

A Retrospective Review of Black Widow Spider Envenomation

Because there are few recent studies of black widow spider (Latrodectus Mactans) envenomation, a six-year retrospective study was conducted of patients admitted to or discharged from our hospital with this diagnosis. Fourteen patients with apparently severe envenomation were found and reviewed for the frequency of presenting signs and symptoms, the use of laboratory and radiographic studies, and the effectiveness of drug therapies. The most frequent symptoms were bite site pain (79%), abdominal pain (71%), and lower extremity weakness (57%). The most frequent signs were bite site lesions and abdominal tenderness or rigidity (71%). Laboratory and radiographic studies did not influence the initial emergency department evaluation. All drug therapies resulted in good clinical outcome despite two complications, and we therefore believe that the use of antivenom for symptomatic relief should be discouraged. [Moss HS, Binder LS: A retrospective review of black widow spider envenomation. Ann Emerg Med February 1987;16:188-191.]

INTRODUCTION

Although black widow spiders (*Latrodectus Mactans*) are found in all states within the continental US,¹ acute envenomations are uncommon; most physicians will not see more than one or two cases in their careers. Recommendations for use of antivenom have been based largely on the work of Parrish (who attributed 63 deaths in a ten-year period to *Latrodectus Mactans* envenomations)² and on a number of subsequent case reports. No recent series in either the emergency medicine or general medicine literature have been reported.

On a volume-per-volume basis, the neurotoxin of *Latrodectus* is more potent than that of the pit viper.¹ Its complex action apparently occurs through binding of glycoproteins and/or gangliosides on neuromuscular synaptic membranes, allowing a channel for monovalent cation exchange to remain open. This depolarization promotes calcium-independent release of neurotransmitter down concentration gradients and inhibits re-uptake. Specific antivenom blocks the ability of the venom to bind to the synaptic membrane.³

Current therapeutic recommendations include calcium gluconate 10%, muscle relaxants, and specific antivenom.⁴ Much of the medical treatment rendered seems predicated on the belief that all patients with black widow envenomation are at significant risk for morbidity and mortality. Hence, many physicians proceed quickly to the use of antivenom in their acute management of black widow spider bites when other effective and less potentially harmful therapies are available.

The purpose of this study was to review our experience with patients presenting to the emergency department between 1978 and 1984 with black widow spider envenomation severe enough to warrant admission. We sought to establish the frequency of presenting signs and symptoms, define the role of laboratory and radiographic studies in the ED, and evaluate the effectiveness of drug therapies.

METHODS

Entrance into the study required admission to the hospital with either an admitting or discharge diagnosis of black widow spider envenomation. We

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were unable to adequately identify or retrieve records of those patients seen and treated successfully in the ED or those who may have refused admission. These groups were therefore excluded from this study.

From November 10, 1978, to November 19, 1984, 14 patients presenting with black widow spider envenomation were admitted following ED evaluation. Admissions were based on either severity of symptoms or the use of or imminent need for antivenom.

Our retrospective evaluation of the medical records included data on the following: age; sex; date and location of the bite; method for determining diagnosis; time between bite and onset of signs and symptoms associated with envenomation; laboratory and radiographic studies performed in the ED and all abnormal results; ED and subsequent therapies; complications; and outcome. Fisher's exact test or the Mann-Whitney U exact test were applied for all statistical analysis.

RESULTS

Nine male and five female patients, average age 24 (range, 2 to 70), were entered into our review. Twelve of 14 (86%) were envenomated in the four-month period of August to November, with single occurrences in May and July. The average time between the bite and onset of symptoms severe enough to seek medical attention was 60 minutes (range, 10 to 120 minutes) and the average time to presentation in the ED was 105 minutes (range, 30 to 240 minutes). Twenty-one percent of patients brought the spider with them and an additional 64% either identified a picture of black widow spiders or had previous knowledge or experience with them.

Ten of 14 (71%) were bitten above the waist; the remainder (29%) suffered bites below the waist (Figure). Eleven of 14 (79%) had pain at the bite site. The other most common symptoms were abdominal pain/cramps (71%) and pain/weakness in the lower extremities (57%) (Table 1). A bite site lesion (79%) and abdominal tenderness/rigidity (71%) were the most common signs on physical examination (Table 2). Fever was not present in any of our patients on initial presentation.

Laboratory and/or radiographic evaluation was performed in 12 of 14 patients. Eight had normal laboratory results. Of the four patients with

TABLE 1. Symptoms versus bite location

	Above Waist	Below Waist	Total	%
Pain at bite site	7	4	11/14	79
Abdominal cramping	7	3	10/14	71
Pain/weakness to lower extremities	5	3	8/14	57
Pain/tightness to chest	3	0	3/14	21
Back pain	2	0	2/14	14
Pain to upper extremities	2	0	2/14	14
Headaches	1	1	2/14	14
Cool/clammy	2	0	2/14	14
Nausea	2	0	2/14	14
Restlessness	1	0	1/14	7
Shortness of breath	1	0	1/14	7

TABLE 2. Signs versus bite location

	Above Waist	Below Waist	Total	%
Erythema at bite site	7	4	11/14	79
Abdominal tenderness/rigidity	7	3	10/14	71
Cramps in lower extremity	4	1	5/14	36
Tachypnea	3	2	5/14	36
Tachycardia	2	2	4/14	29
Restlessness	2	1	3/14	21
Hypertension	1	2	3/14	21
Cardiac arrhythmia	0	1	1/14	7

TABLE 3. Laboratory, radiographic, and ECG studies

	No. Performed	No. Abnormal
CBC	12	1 (leukocytosis)
SMA-6	10	0
Urinalysis	6	2 (pyuria)
ECG	5	3 (2 nonspecific, 1 inferior-lateral wall ischemia)*
VDRL	3	0
Chest radiograph	2	0
Abdominal series	1	0

*This patient had chest pain that independently warranted an ECG.

TABLE 4. Therapies

Total	%		No. Received in ED	No. Receiving Post Admission	No. Not Receiving
11/14	79	IV fluids	14	14	0
10/14	71	Calcium gluconate	11	5	2
8/14	57	Antivenom	4	4	6
3/14	21	Muscle relaxants	1	5	9
2/14	14	Narcotics	2	4	9
2/14	14	Steroids	2	1	11
2/14	14	Nipride	0	1	13
2/14	14	Lasix	0	1	13

TABLE 5. Patient data

Group*	Days in Hospital	No. Drugs Used
A-1	1	3
A-2	1	0
A-3	1	4
A-4	1	3
A-5	1	2
A-6	1	3
A-7	4	4
A-8	1	1
B-1	1	2
B-2	2	3
B-3	2	2
B-4	2	2
B-5	1	0
B-6	1	1

*Group A, those receiving antivenom; Group B, no antivenom given.

tion of the house officer; consequently, a wide variety of drugs, including calcium gluconate (86%), narcotics (36%), muscle relaxants (diazepam or methocarbamol) (36%), and steroids (21%) were used (Table 4). Five patients had trials with more than one agent because of the ineffectiveness of one agent or recurrence of symptoms. Four patients were administered antivenom in the ED and another four received antivenom following admission. All eight patients received 2.5 mL of antivenom following negative skin testing with horse serum. The only complications of drug administration were nausea and vomiting in one patient following a single bolus of 20 mL 10% calcium gluconate and one episode of serum sickness in a patient receiving antivenom. There were no deaths, and in all 14 patients long-term outcome was uniformly excellent.

Fisher's exact test was used to examine the location of the bite in relationship to symptoms and the administration of each drug that was used (either alone or in combinations) with any complications. No statistically significant associations were identified. Beta error was analyzed; this study had a 90% chance of finding a 30% difference in the two groups at the .05 level.⁵

DISCUSSION

Eighty-six percent of our cases occurred during a four-month period in late summer and early fall. This observation correlates well with other studies,^{6,7} and is thought to be related to the life cycle of the black widow spider. The prevalence of young and mature spiders responsible for envenomation is greatest during the late summer and early fall.⁷

Some authors have noted a relationship between the location of envenomation and presenting symptom complex.^{8,9} Our "typical" presentation of envenomation consisted of bite site pain, abdominal pain/tenderness, and lower extremity pain (Tables 1 and 2).

Our study failed to demonstrate any statistically significant relationship between upper and lower extremity envenomation; however, subtle differences in presentation based on bite location could not be detected in this small series.

The results of ED laboratory and radiographic studies proved to be of lit-

FIGURE. Location of bite.

Forearm	4	Above Waist
Chest	1	
Back	3	
Abdomen	2	Below Waist
Leg	1	
Foot	2	
Penis	1	

changes compatible with inferior lateral wall ischemia (Table 3). With regard to radiographic studies, one patient had an abdominal series (flat and upright KUB) performed because of severe abdominal pain. Two additional patients had chest radiographs, one because of chest pain and the other for undetermined reasons. All radiographs were interpreted as normal by the radiologist.

Choice of therapy was at the discre-

abnormal studies, one had leukocytosis and two had pyuria. Three patients had ECG changes, one with

tle value in the initial evaluation. While others have noted the presence of leukocytosis and fever, only one patient in our study had leukocytosis and none had an elevated temperature. The entirety of laboratory and radiographic evaluation performed in this study revealed normal or non-specific findings and was not helpful in diagnosis, in management, or in assessing severity of envenomation (Table 3). One patient, age 32, suffered chest pains in the ED and had associated ECG changes suggestive of lateral wall ischemia. These changes resolved quickly and the patient was discharged with no evidence of myocardial injury.

A prospective study by Key indicated calcium gluconate to be superior to methocarbamol in the treatment of acute symptoms of envenomation.¹⁰ Evaluation of the effectiveness of the treatment modalities could not be assessed retrospectively in our series due to frequent polypharmacy and poor documentation of symptomatic relief. We were, therefore, unable to draw any conclusions regarding analgesic effectiveness.

Eight patients in this study were given antivenom. One adult patient who received antivenom was discharged within 24 hours. He subsequently returned, was admitted, and was treated successfully for serum sickness. There was no significant difference in length of hospitalization for those receiving antivenom and those receiving only symptomatic treatment. There also was no difference in amount of ancillary drug use for pain relief once antivenom was administered, nor was there any difference in clinical outcome (Table 5).

Experience with horse serum antivenom for *Crotalidae* envenomations has shown an approximate 3% incidence of serious allergic reactions in patients with negative skin testing to horse serum (personal communication, Russell FE, University of Arizona, Tucson, 1985). This probably represents the risk of serious morbidity from horse serum-derived, *Latrodectus* antivenom administration as well. Is this greater than the risk of serious morbidity or mortality for envenomation? Parrish claimed 63 deaths in a ten-year period attributable to black widow spider envenomation,² with 90% of deaths occurring 12 hours or more after the patient was bitten. However, no differentiation

TABLE 6. Interval between bite and death from black widow spiders, 1950-1959*

Interval	No. Deaths
0-1 hr	1
2-5 hr	1
6-11 hr	4
12-18 hr	3
19-24 hr	7
25-48 hr	11
3-7 days	14
8-14 days	8
15 or more days	3
Not stated	11

*Modified from reference 2.

was made between death from envenomation and death from complications, and no autopsy findings were included (Table 6). Ennik noted only two deaths in 16 years attributable to black widow spider envenomation, both of which were highly suspect for true *Latrodectus* involvement on his closer investigation.¹¹ Maretic and Russell noted a mortality rate of less than 1% from *Latrodectus* envenomation in the United States since 1965. In our series, no significant morbidity or mortality related to envenomation was noted. We suspect that serious morbidity from envenomation occurs far less frequently than does serious allergic reaction (or serum sickness) from horse-serum-based antivenom administration.

Recommendations for the use of antivenom for *Latrodectus Mactans* have long been limited to children and elderly persons and certain other high-risk situations, including hypertension^{12,13} and, more recently, pregnancy.¹⁴ However, the majority of envenomations are self-limited, peak in severity at three to four hours, and require only symptomatic treatment. While our current armamentarium of drugs is not always effective in treating symptoms of serious envenomation, using antivenom did not result in shorter hospitalization or improved outcome and was associated with the complication of serum sickness in our study.

CONCLUSION

In our study of apparently severe

Latrodectus Mactans envenomation, we found no statistical difference in presentation between upper body and lower extremity envenomation. The majority of patients had bite site pain, abdominal pain/tenderness, and lower extremity pain. Laboratory and radiographic studies did not facilitate ED evaluation following envenomation, and we therefore suggest that they should be obtained only to include or exclude alternative diagnoses. Symptomatic treatment with calcium gluconate and methocarbamol was as effective as the use of antivenom in terms of patient outcome. Based on the relative frequency of potentially harmful results, we believe that the use of horse-serum-based antivenom should be restricted to life-threatening situations. In the absence of such situations, we believe that the use of horse-serum-based antivenom should be discouraged.

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