

TOXICITY OF SCORPION STINGS

Dr. Pravanchana Sahu^{1*} and Dr. Prafulla²

¹M.D. Scholar 2nd Year, Dept. Of Agad Tantra, Rani Dullaiya Smriti Ayurved P.G. Mahavidhyalaya Evam Chikitsalaya, Bhopal (M.P.).

²Reader, Dept. Of Agad Tantra, Rani Dullaiya Smriti Ayurved P.G. Mahavidhyalaya Evam Chikitsalaya, Bhopal (M.P.).

***Corresponding Author: Dr. Pravanchana Sahu**

M. D. Scholar 2nd Year, Dept. Of Agad Tantra, Rani Dullaiya Smriti Ayurved P.G. Mahavidhyalaya Evam Chikitsalaya, Bhopal (M.P.).

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ABSTRACT

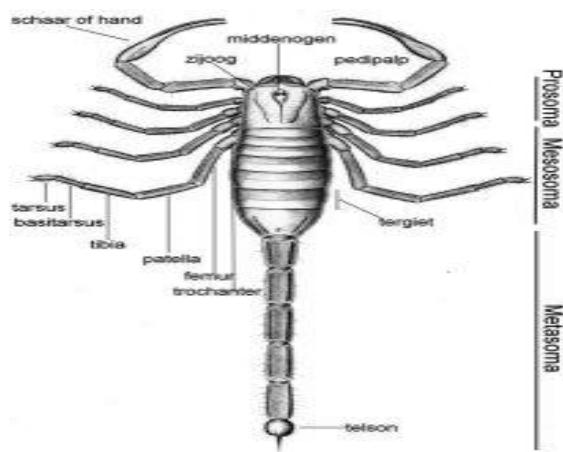
A scorpion has a flattened elongated body and can easily hide in cracks. It has 4 pairs of legs, a pair of claws and a segmented tail that has a poisonous spike at the end. Scorpions vary in size from 1-20 cm in length. Out of 1500 scorpion species, 50 are dangerous to humans. Scorpion stings cause a wide range of conditions, from severe local skin reactions to neurologic, respiratory and cardiovascular collapse. Envenomation from most scorpions results in a simple, painful, local reaction that can be treated with analgesics, antihistamines, and symptomatic/supportive care. Scorpion stings are a major public health problem in many underdeveloped tropical and subtropical countries, especially Sahelian Africa, South India, the Middle East, Mexico, and South Latin America. The estimated annual number of scorpion stings is 1.2 million leading to 3250 deaths (0.27%). For every person killed by a poisonous snake, 10 are killed by a poisonous scorpion. In Mexico, 1000 deaths from scorpion stings occur per year. In the United States, only 4 deaths in 11 years have occurred as a result of scorpion stings. Furthermore, scorpions can be found outside their normal range of distribution, that is when they crawl into luggage, boxes, containers, or shoes and are unwittingly transported home via human travelers. Signs and symptoms at the site of the sting may include difficulty in breathing, muscle twitching or thrashing, Unusual head, neck and eye movements, drooling, sweating, nausea and vomiting, High blood pressure (hypertension), accelerated heart rate (tachycardia) or irregular heart beat (arrhythmia), restlessness or excitability or inconsolable crying (in children).

KEYWORDS: scorpions, cardiovascular, neurologic, arrhythmia.

INTRODUCTION^[1,2]

Scorpions have a crab-like appearance with a long, fleshy, five segmented, tail-like post-abdomen, ending in a broad sac and a prominent hollow sting which communicates by means of a duct with the venom secreting glands. The venom contains toxalbumins having neurotoxic and hemotoxic actions. Its toxicity is greater than that of snakes but only a small quantity is injected. Red scorpion venom contains a potent cardiotoxin. About 100 species of scorpions are found in India. These are eight-legged arthropods and the end part of tail has two poisonous glands and a sting. Fatal cases have been reported from Maharashtra and Bihar due to acute pulmonary edema caused by Indian red scorpion.





Historical Review^[3]- Vedic Period (10,000 to 500 BC)- “Veda” the first source of literature and knowledge that narrates medical science very cogently. Explanations regarding several Keetaas have been mentioned in Yajurveda but the word “Vrishchika” is not found in the text.

Samhita Period (200 BC to 400 AC)- This is also considered, as a golden age of Ayurvedic history. All the Samhita Granthas have divided Ayurveda in eight main branches, among them Agadatantra is one. Here Vrishchika has been mentioned under the Jangama Vish”a in Keeta prakaran.

1. **Charaka Samhita (2 BC)**- 23rd Chapter of Chikitsa sthana, Vish”a Chikitsa Adhyaya.
2. **Sushruta Samhita (2AD)**- 8th Chapter, Kit’a Kalpa Adhyaya of Kalpasthana.
3. **Ashtang Samgraha (6AD)**- Vrishchika in Sarpa Vish”a Pratish”edha Adhya (42nd chapter), Kit’a Vish”a Pratish”edha Adhyaya (43rd chapter) and Vish”opayogiyā Adhyaya (48th chapter) of Uttaratantra.
4. **Ashtang Hridaya (7AD)**- Vrishchika in 36th and 37th Chapter of Uttaratantra
5. **Harita Samhita (2BC)**- 55th Chapter of 3rd Sthana Mantra Chikitsa has been mentioned for the management of Vrishchika Damsha.

Ayurveda & Scorpions (Vrishchika)^[3]

Vrishchika is a Keeta, which possess Shooka or stinger. Reference regarding the Vrishchika is available in the very old Hindu text like Shreemadbaagvat. Where it is mentioned that when Halaahala a very potent Vish”a produced by the churning of the ocean of the milk, all the Sura, Asura and other creatures on this earth were gloomed by its effect. So to save the life of all these, Lord Shiva consumed this Vish”a. while drinking, some drops of Halaahala fell on the earth. Some creatures like Snake, Scorpion and plants accepted it and became Poisonous.

Classification of the Vrishchika^[4]

1. **Mandavisa Vrschika (mild poisoned scorpion)**- Scorpions germinating from cow-dung or from any

rotten substances are mandavisa. These are sub-classified in to twelve types.

2. **Madhyamavisa Vrschika (moderate poisoned scorpion)**- Those which germinate from (decayed) wood or (decayed) bricks are madhyamavisa. These are subclassified into three types.
3. **Tiksnavisa Vrschika (strong poisoned scorpion)**- Those which originate from the decomposed carcase of a snake or from any other poisonous putrid organic matter are tiksnavisa. These are subclassified into fifteen types.

Poisonous features^[4]

These features can be classified into two types-

1. **General poisonous features**- The Scorpion poison is sharp in nature and causes burning sensation like fire in the beginning and there after it spreads upwards. At the end, it localizes at the site of sting. It produces severe pain, blackish discolouration, pricking and throbbing type of pain at site of sting.
2. **Specific Poisonous features-**
 - A. **Manda visalaksana**- A bite by a scorpion of this species is accompanied by pain, tremours, stiffness of the body and flow of blackish discoloured blood. In the case of a bite at any of the extremities the pain radiates upwards accompanied by a burning sensation, perspiration, swelling of the bitten part and fever.
 - B. **Madhyama visalaksana**- A bite by a scorpion of this species is accompanied by a swelling of the tongue, difficulty in digitation and deep fainting.
 - C. **Tikсна visalaksana**- A bite by a scorpion produces poisonous impulses similar to snake poison and gives rise to pustular eruptions along with vertigo, burning sensation, fever and excessive discharge of blackish discoloured blood from the passage due to which the person dies soon.

Physical properties^[1]

The venom is a clear, colourless, proteinous toxalbumin, having hemolytic and neurotoxic effect. Its toxicity is more than that of snakes, but only a small quantity is injected.

Composition Venom^[5]

Scorpion venom may contain multiple toxins and other compounds. The venom is composed of varying concentrations of neurotoxin, cardiotoxin, nephrotoxin, hemolytic toxin, phosphodiesterase’s, phospholipases, hyaluronidases, glycosaminoglycans, histamine, serotonin, tryptophan, and cytokine releasers.

Mode of Action of Venom^[5]

- Venom toxins alter the sodium channels, leading to prolonged neuronal activity.
- Somatic and cranial nerve hyperactivity results from neuromuscular overstimulation.
- Additionally, serotonin may be found in scorpion venom and is thought to contribute to the pain associated with Scorpion envenomation.

Action^[1]

The venom is a potent autonomic stimulator, resulting in the release of massive amounts of catecholamines from the adrenals. It has also some direct effect on the myocardium.

Fatal Dose & Period^[5]

Uncertain (Generally not fatal in Adult & fatal in Child)

Signs and Symptoms^[2]

Dysfunction of cranial nerve and hyperexcitability of skeletal muscles develop within hours.

Local- Little swelling, but prominent radiating pain, reddening, paresthesia, and hyperesthesia which is accentuated by tapping on the affected area.

Systemic effects are nausea, vomiting, restlessness, fever, headache, giddiness, blurred vision, abnormal eye movement, profuse sweating and salivation, lacrimation, rhinorrhea, slurred speech, muscular fasciculations, jerking and shaking (may be mistaken for a seizure), slow pulse, cyanosis, convulsions, coma and respiratory depression, and death may occur from pulmonary edema or cardiac failure in children.

Complications^[1]

Tachycardia, hypertension, arrhythmias, hyperthermia, rhabdomyolysis and acidosis.

Treatment^[1]

1. The limb is immobilized and a pressure bandage is applied proximal to the site of sting.
2. The site may be incised and washed with water or weak solution of ammonia, borax or KMnO₄.
3. Prazosin Therapy-Prazosin 30 µg/kg/dose (1mg for adult, 500 µg for children) is given orally and then after every 3h till extremities are warm, dry and peripheral veins are visible.
4. Scorpion antivenom (SAV) is specific antidote to scorpion venom. SAV against Indian red scorpion is available. Recovery is better by simultaneous administration of SAV and prazosin compared with prazosin alone.
5. Calcium gluconate 10 ml of 10% solution slow IV is given for pains, cramps and edema.
6. Barbiturates/chlorpromazine is given to sedate and control convulsion.
7. Atropine to prevent pulmonary edema.
8. Symptomatic treatment.

In Ayurveda^[4]

1. Treatment According to Type of Scorpion bite-
 - a. Strong and Moderate Venomed Scorpion poison- A bite by a scorpion of the middle-venomed or strong venomed class should be treated as a case of snake bite to all intents and purposes. And around the site of the bite fomentation should be done followed with the: -
 - i. Pratisaranam
 - ii. Lepam
 - iii. Panam
 - b. Mild Scorpion poison- In case of a bite by a mild-venomed one can be followed as mentioned in the specific treatment principles.
 - i. Secanam
 - ii. Svedanam
 - iii. Panam
 - iv. Dhupanam

Some of the Anti-Poisonous Therapeutics from the Yogarantakara^[4]

1. Mantravidhi
2. Jirakadilepa
3. Ajaksiradiyogam
4. Karpasapatradiyogam
5. Manahsiladi Gutika
6. Jaipalaprayoga
7. Ullipasana Lepa
8. Usage of Punarnavayoga.

Postmortem Finding^[1]

External- At the site of stings erythema, redness, and inflammation maybe found sometime.

Internal-

- a. Widespread haemorrhage will be found in internal organ.
- b. Affected site is swollen. Sting may be found at the site. The area may show ecchymosis. Pulmonary edema and myocardial infarction may be seen.

Medico-legal aspects^[5] Poisoning is usually accidental.

Accidental- Scorpion Stings are often accidental.

Suicidal- Till not recorded.

Homicidal- It was found in ancient times. Now a day it found rarely rare.

CONCLUSION

The mediators affecting inflammatory processes may be released after scorpion envenomation including kinins, eicosanoids, platelet activating factor, permeability increasing factor, nitric oxide, and cytokines. This released of cytokines and other mediators may account for several of inflammatory manifestations observed such as acute respiratory of inflammatory manifestations observed such as acute respiratory distress syndrome, systemic inflammatory responses syndrome and multiple organ failure. The cytokines regulate and amplify the immune response, induce tissue injury and mediate complications of the inflammatory response. Th1 cytokines are mainly proinflammatory, while Th2 cytokines are mainly anti-inflammatory. Equilibrium between pro- and anti-inflammatory is essential to maintain the homeostasis in the system. Dysregulations of the pro- versus anti-inflammatory are involved in the pathogenesis of envenomation in humans and experimental animals. The balance between proinflammatory and anti-inflammatory cytokines in envenomation determines the degree and extent of

inflammation which can lead to major clinical effects such as cardiac dysfunction, pulmonary edema and shock.

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