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Cardiological findings in different regimens of scorpion sting treatment

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ABSTRACT

Background: Envenoming by fatal scorpions is one of the most important accidents that occur in different parts of the world, specifically in developing countries. Cardiovascular complications associated with scorpion sting are considered one of the commonest causes of morbidity and mortality.

Aim: Evaluation of the cardiological findings according to the different bases of treatment of scorpion sting in Minia Poison Control Center (MPCC).

Patients and Methods: A prospective clinical study was conducted on 80 children, both males and females, aged 3 to 17 years, who were admitted to the Minia University Hospital Poison Control Center (MPCC). It was completed over 18 months, from December 2023 to May 2025. Patients were classified into four groups according to specific treatment. Socio-demographic data, electrocardiography (ECG) on admission and during follow-up, and echocardiography were collected and registered.

Results: Significant improvement was detected in ECG abnormalities in group IV than in group III during follow-up. However, echocardiographic findings didn't differ significantly among different groups.

Conclusions: Doxazosin-containing regimens play an important role in the improvement of cardiovascular complications linked with scorpion envenomation. We recommend a combination treatment for patients with scorpion envenomation.

KEYWORDS: Scorpion envenomation, Doxazosin, Insulin-glucose infusion, ECG, Echocardiography, Pediatric poisoning.

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INTRODUCTION

Human envenomation is considered a serious health problem that threatens various regions all over the world, particularly the developing nations. New studies have reported a high prevalence of morbidity and mortality because of scorpion envenomation in developing nations, particularly in rural areas [1].

Egypt is regarded as the home for numerous species of scorpions, some of which are fatal, like the death stalker, which is found in deserts and very dry regions [2].

The venom of the scorpion is water-soluble in nature and heat-stable; it comprises different concentrations of different toxins. The clinical picture is a mixture of neurological, gastrointestinal, cardiac, and respiratory manifestations, which develop as a result of the fast liberation of neurotransmitters like acetylcholine, catecholamines [3].

Anti-scorpion antivenom (ASA) is considered the first accepted FDA treatment of scorpion stings. It plays an important role in neutralization of circulating toxins; it should be given rapidly to reverse the clinical manifestations. ASA, unfortunately, cannot neutralize any already bound venom [4].

IV insulin-glucose can play a role in controlling the metabolic effects that results from decreased insulin secretion associated with scorpion envenomation. So, it can be valuable if it is added to ASA [5].

Doxazosin, prazosin analogue, is alpha blocker drug that was recommended to be used in the management of scorpion sting as pharmacological antidote [6].

Aim of the work:
Evaluation of the cardiological findings according to the different basis of treatment of scorpion sting in Minia Poison Control Center.

PATIENTS & METHODS:

The present study was done on 80 children, males and females, aged from 3 to 17 years, who were admitted to Minia University Hospital Poison Control Center (MPCC) and diagnosed with scorpion sting, in the period from December 2023 to May 2025.
An ethical approval was provided by the Ethical Committee, Faculty of Medicine, Minia University, with approval number 972-

11/2023. The legally accredited relatives signed a documented informed permission to share in the study.

Patients of the study were diagnosed according to these criteria: exposure history to scorpion sting, clinical manifestations of sympathetic storm, local manifestations as sharp pain, unilateral or bilateral edema, systemic manifestations like persistent vomiting, hyperthermia, hypertension, tachycardia, pripism and any of life life-threatening manifestations.

Children of both sexes, age 3-17 years old, diagnosed with scorpion envenomation, with delay time less than 8 hours, with class severity (II- III) and their licensed relatives consenting to share in present study were involved.

However, patients aged < 3 years and > 17 years old, refused to share in the study, had delay time more than 8 hours, grade I severity, history of any drugs before admission to MPCC or chronic illness history were excluded.

They were divided into 4 groups; group I: received anti scorpion antivenom (ASA) only, group II : received ASA and IV insulin-glucose infusion, group III: received ASA and doxazosin orally and group IV recived ASA, IV insulin-glucose infusion and doxazosin orally.

All children included were subjected to detailed history including socio-demographic and toxicological data. Electrocardiograhy (on admission and post treatment follow-up ECG) and echocardiography were done.

Statistical Analysis:
All data were collected, processed, and statistically summarized using SPSS 26 for Windows (SPSS Inc., Chicago, IL, USA).
The Shapiro-Wilk test was employed to verify the normal distribution of the data. Qualitative data was presented as frequencies and relative percentages. Quantitative data were presented as mean ± SD (standard deviation) and range.
Statistical significance A P-value of ≤ 0.05 denotes significance, p < 0.001 signifies a highly significant difference, whilst P > 0.05 shows a non-significant difference.

RESULTS:

Socio-demographic and toxicological data:
The sociodemographic data of the studied groups were well-matched, with no statistically significant differences in age, gender distribution, residence, or site of sting. This ensures comparability across groups.

Electrocardiography (ECG):
On admission, all patients in the different groups presented with abnormal ECG findings as sinus tachycardia and inverted T wave. During post treatment follow-up, there was significant improvement of ECG findings in group IV as 20% of patients had normal ECG, 50% of patients presented with sinus tachycardia and 30% presented with inverted T wave. Patients in group III also showed improvement; 5% of patients presented with normal ECG, while 65% of patients presented with sinus tachycardia and 30% of patients presented with inverted T wave.

Echocardiography:
Echocardiographic findings were comparable across groups with no significant differences (p=0.80). seventeen patients (85%) had normal echocardiography and 3 (15%) had abnormal echocardiogrphy in group IV. Group III, 80% of patients had normal echocardiography and 20% had abnormal echocardiography. Group II, 75% of patients had normal echocardiography and 25% had abnormal echocardiography. Group I, 70% of patients had normal echocardiography and 30% had abnormal echocardiography.

Table (1): Post-treatment follow-up elecrocardiogram (ECG) of the patients in the different studied groups

	Group I (N=20)	Group II (N=20)	Group III (N=20)	Group IV (N=20)	P value
ECG 3h					
Normal	0 (0%)	0 (0%)	1 (5%)	4 (20%)[#]	
Sinus tachycardia	12 (60%)	14 (70%)	13 (65%)	10 (50%)	
Inverted T wave	8 (40%)	6 (30%)	6 (30%)	6 (30%)	**0.03***

- Chi-square test and Fisher's exact test for categorical variables
*- * significant at p value <0.05*
- ECG: electrocardiogram
- N: number
- h: hour

Table (2): Echocardiography results of the patients in the different studied groups

	Group I (N=20)	Group II (N=20)	Group III (N=20)	Group IV (N=20)	P value

Echocardiography Normal Abnormal	 14 (70%) 6 (30%)	 15 (75%) 5 (25%)	 16 (80%) 4 (20%)	 17 (85%) 3 (15%)	**0.80**

-Chi-square test for categorical variables.
-N: number

DISCUSSION:

Scorpion envenomation is popular emergency in both tropical and subtropical regions, which is considered a fatal state all over the Middle East. The world health organizaton (WHO) revealed that almost 1.5 million cases per year are subjected to scorpion envenomati on [7].

In Egypt, there is an increase in the incidence of scorpion sting, it estimated about 334 cases among the 21,492 of all patients presented to Ain Shams Hospital [8].

The study aimed to evaluate the cardiological findings according to the different basis of treatment of scorpion sting in Minia Poison Control Center. Cardiological manifestations seen after scorpion envenomation are caused by sympathetic stimulation which results in increased catecholamines levels and severe vasospasm [9].
In the current study, there was significant improvement of ECG findings in group IV followed by group III (p =0,03) compared to groups I and II.

This agree with ***Bawaskar and Bawaskar, 2011*** [10], who conducted a study on **70 patients** (35 received antivenom + prazosin and 35 received prazosin alone) and observed that group of patients treated with ASA and alpha blockers showed faster recovery of ECG abnormalities. This is explained as alpha blockers can **antagonize the excess catecholamines and ASA can neutralize the venom**.

Yugandhar et al., 1999 [11] carried out a study on 25 patients with scrpion sting. They received IV insulin- glucose infusion plus ASA and the majority of the cases showed reversal of ECG abnormalities. This was explained as IV insulin- glucose could help the cardiac muscle to utilize glucose which is considered effective fuel source that decreases free fatty acids production.

Abdel Baseer et al., 2021 [12] revealed that scorpion sting patients who were managed with alpha blockers had normal echocardiography compared to others not treated by it. This study revealed that Echocardiographic findings were comparable across the different groups (p=0.80) with no statistically significant differences.

However, a doctoral dissertation of Rajiv Gandhi University of Health Sciences on 141 childern by ***Shashidhar, 2011*** [13]**,** revealed that after adding alpha blockers as prazosin to ASA, the Echocardiographic findings of the patients improved and 9% only of cases presented with abnormal echocardiography.

It has been noted that doxazosin may activate inhibited potassium channels by scorpion venom, leading to a decrease in heart rate, systolic and diastolic blood pressure, the preload, and after load of the heart. So, adding doxazosin could help in the normalization of ECG changes. In addition, IV insulin-glucose could decrease the autonomic storm initiated by scorpion venom as it could enhance the cardiac muscle to use glucose as a fuel and decrease free fatty acid levels. So, combination treatment could help in improving ECG and electrocardiography findings associated with scorpion envenoming [14, 15].

CONCLUSION:

Electrocardiographic abnormalities associated with scorpion sting significantly improved faster in patients received doxazosin-containing regimens. However, the incidence of echocardiographic abnormalities didn't significantly change with different treatment regimens used in scorpion sting management.

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Authors' Contribution:

- **Mohamed A. M. Khalaf:** Conceptualization, data collection, clinical supervision, and final manuscript review.
- **Jaklin F. Zaher:** Study design, methodology development, and statistical analysis.
- **Yasmeen M. Abdulha:** Corresponding author; literature review, data interpretation, manuscript writing, and submission coordination.
- **Rana Adel:** Data acquisition, patient follow-up, and ECG/Echocardiographic analysis.
- **Nada A. Yousri:** Data tabulation, references formatting, and manuscript editing.

REFERENCES:

1. Salama W M and Sharshar K M (2013**):** Surveillance study on scorpion species in Egypt and comparison of their crude venom protein profiles. The Journal of Basic & Applied Zoology, 66 (2): 76-86.

2. Boyer L V, Theodorou A A, Chase P B, et al (2013): Effectiveness of Centruroides scorpion antivenom compared to historical controls. Toxicon, 76: 377-385.
3. Güllü U U, İpek S, Dalkıran T, et al. (2021): The role of ProBNP on prognosis in scorpion stings. Wilderness & environmental medicine, 32 (2): 137-142.
4. Yadav R K, Alim M, Yadav Y S, et al. (2020): Retrospective study of children with scorpion envenomation in a tertiary care center of North India. Asia Pacific Journal of Medical Toxicology, 9 (3): 91-96.
5. Abd El-Aziz F E A, El Shehaby D M, Elghazally S A, et al (2019): Toxicological and epidemiological studies of scorpion sting cases and morphological characterization of scorpions (Leiurusquinquestriatus and Androctonuscrassicauda) in Luxor, Egypt. Toxicol Rep, (6): 329–335.
6. Abdelhamid W (2021): Evaluation of severity of poisoning exposures among patients presented to Poison Control Center, Ain Shams University Hospitals, Egypt during 2019. Ain Shams journal of forensic medicine and clinical toxicology, 36(1), 106-122.
7. Shokry Zaghary M M and Abd ElKader M M (2025): A comparative study of using scorpion antivenom versus scorpion antivenom and prazosin drug for scorpion stings management in Sohag University Hospitals. BMC Pharmacology and Toxicology, 26 (1): 31.
8. Shashidhar G. (2011): A clinical spectrum of scorpion sting at vims hospital bellary (Doctoral dissertation, Rajiv Gandhi University of Health Sciences (India).
9. Amr Z. S., Al Zou'bi R., Abdo N., et al. (2017): Scorpion stings in Jordan: An update. Wilderness Environ Med, 28 (3): 207–212.
10. Bawaskar H. S. and Bawaskar P. H. (2011): Efficacy and safety of scorpion antivenom plus prazosin compared with prazosin alone for venomous scorpion (Mesobuthus tamulus) sting: randomised open label clinical trial. BMJ: 342.
11. Yugandhar B, Radha Krishna Murthy K and Sattar S A (1999): Insulin administration in severe scorpion envenoming. Journal of Venomous Animals and Toxins : 200-219.
12. Abdel Baseer K. A., Aboelela M. G. and Qubaisy H. M. (2021): Echocardiographic evaluation of the response to Prazosin Treatment in Scorpion Sting. Journal of Tropical Pediatrics, 67 (3), fmaa063.
13. Shashidhar G. (2011): A clinical spectrum of scorpion sting at vims hospital bellary (Doctoral dissertation, Rajiv Gandhi University of Health Sciences (India).
14. Bawaskar H. S. (2005): Management of severe scorpion sting at rural settings: what is the role of scorpion antivenom. Journal of Venomous Animals and Toxins including Tropical Diseases, 11: 3-7.
15. Murthy K. R. K. and Hase N. K. (1994): Scorpion envenoming and the role of insulin. Toxicon, 32 (9): 1041-1044.