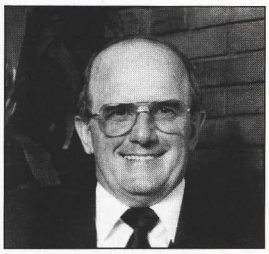
When is a boil not a boil?

A Study of Arachnid envenomation in humans in Southern Africa

Dr PA Matthews
MBChB, MFGP(SA)

S Afr Fam Pract
1994;15:440-9

KEYWORDS:
Arachnidism;
Spider venoms;
Diagnosis, differential;
South Africa



Curriculum Vitae

Peter Matthews grew up in Northern Rhodesia (Zambia), matriculated in Kimberley, qualified at UCT in 1965 and has been in private practice in East London for twenty-something years. He obtained his MFGP in 1989 and the M Fam Med from Medunsa in 1991. He is currently a co-director of the Vocational Training Programme at the Frere/Cecelia Makiwane Hospitals in East London, a part-time member of the Department of Family medicine at Medunsa, the Director of Research for the Academy, a lecturer at the Port Elizabeth Technikon, a member of the SA Society for Clinical Hypnosis and the convener of the 1996 Academy Congress. Peter has three adult children and they enjoy cycling together.

32 St James Road
Southernwood
East London, 5201

Summary

Hardly any work has been done on the effects of arachnid envenomation in man due to poisonous bites by southern African spiders, and the work carried out by Newlands was only done on rabbits. This study was undertaken in the East London area of South Africa:

1. *to show that the findings of Newlands in rabbits could be extrapolated to human subjects, and*
2. *to show reliable diagnostic differences between spider bites and other infective skin lesions. The poisonous Chiracanthium spiders are found fairly frequently in East London and it would appear equally frequently in other urban areas, which means a number of people may be suffering from bites by these spiders.*

Introduction

Minimum literature is available on the effects of arachnid envenomation in man due to bites by southern African spiders and with few exceptions, concerns envenomation by the neurotoxin producing *Laterodectus indistinctus* ("button spider" or "knopie spinnekop") (Fig 1).[1,2,3,4,5] This spider has been studied by various researchers both in South Africa and throughout the world and the effects of its envenomation have been documented to the extent that these effects in man are now well recognised and a reliable treatment protocol has been evolved.[6]

Unfortunately, this is not the case with the other Southern African toxic arachnids identified thus far, as virtually all the work in this field has been done by Newlands[7,8,9,10,11,12,13,14,15] who has, to date, reliably identified four spiders, including the button spider, whose bites are toxic to the extent of producing signs and symptoms in addition to pain and/or transient inflammation.

Most of Newlands' work was done by the experimental envenomation of rabbits and the observation of the effects produced over a period of time. In this way, he was able to describe a consistent progression of events and lesion development from envenomation to death or recovery of the rabbit.[7]

The southern African spiders known to be venomous are: *Laterodectus indistinctus*, producing a neurotoxin and *Chiracanthium* or "Sac Spider", *Loxsoceles* or "Fiddle Back" spider and *Sicarius* or the "Six Eyed Crab Spider", all of whom produce cytotoxins (See Fig 2). Certain other species are capable of producing a painful bite or sting but these spiders have, to date, not been shown to have significant neuro- or cytotoxic effects. They include *Harpactria* or the "Baboon Spider". *Palystes* or the "Wandering Spider"[14], certain of the *Salticidae* or "Jumping Spiders" and possibly *Caerosteris* or the "Bark Spider". Bites from these spiders are alleged to produce varying degrees of pain and inflammation which is usually transient. Systemic symptoms have not been reliably reported.

The lesions produced by *Chiracanthium*, *Sicarius* and *Loxsoceles* as observed by Newlands are summarised in Table 1, but, to date, these findings have not been accurately or reliably validated in humans.

Of the three, *Chiracanthium* is the most likely to produce envenomation in man as it is regularly found in and around human habitation. It is an aggressive small golden or honey coloured spider with darker mouthparts (see Fig 3) and builds a sac-like nest in the folds of leaves or curtains, under window ledges, in cracks or crevices etc, from whence it emerges, usually at night, to seek its prey, thus most bites in humans occur at night.

Figure 1. Black widow (Button) spider

(Photo by Dr GJ Müller)

Loxsoceles (Fig 4), while having been found in urban areas in the Transvaal, is usually found in caves or grassland and is thus not as serious a threat. Also, its venom appears to be less toxic than its American counterpart, the "Brown recluse" spider, whose venom can produce very large and serious necrotic lesions.[7] It is a small bodied, long legged spider with a typical "fiddle" or violin shaped marking on its carapace. In urban areas it is usually found in storage areas like warehouses, unused garages etc.

Figure 3. Sac Spider (*Chiracanthium*)

(Photo from Filmer MR. Spiders Struik ISBN 186625 188 8.)

Fortunately, as it possibly produces the most toxic venom of any spider found anywhere, Sicarius (Fig 5), is only found in very dry arid areas where it tends to partially bury itself in the sand and to remain motionless for very long periods of time and so

Figure 2. A pictorial key for the identification of the medically important spiders in southern Africa.

With acknowledgement to Dr G Newlands

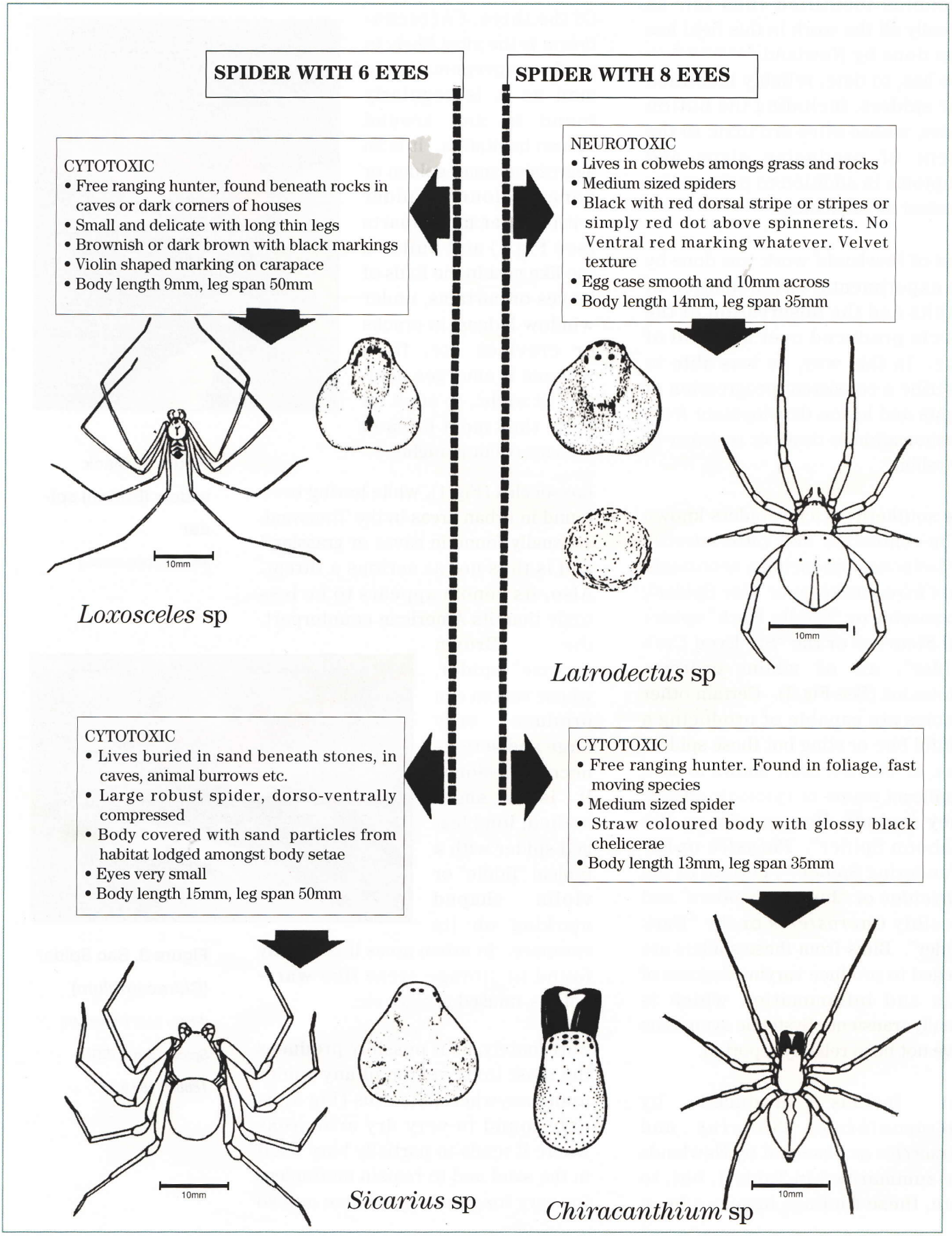


TABLE I. Summary of the Evolution of Lesions Produced by Experimental Envenomation of Rabbits (Newlands 1988)

Time	Chiracanthium	Loxosceles	Sicarius
STAGE 1 0 TO 2 HOURS POST BITE	• Two bite marks 6-8mm apart • Yellow green colour • Little oedema & erythema	• Small purple discolouration at bite site with slight erythema oedema • Wheal formation possible	• ± 6mm, purple discolouration • Wheal ± 20mm across • No erythema or oedema
STAGE II 6 TO 8 HOURS POST BITE	• Two bite marks as yellowish necrotic spots 1-2mm in diameter • Slight oedema & erythema • Slight pain	• Purple area centre of lesion • Surrounding oedema (20mm) • Erythema • Painful	• Black intensely necrotic central area surrounded by intensive haemorrhagic & ecchymotic region with oedema or • Pain ???
STAGE III 1 TO 3 DAYS POST BITE	• Two necrotic areas tend to merge • Yellow colour • 40mm surrounding oedema • Moderate erythema • Painful • ? Headache & fever (can be misdiagnosed as tick bite fever)	• Intense oedematous area black in colour surrounded by intensely inflammed erythematous zone 80mm across • Very painful • No systemic symptoms	• Intensely necrotic central area with black "scab" surrounded by large area of haemorrhage & ecchymosis with very little oedema or inflammation • Possible systemic DIC
STAGE IV 7 TO 10 DAYS POST BITE	• Small necrotic lesion ulcerating up to 10mm across surrounded by erythema & oedema • Healing starts after ± 10 days	• Blackish oedematous area of cellulitis subsides tissue 2-10cm intensely necrotic • Surrounded by area of erythema ± 10 cm • Necrotic lesion sloughs producing ulcer crater up to 10cm across • Build up of sterile pus deep in dermis	• Massive tissue destruction about bite size • Systemic DIC • ? generalised oedema

the risk of envenomation tends to be limited to people such as geologists, naturalists, military personnel etc. Newlands describes two cases of envenomation from Sicarius bites in humans.[7] Bites from these spiders cause not only an intensely necrotic local lesion but are also capable of producing a Disseminated Intravascular Coagulopathy (DIC) and death.

.

All three spiders are "free ranging" ie they do not build webs to catch their prey.

In an attempt to show that:

- Newlands' findings in rabbits could be extrapolated to human subjects; and
- show reliable diagnostic differences between spider bites and other infective skin lesions;

a study of possible spider bites was undertaken in the East London area of the Border region of the Cape Province.

Methods

This study was complicated by the fact that very few people who suffer spider bites ever actually see the spider biting them. In the study population, only two people saw a spider in the vicinity at the time of the bite and only one of those brought the spider when presenting. Unfortunately it was too damaged for accurate identification. Thus, in most spider bite situations, an accurate cause and effect relationship cannot be demonstrated.

Therefore, all undifferentiated inflammatory skin lesions presenting to a four man practice in central East London over a period of one year were analysed. An important inclusion criterion was that the lesions should not be able to be reliably diagnosed on physical appearances alone at the time of presentation. Informed consent was obtained and confidentiality was assured.

Most Chiracanthium bites in humans occur at night

A structured questionnaire was then completed to capture data concerning demographic details, onset of lesion, weather conditions pertaining, geographic locale of subject at the time of initial observation of the lesion and whether any spiders were observed in the vicinity. The presence or development of associated symptoms such as pain, pyrexia, pruritis, pus formation lymphadenitis and lymphadenopathy were also noted, both at presentation and throughout the course of the lesion. Pain and pruritis were quantified and the total duration of the lesion was noted.

Figure 4.
Loxosceles spider
(Photo from Filmer MR. Spiders Struik ISBN 186625 188 8.)

The patients were assessed at 48 hour intervals and the progression of the lesions were monitored photographically as well as visually.

If, at any stage, a lesion became obvious as a wasp or bee sting, it was dropped from the study. If it became obvious that it was a boil, cellulitis, or tick bite on physical appearance and local symptomatology alone, it was grouped as "definite infective lesion" the remaining lesions then became "possible other inflammatory" or "possible spider bite".

Sicarius produces the most toxic venom of any spider anywhere

At the same time, spiders were collected from an area in a radius of about 15km from the centre of East London. These were identified by Mr

TABLE II. Spiders Collected in East London and Environs

	Family	Genus	Species	Common Name
*	Clubionidae	Chiracanthium	Lawrencii x 4	Sac Spider
	Clubionidae	Clubiona	–	
*	Heteropodiae	Palystes	Superciliosis x 2	
*	Heteropodiae	Palystes	Natalius	Wandering Spider
	Heterpopdiae	Olios	–	
*	Gnaphosidae	?		–
*	Salticidae	?	– x 3	Jumping Spider
*	Theridiidae	Laterodectus	Geometricus x 2	Brown Button Spider
*	Theraposidae	Harpactria	–	Baboon Spider
	Aranaeidae	Cyclosa	–	
	Aranaeidae	Leucauge	–	
	Aranaeidae	Arinaeus	–	
*	Aranaeidae	Caerostis	–	Bark Spider
	Thomisidae	Tibellius	–	Crab Spider
	Thomisidae	Thomisus	–	Crab Spider
	Ctenadae	Allothele	–	
	Ctenadae	Ctenus	Spencerii	
	Mygalomorpha	Dipluridae	Allothele	
	Segesriidae	Ariadna	–	
	Pholcidae	Smeringopus	–	Daddy Long-Legs
	Selenopydae	Anyphops	–	"Flattie" or Wall Spider
	Nephilidae	Nephilia		Golden Orb Web Weaver

* Indicates those spiders known or thought to be venomous to man.

TABLE III. Assumed Differences Between "Bites" and Boils etc

	Arachnids ***(Bites)***	**Bacteria** ***(Boils)***
Duration	Long	Short
Presence of Pus	Rare	Common
Lymphangitis	Rare	Common
Regional Adenopathy	Rare	Common
Pyrexia	Rare	Common
Pain	Usually Minimal	Common
Pruritis	Common	Unusual
Antibiotic Response	Poor	Good
Depth of Lesion	Usually Superficial	Can be deep
Other Systemic Symptoms	Unusual	Common

Peter Croeser from the Natal Museum and are listed in Table II. As can be seen, Chiracanthium was frequently identified but to date, no clear identification has been made of either Loxsoceles or Sicarius in this region.

Results

In the possible inflammatory/possible bite group, several lesions were assessed as being either stings due to hymenoptera etc or the possible non-cytotoxic spiders mentioned earlier as they all settled rapidly ie within 48 hours. These were excluded from the study.

The remaining lesions were considered as probable cytotoxic spider bites. This group numbered 32 lesions which more than allowed for statistical comparison with the "definite infective" group at a p of <0,05, a power of 80% and a 30% difference in healing rates of the lesions in the two groups, as a suspicion that spider bites took considerably longer to heal than boils or cellulitis was part of the initial hypothesis.

Again, on physical appearances only, the "probable bites" could be sub-divided into two very clear groups of lesions.

The first group correlated almost exactly to Newlands' description of the experimental envenomation of rabbits by Chiracanthium ie two clear bite marks with a light greenish colour due to the venom, these soon formed shallow ulcers which then coalesced into a single ulcer covered with a necrotic slough with an erythematous halo surrounding it. The lesion gradually expanded over 24-72 hours then remained static in size. The slough then slowly separated leaving a fairly shallow, relatively painless ulcer which gradually healed with a variable amount of scarring (See Figs 6-9).

The second group had a different lesion, namely a larger "cellulitis" looking lesion with a paler, purple or even yellow central area but with no actual tissue breakdown. This lesion in some respects resembled the stage II Loxosceles bite described by Newlands and persisted for a great deal longer than any other non-

Spider bites take considerably longer to heal than boils or cellulitis

Many Chiracanthium spiders in urban areas of South Africa

TABLE IV

Criterion	Bites N=30	Inflammatory Lesions N=25	p Value
Mean duration of lesion	20,88 (± 12.25)	13,32 (± 10,29)	<0,01
Presence of Pus	0 (0%)	18 (72%)	<0,001
Lymphangitis	5 (16,6%)	12 (48%)	<0,03
Regional Lymphadenopathy	7 (23,3%)	14 (56%)	<0,03
Pyrexia	8 (26,6%)	13 (52%)	<0,01
Mean Pain Score	2,4 (± 1,84)	4,8 (± 2,1)	<0,01
Pruritis	15 (50%)	2 (8%)	<0,005
Antibiotic Response	0 (0%)	24 (96%)	<0,001

infective inflammatory lesion. It was also minimally painful. (See Fig 10).
In addition to the 32 patients in the "bite" group, three other patients showed the "pseudo-tick bite" lesion described by Newlands[7] as also being due to Chiracanthium. (See Fig 11). These patients, although developing lesions physically very similar to true tick bites, did not show any of the other signs or symptoms usually seen in tick bite fever, ie local tenderness, pyrexia, headaches or lymphadenopathy.

All patients in the study were treated with an antibiotic after the first 48 hours (when those with stings and allergic reactions had been excluded). Erythromycin, Co-trimoxazole or Ampicillin was used depending on the nature of the lesion and suspected pathogen.

The 32 "bite" patients were then compared to a "control" group of twenty five obvious infective skin lesion patients with either boils or cellulitis. Analysis of the questionnaires to compare the criteria of pain etc, mentioned earlier, showed diagnostic differences other than the physical appearances of the lesions. These differences are summarised in Table III. In comparing the two groups, two patients with very long healing times in the "bite" group were not included as there were other possible complicating factors (Diabetes and PVD respectively).

Statistical comparisons using either Chi-square or Kruskal-Wallis tests were done for each criterion and showed statistically significant differences in each criterion except No.10 (see Table IV).

Conclusions

Very few people who suffer spider bites, actually see the spider biting them

This study, I believe, showed that:

- Newlands' experimental observations concerning Chiracanthium envenomation can be reliably applied to similar bites in humans.
- There appears little doubt that Chiracanthium spiders are found fairly frequently in East London and from reports supplied to the author, it would appear that they occur equally frequently in other urban areas and that a number of people suffer from bites by these spiders annually.
- As with snake envenomation, the type of lesion produced can vary considerably depending on spider size, quantity of venom injected, patient size, site of bite and possible other debilitating conditions present in the patient.
- There exists an, as yet, unexplained skin lesion which might possibly be due to Loxosceles envenomation, ie the second group of probable bites with the "cellulitis" appearance which resembled Newlands stage II Loxosceles bite.
- There are several constant factors associated with cytotoxic spider bites which provide for reliable clinical differentiation between spider bites and the commoner forms of infective and other inflammatory skin lesions. (Table III).
- Considerable work still needs to be done to determine the optimum treatment for the cytotoxic spider bites.

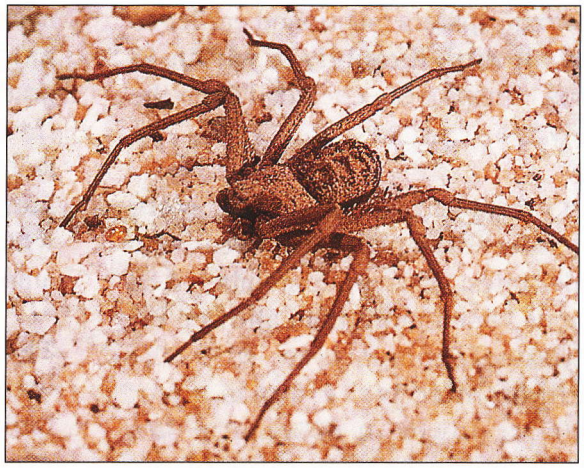


Figure 5. Six Eyed Crab Spider

(Photo from Filmer MR. Spiders Struik ISBN 186625 188 8)

Very few publications on arachnid envenomation in man due to South African Spiders

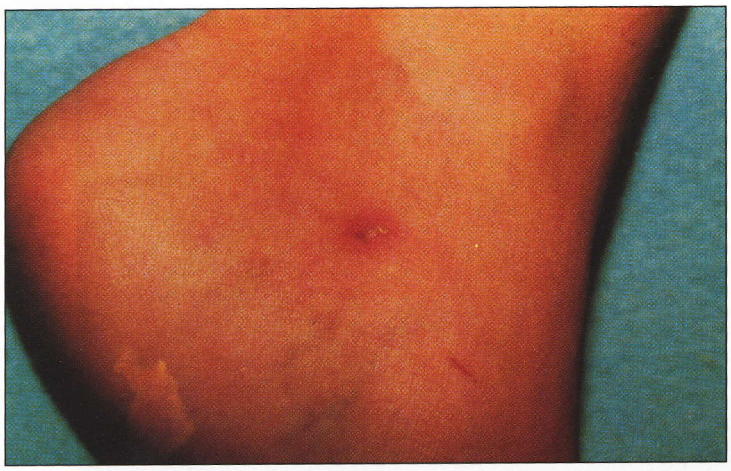


Figure 6. This lesion on the medial aspect of the left ankle, began with two clear bite marks with a greenish tinge but never progressed further than the stage shown above. It is assumed that minimal envenomation occurred here.

Duration of lesion at time of photograph: 7 days
Total duration of lesion: 15 days
Pain score: 2
Other systemic symptoms: Pruritus

Figure 7. This lesion behind the right knee shows the two bite marks with the surrounding inflammatory halo – the lesions are beginning to ulcerate in the photo. The two small ulcers later coalesced into a typical shallow Chiracanthium ulcer.

Duration of lesion at time of photograph: 3 days
Total duration of lesion: 24 days
Pain score: 5
Other systemic symptoms: Pruritus

Figure 8. This shows the slough at the base of a large Chiracanthium ulcer. When first noticed the lesion was a large blister, which broke down leaving the dry slough. The patient refused debridement and the slough separated leaving an ulcer which gradually healed with scar formation.

Duration of lesion at time of photograph: 5 days
Total duration of lesion: 2 days
Pain score: 2
Other systemic symptoms: Nil

Figure 9. This shows the typical Chiracanthium ulcer observed in many cases, a shallow ulcer with minimal pain and systemic symptoms only in the very early stages of the lesion.

Duration of lesion at time of photograph: 4 days
Total duration of lesion: 23 days
Pain score: 0
Other systemic symptoms: Rigors, nausea and pruritus

Figure 10. This patient had two similar appearing lesions, one behind his left knee, the second on the lateral aspect of his left ankle. Both had a similar erythematous base with a pale central area. Again mild pruritus was the only initial symptom.

Duration of lesion at time of photograph: 65 days
Total duration of lesion: 16 days
Pain score: 1
Other systemic symptoms: Pruritus

Figure 11. This lesion illustrates the pseudo-tickbite lesion described by Newlands. Despite the lesion being locally quite painful, there was no pyrexia, regional adenopathy or severe headache typical of typhus.

Duration of lesion at time of photograph: 1+ days
Total duration of lesion: 7 days
Pain score: 4
Other systemic symptoms: Nil

References

1. Finlayson MH. "Knopie-Spider" Bite. S Afr Med J 1936;43-5.
2. Finlayson MH, Hollow K. The Treatment of Spider-bite in South Africa by Specific Antisera. S Afr Med J 1945;431-3.
3. Finlayson MH. "Knopie-Spider" Bite in Southern Africa. Med Proceedings. 1956;634-8.
4. Rayner BL. The Bite of Lactrodectus indistinctus (button spider) S Afr Med J. 1987;71:716.
5. Visser LH, Khusi SN. Pulmonary oedema from a widow spider bite. S Afr Med J. 1989;75:338-9.
6. Christopher W, Zukowski DO. Black Widow Spider Bite. JAB FP. 1993;6(3):279-81.
7. Newlands G. Necrotic Arachnidism in Southern Africa. PhD Thesis University of Witwatersrand, JHB. 1986.
8. Newlands G, Atkinson P. Review of southern African spiders of medical importance, with notes on the signs and symptoms of envenomation. S Afr Med J 1988;73:235-9.
9. Newlands G. Preliminary report on investigations concerning violin spider bite (Loxoscelism) in Southern Africa. South Afr Mus Bull 10:158-61.
10. Newlands G. Preliminary report on the spider Sicarius (Sicariidae: Aranea) and the action of its venom. Mem Ins Butantan 1984;46:293-304.
11. Newlands G. A New spelaean species of Loxosceles (Araneae: Sicariidae) J Entomol Soc South Afr. 1980;43(2):367-9.
12. Newlands G. The violin spider, Loxosceles parrami – a pest species which is being spread. J Entomol Soc South Afr 1984;47:357.
13. Newlands G, Martindale C, Berson SD, Rippey JJ. Cutaneous Necrosis caused by the bite of Chiracanthium Spiders. S Afr Med J 1980;57:171-3.
14. Newlands G, Martindale CB. Wandering spider bite – much ado about nothing. S Afr Med J 1981;60:142.
15. Newlands G. Review of the Medically Important Spiders in southern Africa. S Afr Med J 1975;49:823-6.

Acknowlegements

The author wishes to thank Dr G Newlands for his assistance and for permission to publish extracts from his articles and Mr P Croeser for his encouragement and spider identification.