

RESEARCH ARTICLE

FROM STING TO MYOCARDIAL DYSFUNCTION: SCORPION VENOM AND THE HEART

F. Berraiteb^{1,2}, S. Tougar^{1,2}, H. Darouich^{1,2}, K. Elfakhr^{1,2} and S. Kalouch^{1,2}

1. Faculty of Medicine and Pharmacy, University of Hassan Second, Casablanca, Morocco.

2. Pediatric Emergency Department, Mother-Child Hospital, Ibn Rochd University Hospital Center, Casablanca,

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Manuscript Info

Abstract

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*Key words:-*Scorpion Sting, Myocarditis, Pediatric Emergency, Multiorgan Failure, Cardiac Toxicity Scorpion stings are a significant public health concern, particularly in endemic regions, due to their potential to cause severe envenomation with fatal complications. We present the case of a 3-year-old male who developed fulminant myocarditis following a scorpion sting. The patient was admitted in a critical state with cardiogenic shock, acute pulmonary edema, and multiorgan failure. Despite aggressive management, including mechanical ventilation, inotropic support, and intensive care interventions, the patient succumbed to progressive cardiac and systemic complications. This case underscores the severity of scorpion envenomation, the rapid progression of cardiac toxicity, and the importance of early, intensive management. Preventive measures and enhanced critical care protocols are crucial in endemic regions to reduce morbidity and mortality associated with scorpion stings.

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Introduction:-

Scorpion envenomation (SE) is a relatively common incidentand a serious public health concern in tropical and subtropical areas, particularly in Latin America, the Middle East, India and North Africa. Like all countries in North Africa, Morocco is one of the main African ones affected by scorpionenvenomation. It constitutes a serious medical emergency, especially in young children (1-2). In a 20-year study, 437,779 cases of scorpion stings were reported to the Moroccan poison control center, representing an incidence of 89 cases per 100,000 inhabitants (3). The majority of scorpion envenomation (80% to 90%) is marked by severe, localized pain (stage 1) that lasts for up to 24 hours. Even though severe types of scorpion envenomation (stage 3) are extremely uncommon (less than 1%), they are nevertheless deadly since they can result in life-threatening cardio-respiratory collapse (4). Shock, pulmonary edema, and a sudden cardiac failure are frequently considered to be the most severe instances. To avoid these fatal consequences, early diagnosis and following established protocols remains the most effective way to increase the chances of survival. In Morocco, the mortality rate has dropped from 5.71% in 1999 to 0.69% in 2017 thanks to the launch of the national strategy to combat scorpion stings and envenomation (3).

We describe a case of myocarditis in a young boy that had been caused by a scorpion sting, emphasizing the challenges in recognizing and managing this potentially fatal complication.

Case presentation:

An hour after being stung by a scorpion, a 3-year-old boy with no notable medical history was admitted to the pediatric emergency room of the Mother-Child Hospital at Ibn Rochd University Hospital Center in Casablanca. Considering the mother recognized the scorpion, history supported the diagnosis. The infant had grade III

Corresponding Author:-F. Berraiteb Address:-Faculty of Medicine and Pharmacy, University of Hassan Second, Casablanca, Morocco.

envenomation and was sent to pediatric critical care immediately. After admission, a thorough biological analysis was completed.

Clinical Findings and Management:

The patient presented with severe clinical instability upon admission. He was in impaired consciousness with agitation and confusion. On the hemodynamic level, he was tachycardic at 170 bpm with hypotension at 50/30 mmHg, cold and cyanotic extremities, marbled skin, capillary recoloration time greater than three seconds. The patient had an oxygen saturation rate of 68% and foamy secretions, a sign of acute pulmonary edema. Pulmonary auscultation revealed bilateral crackles. Diarrhea, vomiting and priapism were among the other symptoms observed. Given this clinical situation, the patient was intubated and put on mechanical ventilation, with an invasive blood pressure catheter, central venous access, and a urinary catheter to quantify diuresis. We started dobutamine at 7 μ g/kg/min.

Laboratory and Imaging Results:

Laboratory tests showed hyperleukocytosis (23,600/mm³), elevated CRP (212 mg/l) and significantly increased troponin (600 ng/l) and creatine phosphokinase. Within three hours of hospital admission, acute kidney injury became clinically apparent, progressing from oliguria to anuria. Cardiacally, a transthoracic echocardiogram was performed, revealing significant left ventricular dysfunction with a 20% lower ejection fraction.

Clinical Course:

The child's hemodynamic status deteriorated rapidly. Despite increased inotropic support (10 μ g/kg/min), the patient developed acute kidney injury at the tenth hour, which led to multiple organ failure. At the twelfth hour, the patient suffered a cardiac arrest and was resuscitated successfully. However, at the fifteenth hour, a second cardiac arrest occurred despite resuscitation measures.

Discussion:

Scorpion stings can result in severe envenomation and a high fatality rate, making them a major public health concern, particularly in endemic regions (1). It is a medical emergency that can cause severe cardiovascular and systemic consequences. Scorpion venom is composed of many poisons. They work on the membranes of excitable cells [nerve and muscle cells] via ion channels (5). Neurotoxins impact the central and autonomic nervous systems, inducing agitation, hyperthermia, nystagmus, muscular stiffness, hypothermia, lower consciousness, and convulsions, as well as the sympathetic autonomic nervous system, which causes miosis and priapism (6). In the other hand, the involvement of the cardiovascular system is the most studied. Three hypotheses have been suggested to explain cardiac dysfunction: Adrenergic myocarditis (massive discharge of catecholamines), toxic myocarditis (direct effect of the venom on the membranes of myocardial cells) and myocardial ischemia. Intense vasoconstriction, temporary hypertension followed by hypotension, and perhaps cardiac failure are caused by this excessive catecholamine surge (4). Severe but reversible biventricular dysfunction is a hallmark of this kind of myocarditis (7). The correlation between young age and the severity of clinical manifestations has been well established. In addition, several studies have demonstrated that severe scorpion envenomation is associated with a systemic inflammatory reaction (SIRS) that can explain the systemic manifestations often observed in severe patients (stage 2 or 3) (4). Our clinical description is perfectly consistent with the data found in the literature.

Biological alterations found during scorpion envenomation include hyperglycemia, electrolytic disturbances (hypokalemia, hyperkalemia, hypocalcemia), hyperleukocytosis, and transaminase and muscle enzyme disruption. In almost all cases of severe envenomation, metabolic acidosis is evident (8,9).

Myocardial damage is the main sign of severity. There for, making a cardiac marker assays, EKG and echocardiography is crucial to confirming the diagnosis and improving cardiac monitoring (10). The elevated cardiac biomarkers and the aberrant EKG readings are common indicators of myocardial damage (11). A study conducted in Algeria found that 52.6% of patients had a low ejection fraction, and 56.1% had hypokinesiaglobal or segmental (12). The two ultrasonography parameters described above reflect the most common aberrations seen in severe forms and must be explored systematically. Our paraclinical description seems entirely aligned with the literaturedata.

Therapeutically, the indication of antivenom and symptomatic treatment depend on the clinical severity of the envenomation. Symptomatic therapy is the main approach for severe scorpion envenomation

Symptomatic treatmentis based on (4-13):

- Local disinfecting: Use a non-alcoholic solution, as alcohol may increase venom distribution via vasodilation.
- Analgesia: Paracetamol: 60 to 80 mg/kg/24h in 4 doses. Lidocaine-prilocaine cream. Ice pack if no anesthetic cream is available
- Antipyretics: Paracetamol, Physical means [ice pack]
- Sedatives and anticonvulsants: Diazepam: if convulsions. Midazolam: if agitation.
- Oxygen therapy / mechanical ventilation for acute pulmonary edema
- Dobutamine administration in cardiogenic shock.

Serotherapy (Specific treatment) is currently the only specific treatment for severe SE. However, experimental and clinical data cast great doubt on the efficacy of immunotherapy and its indication in the treatment of SE.



Figure 1: The protocol established by the Moroccan poison control center.

To lower the frequency of envenomation, especially in endemic areas, prevention and health education are crucial (14).

Conclusion:-

This case highlights the considerable risk that scorpion envenomation represents to the vital prognosis, including multiorgan failure, fulminant myocarditis, and renal failure. Despite intensive care, the prognosis remains unfavorable due to fast progression of systemic issues and heart toxicity. To stabilize these individuals, early and

rigorous diagnosis and therapy are required. Strengthening preventative measures against scorpion envenomation is the most effective strategy for reducing the incidence of this public health problem.

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