Black Widow Spider Bite

Christopher W. Zukowski, DO

Black widow spiders (*Latrodectus mactans*) are found throughout the United States, frequently near areas of human habitation. Though not an aggressive creature, a black widow spider will attack if disturbed or threatened. Family physicians who serve in or near rural areas will eventually see the signs and symptoms of latrodectism.

The manner in which the symptoms appear can be confusing, but a history of any insect bite or a dramatic response to intravenous calcium should help to make the diagnosis. Pain and muscle spasms that are not localized and respond poorly to analgesics or muscle relaxants are typical. These symptoms are generally well controlled with intravenous calcium.

Mortality is 3 to 5 percent, and envenomation carries a greater risk for the young and the old. Though antivenin exists and is very effective, it carries its own risk of serum sickness. This situation has created controversy about the proper treatment of latrodectism and the use of antivenin.

Reported here are two cases that show the classical presentation of latrodectism, as well as some treatment modalities.

Illustrative Cases

Case 1

A 21-year-old male active-duty Marine remembered being bitten on the left ankle by "something" while in a telephone booth at the beach. The patient brushed away the biting insect without looking at it and finished his conversation. During the next 20 to 30 minutes he developed a burning, crampy pain in the area of the bite, which gradually spread to the rest of the left lower extremity. The patient sought care in the emergency department of a local hospital, where he was initially treated with cleaning of his bite and diphenhydramine hydrochloride. The crampy pain continued to worsen and spread to the contralateral lower extremity and to the abdominal musculature, which gradually became board-like. The emergency department physician recognized this constellation of symptoms and diagnosed latrodectism.

The young man's condition was treated with meperidine 100 mg, hydroxyzine 25 mg, and diazepam 15 mg without notable relief. The admitting resident arrived at this time, advised against further narcotics, and after consulting an index for venomous bites gave 4.5 mEq of calcium gluceptate intravenously (calcium gluconate was recommended but was not available.) The relief of pain was dramatic and complete but short lived. Repeat calcium injections were required initially every 30 minutes, then every 10 to 15 minutes. The patient was admitted to the intensive care unit for calcium therapy and because of concern about respiratory depression resulting from the narcotics and the spider venom. His symptoms continued to intensify during the next 6 hours, and the admitting resident decided to give him latrodectus antivenin. About 10 hours had elapsed since the envenomation. Frequent calcium injections were required for the next 3 hours, after which the pain was well controlled with acetaminophen. The patient's recovery was uneventful. The results of his laboratory studies were and remained normal except for an erythrocyte sedimentation rate of 17 mm/h and his serum calcium level, which rose from 9.63 mg/dL (normal 8.5 to 10.4 mg/dL) to 11.94 mg/dL then returned to 9.51 mg/dL within 12 hours.

Case 2

An 11-month-old boy came to the emergency department with his mother. The chief complaint was inconsolable crying and shaking. The mother related that the child was found playing with a "bug." She had the foresight to bring the dead insect with her in a small plastic vial. On examination the "bug" proved to be a black widow spider. The child was examined thoroughly by at least 3 physicians, several nurses, the mother, and her friends without their dis-

Submitted, revised, 14 January 1993.

From the Family Practice Department, Naval Medical Clinic, Quantico, Virginia. Address reprint requests to Christopher W. Zukowski, DO, 15792 Lazy Day Lane, Dumfries, VA 22026.

J Am Board Fam Pract: first published as 10.3122/jabfm.6.3.279 on 1 May 1993. Downloaded from http://www.jabfm.org/ on 6 November 2026 by guest. Protected by copyright.

covering a bite mark. No other cause for the symptoms could be determined.

Findings on the boy's physical examination were normal except for moderate abdominal tenderness and firmness, which developed during the course of the child's stay in the emergency department. Results of laboratory studies were normal except for a hemoglobin of 10.6 g/dL, hematocrit 33.1 percent, mean corpuscular volume of 80.5 μm^3, and platelets of $755 \times 10^3/mm^3$. The child was admitted with a diagnosis of latrodectism and probable iron-deficiency anemia.

Acetaminophen was given without relief of symptoms. Antivenin was given with several considerations in mind: (1) 20 percent of envenomations have no visible bite, (2) mortality from black widow bites is less than 5 percent with the majority of deaths in children and the elderly, and (3) it was about 12 hours since envenomation and the child showed no improvement. The response to the antivenin was almost immediate, and the child's recovery was uneventful.

Discussion: *Latrodectus mactans*

The black widow spider is found throughout the United States. Its favorite haunts are warm, dry areas, such as woodpiles and outhouses. Most of its life is spent hanging upside down and waiting for a victim to enter the web. Disturbance of the web or threats to the eggs or nest will cause an attack. If not disturbed, the black widow spider is not particularly aggressive toward man.[1]

The spider is shiny black with a small amount of red on the abdomen, usually in the shape of an hourglass. The female spider's body can be up to 15 mm, and she can have a leg span of 40 mm. The male spider is about 1/20th the size of the female spider. If given the opportunity, the female spider will kill and eat the male spider after mating. The male spider, being much faster, generally avoids this fate. Only the female spider has fangs long enough to envenomate a human.[1,2]

Black widow venom is a neurotoxin. It causes little reaction at the bite site but can cause extensive systemic effects. On a volume-for-volume basis, black widow venom is more potent than pit viper venom. The initial effect of envenomation on the body is a massive release of acetylcholine, followed by blockage of the reuptake of the neural transmitter. Both the sympathetic and parasympathetic systems are stimulated. The venom appears to cause a channel for monovalent cation exchange to remain open. The channel seems to be calcium dependent and provides a basis for therapy and diagnostic challenge.[2,3]

As shown by these case reports, the spider bite initially can be unremarkable in both subjective sensation and objective signs. In 80 percent of envenomations a bite mark is found but might not have been felt. Slight erythema, piloerection, perspiration, and lymphangitis can appear around the bite in about 30 to 40 minutes. In 30 to 60 minutes severe pain, cramps, and muscle contractions begin in a generalizing pattern starting in the area of the bite. These reactions peak in 1 to 6 hours and last 24 to 48 hours. The muscular pain and contractions can involve the abdomen and can sometimes appear as an acute surgical abdomen. Should the chest muscles be involved, respiratory distress can develop. Other symptoms include headache, restlessness, anxiety, fatigue, insomnia, salivation, lacrimation, diaphoresis, tremors, tachycardia, bradycardia, hypertension, shock, and coma. Death occurs in less than 5 percent of cases and is disproportionately greater in children and the elderly.

Diagnosis is best made on the patient's history. Classical symptoms with a history of an insect bite should raise clinical suspicion. A rapid response to intravenous calcium gluconate confirms the diagnosis.[3]

Treatment varies with the severity of symptoms. Mild cases might not need any treatment. For those cases that require therapy, relief of pain and muscle cramping should be the primary goals. Narcotics, muscle relaxants, and intravenous calcium gluconate (10 percent solution, 1 to 2 mL/kg up to 10 mL per dose, repeated as needed) are appropriate. Latrodectus antivenin, though its use is controversial, is available and effective. Rapid and effective relief of symptoms can be obtained with a single vial given intramuscularly or intravenously. Serum sickness and anaphylaxis are possible complications. These complications must be considered in the light of a generally nonfatal illness before deciding to use antivenin therapy. Hospitalization is usually not necessary but should be strongly considered for the elderly, children, and those severely affected.

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Summary

These two cases illustrate many classical features of latrodectism. A subclinical bite followed by extensive systemic signs and symptoms in a recognizable pattern is strongly suggestive of the diagnosis. Pain and muscle spasms are refractory to standard therapy but are relieved by intravenous calcium. Finally, there should be complete resolution of the symptoms after only one vial of antivenin is administered. The common features of these cases form a recognizable constellation of signs and symptoms known as latrodectism.

The specifics of these cases highlight the uncertainty of therapy. The older patient, because of the severity of his symptoms, warranted the use of antivenin perhaps earlier than it was given. The argument could be made, however, that because the patient was experiencing minimal morbidity and mortality, the calcium would have controlled his symptoms until the venom was cleared from his system. There would then have been no risk of anaphylaxis or serum sickness. One can only guess whether continued calcium use would have precipitated a hypercalcemic state and also would have been a health risk. The decision to provide antivenin therapy was made and the patient did well.

The younger patient was not as severely affected as the older patient, so it could be argued that he was less in need of the antivenin. Still, his symptoms had not abated despite a reasonable length of time and might even have been considered to be worsening. No bite was found, but having discovered him playing with the spider certainly qualifies as circumstantial evidence. Also, the child was 11 months old and had greater risk of mortality.

Latrodectus mactans will always be with us. I hope that a safer antivenin will be developed to avoid the therapeutic dilemma.

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