures

- Atropine to reduce salivation and bronchorrhoea
- Intubation and mechanical ventilation can assist in decreasing ventilation and gas exchange in the presence of excessive secretions and noncardiogenic pulmonary oedema. If secretions are not problematic and the patient is awake, noninvasive ventilation such as continuous positive airway pressure (CPAP) may be of benefit (CPAP may exacerbate hypotension)
- Fluid resuscitation should be used with caution in the event of hypotension because of noncardiogenic pulmonary oedema
- Relapse 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

- autonomic – diaphoresis (78%), hypersalivation (44%) and piloerection (12%)
- cardiovascular – hypertension (75%) and tachycardia (59%), bradycardia and hypotension (less commonly – both 10%)
- neurological – fasciculations (54%) and oral paraesthesia (17%)
- noncardiogenic pulmonary oedema (54%), more common in children than adults (70% compared to 44%)
- other – agitation (47%), vomiting (41%), headache (10%).

Children may deteriorate rapidly and death may result in 1–2 hours if left untreated.[36] In adults, untreated envenomation may result in death from progressive, irreversible hypotension, or possibly raised intracranial pressure resulting from cerebral oedema.[37]

Treatment

Funnel web spider antivenom is the only example of the use of rabbit IgG to treat a human envenomation. It was developed by Sutherland in 1980.[38] Isbister et al[34] reported a severe allergy rate of 1.3%. Treatment of funnel web spider envenomation is outlined in *Table 3*.

Mouse spider

The mouse spider (Missulena spp.) (*Figure 5*) is not only of interest because of its venom, but because it is often mistaken for the funnel web spider due to its similar appearance. Mouse spiders can be found throughout mainland Australia. In a review of 40 definite bites from around Australia, Isbister[40] reported only minor local effects apart from a single case of severe neurotoxic envenomation in a 19 month old child who developed hypertension, muscle spasm, opisthoclonus and unconsciousness. The child responded to funnel web spider antivenom. This is not surprising given the mouse spider venom has 88% homology to that of the funnel web spider. What is surprising is that given this similarity mouse spider envenomation is generally mild and clinically insignificant.[5] Note: if the presentation is consistent with funnel web spider envenomation, the patient should be treated for funnel web spider envenomation.

Figure 5. Mouse spider

Summary of important points

- Spider bite is common, but most species cause minimal or no effects.
- Lay identification of the spider has not been shown to be reliable.
- Latrodectism (red back spider envenomation) is characterised by pain (local, radiating, and regional); systemic symptoms occur less commonly.
- Red back spider antivenom is recommended for patients with signs of systemic envenomation, pain not controlled with simple analgesia or who require repeated doses of opiates.
- Funnel web spider bite is a medical emergency; a pressure immobilisation bandage should be applied and the patient transferred to a hospital with antivenom and resuscitation facilities.
- Always consider spider bite in the differential diagnosis of unexplained autonomic and neurological dysfunction, particularly in children.
- In Australia, skin ulceration is more likely to be an infective, inflammatory or traumatic cause than a case of necrotising arachnidism.

Conflict of interest: none declared.

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