

SCORPION ENVENOMATION IN CHILDREN: SHOULD ALL STINGS BE GIVEN ANTIVENOM?

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Venomous scorpions pose a great health hazard to children. The most common genera of scorpions found in Saudi Arabia are *Androctonus crassicauda* and *Leiurus quinquestriatus*. Scorpion venom is among the most potent of animal venoms. Stings by dangerously venomous scorpions do produce serious symptoms and have to be treated. Yet there is no unanimity about the treatment of scorpion sting. The suggested treatment regimes are: 1) no antivenom serum,¹ symptomatic treatment only; 2) 1 mL antivenom intramuscularly;² and 3) 5 mL intravenous antivenom in all cases. The object of the present study was to determine whether all scorpion stings need treatment with antivenom, or whether the cases can be categorized so that asymptomatic ones are not given antivenom.

Materials and Methods

This study was based on scorpion sting cases in children seen during a five-year period from 1991 to 1995 at the King Fahad Hospital, Al Baha, which is a referral hospital for the Al-Baha region of Saudi Arabia. The total number of cases seen were 386, with ages varying from one year to 12 years, the youngest of which was a baby of 10 months. The patients comprised 237 males and 149 females. Fifty-three of them were below two years, 125 were between two to five years, and 208 were between five and 12 years of age.

Symptoms of Envenomation in Present Series

A total of 169 patients (91%) out of a symptomatic group of 185 had developed symptoms by two hours of the sting, and by four hours, all cases (100%) had developed some definite local or general symptom. Those stings which were to show signs of envenomation, local or systemic, had done so within four hours.

A total of 201 (52%) out of the 386 cases were completely asymptomatic. Twenty-nine (7.5%) had local symptoms like pain, swelling, redness, and itching lasting for between two and four hours. Systemic involvement was

seen in 156 cases (40%). General symptoms such as salivation, sweating, extreme irritability, agitation and excessive crying were present in 132 cases (32%). Priapism was present in 52 affected male children (22%). The symptomwise presentation, laboratory and radiological abnormalities are listed in Table 1.

Cardiovascular and neurological complications cause the most morbidity and are major causes of mortality in scorpion envenomation. Neurological complications were the next most common feature, and were seen in 51 cases (13%). The main neurological complications were extreme agitation and disorientation, muscular spasms, seizures, coma and cerebral edema, which is the most dreaded complication. A girl of four years who presented to hospital in a comatose condition after about six hours of envenomation died of cerebral edema.

Hypersensitivity Reactions to Antivenom Serum

A total of 182 patients (163 symptomatic and 19 asymptomatic) were given 5 mL antivenom intravenously. Reactions were seen in 25 patients (13.7%), with minor transient skin reactions in 23 (12.6%) of them. In two patients (1%), the reactions were more serious, such as severe urticaria, periorbital edema, cough, breathlessness, severe hypotension and heart failure. One asymptomatic patient who was given serum intravenously started showing signs of anaphylactoid reaction within minutes, and had to be sent to ICU, where the patient eventually recovered.

Management and Treatment Protocol

The treatment of scorpion envenomation consists of nonspecific or supportive care and specific treatment with scorpion antivenom, which should be species-specific. We followed the Saudi Ministry of Health's Protocol and gave 5 mL antivenom intravenously in all cases. Patients with a history of reactions to antivenom were excluded. We gave 10 mL antivenom in moderate systemic affection and 15-20 mL in severely affected cases showing signs of myocarditis or central nervous system (CNS) affection. The antivenom used was purified polyvalent anti-scorpion serum produced by the Egyptian Organisation for Biological Vaccine Production in Cairo, Egypt. The serum was prepared from the purified plasma of healthy horses immunized with venoms of *Leiurus quinquestriatus*, and

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Androctonus amoreuxi, and capable of neutralizing venoms of *L. quinquestriatus*, *A. amorexi*, *A. crassicauda*, *A. aeneas* and *Buthus occitanus*.

Nonspecific (supportive) treatment consisted mainly of chlorpromazine (largactil) 0.5 to 2 mg/kg, repeated once or twice, and sometimes promethazine (phenergan) 0.25 to 1 mg/kg (Protocol of MOH, Saudi Arabia) This was adequate to control autonomic symptoms and agitation. For convulsions, diazepam 0.1 to 0.5 mg/kg was used, and occasionally had to be repeated. For cardiac complications like pulmonary edema, myocarditis and heart failure, furosemide 1 to 3 mg/kg, and ACE inhibitors like captopril were used. Corticosteroids were not used as a standard practice. For cerebral edema, appropriate therapy, such as mannitol, dexamethazone, hyperventilation, etc., were used. Those who presented with deep coma and cerebral edema did not survive. Cases which showed marked respiratory distress or impending respiratory failure were put on mechanical ventilation.

Results

In our series of 386 cases, 201 (52%) were asymptomatic and 185 (48%) were showing some local or general symptoms of envenomation at the time of arrival at the hospital. Of these 185 symptomatic cases, 169 had developed symptoms within two hours of the sting and all 185 by four hours. Though it was not possible on ethical grounds to group scorpion envenomation cases for experimental purposes and give serum to one group and placebo to the other group, during this period 182 asymptomatic and 22 symptomatic children could not be given serum because none was available. None of the asymptomatic cases developed any symptoms during the 24 hours of observation. The difference in outcome and hospital stay, whether antivenom was given or not, was of no statistical significance ($P \geq 0.5$).

In the 163 symptomatic cases, antiscorpion venom serum was given. In the remaining 22 cases, it could not be given because of non-availability or hypersensitivity to serum. Those affected children who were given serum had fewer complications, and shorter hospital stay, and there were no deaths in the group. The hospital stay in the group that was given serum was between 3 to 7 (mean \pm ISD=5 \pm 1.5) days. For those who were not given serum, it was between 7 to 13 (mean \pm ISD=10 \pm 2.35) days. The difference between the two groups with regard to morbidity and hospital stay was highly significant ($P \leq 0.01$).

Discussion

In humans, the effects of scorpion venom are due to stimulation of the hypothalamus, leading to hypothalamic discharges, and causing profound effect on sympathetic and parasympathetic systems.⁴ There is a massive release

TABLE 1. *Scorpion stings: symptoms and laboratory abnormalities (n=386).*

Symptoms and laboratory abnormalities	Number (%)
Asymptomatic	201 (52)
Local symptoms	29 (7.5)
Generalized symptoms	156 (40)
Sweating, salivation	132 (34)
Vomiting, diarrhea	86 (22)
Abdominal rigidity	30 (8)
Tachycardia	125 (32)
Bradycardia	3 (0.77)
Hypotension	7 (2)
Circulatory failure	4 (1)
Breathlessness	18 (5)
Pulmonary edema	5 (1)
Respiratory failure	1 (0.2)
Seizures	17 (44)
Coma	7 (1.8)
Pupillary changes	19 (5)
Hemiplegia	1 (0.25)
Cerebral edema	1 (0.25)
Priapism	52 (22)
Hyperglycemia	22 (5.6)
Raised cardiac enzymes	24 (6)
ECG changes	30 (7)
Echo changes	5 (1.2)
Chest x-ray, pulmonary edema	5 (1.2)
Hyperkalemia	20 (5)
Leukocytosis	60 (16)

of catecholamines, probably causing shunting of blood from metabolically active areas. There may be a direct toxic effect of the venom on regional oxygen transport at the cellular level. There is persistent arterial and gastric mucosal acidosis and increased lactate concentration.⁴ A number of clinical cardiovascular syndromes and central nervous system dysfunctions may be seen as a result of the effects of the released transmitters. Myocarditis, heart failure, pulmonary edema, hypertension, acute myocardial infarction-like picture, rhythm disturbances, etc., may occur. Soomro et al.⁵ reported major cardiovascular complications, such as changes in blood pressure, reversible ECG abnormalities simulating myocardial ischemia or infarction, reversible echocardiographic changes of systolic dysfunction, congestive heart failure and pulmonary edema in 18.5% of cases of scorpion envenomation. Also in our series, cardiac complications such as pulmonary edema, myocarditis, changes in heart rate and rhythm, and cardiac failure were seen in 70 cases (18%). In one case of a 12-year-old boy, the electrocardiographic changes were striking. The first ECG taken on admission showed ventricular bigeminy or

coupling, but after 48 hours the ECG showed a picture of anterolateral wall infarction and ischemia, with Q-waves, raised ST and inverted T-waves in leads I and avL and tall T-waves in leads II, III, V3-V6. The ECG changes started regressing rapidly and after four days were showing normal ST-T-waves in LI and avL, the only remaining defect being Q-waves in lead I. After four weeks, the ECG had become completely normal (Figure 1).

For cardiac complications, afterload reduction with either nifedipine or an angiotensin-converting enzyme inhibitor should be considered. Central nervous system disturbances such as confusion, agitation, seizures, cerebral edema and coma are more common in children.⁶⁻⁸ All cases of scorpion sting should be kept under close observation for at least 12 hours.

Santhanakrishnan and Balagopal Raju⁹ reported a mortality rate of 2.7% for cases of all ages. In our series, there were two deaths in 1991, the first a girl of one year who died of disseminated intravascular coagulopathy and renal failure, and the second, a girl of four years who died of cerebral edema. The mortality percentage in our series was 0.5%. In cases of definite envenomation, the earliest use of species-specific antivenom serum reduces mortality and morbidity. Still, it should always be borne in mind that antivenoms are animal-derived Igs. Because they are concentrates of animal serum, both immediate and delayed hypertension-sensitivity reactions are common, and may themselves be life-threatening. The decision to use antivenom should be made as quickly as possible and should be based on both known potency of the venom and the clinical severity of the victim.

Reports about hypersensitive reactions to antivenom serum are few. Bond¹⁰ reported that 58% of patients treated with antivenom had a delayed onset of rash or symptoms of serum sickness, and states that the use of antivenom for the less severe envenomation may subject them to unjustified risk. In our series, of the 182 patients who were given antivenom serum, minor reactions were seen in 13.7% and more serious reactions in 1%. With regards to treatment of completely asymptomatic cases,

which in our series were 201, of which 182 (90%) could not be given any serum, these patients did not develop any symptoms and were discharged home in good condition after 24 hours of observation.

From the review of our cases, it seems that completely asymptomatic cases who remain so during observation need not be given antiscorpion serum, for, however small the risk may be, there is a substantial danger of serious reactions to the animal protein in the antivenom serum, and it should be avoided if possible.

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