

A study on clinical features, complications and management of scorpion sting envenomation at a tertiary care hospital, in rural South India

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Abstract

Background: Scorpion sting is a common medical emergency in rural India. Sparse published data are available regarding scorpion sting envenomation in adults from South India.

Methods: We prospectively studied the clinical manifestations and two-dimensional echocardiography findings in fifty adult patients admitted with scorpion sting at a tertiary care teaching hospital in South India.

Results: Their mean age was 34.8 ± 13.6 years; there were 28 (56%) males. Forty-one (82%) patients were stung over the limbs and the remaining over the rest of the body. Seventeen (34%) patients received prazosin within 5 h of sting; the remaining 33 (66%) received prazosin thereafter. Salient symptoms were pain over the sting area ($n = 18$, 36%), dyspnoea ($n = 13$, 26%), chest pain ($n = 9$, 18%), vomiting ($n = 6$, 12%), sweating ($n = 5$, 10%), nausea ($n = 3$, 6%), priapism ($n = 7$, 14%) and piloerection ($n = 6$, 12%). Common complications were accelerated hypertension ($n = 12$, 24%), pulmonary oedema ($n = 10$, 20%), myocarditis ($n = 8$, 16%), congestive heart failure ($n = 6$, 12%) and peripheral circulatory failure ($n = 3.6\%$). Common electrocardiogram abnormalities were tachycardia (20%), T-wave inversion (10%), tall T-waves (10%), ST-depression (4%) and atrial fibrillation (2%). Mitral regurgitation was mild (Grade I) in 4 (8%) and moderate (Grade II) in 3 (6%) patients. Decline in left ventricular ejection fraction was noted ($n = 14$, 28%).

Conclusion: Scorpion sting patients present with complaints of pain, palpitation, dyspnoea and paraesthesia. Complications such as hypertension, pulmonary oedema and sinus tachycardia are common. Early administration of prazosin is advocated for better outcome. Therefore, prudent knowledge on cardiovascular manifestations of the disease and timely management is pivotal for physicians.

Keywords: Complications, Echocardiography, Envenomation, Myocarditis, Scorpion sting

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INTRODUCTION

Scorpion stings are a menacing problem in India which is one of the top nations with high agricultural productivity.

Scorpion sting envenomation is a frequent medical emergency in rural India, especially in children. Sparse data are available

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regarding clinical presentation and complications in adult patients with scorpion sting from rural South India.

The incidence of scorpion sting envenomation yearly is about 12 lakh people per year and is responsible for about 3250 deaths.^[1] Among the numerous species of scorpions, *Mesobuthus tumulus* and *Palamnaeus swammerdami* (*Heterometrus swammerdami*) are the important genera in India.^[2] Among the scorpion sting cases, the incidence with *M. tumulus* sting (red scorpion) is more common in South Indian coast.

Of the myriad of clinical features of scorpion sting envenomation, cardiovascular effects such as tachyarrhythmias, pulmonary oedema and hypertension are mainly responsible for morbidity and mortality, and it is affected by the time of presentation and administration of vasodilators.^[3]

Venom from the scorpion sting may be an admixture of many toxins which can affect the heart, kidneys and neurons and can cause haemolysis. The toxic venom acts on various ion channels, especially the sodium–potassium channels. The toxin is concentrated in various organs in different portions. Apart from this, there is also dysregulation of cytokine-induced inflammation and anti-inflammatory response causing the clinical effects.^[4]

Electrocardiography changes are common after scorpion sting envenomation; it varies from sinus tachycardia to ST changes^[5] [Figure 1], which are attributed to coronary vasospasm and dysregulation of sympathetic and parasympathetic nervous systems.^[6] Two-dimensional (2D) echocardiography is an important tool to study the cardiotoxicity of scorpion sting such as myocardial dysfunction and dilatation of chambers [Figure 2].^[2]

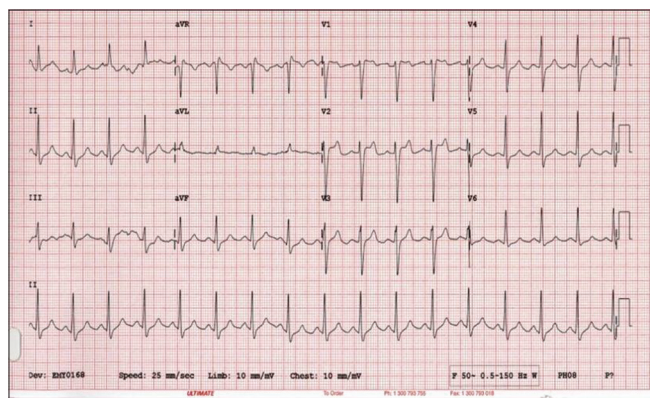


Figure 1: Electrocardiogram of a scorpion sting victim

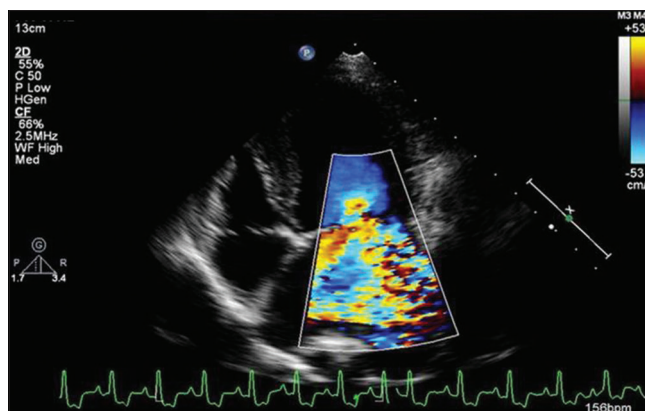


Figure 2: Two-dimensional echocardiography showing mitral regurgitation

MATERIAL AND METHODS

We prospectively studied the clinical presentation, electrocardiogram (ECG), chest radiograph, 2D echocardiogram and laboratory abnormalities in fifty consecutive patients presenting to the emergency room with scorpion sting envenomation at Rajah Muthiah Medical College and Hospital, Chidambaram, Tamil Nadu during the period of October 2011–July 2013.

The study was approved by the Institutional Ethics Committee. All the patients presenting to the emergency room who were aged more than 12 years were included in the study. Patients with congenital heart disease, ischaemic heart disease, valvular heart disease, arrhythmias, conduction defects, hypertension, diabetes mellitus, febrile illness, severe anaemia and patients with underlying liver or renal diseases were excluded from the study.

Written informed consent was obtained from all the study participants. From the entire study population, a detailed history was obtained, and a thorough physical examination was carried out. Details regarding clinical presentation, co-morbid conditions, past history, personal history, menstrual history, vital parameters, height, weight, body mass index, fundus examination, local examination of the sting site, details of systemic examination, salient laboratory abnormalities, electrocardiography and imaging abnormalities were recorded in a structured pro forma. All patients had undergone 2D echocardiography; observations regarding the presence or absence of mitral regurgitation, left ventricular ejection fraction (LVEF), diastolic dysfunction and left ventricular internal diameter in diastole and systole were studied.

All the patients with scorpion sting envenomation were given prazosin 2 mg and were given pain relief medications, fluids and pressors as required.

Statistical analysis

Data were recorded in a structured proforma and are managed with Microsoft Excel 2010 (Microsoft Corp, Redmond, USA). Continuous variables are summarised as mean ± standard deviation as appropriate. Categorical variables were summarised as percentages. The statistical software IBM SPSS Statistics Version 20 (IBM Corp, Somers, USA) was used for statistical analysis.

RESULTS

The mean age of the patients was 34.8 ± 13.6 years; there were 28 (56%) males. Age distribution is shown in Table 1. Of the 50 patients studied, 14 (28%) were aged below 20 years, 9 (18%) were in the age group of 21–30 years (Table 1). Scorpion sting was common among males (*n* = 28, 56%). Twenty-two (44%) patients were stung over the distal part of the upper limb, over the lower limb (*n* = 19, 38%), over the thorax (*n* = 6, 12%), over the abdomen (*n* = 1, 2%) and over the face (*n* = 1, 2%). Eighteen (36%) patients had local pain alone over the sting area, dyspnoea (*n* = 9, 18%), chest pain (*n* = 9, 18%), vomiting (*n* = 6, 12%), sweating (*n* = 8, 16%), nausea (*n* = 3, 6%), priapism (*n* = 7, 14%) and piloerection (*n* = 6, 12%). The details are shown in Table 2.

Table 1: Age distribution

Age (years)	No. (%)
<20	14 (28.0)
21-30	9 (18.0)
31-40	10 (20.0)
41-50	12 (24.0)
51-60	5 (10.0)
Total	50 (100.0)

SD=Standard deviation

Table 2: Symptoms and signs in the study population

Variable	No. (%)
Chest pain	9 (18)
Dyspnoea	13 (26)
Vomiting	6 (12)
Nausea	3 (6)
Sweating	5 (10)
Only local pain	18 (36)
Palpitation	13 (26)
Paraesthesias	18 (36)
Signs	
Piloerection	6 (12)
Priapism	7 (14)

The most common complications were pulmonary oedema (*n* = 10, 20%), myocarditis (*n* = 8, 16%), congestive cardiac failure (*n* = 6, 12%), peripheral circulatory

failure (*n* = 3, 6%) and accelerated hypertension (*n* = 12, 24%). Tachycardia (*n* = 10, 20%) was the most common ECG finding followed by T-wave inversion, tall T-waves (10% each), ST-depression (4%) and atrial fibrillation (2%). These details are shown in Table 3. Myocarditis, acute pulmonary oedema, peripheral circulatory failure and congestive cardiac failure were more common in patients aged below 20 years, and there were no patients with ventricular fibrillation and other ECG findings. In the present study, 7 (14%) of the patients developed significant MR (graded by regurgitant jet size with colour wave Doppler echocardiography)^[7] following scorpion sting. MR was mild (Grade I) in four (8%) patients, whereas it was moderate (Grade II) in three (6%) patients. Fourteen (28%) patients showed a decline in LVEF following scorpion sting (LVEF estimated using Simpsons method).^[8] The study, left ventricular end diastolic dimension was normal in majority of cases (*n* = 31, 62%) whereas in 19 (38%) patients, it was dilated. In the present study, left ventricular end systolic dimension was normal in majority of cases (*n* = 35, 70%), whereas in 15 (30%) patients, it was dilated. The details are shown in Table 4. Seventeen (34%) patients received prazosin within 5 h of sting, whereas 16 (32%) received prazosin in 5–10 h, 8 (16%) and 4 (8%) patients received prazosin in 11–15 h and 16–20 h, respectively, and 3 (6%) and 2 (4.0%) patients received in 21–25 h and >25 h, respectively. Patients who received prazosin within 5 h (*n* = 7), did not develop any complications, whereas complications such as cardiac failure, pulmonary oedema, circulatory failure and myocarditis occurred in patients who received prazosin after 5 h (*n* = 33) (Chi-square = 45.643; *P*<0.0001).

Table 3: ECG changes in the study population

ECG change	No. (%)
ST depression	2 (4.0)
T inversion	5 (10.0)
Tachycardia	10 (20.0)
Tall T-waves	5 (10.0)
Atrial fibrillation	1 (2.0)
Ventricular fibrillation	0
Others	0

ECG=Electrocardiogram

Table 4: LVEF on echocardiography

LVEF	No. (%)
>55%	21 (42.0)
46%-54%	15 (30.0)
<45%	14 (28.0)
Total	50 (100.0)

LVEF=Left ventricular ejection fraction

DISCUSSION

In studies^[9,10] conducted on scorpion sting envenomation, the age distribution was diverse. In the present study, majority

of the patients (28%, Table 1) were in the age group of <20 years. In a multicentric study^[9] from Iran, 21.8% were in the age group of 15–24 years and 21.3% were of in the age group of 24–34 years. Nearly 15% of the patients were in the age group of 34–44 years. The age group of 50 years and above was affected very less, with only 5% of the total study. All the other groups combined together were <9%. In another study^[10] conducted in Brazil, it was documented that majority of the patients (63.8%) were aged <12 years. The age group of 50 and above constituted only for 9.9% of the patients. The findings of the present study are inconsistent with those of other studies in relation to age. This may be attributed to the differences in geographical factors, social factors and study designs.

In the present study, 28 out of 50 patients were male (56%) showing a male preponderance. In a descriptive observational study^[11] conducted at a tertiary care hospital, Maharashtra, 21 of the 30 patients studied (70%). However, in a prospective observational study^[12] conducted at an intensive care unit (ICU) in Allahabad, North India, females (154/210, 73%) were more frequently affected. These differences could have been due to various reasons, such as lifestyle in those regions and discrepancies in seeking early healthcare. Further studies are required to know the exact reason.

Scorpion can sting any part of the body particular regions. In the present study, the upper limb sustained sting in 44% of the cases and 38% on the lower limb. In a prospective observational study in Allahabad, Uttar Pradesh,^[12] India, foot was afflicted in 61% of the cases and hand in 22.3% of the cases. In another prospective observational study in Khammam, Telangana,^[13] the upper limb was sustained sting in 55% of the cases and the lower limb in 45% of the cases. These observations suggest that the most frequent site of scorpion sting limbs.

Pain was occurring inevitably in every case at the site of scorpion sting. The severity of pain varied from mild to severe. Local pain and paraesthesia were the most common complaints, each accounting for 36% of the cases in the present study, while only very few patients (6%) suffered from nausea. In a cross-sectional study^[14] conducted in Karnataka, the most common complaint was pain (98.6%), followed by cold peripheries (48.1%), paraesthesias (44.3%) and others. In a retrospective descriptive study^[15] conducted in Raichur, Karnataka, majority of the patients complained pain at the site of sting (93.9%). Sweating and palpitation were present in 33.7% and 27.3% of the patients securing second and third positions, respectively. Abdominal discomfort was present in only 6% of the cases. These observations^[14,15] are in agreement that local pain is the most common symptom. The differences in the frequency of other symptoms may

be due to the difference in scorpion species in different geographical areas.

The common sympathetic sign noted in the present study was piloerection in 12% of the cases. Whereas the common parasympathetic sign observed in the present study was priapism in 14% of the cases. In a cross-sectional study conducted in Karnataka,^[14] piloerection and priapism were present in 13.2% and 21.7% of the patients, respectively. In another prospective observational study done at a tertiary care centre in Puducherry,^[16] priapism was noted in 25.72% of the cases. Nearly 24% of the patients had hypertension within 4–8 h after the sting, in the present study. In an observational study^[17] conducted in Maharashtra, hypertension was present in 38% of the patients. The variation between the studies may be due to difference in age groups and geographical variation.

Tachycardia in the ECG was the major manifestation in the present study, (20%) followed by T wave inversion, tall T waves (10% each); ST-depression was seen in 4% of the cases, and atrial fibrillation was the least common ECG change which was noted in 2% of the cases. In a prospective observational study done in Turkey,^[18] sinus tachycardia was present in 17.1% of the patients and ST changes in 7.9% of the individuals. In another cross-sectional study conducted in Iran,^[19] tachycardia was noted in 11.6% of the cases, ST-depression was seen in 9.3% of the individuals and T-wave inversion in 4.6% of the cases. Differences in the venom load could be the reason for these differences.

In majority of the patients (86%), there was no mitral regurgitation. In 14% of the cases, mitral regurgitation was Grade I or Grade II on echocardiography. In a prospective multicentric observational study conducted in northern part of Karnataka,^[20] there was no evidence of mitral regurgitation at all. The occurrence of mitral regurgitation is probably related to the regional wall motion abnormalities, which is due to scorpion venom-induced cardiotoxicity.^[21]

LVEF was normal (>55%) in 45% of the cases in the present study. It was between 46% and 54% in (30%), <45% in 28% of the cases. In a multicentric prospective observational study,^[20] 71.4% of the cases had LVEF <50% and severe left ventricular dysfunction was noted in 33.3% of the patients. In another retrospective interventional study,^[22] LVEF was depressed in 88% of the patients.

In the present study, pulmonary oedema was the most prevalent complication observed in 10 out of the 50 patients, accounting for 20%, followed by myocarditis

which was present in 8 (16%) patients. Congestive cardiac failure and peripheral circulatory failure were the least common complications in six (12%) and three (6%) patients, respectively. However, in a prospective observational study in Khammam,^[23] it was noted that the major complication was peripheral circulatory failure with 40 out of 50 (80%) cases suffering with it. In the same study, pulmonary oedema was observed in 24% of the cases, myocarditis in 18% and congestive cardiac failure in 9 out of 50 cases (18% of cases). In another prospective observational study conducted at a tertiary care hospital in paediatric ward and paediatric ICU in Andhra Pradesh,^[3] the most common complication was peripheral circulatory failure noted in 72% of the cases. It was followed by myocarditis and acute pulmonary oedema which were observed in 42% and 22% of the patients, respectively. The most common complication in the present study was pulmonary oedema, whereas in other studies,^[3,23] it was peripheral circulatory failure. This difference could be due to the fact that all patients in the present study were adults, whereas, the subjects in the other studies^[3,23] were paediatric patients.

In the present study, patients who were given prazosin within 5 h showed no complications, whereas complications such as cardiac failure, pulmonary oedema, circulatory failure and myocarditis occurred in patients who received prazosin after 5 h ($P < 0.0001$). In a study conducted at a general hospital in Mahad,^[24] it was observed that patients who received prazosin had complete recovery and was uneventful. Further studies with large sample size are required to evaluate this issue.

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Conflicts of interest

There are no conflicts of interest.

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