When is a boil not a boil?

A Study of Arachnid envenomation in humans in Southern Africa

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 Chironomus 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 "knope spinnekop") (Fig 1). 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

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.

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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 who, 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.

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", certain of the *Salticidae* or "Jumping Spiders" and possibly *Caerostris* 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.

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. 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.

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 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 Muller)

Figure 3. Sac Spider (Chiracanthium)
(Photo from Filmer MR. Spiders Struk ISBIN 186625 188 8.)
Figure 2. A pictorial key for the identification of the medically important spiders in southern Africa. With acknowledgement to Dr G Newlands

- **NEUROTOXIC**
  - Lives in cobwebs amongs grass and rocks
  - Medium sized spiders
  - Black with red dorsal stripe or stripes or simply red dot above spinnerets. No Ventral red marking whatever. Velvet texture
  - Egg case smooth and 10mm across
  - Body length 14mm, leg span 35mm

- **CYTOTOXIC**
  - Free ranging hunter, found beneath rocks in caves or dark corners of houses
  - Small and delicate with long thin legs
  - Brownish or dark brown with black markings
  - Violin shaped marking on carapace
  - Body length 9mm, leg span 50mm

- **CYTOTOXIC**
  - Lives buried in sand beneath stones, in caves, animal burrows etc.
  - Large robust spider, dorso-ventrally compressed
  - Body covered with sand particles from habitat lodged amongst body setae
  - Eyes very small
  - Body length 15mm, leg span 50mm

- **CYTOTOXIC**
  - Free ranging hunter. Found in foliage, fast moving species
  - Medium sized spider
  - Straw coloured body with glossy black chelicerae
  - Body length 13mm, leg span 35mm

- **SPIDER WITH 6 EYES**

- **SPIDER WITH 8 EYES**

**Loxosceles sp**

**Latrodectus sp**

**Sicarius sp**

**Chiracanthium sp**
**TABLE 1. Summary of the Evolution of Lesions Produced by Experimental Envenomation of Rabbits (Newlands 1988)**

<table>
<thead>
<tr>
<th>Time</th>
<th>Chiracanthium</th>
<th>Loxosceles</th>
<th>Sicarius</th>
</tr>
</thead>
</table>
| **STAGE I**  
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 inflamed 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  
- Massive tissue destruction about bite size  
- Systemic DIC  
- ? generalised oedema |
| **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 | |
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. 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.

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.

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”.

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

<table>
<thead>
<tr>
<th>Family</th>
<th>Genus</th>
<th>Species</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Clubionidae</td>
<td>Chiracanthium</td>
<td>Lawrencii x 4</td>
<td>Sac Spider</td>
</tr>
<tr>
<td>* Clubionidae</td>
<td>Clubiona</td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Heteropodidae</td>
<td>Palystes</td>
<td>Supercilios x 2</td>
<td>Wandering Spider</td>
</tr>
<tr>
<td>* Heteropodidae</td>
<td>Palystes</td>
<td>Natalius</td>
<td></td>
</tr>
<tr>
<td>* Heteropodidae</td>
<td>Ollos</td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Gnaphosidae</td>
<td>?</td>
<td>x 3</td>
<td>Jumping Spider</td>
</tr>
<tr>
<td>* Salticidae</td>
<td>?</td>
<td>x 3</td>
<td>Brown Button Spider</td>
</tr>
<tr>
<td>* Theridiidae</td>
<td>Laterodectus</td>
<td>Geometricus x 2</td>
<td></td>
</tr>
<tr>
<td>* Theraphosidae</td>
<td>Harpactria</td>
<td></td>
<td>Baboon Spider</td>
</tr>
<tr>
<td>* Aranaeidae</td>
<td>Cyclosa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Aranaeidae</td>
<td>Leucauge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Aranaeidae</td>
<td>Arinaeus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Aranaeidae</td>
<td>Caerostis</td>
<td></td>
<td>Bark Spider</td>
</tr>
<tr>
<td>* Thomisidae</td>
<td>Tibellius</td>
<td></td>
<td>Crab Spider</td>
</tr>
<tr>
<td>* Thomisidae</td>
<td>Thomisus</td>
<td></td>
<td>Crab Spider</td>
</tr>
<tr>
<td>* Ctenidae</td>
<td>Allotole</td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Ctenidae</td>
<td>Ctenus</td>
<td>Spencerii</td>
<td></td>
</tr>
<tr>
<td>* Mygalomorpha</td>
<td>Dipluridae</td>
<td>Allotole</td>
<td></td>
</tr>
<tr>
<td>* Segersriidae</td>
<td>Ariadna</td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Pholcidae</td>
<td>Smeringopus</td>
<td></td>
<td>Daddy Long-Legs</td>
</tr>
<tr>
<td>* Selenopydae</td>
<td>Anyphops</td>
<td></td>
<td>“Flattie” or Wall Spider</td>
</tr>
<tr>
<td>* Niphilidae</td>
<td>Nephilia</td>
<td>Golden Orb Web Weaver</td>
<td></td>
</tr>
</tbody>
</table>

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

### TABLE III. Assumed Differences Between “Bites” and Boils etc

<table>
<thead>
<tr>
<th></th>
<th>Arachnids (Bites)</th>
<th>Bacteria (Boils)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>Long</td>
<td>Short</td>
</tr>
<tr>
<td>Presence of Pus</td>
<td>Rare</td>
<td>Common</td>
</tr>
<tr>
<td>Lymphangitis</td>
<td>Rare</td>
<td>Common</td>
</tr>
<tr>
<td>Regional Adenopathy</td>
<td>Rare</td>
<td>Common</td>
</tr>
<tr>
<td>Pyrexia</td>
<td>Rare</td>
<td>Common</td>
</tr>
<tr>
<td>Pain</td>
<td>Usually Minimal</td>
<td>Common</td>
</tr>
<tr>
<td>Pruritis</td>
<td>Common</td>
<td>Unusual</td>
</tr>
<tr>
<td>Antibiotic Response</td>
<td>Poor</td>
<td>Good</td>
</tr>
<tr>
<td>Depth of Lesion</td>
<td>Usually Superficial</td>
<td>Can be deep</td>
</tr>
<tr>
<td>Other Systemic Symptoms</td>
<td>Unusual</td>
<td>Common</td>
</tr>
</tbody>
</table>
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 Loxosceles 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 subdivided 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-

**TABLE IV**

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Bites N=30</th>
<th>Inflammatory Lesions N=25</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean duration of lesion</td>
<td>20.88 (± 12.25)</td>
<td>13.32 (± 10.29)</td>
<td>&lt;0,01</td>
</tr>
<tr>
<td>Presence of Pus</td>
<td>0 (0%)</td>
<td>18 (72%)</td>
<td>&lt;0,001</td>
</tr>
<tr>
<td>Lymphangitis</td>
<td>5 (16,6%)</td>
<td>12 (48%)</td>
<td>&lt;0,03</td>
</tr>
<tr>
<td>Regional Lymphadenopathy</td>
<td>7 (23,3%)</td>
<td>14 (56%)</td>
<td>&lt;0,03</td>
</tr>
<tr>
<td>Pyrexia</td>
<td>8 (26,6%)</td>
<td>13 (52%)</td>
<td>&lt;0,01</td>
</tr>
<tr>
<td>Mean Pain Score</td>
<td>2,4 (± 1,84)</td>
<td>4,8 (± 2,1)</td>
<td>&lt;0,01</td>
</tr>
<tr>
<td>Pruritis</td>
<td>15 (50%)</td>
<td>2 (8%)</td>
<td>&lt;0,005</td>
</tr>
<tr>
<td>Antibiotic Response</td>
<td>0 (0%)</td>
<td>24 (96%)</td>
<td>&lt;0,001</td>
</tr>
</tbody>
</table>
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 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**

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 IV).

- Considerable work still needs to be done to determine the optimum treatment for the cytotoxic spider bites.
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

References

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


Acknowledgements
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