



Approach and management of spider bites for the primary care physician

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Summary The class *Arachnida* of the phylum *Arthropoda* comprises an estimated 100,000 species worldwide. However, only a handful of these species can cause clinical effects in humans because many are unable to penetrate the skin, whereas others only inject prey-specific venom. The bite from a widow spider will produce local symptoms that include muscle spasm and systemic symptoms that resemble acute abdomen. The bite from a brown recluse locally will resemble a target lesion but will develop into an ulcerative, necrotic lesion over time. Spider bites can be prevented by several simple measures including home cleanliness and wearing the proper attire while working outdoors. Although most spider bites cause only local tissue swelling, early species identification coupled with species-specific management may decrease the rate of morbidity associated with bites.

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More than 100,000 species of spiders are found worldwide. Persons seeking medical attention as a result of spider bites is estimated at 50,000 patients per year.^{1,2} Although almost all species of spiders possess some level of venom, the majority are considered harmless to humans.² A spider bite is defined as a skin lesion produced by the oral elements typically used for catching prey.³ Other systemic or local reactions to be discussed are caused directly from venom. However, 80% of spider bite diagnoses are missed because of the relative lack of toxicity seen in the patient and a presumptive diagnosis of a skin infection is made.⁴ This commonly leads to unnecessary use of antibiotics. Because of this, several other diagnostic criteria should be met including collection and identification of the spider if possible.³

In the United States, only two species of spiders are considered poisonous and medically relevant to humans. *Loxosceles*, or recluse spiders, are a common inhabitant of

homes and yards in the southwestern United States, and related species occur in the temperate climate zones across the globe.^{2,5} The second, *Lactrodectus*, or the common widow spider, are found in both temperate and tropical regions of both the United States and across the world.^{2,6} Although less commonly seen, tarantulas (*Theraphosa*), running spiders (*Chiracanthium*), wolf spiders (*Lycosa*), black jumping spiders (*Phidippus*), and hobo spiders (*Tegenaria agretis*) are considered poisonous to humans.¹

Most spider bites cause local inflammation, itching, and pain, and, not uncommonly, these dermatologic symptoms enlarge over four to five days. Mainstay treatment consists of opioid pain medications, nonsteroidal anti-inflammatory drugs, and antihistamines. However, physicians need to be able to recognize the signs and symptoms of the more toxic spiders because a misdiagnosis may result in significant morbidity or, rarely, mortality. Knowledge of the habitat, venom, and physical description of the spider, if available, may be helpful in the diagnosis. These aspects coupled with a detailed treatment plan will be discussed to aid the physician in devising a comprehensive medical care plan (Table 1).

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Table 1 Characteristics of common spider bites

Bite characteristics	Widow spiders (<i>Lactrodectus</i>)	Recluse spiders (<i>Loxosceles</i>)	Tarantula spiders
Initial bite symptoms	Moderate to severe pain; typically pain out of proportion to the appearance of the bite; little to no surrounding inflammation	Little to no pain; severe local inflammation that will typically spread	Little to no pain with little or no inflammation
Venom mechanism of action	Presynaptic release of neurotransmitters caused by alpha-latrotoxin	Cytotoxicity with local ulceration and subsequent necrosis caused by sphingomyelinase D	Species dependent
Most common signs	Muscular spasm including piloerection at the site and local region, which spreads proximally toward the abdomen and face; abdomen will appear rigid and show rebound, which mimics acute abdomen	Joint pain, fever, nausea, vomiting, and a maculopapular rash	Local pain from the bite; urticating hairs cause edema, inflammation, and severe pruritus
Outcome	Typically complete resolution in one week; death seen in less than 1% of all patients	Wounds may take up to 8 weeks to heal, with a small percentage experiencing major scarring; death rarely occurs	Death rarely occurs in humans; domestic animals and pets have a significant mortality rate

Widow spiders

The genus *Lactrodectus* is found worldwide, but only five species occur naturally in the United States.^{2,7} These spiders include the *Latrodectus bishopi*, *Latrodectus geometricus*, *Latrodectus hesperus*, *Latrodectus variolus*, and the *Latrodectus mactans* spiders.^{2,7} *L. mactans* is typically located between the New England states and Florida. *L. variolus* is seen from Texas to the east coast, and *L. hesperus* is found in the Midwestern United States.⁷ Both *L. bishopi* and *L. geometricus* are found predominantly in Florida.⁷ Although all widow spiders are common to the United States, Australia has the highest rate of widow spider bites per capita in the world.⁸

Classically, the female black widow spider is significantly larger than her male counterpart (leg spans of 30-40 mm compared with 16-20 mm).^{2,9} In addition, female widow spiders are darker and more venomous to humans than males.^{2,9} This is directly related to the relatively small size of the male's fangs compared with those of the female. As the immature female spider ages, the body becomes globular and black with a distinctive red or orange hour glass or geometric pattern appearing on the ventral surface (Fig. 1).^{1,2,7,9}

Typically, the black widow spider is nocturnal and more active during the warmer summer months.⁷ Bites will usually only occur when the spider is confined or disturbed because widow spiders are generally not aggressive.⁷ In their natural habitat, widow spiders are considered "web weavers" because they entrap their prey before feeding.⁷ When the web is disturbed, it will make a characteristic crinkling sound and should be heeded as a warning.

The venom from all widow spiders seems to produce similar prodromal syndromes. This varies depending on the

species, size of the spider, and the amount of the venom injected. This systemic toxicity, or *lactrodectism*, is caused by alpha-latrotoxin found in the venom of the *Lactrodectus* species.^{2,10} This particular venom is neurotoxic in nature and causes a massive presynaptic release of acetylcholine, norepinephrine, dopamine, and glutamate.⁷ However, 75% of those bitten by widow spiders will generally only develop local signs and symptoms and will never progress to full lactrodectism.²

Within the first hour of a bite, the patient will describe worsening pain, if present, that is not proportional to the appearance of the wound, as well as sweating and piloerection locally.^{2,11} These symptoms are pathognomonic for widow spider bites within the first hour, even though a bite mark may not be present. These are typically the earliest signs of lactrodectism. The pain will radiate to the abdomen,



Figure 1 (A) Black widow spider depicting the distinctive hour-glass appearance. (Reprinted with permission from the Centers for Disease Control and Prevention).

causing severe muscle cramping that will make it rigid and board like, much like an acute abdomen.^{2,11} If allowed to progress, victims may develop systemic diaphoresis, muscle cramps and spasm, patchy paralysis, hypertension, seizures, dyspnea, nausea, vomiting, diarrhea, and even priapism in males.¹⁻¹⁰ However, significant mortality is seen in less than 1% of victims with widow spider bites. This rate is higher in children, pregnant women, or those with medical conditions.⁷ Serious, long-term sequelae including secondary infections are rare and are usually related to neurological deficits.

Most patients will only need symptomatic and local wound care. Local wound care should consist of a thorough cleaning of the wound as well as the application of an ice pack.¹² Other treatments should include oral or parental analgesia, benzodiazepines for muscle spasticity, and tetanus prophylaxis.¹² Although few clinical trials are focused on decreasing spasticity, several have recommended calcium infusions instead of benzodiazepines for any acute reactions.¹²

Lactrodectus antivenin, a product derived from horse serum, should only be used in patients experiencing severe lactrodectism (i.e., seizures, uncontrolled hypertension, or respiratory arrest) and has been shown to be the only effective treatment in shortening the duration of symptoms and hospital stay.^{2,13} All patients receiving the antivenin should be skin-tested with a small dose first to determine the risk of immediate hypersensitivity reactions.^{2,13} To treat severe lactrodectism, one vial of antivenin should be diluted in 100 to 250 mL of normal saline and infused over a two-hour period. This process can be repeated every two hours until symptoms of lactrodectism dissipate.^{2,13} It has been shown

that in both severe envenomations and in children, antivenin can be given up to 90 hours post bite and still show symptoms of improvement.¹⁴

Recluse spider

Necrotizing arachnidism, or loxoscelism, is the name given to a spider bite that appears with skin blistering, ulceration, and necrosis. In the United States, only the *Loxosceles* species of spiders, which includes the brown recluse, are capable of this type of arachnidism.^{2,5,15} The six common species to the United States include the *Loxosceles arizonica*, *Loxosceles deserta*, *Loxosceles devia*, *Loxosceles blanda*, *Loxosceles apachea*, and *Loxosceles reclusa*.^{2,5,15} Found mainly in the southwestern United States, recluse spiders are more active during warmer months as well as during the evening hours (Fig. 2).^{2,5,15}

Typically, the female brown recluse spider has a 20- to 30-mm leg span, with the male being slightly smaller.⁵ Females will also usually have a distinctive dark brown pattern on their cephalothorax that resembles a violin or cello, earning them the name “fiddleback” spiders (Fig. 3).^{2,5,15} Recluse spiders are unique in that they have six eyes compared with the majority of other spiders, which have eight.⁵ Contrary to popular belief, the recluse spider does not predate humans and usually is not aggressive unless trapped against clothing or bed sheets.^{5,15}

Typically, the bite of a recluse spider is painless and causes a generalized macular rash in one-third of all patients.^{2,15} Several other studies have shown that the bite may actually appear as a target lesion which closely resembles

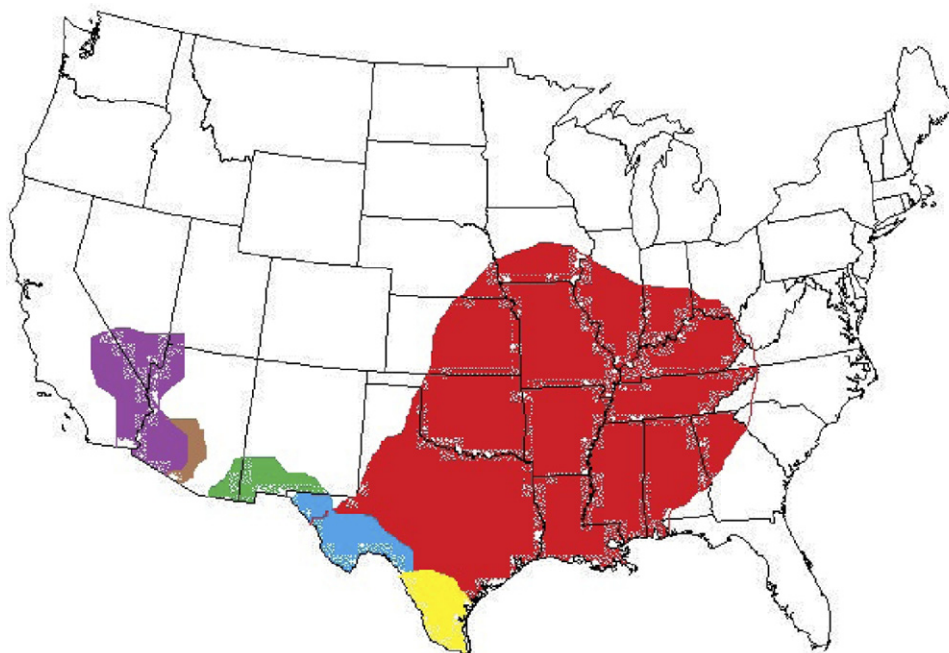


Figure 2 Map depicting the range of the brown recluse in the United States: red – reclusa, yellow – devia, blue – blanda, green – apachea, brown – arizonica, purple – deserta.



Figure 3 Brown recluse spider. (Reprinted with permission from the Centers for Disease Control and Prevention).

that found in Lyme disease.¹⁵ Bite marks may also cluster in areas because of the confining nature under which the bite usually occurs. Over time, the bite will have a central depressed area of blue necrosis with surrounding tissue erythema.^{2,15} Within 72 hours, a prominent serous or bloody bulla may appear. In 3 to 5 days, the bulla will develop into a spreading eschar, eventually sloughing to reveal an ulcerative base.^{2,15}

The local and systemic reactions that are seen with a brown recluse bite are caused by the natural defense mechanism of the human body toward the venom injected by the spider. Sphingomyelinase D becomes incorporated into the cell membranes of the tissue, which triggers an inflammatory response to the site of the bite.¹⁶ A histologic evaluation of the area surrounding the bite will reveal inflammatory cell infiltrates, coagulative tissue necrosis, and possibly an inactivation of the complement system.¹⁶ These reactions result in tissue destruction and necrosis of the surrounding tissue.

Although the current treatment is supportive care, local and immediate wound care should be addressed. This care should include the cleansing of the wound, applying cold compresses, immobilization, parental or oral analgesia, and tetanus prophylaxis. Early excision of the wound and intral-lesional injections with corticosteroids are contraindicated because of their subsequent expansion of dermatomal necrosis.^{17,18} Currently antivenom is not available in the United States but research is ongoing in animal models.

Follow-up wound care should be established and includes debridement of tissue necrosis and delayed excision of eschars followed by a split thickness skin graft if deemed necessary. Hyperbaric oxygenation has been recommended in the past for slowing and even reversing the spread of necrosis, but controlled trials have not shown promise.¹⁹ Antihistamines can be used for long-term pruritus. Leuko-

cyte inhibitor therapy is no longer supported because of its substantial risk of toxicity.¹⁸

Mortality and secondary infection from a recluse spider bite are rare in the immunocompetent patient. However, children and those with comorbidities have a higher rate of death. It has been theorized that immunocompromised patients may be at higher risk to secondary infection because *Clostridium perfringens* has been cultured from the fangs of the recluse spider species.²⁰

Tarantula

Although most native tarantulas live in the deep southwest of the United States, many non-native species are seen throughout the country because of their widespread trade as pets. The tarantula measures 2.5 to 7.5 cm and can live for up to 35 years (Fig. 4). Typically, these spiders are nonaggressive and use a retreat method as their main line of defense. When a tarantula is about to strike, it will raise its front pair of legs and rear back on its abdomen.

Native tarantula envenomation in humans will cause mild pain with surrounding erythema. Its bite feels similar to a pinprick. Dermonecrosis or systemic symptoms are not typical. Although the bite is mostly nonvenomous in humans, there is significant morbidity and occasional death in domestic animals and pets.

Many of the tarantula species contain urticating hairs on their dorsal surface, which can be flicked off to irritate predators.²¹ In humans, these barblike hairs can cause ocular, dermatologic, and respiratory irritation.^{21,22} When they are exposed to the skin, severe pruritus, and slight edema with erythema will be seen. However, when exposed to the eye, the hairs can cause keratoconjunctivitis or ophthalmia nodosa.^{21,22} Any patient with a history of tarantula exposure and a red eye should have a slit-lamp examination, imme-



Figure 4 Tarantula. Note the urticating hairs on the dorsal surface. (Reprinted with permission from the Centers for Disease Control and Prevention).

diate ophthalmology consultation, and/or close follow-up care.²¹

Prevention and control

Although only a small number of spider species bite humans, and severe morbidities from such bites are rare, several simple steps can be taken to minimize the risk of exposure. The frequency of outdoor spider bites can be diminished by wearing gloves, long sleeves, and long pants tucked into the socks when working outdoors or around wood piles. Campers should clean their campsite, tents, cabins, and toilets before use. Clothing can be sprayed with a synthetic pyrethroid and an insect repellent containing DEET (N, N-diethyl-m-toluamide) to all nonmucosal-exposed skin surfaces.

Indoors, spider bites can be diminished by maintaining a clean and well-kept domestic environment. As an additional diminishing agent, the home can be sprayed with safe indoor pesticides such as synthetic pyrethroids or natural pyrethrins. The homeowner should also never underestimate the need for proper insulation of attics, basements, and windows. If spider webs are seen, they should be cleaned from a safe distance with a broom or vacuum. Patients should be counseled that the safest way to remove a spider from the skin is to flick the spider rather than crushing it into the skin.

Lastly, when handling tarantulas, proper techniques should be followed. First and foremost, gloves and eye protection should be worn at all times. The spider should not be allowed to come into contact with the face.

Conclusion

Although most spiders are venomous, only several species here in the United States are considered medically relevant to humans. This is mostly because of most spiders' inability to penetrate human skin and/or the low toxic effects and quantities of their venom. The differential diagnosis is extensive and should include arthropod bites, skin infections, and an exposure to an unknown chemical or toxin. Early species identification coupled with specific spider management should be followed to decrease the systemic symptoms of most bites. However, these bites can be prevented by simply applying long-sleeved clothing and keeping a clean domestic environment.

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