

Pediatric scorpionism in southwest Turkey: the experience of a training and research hospital

Güneybatı Türkiye'de Çocuklarda Akrep Sokması: Bir Eğitim ve Araştırma Hastanesi Deneyimi

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ABSTRACT

Aim: The aim of this study was to evaluate the clinical and laboratory features and prognosis of scorpion stings in children.

Methods: This was a retrospective study of children with scorpion stings, who were admitted to the pediatric emergency department in Alanya Alaaddin Keykubat University (ALKU) Training and Research Hospital between the 1st of January 2019 and the 31st of December 2020. Demographic data, admission date, time periods from sting to admission to hospital and geographical location in which the sting occurred were recorded. Recordings were also made of the affected body sites, local and systemic signs and symptoms of envenomation, results of hematological and biochemical laboratory tests, management, length of hospital stay and outcome.

Results: In total, medical records of 111 children were reviewed. Patients were separated according to the clinical findings into three groups, seventy patients (63.1%) with mild symptoms and thirty-four patients (30.6%) with moderate symptoms, seven patients (6.3%) with severe symptoms. There was one exitus due to scorpion stings in the study period. Forty-one (37%) patients were hospitalised, and seven patients (6.3%) were hospitalised in the pediatric intensive care unit. Five patients (4%) received doxazosin and nineteen (17%) patients had antivenom therapy. Hospitalization in the intensive care unit was necessary for seven cases. No patient exhibited sequelae at the hospital discharge.

Conclusions: Scorpion stings in our region mostly result in mild envenomation. Doxazosin, an analog of prazosin more readily available in our country, can be considered as a treatment option in serious scorpion envenomations with significant sympathetic symptoms.

Key Words: Scorpion, scorpion sting, pediatric emergency, envenomation, antivenom, prazosin

ÖZ

Amaç: Çalışmamızın amacı, akrep sokması nedeni ile başvuran çocukların klinik ve laboratuvar özelliklerini ve prognozunu değerlendirmektir.

Yöntem: Alaaddin Keykubat Üniversitesi (ALKÜ) Eğitim ve Araştırma Hastanesi Acil Servisi'ne 1 Ocak 2019-31 Aralık 2020 tarihlerinde akrep sokması nedeniyle başvuran çocuk hastaların verileri retrospektif olarak incelendi. Vakaların başvuru tarihi, sokulan bölge, hastaneye başvuru saati, olayın saati ve sokulma ile başvuru arasında geçen süre, hastaneye yatış gereksinimi, zehirlenmenin lokal ve sistemik belirti ve semptomları, hematolojik ve biyokimyasal laboratuvar testleri, hastaya verilen medikal tedaviler, hastanede kalış süresi kaydedildi. Bulgular: Toplam 111 hastanın verileri tarandı. Hastalar klinik bulgulara göre üç gruba ayrıldı. Yetmiş hastada (%63.1) hafif, 34 hastada (%30.6) orta, 7 hastada (%6.3) şiddetli semptomlar saptandı. Çalışma döneminde akrep sokması nedeniyle 1 ölüm meydana geldi. Beş (%4) hastaya doxazosin ve 19 (%17) hastaya antivenom verildi. 41 hasta için (%37) hastaneye yatış gerekti. Yedi hastada yoğun bakım ünitesinde yatış gerekti. Hastaneden taburcu olurken hiçbir hastada sekel görülmedi.

Sonuç: Bölgemizde akrep sokmaları çoğunlukla hafif klinik tablo ile sonuçlanmaktadır. Doxazosin ülkemizde daha kolay bulunabilen bir prazosin analogu olarak sempatik semptomları olan, ciddi akrep zehirlenmelerinde tedavide seçenek olarak düşünülebilir.

Anahtar Kelimeler: Akrep, akrep sokması, çocuk acil, antivenom, prazosin

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Introduction

Scorpion stings are a significant health issue in many parts of the world, particularly in regions with mild and hot climates. The estimated yearly global incidence is 2 600 deaths resulting from 1.5 million scorpion stings based on national health data [1]. Turkey has a high rate of scorpion stings due to its geographic location, where the dangerous species *A. crassicauda*, *L. quinquestriatus*, *M. gibbosus*, and *M. eupeus* have been observed [2-4]. The Mediterranean Sea region has the second highest rate of sting cases reported in Turkey, and Antalya is the province with the highest rate of scorpion stings in this region [2]. The clinical presentation of scorpion stings may range from mild local symptoms such as paresthesia, pain, erythema and mild edema, to serious autonomic, neurological cardiovascular and gastrointestinal systemic effects. The age and health of patients, the species of the scorpion, the number of stings, depth of the venom injection and location of the stings, determine the severity of the envenomation [4]. The incidence of scorpion stings is greater in adults, but the severity of envenomation is significantly greater in children, in whom the case fatality rate is up to ten times greater than in adults [5-9]. Since studies on scorpion stings in our region are generally carried out in adult patients, there are few studies on this subject in the literature.

The aim of this study was to assess the clinical and laboratory features and prognosis of scorpion stings, in children admitted to the pediatric emergency department of the Alanya Alaaddin Keykubat University (ALKU) Training and Research Hospital.

Methods

The medical records of 111 children admitted to the pediatric emergency department of the ALKU Training and Research Hospital due to scorpion stings, between the 1st of January 2019 and the 31st of December 2020, were retrospectively reviewed. Demographic data, time and date of admission, geographical location in which the sting occurred, affected body sites, colour of the scorpion and time intervals from sting to admission to hospital were recorded.

Also documented were local and systemic signs and symptoms of envenomation, results of hematological and biochemical laboratory tests, management, length of hospital stay, as well as outcome. In terms of geographic location in which the sting occurred, villages were considered rural areas, while towns and city centers were considered to be urban areas.

Patients were separated into three groups based on the severity of clinical findings (mild, moderate and severe). Mild envenomation included patients with local pain, erythema, edema, sweating, tremors and agitation. Moderate envenomation included patients with foreign body sensation in the throat, fever, nausea, vomiting, abdominal pain, joint pain, hyperglycemia, tachycardia, dysphagia, irritability, tachypnea, as well as mild to moderate respiratory distress. Severe envenomation included patients with nystagmus, mental disorientation, severe respiratory distress, heart failure and myocarditis, lethargy, stupor, coma, focal or generalized seizures, increased muscular tone, hypotension, cardiac failure, and/or acute pulmonary edema.

Leukocyte counts above 11 000/mm³ were considered leukocytosis. The glucose cut-off value for hyperglycemia in the literature is >10 mmol/L or 180 mg/dl in critically ill adults and children; we used this cut-off value in accordance with this literature. Values below 135 mEq/L were considered as hyponatremia, values above 145 mEq/L were considered as hypernatremia. Values below 3.5 mEq/L were considered hypokalemia, and values above 5.5 mEq/L were considered hyperkalemia.

Statistical analyses were performed where categorical variables were expressed as number and percentage and numerical variables as mean \pm SD. The t test was used to compare normally distributed data and the Mann Whitney U test was used to compare data with abnormal distribution. The statistical significance was set at 0.05 for all analyses.

This study was conducted with the ethics committee of the ALKU Faculty of Medicine approval, dated 14.04.2021 and numbered 07-04. It was designed as a single center retrospective study.

Results

Between the 1st of January 2019 and the 31st of December 2020, there were 1 188 cases admitted to the ALKU Research and Training Hospital emergency departments with the complaint of scorpion sting and 111 of these were children: namely one child for every ten patients. A total of 111 cases of scorpion cases in Alanya who were admitted to our pediatric emergency department were included in this study. There was one infant who was 9 months old (0.9%), 76 children between 1 and 10 years old (68.5%) and 34 adolescents between 10-18 years old (30.6%). The female to male ratio was similar, 49.5% of the patients were male. Concerning the region of occurrence, 40.9 % were reported from rural areas (Table 1). The age group most affected was between 6 and 10 years old (33%). Medical assistance was received within the first 3 hours after the sting for the majority of the cases (61.6%). There was an escalation in the number of scorpion stings in our region between July and August. In twenty-five cases (22.5%), the colour of the scorpion was known and noted, as follows: fifteen black (60%), eight brown (32%) and two yellow (8%). There was one sting recorded in 97 cases (96.0%), two stings in three cases (2.9%) and numerous stings in one case (1%). Stings occurred mostly in the upper (44.9%) and lower extremities (41.3%), and the sting site was on the neck in one solitary case (1%). The majority of stings occurred during the night (20:00 to 03:00), namely in 57 cases (63%). The highest rates of scorpion stings were seen between 23:00 and 03:00 in 31 cases (27%), 20:00 and 23:00 in 26 cases (23.4%) and between 13:00 and 16:00 in 21 cases (18.9%). Patients were separated according to the clinical findings into three groups, seventy patients (63.1%) with mild symptoms, thirty-four patients (30.6%) with moderate symptoms and seven patients (6.3%) with severe symptoms (Figure1).

Leukocytosis was observed in thirty-two cases (28%). The mean leukocytes count was $9\ 770 \pm 3\ 300/\text{mm}^3$. Leukocytosis was significantly associated with moderate and severe clinical findings ($p=0.02$). Hyperglycemia was observed in two cases (1%). Hyperglycemic patients were all with severe clinical findings. The mean serum potassium level was $4.07 \pm 0.50\ \text{mmol/L}$.

Table 1. Baseline characteristics of patients

	N	%
Age		
Infant (0-12 months)	1	0.9
Children (1-10 years)	76	68.5
Adolescents (10-18 years)	34	30.6
Sex		
Male	55	49.5
Female	56	50.5
District		
Urban	66	59.4
Rural	45	40.6
Laboratory findings		
Leukocytosis ($>11000/\text{mm}^3$)	32	28
Hypokalemia ($<3.5\ \text{mEq/L}$)	7	6
Hyperglycemia ($>180\ \text{mg/dL}$)	2	1
Hypernatremia ($>145\ \text{mEq/L}$)	1	0,9

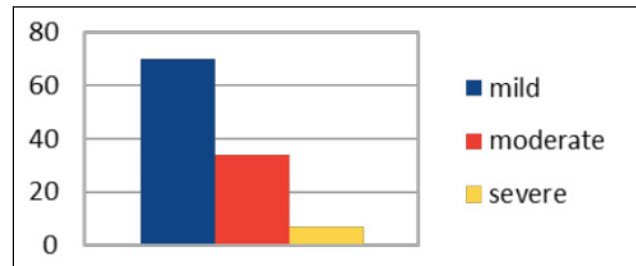


Figure 1. Severity of symptoms: 70 patients (63.1%) with mild symptoms, 34 patients (30.6%) with moderate symptoms, 7 patients (6.3%) with severe symptoms

Hypokalemia was observed in seven patients (6%). All our hypokalemic patients were with moderate to severe clinical findings: one of our patients had hypernatremia, thirty-five patients (31.5%) had no steroid therapy. Sixty patients (54%) received dexamethasone and sixteen patients (14.5%) received methylprednisolone. Four patients (3%) were administered oxygen therapy and only one patient (0.9%) required mechanical ventilation. Analgesics were prescribed to eighty-eight patients (79%). Five (4%) patients received doxazosin and 19 (17%) patients received antivenom. Forty-one patients (37%) were hospitalised; the duration of the hospital length of stay ranged from 1 to 7 days and was below three days in thirty-six patients (87%). Seven cases required hospitalization in the intensive care unit. No patient presented sequelae at the hospital discharge, whereas one exitus was observed during the study period.

Of the nineteen patients who were given antivenom,

seven patients did not require hospitalization and two of them required hospitalization in intensive care; one of these patients died. The deceased patient was a 9-year-old female who was stung on her foot. She came to the hospital with complaints of confusion, vomiting and weakness. She had dilated pupils, difficulty breathing, high blood pressure, and high troponin levels, there was no sign of pulmonary edema in her chest x-ray. Cardiac arrest developed two hours after antivenom administration, after 15 minutes of resuscitation the patient was converted to a sinus rhythm. The patient transferred to a center with a pediatric intensive care unit, but cardiac arrest developed again and the patient did not respond to resuscitation. The second patient in intensive care was a 4-year-old male, who was stung on the hand. He had sweating and priapism, his cardiac marker levels were normal; after antivenom and doxazosin treatment, symptoms regressed.

Four patients who received only doxazosin treatment presented with symptoms such as sweating, tremors, cold extremities and priapism. Vital signs and laboratory findings of all patients were normal, except for one patient whose blood pressure values were above the limits for their age. After the doxazosin treatment, symptoms regressed.

Discussion

Morbidity and mortality due to scorpion stings are a serious health concern in Turkey as well as throughout the world, particularly in tropical areas. Previous reports have revealed that there are fifteen scorpion species that are especially common in the Southeastern region of Turkey and the risky locations for scorpion stings are the south region of Turkey, in particular Antalya. This is the first study that has investigated clinical and laboratory characteristics of children with scorpion stings in Antalya. From Southeastern Turkey some studies that investigated scorpion envenomation were published previously, but for our region which is a highly touristic area, there were no previous publications that investigated scorpion envenomations. In this retrospective study, we reviewed 111 children who were admitted with scorpion stings. The majority of our patients were ranked as Grade I and most of them receiving only

symptomatic therapy.

There are few detailed studies analysing the toxicity level of scorpion stings in children. Young, active adolescents and females have been commonly envenomated by scorpions, there was a higher frequency of scorpion stings in the spring and summer months and the majority of the stings occurred in the lower extremities. Most affected cases were from urban areas and the demographic results in this study reflected those reported in previous studies. Stings most commonly occur during the summer season, especially during the months of July and August, mostly at night. Scorpions are active especially at night which explains the increased frequency of envenomation during night hours. Children between the ages of 7 and 10 years old were prone to scorpion stings as well.

The majority of our patients needed only symptomatic treatment, 4% needed doxazosin, 17 % of patients received antivenom. Half of our patients were hospitalized and 15% of all patients needed special treatment such as antivenom and doxazosin. Although scorpion antivenom is the specific therapy for scorpion envenomation, it does not placate most of the sympathetic effects of scorpions stings, such as the cardiovascular effects. The beneficial effects of prazosin, irrespective of different scorpion species with similar cardiovascular manifestations, have been reported in scorpion sting victims, and prazosin seems more effective than scorpion antivenoms [10-15]. Prazosin is often referred to as a "poor man's" scorpion antivenom and a universal antidote to scorpion venom action, irrespective of different species [10-15]. The World Health Organization is still emphasizing the importance of scorpion antivenom administration in scorpion envenomation, but not prazosin [16].

Doxazosin, a prazosin analog more readily available in our country, and prazosin, might be used safely in cases of scorpion stings with unidentified species. In our case series, the sole case of exitus, a nine-year-old girl, developed systemic collapse and shock on the second day of her hospitalization; her medical records revealed that scorpion antivenom was given to her, however it was not doxazosin. A previous

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study from a tertiary pediatric intensive care unit in the Southeast region claimed that neurological manifestations might result in a poor prognosis and that encephalopathy, with or without other complications, may result in higher mortality. One patient in our series also had confusion and dilated pupils [17]. In another study, including 104 patients, in which childhood scorpion stings were investigated in our country, mortality and morbidity rates were found to be higher. This difference may be due to the presence of much more venomous species such as *Leiurus Abdullahbayrami* and *Androctonus crassicauda* in the Malatya and Adıyaman regions than the less poisonous and harmless species like *Lurus asiaticus* and *Euscorpis carpathicus*, found in the Alanya region [3].

Limitations of the study: We reviewed data for no more than a two-year period and we suspect more extensive investigations of additional cases would reveal additional informative results. Furthermore, had we been able to obtain photographs of the scorpions, their species could have been definitively identified.

Conclusion

Scorpion stings in our region mostly result in mild envenomation. Doxazosin, a prazosin analog which is more easily available in our country, can be considered as a treatment option in serious scorpion envenomations with significant sympathetic symptoms.

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