Case Report

Fatal Scorpion Sting in A Child: A Case Report

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Abstract
It is a common assumption that a scorpion sting is non-fatal. Out of many cases which come to hospital due to scorpion sting, only few suffer from complications which later lead to death. The fatality rate among children due to scorpion sting is higher than that in adults. Though many are aware of autonomic storms due to scorpion stings, many are not aware that the heart can also be affected in such cases. Here, we report a case of a twelve-year-old boy brought to the Emergency department with an alleged history of scorpion sting nearly six hours back with first aid given in local hospital and who was suffering from autonomic storm, grade II at the time of admission. Despite vigorous treatment, the child succumbed.

Keywords: Scorpion sting; fatal; myocarditis; child.

Introduction:
Scorpions are venomous arthropods present all over the world except in Antarctica. Scorpions belong to the class Arachnida and order Scorpiones. This arthropod comprises 16 families and over 1500 species and subspecies[1]. Among 86 species in India, Mesobuthus tamulus (Indian red scorpion) and Heterometrus swammerdami are of medical importance[2]. Though local symptoms including severe pain and burning sensation at the site of sting are the most common manifestations, systemic complications are also known to happen. Cardiovascular complications are particularly prominent following stings by Indian red scorpion[3]. We present a pediatric case with clinical manifestations following the scorpion sting which turned out to be fatal.

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Case Report:
A twelve-year five-month-old boy, weighing 30 kg, came to the Emergency department of our hospital around noon with an alleged history of scorpion sting to his right ring finger in the morning. He was treated in the nearby government hospital with Inj. Prazosin, Inj. Hydrocortisone, IV fluids and referred to our center.
On arrival, the child was sweating profusely with flushing all over the body and altered sensorium. His heart rate was 140bpm, RR was 42cpm, BP was 95/46 mm of Hg and SpO2 was 70% at room air. On systemic examination, crepitations were present on both sides of the lungs. He was admitted to hospital with an initial diagnosis of envenomation by scorpion sting with grade II autonomic storm.
The child was immediately shifted to PICU, started on PSIMV non-invasive ventilation mode. Investigations were done. ABG analysis showed acidosis [pH-7.232 (Normal-7.35-7.45), pCO_2 51.8mm HG (normal- 32-45), pO_2 – 47mm Hg (Normal- 83-100), Na^+ - 132 mmol/L(Normal- 1135-245), Ca^{2+} - 0.62mmol/L(Normal- 1.15-1.33), Lactic acid-16 mmol/L(Normal- 0.3-0.7), Base excess- -

5.7mmol/L(Normal-7.1-9.9)]. ECG showed Sinus tachycardia, middle ST depression (V5), left ventricular hypertrophy. CBC was within normal limits with neutrophilia [Neutrophils –89.9 (normal-40-80)]. Inflammatory marker, CRP was within normal limits. [0.1(Normal-0-0.9)]. SGOT and Alkaline phosphatase were elevated in LFT. [SGOT- 59(Normal-0-35) and Alkaline Phophatase-361 (Normal-53-128)]. RFT and lipid profile were within normal limits. PT INR was elevated. [PT-17.1, INR- 2.78]. Chest X ray showed pulmonary oedema features. 2D ECHO report revealed- dilated left ventricle, moderate LV dysfunction and mild tricuspid regurgitation

Tab Prazosin 1mg, Inj Dobutamine, Inj Furosemide and IV fluids were started. In view of low blood pressure, Inj Noradrenaline and saline bolus were also given. Child was on NIV with saturation of 95% with FiO2 of 70%. Child became more active, alert, oriented and there was no respiratory distress. After nearly fourteen hours of hospitalization, the child developed difficulty in breathing and saturation started dropping. Emergency intubation was done and a large amount of secretions in larynx was noted. Soon after the child was connected to ventilator, the child went into cardiac arrest. After revival, he went into supra ventricular tachycardia for which he was given two doses of adenosine. As the arrhythmia was not corrected, synchronized cardioversion was given twice and arrhythmia got reverted. Within a minute, child had another episode of ventricular tachycardia for which Inj Amiodarone was given. However, the child had cardiac arrest a few minutes later and in spite of all resuscitation efforts, the child could not be revived and was declared dead.

Cause of death was given as – Envenomation by scorpion sting with grade III autonomic storm and myocarditis. As this was a medico-legal case, police were intimated, and the dead body was sent for postmortem examination.

Autopsy findings:

External findings- Antemortem pinpoint punctured wound present over dorsal aspect of right ring finger over middle phalanx, with diffused blood extravasation present underneath on further dissection of wound.

Internal findings- Brain was edematous and congested. Lungs were congested and edematous. Pinpoint hemorrhages present over the anterior surface of the heart. The liver and kidneys were intact and congested.

On perusal of PME and hospital case records, the opinion as to the cause of death was given as “Death is due to myocarditis as a result of envenomation by scorpion sting.”

Discussion:

The venom comprises of water-soluble complexes like mucopolysaccharides, hyaluronidase, serotonin, histamine, phospholipase, acetyl cholinesterase, neurotoxic peptides, cardiotoxins, hemolysins, enzyme inhibitors etc. Clinical signs of envenomation involve the overactivity of the autonomic and central nervous system[1, 2]. The venoms have proven to be selective antagonists for various voltage-gated ion channels like Na+, K+ and Ca2+ channels[4]. It affects the sodium channels with prolongation of action potentials, as well as spontaneous depolarization of nerves of both adrenergic and parasympathetic nervous systems. Thus, both adrenergic and cholinergic symptoms occur. Phospholipase-A causes gastrointestinal hemorrhages, pulmonary hemorrhages and disseminated intravascular coagulation[5].

The inflammatory response is triggered by cascade that includes systems, cell elements, and release of mediators. The T helper cells are responsible for inflammatory mediators against intra- and extra-cellular pathogens. The balance between anti- and pro-inflammatory activities determines the extent of inflammation and thus can lead to different clinical manifestations[1, 4,6].

The signs of the scorpion’s envenomation are determined by the following: (a) scorpion species, (b) venom composition, and (c) the victim’s physiological reaction to the venom.

Children with lower body mass and increased ratio of scorpion venom to body mass have more severe reactions, thus the higher fatality rate[7].

The symptoms of the sting start immediately, a few minutes after the sting and usually progress to a maximum severity within five hours. At this period the massive release of neurotransmitters results in sweating, nausea, and vomiting. Changes in the central and autonomic nervous system and various organ systems will lead to more changes like mydriasis, nystagmus, hypersalivation, dysphagia, and restlessness[1,3,4,5]. The local features include intense burning pain and a red wheal with a hole in the center at the site. The area may be red, swollen and tender. There might be itching, ecchymoses and oedema too[3,5].

Based on clinical signs at the time of admission, envenomation is graded as Grade 1 to 4. Grade 1 has only local symptoms, but Grade 2 has local and general symptoms showing acetyl choline excess or parasympathetic stimulation (vomiting, profuse sweating from all over body, ropey salivation, bradycardia, premature ventricular contraction, hypotension, priapism in men) and sympathetic stimulation (hypertension with blood pressure >140/90, tachycardia with heart rate >120 per minute, cold extremities, transient systolic murmur). In Grade 3, there is cold extremities, tachycardia, hypotension or hypertension with pulmonary oedema (respiratory rate >24 per minute, basal rales or crackles in lungs). Grade 4, we can see tachycardia, hypotension with or without pulmonary oedema with warm extremities (warm shock)[8].

Venom causes acute lung injury. Alveolar capillary endothelial dysfunction results in interstitial and alveolar oedema. Scorpion venom inhibits angiotensin converting enzyme, resulting in accumulation of bradykinin, which is implicated in the development of pulmonary oedema[1,3,4]. Some are of the opinion that pulmonary oedema has cardiogenic origin[9]. Respiratory disturbances have also been observed in the absence of pulmonary edema or myocardial damage because of acidosis, excessive secretions, or electrolyte imbalance[7].

Many components of venom can cause direct injury to the heart. The increase in blood levels of angiotensin and catecholamines results in cardiac stimulation, severe vasoconstriction, increased oxygen requirement of the myocardium and significant changes in myocardial metabolism and perfusion. This may cause acute myocardial infarction too. Myocardial infarction may also be due to sympathetic stimulation or vasospasm[2,4]. Hypertension and hypotension are both possible[9].

The increase in AST and ALT levels may be due to a direct action of venom on the liver and the heart. Envenoming by different scorpions has showed an increase of circulating enzymes levels including ALT, and AST[1]. Gland secretions are increased. Clotting mechanism may get deranged[9].

Agitation, coma, and convulsions are a few of the most common neurologic manifestations. Hypertensive encephalopathy, hypoxia, and a direct effect of venom are suggested as the major pathways for its occurrence[7].

Tachycardia, arrhythmias, hypertension, hyperthermia, rhabdomayolysis and acidosis are also seen in many cases[10]. Complications like gangrene of the affected part, toxic myocarditis, disseminated intravascular coagulation (DIC), acute pancreatitis have been noted in few cases[5,9,10]. Multi organ dysfunction seen in cases of scorpion envenomation is due to syndrome of fuel-energy deficits causing an inability to utilize the existing metabolic substrates by vital organs. Various compounds like cytokines, interleukins, bradykinin etc are released which will affect multiple systems[1].

Treatment depends entirely on clinical signs and symptoms. In few, assuring the patient, giving ice packs to site of envenomation, analgesics and antihistamines would suffice. Local infiltration of anesthetic is useful if the pain is very severe[9,10]. Antivenom might be of great help but not many places will have access to it. In India, Haffkine Biopharma

(Mumbai) has been manufacturing monovalent anti-scorpion venom serum F(ab)2 against *Mesobuthus tamulus* since 1997 and it has been available for clinical use since 2002[8] but there have been controversies about usage of antivenom too[9]. Anxiolytics might be useful in case of agitation and restlessness[9,10]. Hyperoxygenation by positive pressure ventilation at high FiO2 reduces pulmonary hypertension and helps to resolve pulmonary edema[11]. PEEP helps by alveolar recruitment and by shifting edema fluid away from alveoli.

Prazosin is recommended in envenomation due to scorpion stings. It is used for the treatment of pulmonary edema, associated with arterial hypertension[8,12]. Prazosin, being an alpha receptor blocker can indeed alleviate many symptoms due to autonomic storms. Thus, it is recommended to use in many cases[7,10]. Few places use frusemide for raised central venous pressure and pulmonary oedema, crystalloid infusion for reduced central venous pressure, and hydrocortisone and dopamine for hypotension as standard therapy. In a few cases, insulin was administered when the standard therapy failed, and it had a significant outcome[13]. Captopril, an Angiotensin Converting enzyme inhibitor, Sublingual Nifidipene, Sodium Nitroprusside, dobutamine are also being used in many cases[12].

Prevention: The following preventive measures can be considered:

1. Never explore places one cannot see. Use flashlights to check for scorpions as they frequent dark places.
2. Keep your place and surroundings clean and clear debris and trash from areas one inhabits.
3. Inspect boots, clothing, bedding and other articles for the presence of scorpions, small or otherwise, each time.
4. Spraying 10% DDT + 0.2% pyrethrin + 2% chlorine in oil base or Fuel oil + Kerosene + Creosote as spray in roof complexes and building foundations can be of certain use.

As a rule, if one scorpion has been encountered in a particular area, there is a high chance that others are around as female scorpions generally give birth to 50–60 young, which remain close to where they were born. It is important to locate and kill them all when one is found[14].

Conclusion:

Though not all scorpion stings turn out to be fatal, prompt and correct treatment is necessary in each case as syndrome of scorpion sting is complex and variable. Continuous monitoring is necessary in all scorpion sting cases to look for complications and treat them accordingly. Extra care must be taken in pediatric cases as the fatality rate and the complications are high in them. Though it is said that we have various ways to treat autonomic storm seen commonly in Scorpion sting cases, much research is still needed.

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