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Swiss prospective study on spider bites

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Summary

Knowledge of spider bites in Central Europe derives mainly from anecdotal case presentations; therefore we aimed to collect cases systematically. From June 2011 to November 2012 we prospectively collected 17 cases of alleged spider bites, and together with two spontaneous notifications later on, our database totaled 19 cases. Among them, eight cases could be verified. The causative species were: *Cheiracanthium punctorium* (3), *Zoropsis spinimana* (2), *Amaurobius ferox, Tegenaria atrica* and *Malthonica ferruginea* (1 each). Clinical presentation was generally mild, with the exception of *Cheiracanthium punctorium*, and patients recovered fully without sequelae.

In Switzerland, spider bites generally have a benign clinical course, which is characterised by minor effects, with rapid and complete recovery. Since only verified spider bites can be regarded as spider bites, in the case of clinically important arachnidism, the spider should be sent to an expert for identification. Our study may help to diminish spider fear and reassure people who have experienced a bite.

The study was registered at ClinicalTrials.gov (NCT01355744).

Key words: *insect bites; spider bites; humans; Switzerland; Middle Europe; case reports*

Introduction

In Switzerland, the number of spider species theoretically able to bite humans amounts to a few dozen among the nearly 1,000 species found in this country [1]. Despite mostly minor clinical symptoms, the general population may frequently overestimate the danger of spider bites. Additionally, primary care physicians' knowledge of spider bites is limited, because cases of spider bite consultations are quite rare. There are no useful data for estimating the incidence of spider bites in Switzerland or for providing helpful information about their clinical course. This information is also lacking for other central European countries.

Between 2000 and 2010, the Swiss Toxicological Information Centre (STIC) received approximately 30 enquiries per year for acute spider bites, with a peak in the summer season with approximately 5–6 enquiries per month. This compares to about 90 annual enquiries for hymenopteran stings.

The few and only anecdotal publications about spider bites in Europe have been reviewed by Maretic & Lebez (1979) [2]. Since then only scattered information on spider bites has appeared [3, 4] so this situation prompted us to collect cases systematically for Switzerland.

Aim of the study

Main objective: To systematically document the clinical course of spider bites in Switzerland.

Secondary objectives: To collect information on causative species, time of day, seasonal distribution, and circumstances.

Methods

In a prospective, observational study, patients were included who had suspected spider bites and consulted a Swiss physician. The study was planned to take place between 1 June and 30 November 2011, but was then prolonged until 30 November 2012 to include more cases in our study set. In order to inform both Swiss physicians and the Swiss population, the study kick-off was accompanied by a media campaign.

The reporting forms were sent by fax to the Swiss Toxicological Information Centre and the following items were registered about the people who had allegedly been bitten: year of birth, gender and health situation, time, place (including altitude) and circumstances of the bite, the body part involved, symptoms, signs, clinical course (incl. photo documentation) and treatment. The spider had to be caught and sent to the Institute of Ecology and Evolution at the University of Bern for identification by an expert arachnologist (WN). The specimens had to be sent alive or in 70% ethanol vials. In case of ambiguity or incomplete recordings, MG contacted the reporting physician. Every physician who participated received CHF 100.–.

According to international standards [5] spider bites can only be classified as verified when three circumstances have been fulfilled: (1) The spider bite has been observed, (2) the spider is caught during or immediately after the bite and sent for identification, and (3) the case presentation matches the clinical course of a bite by a spider through symptoms such as pain or discomfort.

Data were entered into a standardised Excel spreadsheet (Microsoft Corporation, Redmond, WA) and descriptive statistics were calculated. If not stated otherwise, data are presented as median (interquartile range, IQR).

Written informed consent was obtained.

All ethics committees of Switzerland and the Principality of Liechtenstein approved the study.

Figure 1

Leg of patient 1, two hours after bite by *Amaurobius ferox*.

Table 1: Characteristics of patients and their clinical presentation. Numbers denote median value (interquartile range) or frequencies.

Gender (female/male)	5/3
Age (years)	41 (32)
Area of spider bite – upper extremity – lower extremity – torso	 6 1 1
Diameter (mm) of maximum – swelling – reddening	 20 (56) 20 (30)
Pain – severity (0 to 10) – time until maximum (minutes) – duration (hours) – comparison with bee sting (less / equal / more / missing)	 4 (7) 0 (1) 1 (7) 4 / 1 / 2 / 1
Time until – first consultation (hours) – complete healing (days)	 2 (1) 3 (5)
Presence of systemic symptoms (no / yes / missing)	6 / 1 / 1

Results

During the study period, seventeen cases of alleged spider bites were reported. Together with two cases fulfilling the inclusion criteria, which occurred shortly after the end of the study period and which were spontaneously reported by a physician and therefore included in the study, we received 19 notifications. Only eight cases fulfilled the criteria mentioned above to be regarded as verified spider bites, and are therefore described in detail in this publication. Detailed data on the other 11 cases of assumed spider bites can be requested from MG.

Demographic data of the patients and a general description of their clinical course are summarised in table 1. Figure 1 shows the leg of case one shortly after the bite, notably the reddening and the central haemorrhage.

Six cases were allocated to the study by calls to the Swiss Toxicological Information Centre (cases 1, 6, 9, 11, 14 and 17); the victims in two cases (7, 19) contacted our study board on their own. The initial physician contacts were a family physician (1), a duty physician (1), and hospital (3) or other (2) physicians (one case had missing information); study notifications were sent to us from a family physician (1), hospital physicians (4) or others (3). Five patients reported that they had seen the spider while being bitten. Interestingly, no tropical spider owners were included in this study. Two patients reported previous knowledge about the possibility of spider bites in Switzerland, while five did not (one answer is missing). All patients said that it was the first time they had been bitten by a spider. Two of them recognised spider cocoons at the place where they had been bitten, while five did not (one missing answer).

One out of eight suffered from systemic symptoms. This concerned a female patient who had to undergo hospital surveillance for approximately 12 hours (case 6). The reported systemic symptoms were hypotension, vomiting, and generalised itching. The patient was treated with ibuprofen, acetaminophen, tramadol, morphine, and metoclopramide.

Pain quality reports were burning (4), piercing (2), itching (1) or dull (1). No necrosis at the bite site was reported. One case of a small (3 mm) haemorrhage at the site of the bite was registered. Bite marks were observed in three out of seven patients (one missing report). As treatment meas-

Figure 2

Amaurobius ferox, male (source: Fritz Geller-Grimm, Wikimedia Commons).

ures, we registered analgesics (1), a tetanus vaccine (1), and other symptomatic measures (3).

Two of the patients stated that they would have contacted a physician because of the severity of their complaints even without the study, while for five this was not the case (one missing report).

Table 2 shows the temporal and geographical distribution of the bites. Table 3 lists the causative spider species. Figures 2 to 6 depict spider species caught in our study.

To approach the question whether bites by *Cheiracanthium punctorium* display a more severe course, we compared these three cases with the other five: average pain severity 9 vs 3 points (on a scale from 0 to 10), swelling 30 mm vs 6 mm, reddening 30 mm vs 10 mm, healing duration 4 days vs 1 day. Because of the small sample, no inferential statistics were performed.

Eleven of the 19 patients included in our study were classified into the group in which a spider bite could not be verified. We compared their data with the ones of the verified spider bites. The delay until consulting a physician was 30 hours vs 2 hours, the reported swelling 45 mm vs 20 mm, the reddening 100 mm vs 20 mm, and the healing time 6 days vs 3 days. The pain onset was after 2 min vs 0 min, maximal pain after 20 min vs 0 min, and pain duration 72 hrs vs 1 hr. The presence of bite marks did not differentiate between verified and unverified bites. Multiple bites were only reported for unverified spider bites.

Discussion

The outdoor bites occurred mainly in the summertime; bites by adult *Zoropsis spinimana* occurred also in November and December. There are no obvious detectable patterns with respect to the time of the day, part of the country, or elevation, i.e., spider bites can occur everywhere. The spider bites described in our study were, however, restricted to buildings and their surroundings, where people get into unintentional contact with spiders during all kind of activities such as sleeping, working or leisure. In our study, transportation of the spider in the hand was the reason for three bites, in two occasions putting on clothes in which

Figure 3

Cheiracanthium punctorium, female (source: Lucarelli, Wikimedia Commons).

Table 2: Characteristics of spider bite events.

Case number	Date and time of bite	Region, altitude above sea level (m)	Surroundings, activities
1*	08.06.2011, 13:30	East, 400	garden, leisure
6	01.08.2011, 04:00	South-West, 1290	house, sleeping
7	27.07.2011, 08:00	Midlands, 400	house, leisure
9	12.08.2011, 16:00	South-West,550	house, working
11	04.09.2011, 23:00	Midlands, 500	house, leisure
14	01.12.2011, 15:30	Midlands, 550	playground, leisure
17	27.11.2012, 18:15	North-West,245	house, working
19	22.04.2013, 16:00	East, 700	house, leisure

* Figure 1 depicts the clinical appearance of case 1.

Table 3: Characteristics of spiders involved.

Case number	Species*	Sex	Body length (mm)	Remarks
1	*Amaurobius ferox* (fig. 2)	f	11	defending brood/cocoon
6	*Cheiracanthium punctorium* (fig. 3)	m	10	crushed spider during sleep, 12 hours hospital surveillance
7	*Cheiracanthium punctorium*	f	8	spider hidden in T-shirt
9	*Cheiracanthium punctorium*	f	13	wanted to free a spider which had been caught
11	*Tegenaria atrica* (fig. 4)	?	?	bitten while being transported by hand (photograph only, no specimen sent to us)
14	*Zoropsis spinimana* (fig. 5)	f	20	a toddler was bitten in a playground
17	*Zoropsis spinimana*	f	20	bitten while being transported by hand
19	*Malthonica ferruginea* (fig. 6)	f	13	spider hidden in a coat

* The common names of these spiders are: *Amaurobius ferox:* no species name available, the family Amaurobiidae may be called EN: “meshweb weavers”, GER: “Finsterspinnen”; *Cheiracanthium punctorium:* EN: “yellow sac spider”, GER: “Ammendornfinger”; *Tegenaria atrica* and *Malthonica ferruginea:* no species names available, the genera may be summarised as EN: “house spider”, “dust spider”, “grass spider”; GER: “Hausspinne”, “Kellerspinne”, “Trichternetzspinne”, “Winkelspinne”, FRA: “tégenaires”; *Zoropsis spinimana*: no species name available, the family Zoropsidae may be called: EN: “ground spiders”, GER: Wolfsspinnen-ähnliche Kammspinne

a spider had been nesting was causative, one spider was crushed by a person who was sleeping, a toddler was bitten when touching the spider in a playground, while only one spider was defending its brood when a stone plate was lifted in a garden. These circumstances are comparable to other retrospective [6–8] or prospective [9] studies.

Clinical courses of spider bites show some similarities to other insect bites/stings as caused by bees or wasps, but the symptoms were generally classified as less severe and were of a shorter duration. The lesions healed completely without sequelae. Except for one patient, systemic symptoms were absent. Even in Australian studies by Isbister and Gray [9, 10], in spite of the known prevalence of dangerous spiders, most courses were benign. Knowledge of spider bites in Europe is derived mainly from scattered publications, which are most often not found in medical literature. In our series of systematic case documentations, none except possibly case number 6 had the potential to be published in medical literature. Therefore the few cases, which have been encountered in European literature may be prone to a substantial publication bias towards a more dramatic presentation.

Figure 4

Tegenaria atrica, female (source: Sarefo, Wikimedia Commons).

Figure 5

Zoropsis spinimana, female (photo by Barbara Thaler-Knoflach, www.araneae.unibe.ch).

Figure 6

Malthonica ferruginea (source: Rasbak, Wikimedia Commons).

In contrast to common belief, the presence of bite marks did not differentiate between verified and unverified spider bites, so the presence of two marks is no evidence of a spider-induced lesion. Spiders may also insert only one cheliceral tip or, and most often, the very fine punctures are no longer visible after a bite [9, 10].

In our study, in eight out of 19 cases (42%) the spider was sent in for identification. This compares to 63% in Isbister's Australian Study [9] and 33% in the Brazilian study by Schenone [7]. As concerning the causative spiders, our rule of thumb (WN personal communication) that a spider must have a body size (prosoma and opisthosoma, but without legs) of 10 mm or more to be capable of perforating the human skin seems to be confirmed. One smaller *Cheiracanthium punctorium* female of only 8 mm body length was also able to do so, evidently because of its well-developed chelicerae. Among the five species we present here, only one species, *Cheiracanthium punctorium,* may cause a clinically relevant and prolonged course. Perhaps further biochemical investigations like the newly discovered polypeptide CpTx1 from the venom of *Cheiracanthium punctorium* with cell membrane toxicity may help to elucidate the reasons [11].

Measures for symptomatic treatment of the patients bitten by spiders were rather erratic. Since symptoms were mostly minor and transient, frequently mere "watchful waiting" was indicated instead of activity. Since tetanus infections after insect stings or bites have been described, the application of an outdated anti-tetanus vaccine was suitable. Antibiotics were administered in four (cases 4, 5, 16, 18) of the eleven cases of unverified spider bites but in none of the verified cases. Cutaneous infections seem to be one of the most prominent differential diagnoses of unverified spider bites, but on the other hand, real insect stings or bites could be a source of inoculation of pathogenic bacteria, although in the laboratory, at least "hobo spiders" (*Tegenaria agrestis*) did not transfer the MSRA staphylococci which they had previously been exposed to [12]. Hospital surveillance of patient 6 may have been warranted not only by the severity of symptoms, which could have been partly due to the tramadol treatment, but also by the uncertainty related to the lack of knowledge about clinical courses of spider bites.

In our study, no widow (*Lactrodectus*) or recluse (*Loxosceles*) spiders were found. They do not occur in Switzerland, but due to climate change, Mediterranean spiders may spread and enlarge their native area into Switzerland

and other central European countries. For this reason, *Latrodectus tredecimguttatus* naturally occurring all over the Mediterranean area, or *Loxosceles rufescens* with cases of dermatonecrosis as described in Italy [13] may be good candidates for such spread to northern areas. Perhaps freighters may also import spiders from overseas [14]. Therefore, the need to identify the actual spider in any case of clinically important arachnidism has been confirmed by our study.

The data of patients with unverified spider bites showed remarkable differences from the ones with verified spider bites. The delay until consulting the physician was longer, swelling and reddening was more pronounced, and pain as well as healing lasted longer. We assume that this collection of unverified spider bites may have been caused by arthropod bites or stings such as fleas, bed bugs and ticks, or even by a wide range of dermatoses, infections, intoxications, and allergic reactions, as has been published in previous studies [6–8, 15, 16]. To cite Isbister: "The diagnosis of spider bite is usually clinical, and definite bites should be based on a clear history of a spider biting the person and then being identified. Identification is best done by collection of the spider and expert identification. However, some spiders such as widow spiders can usually be identified by the general population, which is sufficient for the routine management of spider bite but not for research" [17]. In one case in our study, subsequent fleabites could be confirmed to have been responsible for the cutaneous lesions. Thus, the two questions, "What clinical course should I expect when patients say that they have been bitten by a spider?" or "What are the clinical consequences of spider bites?" deserve two different answers.

Strengths and limitations of the study

Our study is the first systematic and prospective collection of spider bite cases in Europe. It was accompanied by a small media campaign to inform physicians and the general population. In spite of this, most patients with verified spider bites did not know about the possibility of being bitten by spiders in our country. Because of legal and financial circumstances, we could not include all spider bite patients in our study – only those who consulted a Swiss physician. During the study period, the STIC recorded six enquiries of verified spider bites without a doctor's visit (which was a pre-requisite for inclusion into the study); these were caused by *Zoropsis spinimana* (3), *Tegenaria atrica* (2) and *Cheiracanthium punctorium* (1); (these cases were published otherwise together with the eight cases of verified spider bites in an arachnologist-oriented publication [18]). In this respect we cannot draw any conclusions about the frequency of spider bites in the Swiss population. Since in Switzerland the clinical course of spider bites is obviously benign, the low notification rate in our study may significantly underestimate the true frequency of spider bites. Only a minority of two out of seven patients admitted they would have consulted a doctor anyway because of the severity of symptoms – perhaps anxiety may have been a major reason to undergo a medical visit after having been bitten. In addition to some publication bias preferring more severe cases as discussed above, the definition of verified spider bites could have selected reporting of cases with dead spiders (they cannot escape), of spiders active during the day (they are easier to detect) and of indoor spiders (they are easier to catch).

Conclusions

In Switzerland, spider bites have a generally benign clinical course characterised by minor symptoms, and patients show rapid and complete recovery. Since only verified spider bites can be regarded as true spider bites, in the case of clinically important arachnidism, the spider should be sent to an expert for identification. Our study may help to diminish spider fear and reassure people who are experiencing a bite.

The cases from this study were simultaneously presented in an arachnologist-oriented publication with approval from the editors of both journals: Nentwig W, Gnädinger M, Fuchs J, Ceschi A. A two year study of verified spider bites in Switzerland and a review of the European spider bite literature. Toxicon. 2013;73:104–10.

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Figures (large format)

Figure 1

Leg of patient 1, two hours after bite by *Amaurobius ferox*.

Figure 2

Amaurobius ferox, male (source: Fritz Geller-Grimm, Wikimedia Commons).

Figure 3

Cheiracanthium punctorium, female (source: Lucarelli, Wikimedia Commons).

Figure 4

Tegenaria atrica, female (source: Sarefo, Wikimedia Commons).

Figure 5

Zoropsis spinimana, female (www.araneae.unibe.ch).

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Malthonica ferruginea (source: Rasbak, Wikimedia Commons).