The Clinical Manifestation and Outcome of Scorpion Sting Envenomation in Children Admitted to Tertiary Care Hospital

Srinivasa K.[1*], Vishwanath B.[2]

[1]Assistant Professor, [2]Associate Professor, Department of Pediatrics, Vijayanagara Institute of Medical Sciences, Bellary, Karnataka, INDIA.

[*]Corresponding Address:

drsriniks@gmail.com

Research Article

Abstract: **Objective:** To study the clinical profile, the pattern of presentation, treatment and the outcome in scorpion sting envenomation at a tertiary care hospital. **Methods:** A total of 120 children were prospectively studied. The data included demographics, the time of presentation to the hospital, the clinical features, and the premedication which was given before the arrival of the subjects at the hospital, response to the oral Prazosin and the hospital outcome. **Results:** Local pain, sweating and peripheral circulatory failure were the common clinical presentations. Complications like acute pulmonary oedema, myocarditis, shock and encephalopathy were also seen. These were treated with a combination of Prazosin with either inotropes or vasodilators. Mortality was seen in 3(2.5%) children. Oral Prazosin, a postsynaptic alpha –1 blocker, is a highly effective drug for scorpion sting envenomation. **Conclusion:** Scorpion sting envenomation is an acute life threatening emergency and an early presentation to the hospital and an early intervention with proper medication(Prazosin) can hasten the recovery in the scorpion sting victim.

Keywords: Scorpion Sting Envenomation, Tertiary Care Hospital.

Introduction

Scorpion sting envenomation is a life-threatening emergency and a common public health problem in many regions of the world, particularly in children (1). It is a frequent event in the tropical, subtropical and the temperate zones of the world and poses a public health problem in certain parts of India also. The Indian red scorpion(*Mesobuthus tamulus*) is the most lethal scorpion species. These are found abundantly in western Maharashtra, northern Karnataka, Andhra Pradesh and Tamilnadu [2, 3,4] The frequency of envenoming by scorpion stings varies throughout the year. The highest incidence is reported during the summer seasons(5). Children are at greater risk of developing severe cardiac, respiratory, and neurological complications. The clinical symptoms of central and peripheral neurotoxicity, cardiotoxicity and metabolic alterations present in envenomed patients are assumed to be directly related to the concentration of toxins existing in the venom injected by the scorpion (5,6,7). The deaths in scorpion sting envenomation are attributed to cardiopulmonary complications like myocarditis and acute pulmonary oedema(7,8,9) The present study was done to observe the pattern of presentation and also the outcome in scorpion sting envenomation in children who were admitted at tertiary care center.

Materials and Method

This prospective study was conducted at Medical College,a tertiary care hospital in Karnataka, India, over period of 3 yrs. All the cases who were aged between 0-14 years and who presented to the emergency department with a history of scorpion sting envenomation, the presence of the sting mark and with the sting or the scorpion seen in the vicinity of the child by the parents or near family members was admitted. In total, around 120 cases were studied during this 3 yrs period. Informed consent was taken from the parents or the relatives of the children. All clinical details and vitals- BP, HR, RR, the temperature of the extremities and chest findings were recorded at the moment of arrival, 30 min later and then every hour until the patient was shifted to stabilization ward on a pretested standard proforma. Details of treatment, time spent in the hospital, evolution of envenoming and any complications were also recorded. The patients were continuously monitored in PICU for pulse rate, respiratory rate, blood pressure, temperature, SPO2, capillary refilling time and for signs of systemic involvements like the development of pulmonary oedema, myocarditis, encephalopathy and shock. A complete haemogram, serum electrolytes, blood sugar, arterial blood gas analysis, renal function tests, ECG and chest radiographs were done and evaluated in all children. The diagnosis of various systemic involvements was done, based on the clinical manifestations and investigations. The autonomic storm was diagnosed on the basis of sweating, vomiting, excessive salivation, priaprism, shivering and hypotension or hypertension. Acute pulmonary oedema was diagnosed on the basis of the presence of tachypnoea, a pinkish frothy sputum, bilateral

crepitations and radiological findings. Myocarditis was diagnosed if the child had tachycardia, muffled heart sounds, a gallop rhythm and a systolic murmur, ECG changes (low amplitude, ST segment changes, and the presence of arrhythmias), cardiomegaly on chest X-ray. Cases with a history of scorpion sting which came within 6 hours were given Paracetamol for pain, antihistamine and a dose of Prazosin (30ug/ kg) tablet either through a naso-gastric tube or per oral, which were given 4 hourly till all the symptoms subsided. Asymptomatic cases which came after 6 hours of the scorpion sting were kept under observation and they received only symptomatic treatment. All the symptomatic cases were given Prazosin and supportive care. Children with acute pulmonary edema were managed with the judicious use of vasodilators and inotropes along with supportive measures. All the cases were observed for a minimum period of 24 hours. Cases with complications were discharged after they were off the drugs for 24 hours and after they were stable for 48 hours. The analysis was done with respect to the complications, the time interval between the scorpion sting and admission to the hospital and mortality.

Results

During the study period 120 children between the age group of 0–14 years were studied. 50 children had local involvement i.e. pain and swelling at the sting area. They were hence observed for 24 hours and discharged as per the protocol. The remaining 70 children were symptomatic and were treated with Prazosin and IV fluids and symptomatic treatment whenever required, like vasodilators and inotropes were used. Most of the cases were within the age range of 2 –6 yrs i.e.92 (76.6%), followed by the age group of 7-12 years. Among the 120 children,72 (60%) males and 48(40%) females were affected. The average age was 5.2 years. A partial correlation between age and severity of the envenoming was observed. The younger the patient was the worse the symptoms. Intense pain in the affected area was observed in 72.3% of the cases, erythema in 25%, while edema and local pruritus or paraesthesia were seen less frequently. In our study most frequently observed symptoms were: local pain, local hyperaemia, sialorrhea, irritability, paraesthesia, and vomiting (**Table 1**). The most frequent symptoms vary depending on the severity of envenoming. Systemic symptoms predominate in all severe cases,whereas local symptoms are prevalent in mild cases. The maximum numbers of cases were from the rural areas, accounting for 104 (86.6%) cases with peaks during summer. The Indian red scorpion (*Mesobuthus tamulus*) species was the cause for 85 (70.8%) of the cases. Most of the bites occurred during the evening to night time(7pm and midnight) accounting 82 (68.3%)cases. The most common site of the sting was the extremities, mainly over the lower limbs, accounting for 86 (71. 66%) cases followed by the upper limb in 29 (24.16%) cases and the other areas (face, neck) in 5 (4.16%) cases. Children who came late had the features of excessive sympathetic activity (tachycardia, intense vasoconstriction and carditis).Those children who presented immediately after the sting (within 30 minutes) had the features of parasympathetic hyperactivity (i.e. sweating, salivation bronchospasm and vomiting). All these symptoms indicated the autonomic storm at presentation. The most common presenting symptoms were irritability and profuse sweating, hurried breathing and cold extremities followed by an altered sensorium. The most common clinical signs were tachycardia, tachypnoea, cold extremities, perspiration and hypotension. A majority of the cases approached the hospital after 6-12 hours of the scorpion sting. Myocarditis was detected in 22(18.3%) cases, clinically could be diagnosed in 40% of cases, after other investigations like ECG findings like ST segment depression in 25% cases. 24 cases(20%) had pulmonary oedema with myocarditis. Acute pulmonary oedema with myocarditis, shock and encephalopathy were found in 16(13.3%). Out of the 16 patients, 3(2.5%) died. All the 8 patients presented 6-12 hours after sting .Mortality and complications were seen in those patients who presented to the hospital after 6 hours of the sting. Most of the deaths (75%) were seen in the age group between 1-5 years. The highest mortality was due to cardiovascular complications i.e. myocarditis in 64%, pulmonary oedema in 24% and encephalopathy in 2% cases. In 2 cases, on follow up, echocardiography showed ventricular dilatation

Table 1: Most common symptoms at presentation (N=120)

Symptoms	Number of patient Percentage (%)
Local pain	85 (70.83%)
Irritability	86 (71.6%)
Local reaction	10 (8.3%)
Vomiting	63 (52.5%)
Cold peripheries	95 (79.16%)
Sweating/perspiration	92 (76.6%)
Salivation	27 (22.5%)
Abdominal pain	5 (4.16%)
Altered behavior	15 (12.5%)
Seizures	4 (3.33%)
Priapism	38 (31.66%)

Discussion

The Indian red scorpion's (*Mesobuthus tamulus'*) venom is a potent sodium channel activator, resulting in the stimulation of the autonomic nervous system, which in turn leads to the sudden release of endogenous catecholamines into the circulation [14]. The venom initially leads to a transient cholinergic phase, followed

by sustained adrenergic hyperactivity, which is a venom dose dependent phenomenon [15]. The clinical manifestations depend upon the dose of the venom, the age of the child and the time lapse between the sting and hospitalization [7]. Of the 120 cases, 72 (60%) were boys and 48 (40%) were girls, as was also reported by Biswal *et al.* [16]. 104 (86.6%) cases of scorpion stings came from rural areas and 86 (71. 66%) cases had the sting over the foot-leg, which was similar to Bosnak *et al.*'s observations [17], where 71% cases were from rural areas and 55.6% had the sting over the foot-leg. Peripheral circulatory failure cases with cold extremities were seen in 95 (79.16%) cases which was similar to the 83% cases which were reported by Bawaskar *et al.* [13] and the 75.5% cases which were reported by Biswal *et al.* [16]. This is due to early stage of compensated shock due to excessive catecholamine, resulting in peripheral vasoconstriction, but without significant myocardial dysfunction. Most of the cases with myocarditis had acute pulmonary oedema and many had the S3 gallop. The late onset acute pulmonary oedema could have been due to the acute myocardial injury and the left ventricular failure and the toxin induced autonomic storm. There was no significant difference between the means of the basic parameters such as age, blood pressure, GCS, haemoglobin levels, total leukocyte count and serum electrolytes among both the survivors and the non-survivors. The time gap between the scorpion sting and presentation to the hospital is one of the significant risk factors which determine better outcomes and mortality. Children who presented after 6 hours of the sting had a significantly higher mortality rate, as was also reported by Biswal *et al.* [16]. Most of the cases with acute pulmonary oedema, encephalopathy and myocarditis, who came to us after 6 hours of the sting, had higher mortality and morbidity. However, some studies [8, 13] have shown higher mortality in those patients who were admitted between 30 min to 3 hours of the sting. The mortality which was observed in this study was seen in 3(2.5%) cases, as compared to the 1% to 10.7% which was reported by various authors from different places [16, 18, 19, 20]. The causes for higher mortality may be late presentation and associated multiple systemic involvements. Dexamethasone alone or in combination with antihistaminics is known to potentiate the effect of catecholamine on the cardiovascular system and the CNS and to worsen the encephalopathy was observed by other authors [16, 21]. The mortality was less in cases which were treated with Prazosin and in severe cases who received dobutamine, dopamine or SNP along with Prazosin. This could be due to the protective effect of Prazosin on the cardiovascular and the respiratory systems. Prazosin reverses both the inotropic and hypokinetic phases and reverses the metabolic effects which are caused by depressed insulin secretion [22]. So the early administration of Prazosin reduces the mortality which is associated with encephalopathy, which is due to the neutralization of the adverse effect of catecholamine which is released into the brain, as the catecholamines which are released outside the brain do not cross the blood- brain barrier.

Conclusion

Scorpion sting envenomation is an acute life threatening emergency in children and timely referral and early therapy with Prazosin may be life saving. The presence of metabolic acidosis, myocarditis, encephalopathy and acute pulmonary oedema are important determinants of the mortality and morbidity in children. Early intervention with oral Prazosin and the appropriate use of dobutamine and SNP can hasten the recovery in the scorpion sting victim.

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