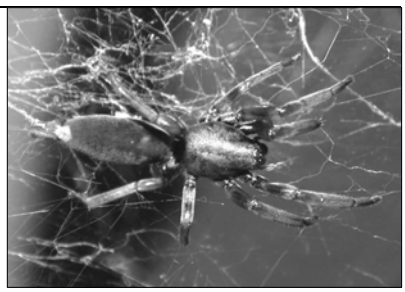
White-tail spider bite: a prospective study of 130 definite bites by *Lampona* species



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ABSTRACT

Objective: To investigate the circumstances and clinical effects of bites by white-tail spiders, including the two species *Lampona cylindrata* and *L. murina* commonly encountered by humans, and the incidence of necrotic lesions.

Design: Prospective cohort study of definite white-tail spider bites. Cases were only included if there was a clear history of bite, the spider was caught and was identified by an expert.

Setting: Calls to Australian poisons information centres and emergency departments.

Patients: 130 patients with a definite bite by a white-tail spider from February 1999 to April 2002.

Results: There were 79 bites by *L. cylindrata* and 51 by *L. murina*. Bites occurred in warmer months, 95% indoors and 75% between 16:00 and 08:00. The activity at the time of the bite was characteristic and the spider was encountered between bedclothes, towels or clothing. 25% of bites occurred on distal limbs. Pain/discomfort occurred in all cases, and was severe in 27%. Other effects included puncture marks (17%), redness/red mark (83%) and itchiness (44%). Systemic effects occurred in 9%. There were no cases of necrotic ulcers (97.5% CI, 0–2.8%) or confirmed infections. Median duration of effects was 24 hours (interquartile range, 1–168 hours). There were three distinct clinical patterns: pain only (21%), pain and red mark for <24 hours (35%), and a persistent painful or irritating red lesion (44%).

Conclusions: Bites by *Lampona* spp. cause minor effects in most cases, or a persistent painful red lesion in almost half the cases. White-tail spider bites are very unlikely to cause necrotic ulcers, and other diagnoses must be sought.

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WHITE-TAIL SPIDER BITE has attracted significant media and public attention in Australia over the past 20 years.[1-3] It has become a feared condition that is purported to cause ulceration and necrotic lesions for which there is no effective treatment.

Before 1980, there were scattered reports of definite white-tail spider bites causing minimal effects.[4,5] However, over the past 20 years, necrotic lesions and ulcers have been attributed to white-tail spider bites.[6-11] In a few cases, houses were searched for spiders and it was suggested that either white-tail spiders or, in some early cases, wolf spiders (Lycosidae) were responsible for the ulcers.[1,6] Several reports of necrotic lesions attributed to white-tail spider bites have been published since then,[3,7-10] despite lack of evidence of an identified white-tail spider biting the patient. These reports led to increased fear in the 1990s and general acceptance that white-tail spider bite causes necrotic ulcers.

Here we report a prospective cohort study of definite white-tail spider bites with expert identification of the spiders. The white-tail spiders in this study belong to two species, *Lampona cylindrata* and *L. murina*, both commonly encountered species in southern and eastern Australia (Box 1).[12] Our hypothesis is that white-tail spider bites do not cause necrotic ulcers or lesions.

METHODS

Case collection

Subjects were recruited prospectively during a 39-month period from February 1999 to April 2002. Most were a subgroup of a large, prospective study of all spider bites in Australia, conducted from 1 February 1999 to 30 April 2001.[13] In the following 12 months, the same methodology was used, but only including white-tail spiders (this study), redback spiders,[14] and mygalomorph spiders (unpublished).

Cases were recruited from emergency department presentations and calls to New South Wales, Queensland and Western Australian poisons information centres. Although the study covered the whole of Australia for the 12-hour period overnight, it did not recruit from Victoria during the day.

Cases were only included if there was a definite history of spider bite and the spider had been collected at the time of the bite. Patients were seen or contacted within 24 hours of the bite where possible, and then followed up by telephone after 1 week, or until the clinical features had resolved. Verbal and written consent for the study was obtained from all patients.

The following information was recorded for each spider bite: patient demographics, circumstances of the bite (location, time, activity at the time, season), bite site, local and systemic effects, past medical history, and management (hospital attendance, first aid, treatment). A standard spider information sheet was completed at the time of each call by GKI and entered into a

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database (full details available from the authors).[15] Severe pain was defined as pain greater than a bee sting or equivalent. Duration of effects was defined as the length of time of objective signs and symptoms of the bite. An asymptomatic red mark remaining at the bite site was not included in the duration.

Spider identification

The spider was either collected directly from the patient or mailed to the authors for identification. Spiders were stored in 70% ethanol and kept at the Australian Museum. Spider identification was done by an expert arachnologist (MG). All spiders were identified to species level. Morphological characteristics (mainly genitalic) and geographical distribution data were used to identify the species.[12]

Ethics approval

Ethics approval was obtained from the Central Sydney Area Health Service Ethics Review Committee (RPAH Zone), the Joint Institutional Ethics Committee of the Royal Darwin Hospital and the Menzies School of Health Research, and the Ethics Committee of the Royal Children's Hospital and District, Brisbane, to cover all institutions involved.

Statistics

For descriptive statistics, median and interquartile range (IQR) were used for data not normally distributed. Fischer's exact test was used for comparison of proportions and the Mann–Whitney test for comparison of medians. All statistical analysis was done using GraphPad Instat,[16] and confidence intervals were calculated with StatMate.[17]

RESULTS

During the initial 27-month period, 1474 subjects with spider bites were recruited.[13] Of these, 122 had a definite bite by a white-tail spider and the spider was collected for identification. Twelve cases in which spiders were collected were excluded (eight were suspected bites, three were not bites, and in one case possibly the wrong spider was collected). A further eight cases were recruited in the 12 months after the major study, to give 130 definite white-tail spider bites: 79 by *L. cylindrata* and 51 by *L. murina*.

The 130 patients included 60 males (46%) and 70 females (54%), aged 3–76 years, with a median age of 30.5 years (IQR, 19–45 years). There were 25 children (age < 15 years). Bites occurred to all parts of the body, with 25% on a hand or foot, 42% on an arm or leg, 27% on the trunk and 6% on the head or neck.

Circumstances of bites

Almost all bites occurred in the warmer months (September to April). Bites by *L. cylindrata* occurred across southern Australia, including Tasmania, while *L. murina* bites were confined to south-eastern Australia (Box 2). Most bites occurred in the evening and night, 75% occurring between 16:00 and 08:00 (70% excluding cases in Victoria), with a peak between 20:00 and midnight. Of the 130 bites, 124 (95%) occurred indoors. Often the spider was encountered between pieces of material/fabric, such as bedclothes, towels or clothing (Box 3).

Clinical effects

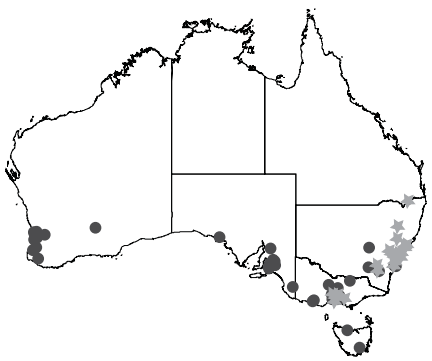
The median duration of effects was 24 hours (IQR, 1–168 hours). Pain or discomfort occurred in all cases, was mild to moderate in 95 cases and severe in 35 (Box 4). Itchiness occurred in 44% of cases, and was delayed from 1 hour to 5 days in 34% (Box 4). There were three distinct patterns of clinical effects: pain only, pain and red mark for < 24 hours,

1: White-tail spiders

The genus *Lampona* (family Lamponidae) contains some 60 species distributed throughout Australia.[12] *L. cylindrata* occurs across southern Australia, including Tasmania, and *L. murina* has an east coastal mainland distribution from southern Victoria to Cairns;[12] both species have been introduced into New Zealand.

L. cylindrata and *L. murina* are very similar in size and appearance. Both are dark grey spiders characterised by a cylindrical body with lateral white patches (sometimes obscure) on the abdomen and a definite white spot at its tip.

2: Geographical distribution of bites by white-tail spiders



● *L. murina*. ★ *L. cylindrata*.There were no bites by *L. murina* in Queensland, although the spider occurs there.

3: Activity of the patient at the time of the white-tail spider bite

Activity	Description or details of activity	No. (%)
Sleeping or in bed	12 patients were sleeping at the time of the bite	41 (32%)*
Dressing	Bitten immediately after dressing, or soon after clothes had been put on	26 (20%)*
	Clothes left lying on the floor or bed	15 (12%)
	Clothes from the cupboard	3 (3%)
Lying or sitting	Patients sitting or lying on the floor, lounge or other chair; spider usually crawled on to them.	22 (17%)
In bath or shower	Bitten while showering, bathing or immediately after	19 (15%)
	On a towel when drying themselves	14 (11%)*
Walking (trod on spider)	Spider on floor	5 (4%)
Picking up an object	Spider mistaken for something else	5 (4%)
Catching spider		3 (2%)
Cleaning		3 (2%)
Other	Driving (2), putting on shoe (2) and picking up a brick (1)	5 (4%)

* Associated with spider being caught between material and the patient's skin (63%).

4: Clinical effects and classification of white-tail spider bites (*Lampona* spp.)

	L. cylindrata (*n*=79)		*L. murina* (*n*=51)		Female (*n*=61)		Male (*n*=40)		Juvenile (*n*=29)		Total (*n*=130)	
Clinical effects	**No.**	**% (95% CI)**	**No.**	**% (95% CI)**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**% (95% CI)**
Local effects												
Pain	79	100% (95%–100%)	51	100% (93%–100%)	61	100%	40	100%	29	100%	130	100% (97%–100%)
Severe pain	21	27% (17%–38%)	14	27% (16%–42%)	20	33%	7	18%	8	28%	35	27% (20%–35%)
Fang marks	9	11% (5%–21%)	13	25% (14%–40%)	9	15%	4	10%	9	30%	22	17% (11%–24%)
Initial bleeding	5	6% (2%–14%)	0	0 (0–7%)	4	7%	0	0	1	3%	5	4% (1%–9%)
Initial redness or red mark	67	85% (75%–92%)	41	80% (67%–90%)	51	84%	36	90%	21	72%	108	83% (76%–89%)
Swelling	5	6% (2%–14%)	5	10% (3%–21%)	5	8%	4	10%	1	3%	10	8% (4%–14%)
Itchiness	35	44% (33%–56%)	22	43% (29%–58%)	27	44%	22	55%	8	28%‡	57	44% (35%–53%)
Immediate	8	10% (4%–19%)	4	8% (2%–19%)	6	10%	4	10%	2	7%	12	9% (5%–16%)
Delayed 1–24 h	13	16% (9%–26%)	8	16% (7%–29%)	11	18%	7	18%	3	10%	21	16% (10%–24%)
Delayed 1–5 days	14	18% (10%–28%)	10	20% (10%–33%)	10	16%	11	27%	3	10%	24	18% (12%–26%)
Systemic effects	8	10% (4%–19%)	4	8% (2%–19%)	8	13%	3	8%	1	3%	12	9% (5%–16%)
Nausea	6	8% (3%–16%)	3	6% (1%–16%)	7	11%	1	3%	1	3%	9	7% (3%–13%)
Vomiting	2	3% (0%–9%)	0	0 (0–7%)	2	3%	0	0	0	0	2	2% (0–5%)
Malaise	2	3% (0–9%)	2	4% (0–13%)	3	5%	1	3%	0	0	4	3% (1%–8%)
Headache	3	4% (1%–11%)	2	4% (0–13%)	4	7%	1	3%	0	0	5	4% (1%–9%)
Clinical syndrome												
Pain only (duration,* 10 min [1–120 min])	14	18% (10%–28%)	13	25% (14%–40%)	9	15%	6	15%	12	41%	27	21% (14%–29%)
Red mark < 24 h and pain† (duration,* 5 h [1–15 h])	30	38% (27%–50%)	16	31% (19%–46%)	19	31%	15	38%	12	41%	46	35% (27%–44%)
Persistent red mark with associated itchiness, pain or lump (duration,* 7 days [5–12 days])	35	44% (33%–56%)	22	43% (29%–58%)	33	54%	19	48%	5	17%§	57	44% (35%–53%)

* Duration (given as median and interquartile range) applies to all *Lampona* spp. bites in each classification. † Red mark and pain for < 24 hours, or red mark for a longer period with no other effects. ‡ $P = 0.0566$. § $P = 0.0012$.

and a persistent painful or irritating red lesion (Box 4). There was no difference in the clinical effects or clinical syndrome caused by *L. cylindrata* and *L. murina* (Box 4). No necrotic lesions or ulcers developed as a consequence of a white-tail spider bite (0; 97.5% CI, 0–2.8%), and there were no cases of confirmed infection.

Effects did not differ between male and female adult spiders (Box 4). However, juvenile spiders caused less itchiness, less systemic effects and significantly less persistent effects compared with adult spiders (Box 4).

Treatment

Twelve of the 130 patients attended an emergency department, but none was admitted to hospital. Nine patients attended their local medical practitioner. First aid and treatment varied considerably. Accurate information was obtained on treatment for 64 patients: 25 applied ice, 23 used some form of antiseptic, and 11 washed the site. Less common treatments included antihistamines (4), analgesia (3), oral steroids (2), topical steroids (2) and antibiotics (1). Seven patients had no treatment.

DISCUSSION

Our study demonstrates three patterns of clinical effects after definite bites by white-tail spiders (*L. cylindrata* or *L. murina*), but no necrotic ulcers. The circumstances of bites were characteristic, with most being in the warmer months in southern Australia, indoors, in the evening and at night.

Considerable mythology has arisen in Australia and around the world regarding spider bites,[3,18] related to attribution of clinical effects without confirmation of bite or spider identification. No previous study has both followed up patients and had spiders expertly identified.

For studies of spider bites it is imperative that there is a clear history of a bite, which will almost universally be indicated by pain or discomfort at the time.[13] The spider must be collected immediately at the time of the bite, and identification must be by an expert because misidentification is not uncommon, particularly by healthcare workers.[19] Without this unbroken chain of causality, clinical effects cannot be definitively attributed to different species of spiders.[15]

There were no cases of necrotic lesions in our study, and the 97.5% CI was less than 3%. This provides good evidence that necrotic ulcers are unlikely to be a result of white-tail spider bite, and previously reported cases are more likely a result of misattribution.[8] The largest previous series (eight definite bites by *Lampona* spp.) found minor effects only.[20] A retrospective record review of 600 skin lesions attributed 14 necrotic ulcers to white-tail spider bites.[7] However, only two spiders were identified by an expert, and both caused self-limiting ulcers lasting less than a month. Previously we have shown that there were no necrotic lesions when all spider types in Australia were analysed.[13] These data suggest that spiders are an extremely uncommon cause of necrotic or cytotoxic lesions, and should be considered only at the end of a long list of other differential diagnoses.

Considerable work has been done on the venom of white-tail spiders over the past 10 years because of the reports of necrotic ulcers.[21-23] Study of the cytotoxic effects of the venom showed it has little potential to cause necrosis.[21,22] In one study, the venom had little effect on human cell cultures.[22] *Lampona* venom does not contain sphingomyelinases, which are the active cytotoxic components of *Loxosceles* venom, a spider with confirmed cytotoxic and necrotic venom.[21] Thus, studies on *Lampona* venom support the results of our study.

There were no differences in clinical effects of *L. cylindrata* and *L. murina* bites. In addition, there were no differences between the effects of bites by adult female spiders and adult male spiders. This contrasts with the pharmacological research on white-tail spider venom,[23] but may simply reflect the fact that white-tail spider bites cause only minor effects, so the differences in male and female venoms is not clinically significant. Juvenile spiders caused less severe effects than adult spiders, which may be a function of either the inability of their fangs to penetrate human skin or the lesser toxicity of their venom.

In 63% of cases, the bite occurred because the spider was trapped between bed sheets, a towel or clothes left on the floor, and a person's skin. This explains the large proportion of white-tail spider bites occurring on proximal limbs and the trunk (69%), compared with the bites of all spiders, where half the bites occurred on distal limbs.[13] This is consistent with the known behaviour of these spiders, which are often associated with crevices and narrow spaces.

The circumstances of definite bites in our study are not consistent with many of the previously reported cases of suspected necrotising arachnidism, in which the bites were thought to have occurred in the garden.[1,8,10,17] Some cases of necrotic ulcers attributed to white-tail spider bites were reported to occur in bed at night time,[9,11] which is more consistent with definite white-tail spider bites. However, half these cases occurred in the winter months (when we found few bites) and the spider was never caught and identified.[9,11] These suspected cases may thus have been misattributed to white-tail spider bites.

Our study had several potential biases. Firstly, patients needed to have collected the spider to be included. Secondly, numbers may have been increased because of the concern about white-tail spiders created by the media. However, sampling from hospital presentations only would introduce greater bias, as this would exclude most minor bites.

Previous analysis of all spider bites in Australia demonstrated that our study involved a representative sample of spider bite in Australia.[13] An unusual finding of our study was that there were no bites by *Lampona* spp. recorded in Queensland. Cases were recruited from the Queensland poisons information centre during the day and the NSW poisons information centre overnight, to cover 24 hours a day, so it is unlikely that many cases were missed.

Our study shows that white-tail spider bites are very unlikely to cause necrotic ulcers and other diagnoses must be sought. We hope this will begin to dispel some of the myths surrounding white-tail spiders and their bite.

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COMPETING INTERESTS

None identified.

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