Reports of Presumptive Brown Recluse Spider Bites Reinforce Improbable Diagnosis in Regions of North America Where the Spider Is Not Endemic

Richard S. Vetter1 and Sean P. Bush2

1Department of Entomology, University of California, Riverside, and 2Department of Emergency Medicine, Loma Linda University School of Medicine, Loma Linda, California

Envenomations by the brown recluse spider have been reported throughout North America, despite the fact that the spider’s range is limited to the South and central Midwest of the United States. Several of these medical reports have originated from regions of nonendemicity where the spider has never or rarely been documented and brown recluse spider populations are unknown. In most of these reports, no spider is positively identified in association with the dermonecrotic wound, and diagnosis has been based on clinical examination findings. Considering the extreme rarity of brown recluse spiders in areas of nonendemicity, the diagnosis of a presumptive bite is a misdiagnosis that reinforces the assumption that brown recluse spiders are common local etiologic agents of necrosis. There are many medical conditions of diverse origin that have been misdiagnosed as brown recluse spider bites, some of which can be fatal or debilitating. Physicians’ awareness of these conditions will increase diagnostic accuracy in areas of North America where bites from brown recluse spiders are improbable.

Recently, Clinical Infectious Diseases published a Photo Quiz describing a patient with a necrotic lesion that was attributed to a brown recluse spider bite [1]. A laborer felt a sudden sensation of warmth under a work glove, which he removed, and “a patch of black fur (diameter, 1 cm) fell from the…glove” [1, p. 595], after which he continued working. A necrotic wound ensued on his index finger. On the basis of clinical examination findings, the authors concluded that the “culprit species in this case remains uncertain, but because of the severity of the ensuing necrosis, and because the spider was hiding in a work glove, the bite was presumed to be caused by a brown recluse spider” [1, p. 636]. All the authors are from Winnipeg, Canada, and we assume that the patient was also from this area, because he left work to be evaluated at the authors’ emergency department.

It is highly unlikely that a brown recluse spider (Loxosceles reclusa) was the cause of the wound. First, there are no brown recluse spiders in Canada. Only 3 verified specimens of Loxosceles spiders have ever been found in Canada, and all were Loxosceles laeta, a South American recluse spider. One was found in Vancouver, British Columbia [2], and 2 were found in the basement of the Royal Ontario Museum (1 of these latter 2 was originally misidentified as a North American brown recluse spider [D. Currie, personal communication], in the taxonomic revision [2]). Second, no spider was definitively associated with the event, merely “a patch of black fur” that was not further identified (at least, not in the report) yet was presumed to have been a medically important, nonendemic spider. Third, after the initial “bite,” the laborer continued to work, which complicated the situation, in that any dermal puncture was then subject to secondary bacterial infection. Although it might be posited that the bite was that of a hobo spider (Tegenaria agrestis), a recently completed study shows no evidence of this spider in Canada east of British Columbia (R. S. Vetter, A. H. Roe, R. G. Bennett, C. R. Baird, L. A. Royce, W. T. Lanier, A. L. Antonelli, and P. E. Cushing, unpublished data).

Many medical reports of brown recluse...
spider envenomation originate from areas of North America where the spiders are not endemic, are extremely rare, or have never been found and, hence, are highly unlikely to be the etiologic agent of the wounds. Unsubstantiated reports reinforce the erroneous notion that the brown recluse spider is a common, widespread cause of necrosis. These reports can lead to aggressive, incorrect treatment because of the recluse spider’s well-known but overstated potential for causing dermonecrotic damage; this erroneous notion can also increase medicolegal risk [3], heighten patient anxiety [4, 5], perpetuate misinformation in the medical literature, and cause incorrect manifestations to be attributed to the venom’s toxicity.

The range of the brown recluse, _L. reclusa_, extends from southeastern Nebraska to southernmost Ohio and south into Georgia and most of Texas [2, 6, 7]. The spider is rarely found outside this range and is not widespread throughout North America. Because it occurs in high concentrations in close proximity to humans, the brown recluse spider is the most medically important recluse spider species in North America. There are additional native and nonnative recluse spider species in the United States, and, although their venom is equally toxic, they are of less concern, because they inhabit southwestern deserts with sparse human population or live where interaction with humans is highly improbable. In justifying diagnoses of recluse spider bites, reviews of necrotic arachnidism [8, 9] and case histories of unsubstantiated “recluse spider bite” from areas where the spider is not endemic [10–12] claim that brown recluse spiders are readily transported around North America. This logical but uncorroborated supposition is resoundingly contradicted by biological evidence, yet it has led to overreliance on the idea that the recluse spider is a common cause of necrotic lesions [7]. There are several examples of reports in which the annual number of reported or presumed brown recluse spider bites in a particular state or area in the United States where the spider is not endemic [7, 13–17] is tens to hundreds of times greater than the historically verified number of brown recluse spiders ever found in that region [2, 7, 17]. In contrast, in areas of endemicity in the Western hemisphere, dozens to thousands of brown recluse spiders can be found annually in individual homes (whose inhabitants sustain no envenomations), and each home shelters more recluse spiders than have ever been collected from individual American states where the spider is not endemic [18; R.S.V., unpublished data]. This paradox—many recluse spiders but no bites in areas of endemicity—demonstrates the improbability of recluse spider bites occurring in areas where there are few or no recluse spiders.

However, physicians from American states or Canadian provinces that lack verified populations of brown recluse spiders have reported brown recluse spider envenomations, despite having no evidence of spider involvement [10–12, 14, 19–25]. Although several reports admit that brown recluse spider involvement has been assumed, such medical articles then typically review the characteristics of the brown recluse spider life history, the manifestations of the venom’s toxicity, and the treatment for necrotic arachnidism. Some of these publications have relied upon the patient’s identification of a spider or other circumstantial evidence as proof of brown recluse spider involvement: for example, a Montana family member [10] and a Chicago patient [14] identified the spider as a brown recluse from memory after being shown pictures of recluse spiders; a Colorado patient’s wife saw what she “believed to be a brown recluse spider” [25, p. 137]; and a Chicago patient did not feel a nocturnal bite but saw a dark brown spider the next morning [14]. From the hundreds of suspected “recluse spiders” submitted to one of us (R.S.V.) by the general public in the continental United States, it is evident that, even after examining photographs of brown recluse spiders, many nonarachnologists still misidentify harmless spiders as brown recluses. Therefore, reliance on a patient’s identification of a spider in a bite scenario is another avenue that leads to incorrect diagnoses of recluse spider bites in areas of nonendemicity. Furthermore, although physicians in such areas have allegedly identified brown recluse spiders associated with envenomations [10, 13, 14], many harmless spiders have dark cephalic patterns that are routinely mistaken for the recluse spider’s “violin” pattern [26]. Physicians have misidentified as brown recluse spiders several virtually harmless nonrecluse spiders associated with verified bites or dermonecrotic lesions ([4]; R.S.V., unpublished data), which reinforces the tendency toward incorrect diagnoses in their area.

One of the consequences of erroneous case histories is that a wide variety of medical conditions are reported in the medical literature under the umbrella diagnosis of “brown recluse spider bite,” and the cumulative spectrum of manifestations is reiterated by later researchers. For example, in a report of a case from Colorado that relied on the patient’s identification of the spider, the authors concluded that “wounds from the venom of a brown recluse spider do not often take the protracted, complex clinical path described in this case” [25, p. 143]. Published reports of unsubstantiated recluse spider bites such as this one muddle the clinical picture and decrease the probability that proper diagnoses will be made by later investigators [27]. Similar unsubstantiated reports exaggerated the importance of or erroneously identified the white-tailed spider in Australia [28] and a wolf spider in Brazil [29] as causes of necrotic arachnidism. With regard to the Brazilian wolf spider, initial conclusions about its necrotic capability were based on undocumented clinical observations and necrosis in rabbit ears that resulted from injection with high doses of venom [27]. Wolf spider antivenin was used for decades after it was developed, yet not 1 of 515 verified...
wolf spider envenomations in humans resulted in necrosis [27, 29].

Russell and Gertsch [30] stated that, among cases in which the identity of an envenomating spider is verified, the range of manifestations for that species is narrow and consistent in presentation. However, recluse spider venom manifestations do vary from mild erythema to extensive necrosis and are influenced by the victim’s health and degree of obesity, the location of the bite, and other factors [5, 31]. Reporting of presumptive recluse spider bites expands this list of manifestations erroneously. The standard criterion for diagnosis of a brown recluse spider bite is positive identification of the spider in a bite scenario [31]. Diagnosis of recluse spider bites purely on the basis of clinical examination findings will always be difficult and speculative because spider involvement is rarely definitively proven and because the spectrum of recluse spider–bite manifestations, the current lack of definitive clinically available tests for recluse spider envenomation [5, 31, 32], and the multitude of diverse etiologies that can cause wounds that look similar to and are misdiagnosed as brown recluse spider bites [7, 30, 33–36]. In the high-profile bioterrorism events of autumn 2001, a case of cutaneous anthrax in a 7-month-old child in New York was initially diagnosed as brown recluse spider bite [36]; New York is outside the areas where the brown recluse spider is endemic, and verification of recluse spiders are extremely rare.

For physicians unaware of the absence of recluse spiders in their local area, a diagnosis of a brown recluse spider bite is not an unreasonable guess, yet it will have a very high probability of being incorrect. Anderson [37] offers excellent (and stringent) guidelines for the diagnoses of “proven,” “probable,” and “possible” brown recluse spider bites. It would be beneficial if these criteria were extended to medical publications as well as diagnoses. With increased physician awareness, it is hoped that the diagnosis of brown recluse spider bite would be limited to areas of North America that have verified populations of the spider. When the diagnosis of brown recluse spider bite is made outside the spider’s range, it should be reserved for cases in which the bite is witnessed and the spider is reliably identified. Secondarily, this increased awareness should also reduce the number of presumptive diagnoses and medical reports of idiopathic necrotic lesions for which spider involvement cannot be proven and bites from brown recluse spiders are improbable.

References

32. Wright SW, Wrewn KD, Murray L, Seger D.


