

# Envenomation -2

## Scorpion Sting

Suchita Khadse

Pediatric Intensivist, CHILD Hospital, Nagpur

Received:15-Apr-2016 /Accepted:15-May-2016/Published online:20-May-2016

**Keywords:** Scorpion, envenomation, sting, bite, poisoning

Scorpion sting is a life threatening medical emergency. The effect of envenomations greatest among children below 5 years of age. Mortality in pre prazocin era was as high as 30%. It is worthwhile to remember Dr.H.S.Bawaskar, a private practitioner from Maharashtra who for the first time in world has introduced the usefulness of alpha blocker in scorpion sting nearly 25 years ago and has helped to reduce the mortality.

### Epidemiology

In India deaths due to scorpion sting occurs across the country but do not get due attention. Larger the scorpion population, greater is the number of scorpion sting cases. Scorpion stings are reported more from rural areas and the rural to urban ratio is approximately 3:1. Mostly stings occur between 6 P.M. to mid-night and between 6 A.M. to 12 Noon, which correlate very well with human activity. Scorpion sting occur more in temperate and tropical zones, and more during summer than winter.

### Eco- biological aspects of scorpion

Scorpions are shy creatures and not aggressive by and large. These are nocturnal creatures and hunt for their prey at night. Scorpions hide normally in crevices and burrows during daytime to avoid light. Scorpions are found elsewhere outside the environmental range. eg, accidentally crawl into luggage, boxes, containers, or shoes, pile of bricks, wooden materials, firewood, etc. They may also be transported in traveller's luggage and cargo. There are about 1500 scorpion species of which 50 are

dangerous. In India 86 species of scorpion have been identified. Among them, *Mesobuthus tamulus* and *Palamneus swammer-dami* are important medically. Except *Hemiscorpius* species, all lethal scorpions belong to the family called the Buthidae. The lethal members of Buthidae family include the genera of *Buthus*, *Parabuthus*, *Mesobuthus*, *Tityus*, *Leiurus*, *Andractonus* and *Centruroides*. Among the 30 scorpion species found in USA, only one of them is dangerous to human beings. Scorpions live in temperate and tropical regions especially between the latitudes of 50° north and 50° south of equator. The distinguishing features between lethal and nonlethal scorpions are provided in Table 1.

**Table 1:** Distinguishing features of lethal and non-lethal scorpion

Structure	lethal	Non-lethal
sternum shape	triangular	pentagonal
Pincers	Weak looking	Strong and heavy
Body	Thin in a empathetic manner	thick
Tail	thick	thin

Scorpions use their pincers to grasp the prey. It arches its tail over its body and stings into its prey. Thus it injects its venom, sometimes more than once. The venom glands are situated in the tail. The striated muscles in the stings regulate the amount of venom injected. When entire venom is used, it takes several days to replenish venom. Scorpion with large venom sacs such as *Parabuthus* species can even squirt their venom.

### Components of Venom and Mechanisms of action

The components of venom are cardiotoxin, hemotoxin, nephrotoxin, neurotoxin, hyaluronidases, phosphodiesterases, phospholipases, glycosaminoglycans, histamine, serotonin, tryptophan and cytokine releasers. Among all, the most potent is the neurotoxin. There are two classes of neurotoxins (long chain & short

#### Correspondence

Dr Suchita Khadse  
Consultant Pediatric Intensivist, CHILD Hospital, Nagpur  
Email: drsuchita@gmail.com, Mobile: +919823032908

chain polypeptide) which are heat stable, have a low molecular weight and are responsible for causing cell impairment in nerves, muscles, and the heart by altering sodium and potassium channel permeability. The long chain polypeptide neurotoxin induces continuous, prolonged, repetitive firing of somatic, sympathetic and parasympathetic neurons which results in autonomic, and neuromuscular over excitation symptoms. It also prevents normal nerve impulse transmissions. Further, it results in release of neurotransmitters viz., epinephrine, nor-epinephrine, acetylcholine, glutamate, and aspartate excessively. The short chain polypeptide neurotoxin blocks the potassium channels.

**Clinical Course**

Clinical course of scorpion sting is usually less alarming but in some cases it may progress to maximum severity in about 5 hours to 12 hours and starts subsiding within a day or two. Even if the patient has features of autonomic nervous system manifestations, it may start subsiding by 12 hours after initiating treatment. Tachycardia usually subsides within 24 to 48 hours. Hypertension may last for 4 to 8 hours.

**Table 4:** Non-neurological signs

<ul style="list-style-type: none"> <li>* Cardiovascular signs</li> <li>• Hypotension</li> <li>• Hypertension</li> <li>• Tachycardia (bradycardia at times)</li> <li>• Cardiac dysrhythmia</li> <li>• Transient apical pansystolic murmur</li> <li>• Cardiovascular collapse</li> <li>• Cardiogenic shock</li> <li>• Cardiac dysfunction</li> <li>* Respiratory Signs</li> <li>• Tachypnoea</li> <li>• Pulmonary edema</li> <li>• Respiratory failure</li> <li>* Gastro intestinal Signs</li> <li>• Dysphagia</li> <li>• Excessive salivation</li> <li>• Nausea and vomiting</li> <li>• Gastric hyperdistension</li> <li>• Increases gastric acid out put and gastric ulcer</li> <li>• Acute pancreatitis</li> <li>• Liver glycogenolysis</li> <li>• Toxic hepatitis</li> </ul>	<ul style="list-style-type: none"> <li>* Hematologic Signs</li> <li>• Platelet aggregation</li> <li>• Disseminated intra vascular coagulation (DIVC)</li> <li>* Metabolic Signs</li> <li>• Hyperglycemia</li> <li>• Increased lactic acidosis</li> <li>• Electrolyte imbalance</li> <li>* Genitourinary Signs</li> <li>• Acute renal failure</li> <li>• Rhabdomyolysis</li> <li>• Priapism</li> <li>* Allergic Signs</li> <li>• Urticaria</li> <li>• Angioedema</li> <li>• Bronchospasm</li> <li>• Anaphylaxis</li> <li>* Pregnancy Signs</li> <li>• Toxin induced uterine contraction</li> </ul>
--	---

**Table 2:** Influencing factors for symptoms and signs Scorpion Sting Status of the patient

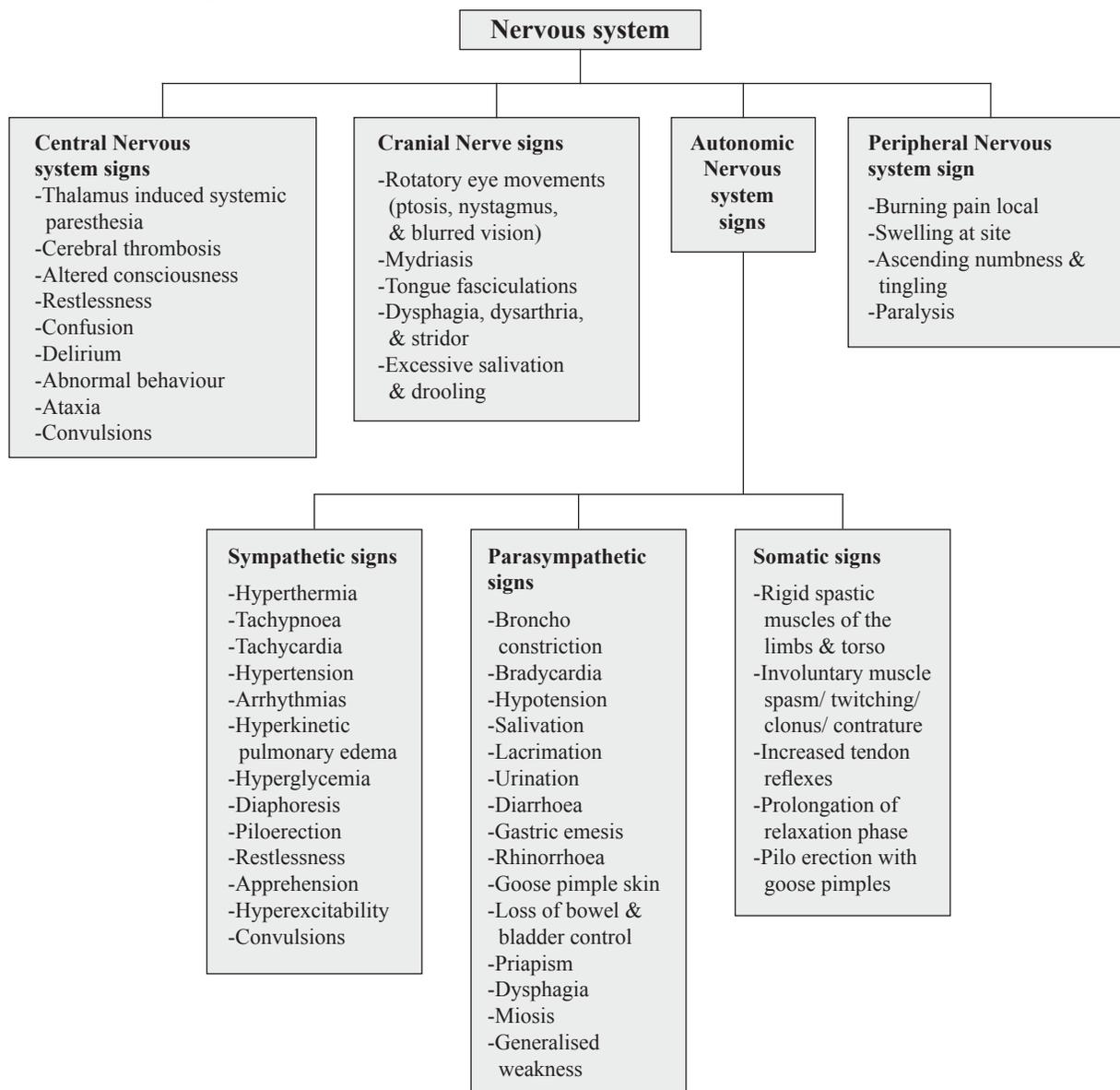
Scorpion	Sting	Status of patient
Species • Age, size and • nutritional status • Stinging apparatus (telson)	Time of sting • Number of stings • Quantity of venom injected (low dose –adrenergic, high dose – cholinergic) • Depth of the sting penetration • Site of sting IV/SC/IM • Components of venom	Age of the patient • Health status • Comorbid conditions • Weight of the victim • Physiological response of the individual • Sensitivity of the systém to the neurotransmitters and Toxins

**Table 3:** Local effects at the site of sting

Non lethal local signs	Neurotoxic local signs at the site of the sting	Cytotoxic local signs at the site of the sting
Pain • Erythema • Induration • Wheal (due to activation of kinins and slow releasing substances of venom)	• Local effect of sting • minimal or absent • Tissue necrosis (rare) • Sharp burning pain • Erythema • Local tissue swelling • Ascending hyperesthesia (paresthesia persists for several weeks and the last symptom to resolve)	Appearance of a macule or papule within hour • Diameter of the lesion vary with quantity of venom injected • Progress of the lesion to a purpuric plaque which will necrose and ulcerate
Non lethal local signs	Neurotoxic local signs at the site of the sting	Cytotoxic local signs at the site of the sting
	Positive “Tap test”- (Paresthesia worsens with gentle tapping at the site of sting) • Hypersensitive to touch and temperature	Lymphangitis (if the venom is transferred through lymphatics)

Systemic signs are grouped into neurologic signs and non-neurologic signs.

**Table 5:** Neurological signs



Hypotension and bradycardia are encountered usually within 2 hours. Once treatment is started, the signs of recovery begins within 48 or 72 hours. In some cases pulmonary edema may develop within 30 minutes to 3 hours, usually secondary to myocardial dysfunction. Unfortunately some cases of scorpion sting may die within 30 minutes and this may be related to ventricular arrhythmias or non cardiac pulmonary edema due to ARDS [often reported from Brazil]. Central nervous system manifestations with

or without convulsions may occur within one to two hours in fatal cases.

**Treatment**

Currently recommended First aid

R = Reassure the patient.

I = Immobilization of the limb in the same way as a fractural limb.

G. H. = Get to Hospital Immediately.

**Table 6:** Investigations

<p><b>Haematology</b></p> <ul style="list-style-type: none"> <li>- Complete Blood Count (CBC)</li> <li>- Leukocytosis</li> <li>- Hemolysis (variable)</li> <li>- Coagulation profile</li> <li>- Defibrination [if required]</li> </ul> <p><b>Imaging studies</b></p> <ul style="list-style-type: none"> <li>• Chest x – ray</li> </ul> <p><b>Other investigations</b></p> <ul style="list-style-type: none"> <li>• Electro cardiogram (Arrowhead tented T wave indicates acute injury. Tent shaped indicates recovery. Myocardial infarction like pattern, atrial arrhythmias, non-sustained ventricular arrhythmias &amp; conduction defect - injury to conducting system. PQRS or T wave alterations- serious myocardial injury. Low voltage, wide QRS complex, tachycardia, hemiblock, marked ST segment depression - bad prognosis.</li> </ul>	<p><b>Blood Chemistry</b></p> <ul style="list-style-type: none"> <li>- Blood sugar</li> <li>- Serum creatinine</li> <li>- Serum creatine kinase</li> <li>- Serum amylase / lipase</li> <li>- Serum aspartate / alanine amino transferase</li> <li>- Arterial blood gas (ABG) analysis [if required]</li> </ul> <p><b>Special investigations</b> [if required]</p> <ul style="list-style-type: none"> <li>• Echocardiogram / and repeat for follow up studies</li> <li>• Color-Doppler</li> <li>• Pulmonary artery catheterisation studies</li> <li>• Serial spirometry to measure pulmonary functions</li> <li>• Hormone studies</li> <li>• Estimation of different cytokines</li> <li>• Serum venom level</li> </ul>
--	---

T = Tell the doctor all that happened from the time of scorpion sting

**Traditional methods**

(Traditional remedies have NO PROVEN benefit in treating scorpion sting).

However, local application of ice bags (one of the traditional methods) to reduce the pain is acceptable for some time if not contraindicated

- 1) **Admit** all victims of scorpion sting & keep the victims under observation for 24 to 48 hrs. (If scorpion is brought try to identify the color and size of it).
- 2) a) Ask for the details of scorpion sting and never be carried away with the sting marks either for diagnosis or for assessment of severity.  
 b) Ask for the time interval between the sting and arrival at the hospital.  
 c) Ask for the details of traditional medicines or household remedies used, as it may sometimes cause confusing symptoms or interfere with other drugs to be administered.

d) Ask for clinical symptoms and correlate with the progression of symptoms and signs due to scorpion sting

**3) Assess the following quickly.**

- a) Airway, Breathing and Circulation
- b) Vitals HR, RR, BP and Pulse oximetry
- c) Site of sting and the probable route of envenomation - (Intravenous have immediate effects, while subcutaneous and intramuscular routes take several minutes to hours to cause effect)
- d) Chest expansion
- e) Clinically from head to foot as well as back
- f) For associated co-morbid illness[es]
- g) For consuming any medication[s]

**5) Administer medication meticulously**

- a) **Tetanus Toxoid** injection intramuscularly
- b) **Topical anesthetic** agent to the site of sting to decrease paraesthesia.
- c) **Injection lignocaine** 1% without adrenaline; (after test dose for lignocaine)(0.1 to 0.2mg/kg body weight for children)
- d) **Oral rehydration solution** to hydrate the patient if not contraindicated.
- e) **Tab. Paracetamol** 10mg/kg body weight to reduce pain
- f) **Tab. Prazosin** [plain 1mg]

**Pharmacological aspects of Prazosin**

Prazosin is an alpha blocker. It is well absorbed after oral administration. Its half-life in the plasma is approximately 2-3 hours and the action lasts 4-6 hours. Peak concentration of prazosin in the plasma reached 1-3 hours. It counteracts scorpion induced adrenergic cardiovascular effects and reduces pulmonary edema through vasodilator effect, Usually it is started with small dose using plain tablet but not exceeding 5mg/day. For children the dose preferred is 30 microgram / kg body weight. Though pediatric requirement has not been established, it is started with small dose. Prazosin can be given irrespective of blood pressure, provided there is no hypovolemia It should be avoided, if the patient is hypersensitive to prazosin. Always exercise caution if patient has renal insufficiency and hypertension.

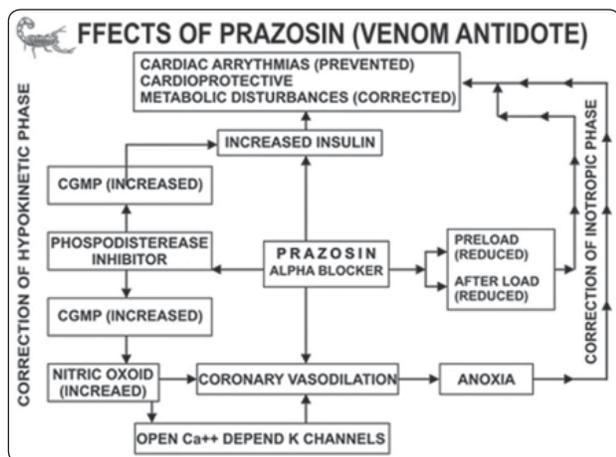


Figure 1. Effects of PRAZOSIN

**Measures to be adopted while using Prazosin**

- Prazosin should not be given as prophylactic dose when pain is the only symptom.
- Give Prazosin through nasogastric tube, if baby has vomiting.
- Keep the patient in lying posture for about 3 hours (even while examining the case) in order to prevent 'first dose phenomenon' (hypotension) due to Prazosin.
- Monitor pulse, BP, and respiration every 30 minutes for 3 hours.
- Reassess for warmth and return of pain at the site of sting.
- Continue monitoring of pulse, BP, and respiration every 60 minutes for next 6 hours.

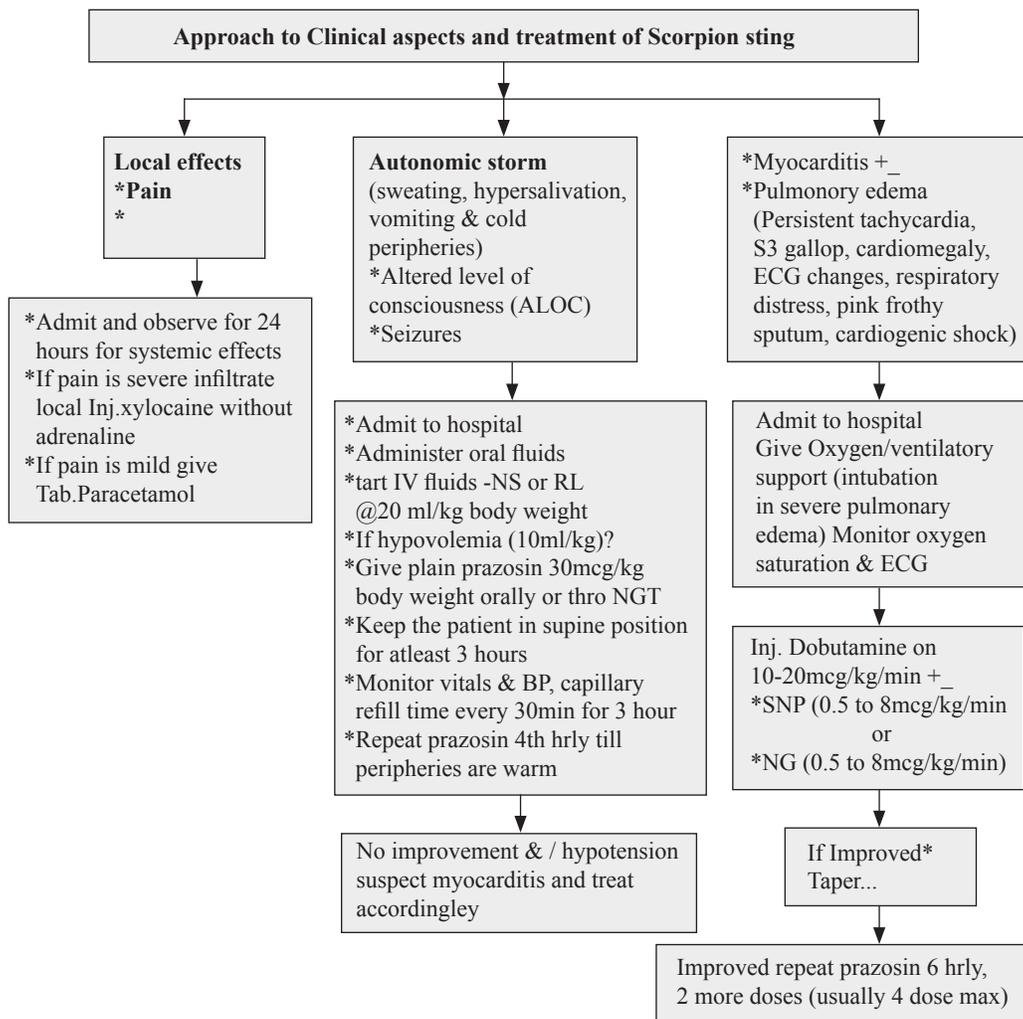
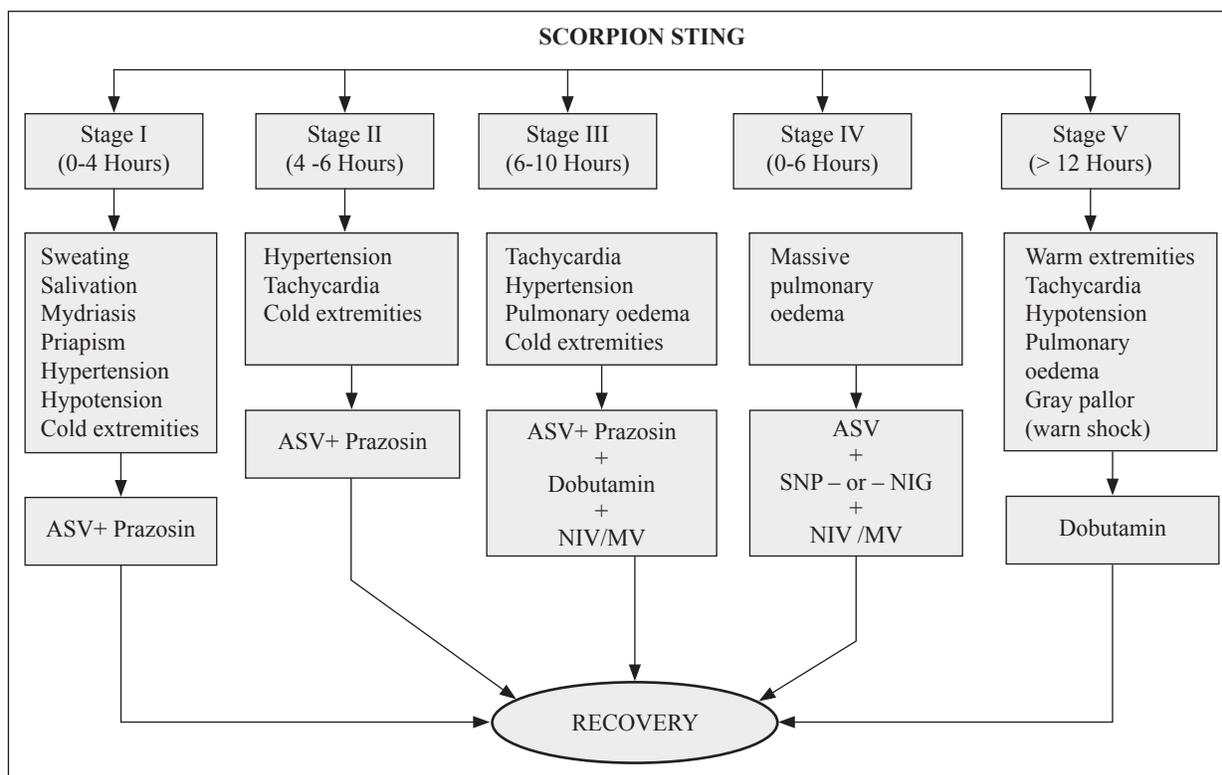


Figure 2: Algorithmic approach to scorpion sting



**Figure 3:** Management of scorpion sting when antiscorpion venom is available.

ASV: Antiscorpion venom; SNP: Sodium nitropruside; NTG: Nitroglycerine; NIV:non invasive ventilator; MV: Mechanical ventilator

- Recheck the same every 4 hours till improvement is visible.
- Repeat Tab. Prazosin in the same dose at the end of 3 hours according to clinical response and later every 6 hours till extremities are warm, dry and peripheral veins are visible easily.
- Alternative to Tab. Prazosin is Nifedipine, Nitroprusside, Nitroglycerine, Isosorbide dinitrate, Hydralazine or Angiotensin converting enzyme inhibitors (ACEIs).

However, users have to remember the constraints while prescribing such drugs.

Since 2002, nonspecific F(ab)2 SAV has been available for clinical use from Haffkine Biopharma Mumbai. addition of scorpion antivenom to prazosin enhances recovery time and shortens hospital stay of patients with grade 2 *Mesobuthus Tamulus* envenomation. The maximum volume of venom injected in one sting by Indian red scorpion is 1.5 mg, and each ml of antivenom is capable of neutralizing

1.2 to 1.5 mg venom hence give 30 ml of antivenom, however more may be required for severe sting. High circulating catecholamine induced by venom prevent a reaction to antivenom and act as a prophylaxis against anaphylaxis.

**Key Messages**

- 1) Severe local pain at the site of sting is unlikely to progress to systemic manifestations.
- 2) Traditional remedies have NO PROVEN benefit in treating scorpion sting
- 3) Autonomic storm is the basic pathogenic mechanism leading to all clinical features and complications of Scorpion sting.
- 4) Pulmonary edema is the most important manifestation.
- 5) Warming up of extremities and appearance of local pain are suggestive of recovery.
- 6) Scorpion antivenom is available. Addition of scorpion antivenom to prazosin enhances recovery time and shortens hospital stay of patients

- 7) Prazosin is alpha blocker and dose is 30 microgram/kg/dose.
- 8) Massive pulmonary edema needs SNP drip.
- 9) Avoid using atropine, steroids, lytic cocktail, morphine, nifedipine and captopril

**Conflict of Interest:** None

**Source of Funding:** None

### References

1. Bawaskar HS, Bawaskar PH. Scorpion sting: update JAPI. 2012 jan; 60
2. Bawaskar HS, Bawaskar PH. Management of snake bite and scorpion sting. Quarterly medical review 2009 oct- dec; 60, no. 4
3. Handbook on treatment guidelines for snake bite and scorpion sting Tamil Nadu health systems project health and family welfare Department, Chennai. 2008; 45-64
4. Bawaskar HS, Scorpion sting. TRSTMH 78:414-415.
5. Bawaskar HS, Bawaskar PH. Efficacy and safety of scorpion antivenom plus prazosin compared with prazosin alone for venomous scorpion (*mesobuthus tamulus*) sting: randomised open label clinical trial. BMJ 2011; 342:c7136.
6. Mahadevan S. Scorpion sting. Indian pediater 2000; 27: 504-514.
7. Santhanakrishnan BR, Ranganathan G, Ananthasubramaniam P. Cardiovascular manifestations of scorpion stings in children. Indian Pediatr 1977;14:353-356
8. Bawaskar HS, Bawaskar PH. Management of scorpion sting. Heart 1999;82:253-254
9. Bawaskar HS, Bawaskar PH. Prazosin in the management of cardiovascular manifestations of scorpion sting. Lancet 1986; 1:510-511.
10. Bawaskar HS. Diagnostic cardiac premonitory signs and symptoms of red scorpion sting. Lancet, 1982, 2, 552-4.
11. Prasad R, Misra O, Pandey N, Singh T. Scorpion sting envenomation in children: factors affecting the outcome. Indian J Pediatrics 2011; 5: 544-548
12. Natu VS, Murthy RK, Deodhar KP. Efficacy of species specific anti-scorpion venom serum (ASCVS) against severe, serious scorpion stings (*mesobuthus tamulus concanensis pocock*) - an experience from rural hospital in western maharashtra. JAPI 2006; april, vol. 54
13. Bawaskar HS, Bawaskar PH. Management of the cardiovascular manifestations of poisoning by the indian red scorpion (*mesobuthus tamulus*). Br Heart J. 1992;68:478-80

How to cite this article: Khadse S. Scorpion sting. J Pediatr Crit Care 2016;2:42-48.

How to cite this URL: Khadse S. Scorpion sting. J Pediatr Crit Care 2016;2:42-48.

Available from: : <http://www.journalofpediatriccriticalcare.com/userfiles/2016/0302-jpcc-apr-jun-2016/JPC0302010.html>