Improved survival in Scorpion Sting patients with severe cardio toxicity resistant to Prazosin.
A Retrospective analysis of a rural set up experience.

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Introduction:-

Scorpion sting is common in rural parts of India. Due to lack of medical and ICU facility in rural areas, case fatality rate was up to 30% in pre Prazosin era. [4] With the advent of Prazosin mortality rate has come down to 1% (4) Majority of the deaths are due to poor LV function leading to pulmonary oedema. [4] Prazosin has been reported to be effective in reducing pre load, after load, thus improving LV Function and pulmonary oedema[5]. However, cardio toxicity is due to sustained adrenergic stimulation, i.e. initial ∝ receptor stimulation followed by sustained β receptor stimulation, which are situated on heart [3,7,10] If the ∝ receptors are blocked by Prazosin, there is unmasked stimulation of β receptors leading to exhaustion of catecholamine stores. [3,10].

Based on this we have successfully demonstrated that timely admistration of Dobutamine has reversed the changes of pulmonary oedema in Prazosin resistant carditoxic cases [8]

Methods:-

We have done retrospective analysis of 198 patients of scorpion sting admitted at B.K.L. Walawalkar Hospital, Dervan from Jan 1999 to Jan 2004. The age group ranged from 1 yr to 50 yrs. According to their signs and symptoms they were classified in to following groups.

1. Mild Envenomation – Locally toxic, pain, tingling and sweating and vomiting.
2. Moderate envenomation–Profuse sweating, Sinus Tachycardia or bradycardia, reduced LV function on 2D Echo, Hypertension, Hypotension, and LVF (killip's class I and II) + local signs.
3. Severe Envenomation-Pulmonary oedema. + signs of moderate envenomation.

They were investigated for complete blood count, Blood glucose, urea, Creatinine, SGOT, Urine, ECG, Chest X – Ray and Serial 2D Echo – cardiography.

Following treatment Protocol was followed.

1. Local treatment – 2% Xylocaine (without adrenaline) at the site of sting for pain relief. Few patients had been prescribed Prazosin by treating

General Practitioners but it was not administered for mildly toxic group of patients at our Hospital. Inj. Tetanus toxoid was administered.

2. According to blood pressure, Prazosin 0.5 – 1 mg was administered to all patients of moderate and severe envenomation. It was repeated depending upon the clinical severity and blood pressure. If there was no improvement within 1 hour / patient developed clinical symptoms of LVF, Digoxin 0.5 mg, and Frusemide were administered.
3. Those patients of LVF who did not respond to Prazosin, digoxin and diuretics, inj. Dobutamine was administered at the rate of 2.5 to 10 micro gm/kg/min within 48 hrs. In those who were admitted with LVF and cardiogenic shock only Dobutamine was administered and Prazosin was not prescribed to them.
4. In the year 1999 Dobutamine was not administered to Prazosin resistant cases as the facility of echocardiography was not available. In the year 2000 Echocardiographic evaluation of these cases were done and global Hypokinesia was confirmed on 2DEcho study and then Dobutamine was introduced as a treatment modality for these patients. For treatment plan patients were classified into four groups in which Prazosin and Dobutamine was used in permutation and combinations. Efficacy of these

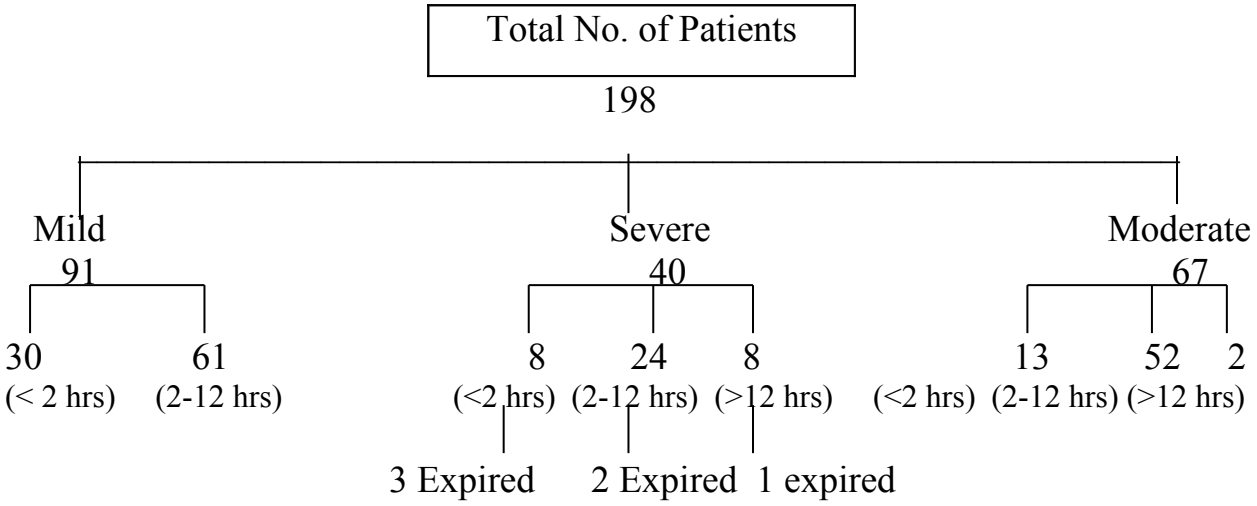
drugs were compared on the basis of cardiotoxicity developed and mortality rate in all four groups.

Result:-

We studied 198 patients of scorpion stings. Out of them 91 (45.95%) patients were mildly envenomated, 67 (33.83%) patients were moderately envenomated and 40 (20.20%) were severely envenomated. Out of 198 patients 6 (3.03%) died of severe envenomation.

The Table 1 is showing a relation of mild, Moderate & Severe envenomation with time lapsed before admission and patient's fate.

Table 1



The table 2 shows Mild, Moderate, Severe envenomation patients in relation to drugs used.

Table 2

Total No. 198	Prazosin + No Dobutamine	No Prazosin + Dobutamine	Prazosin + Dobutamine	No Prazosin + No Dobutamine
Mild envenomation 91 (45.95%)	57	-	-	34
Moderate envenomation 67 (33.83%)	37	5	11	14
Severe envenomation 40 (20.20%)	4	16	18	2

Table 3

Mortality in moderate and severe envenomated group

Dobutamine Group	**Prazosin Group**			
	Not used		**Used**	
	Cases	**Deaths**	**Cases**	**Deaths**
Not used	16	1 (6.25%)	41	3 (7.32%)
Used	21	1 (4.76%)	29	1 (3.45%)

As is evident from the above table mortality is highest in only Prazosin and no Dobutamine group, followed by no prazosin and no Dobutamine group. Mortality is lowest in Prazosin + Dobutamine group, followed by only Dobutamine group.

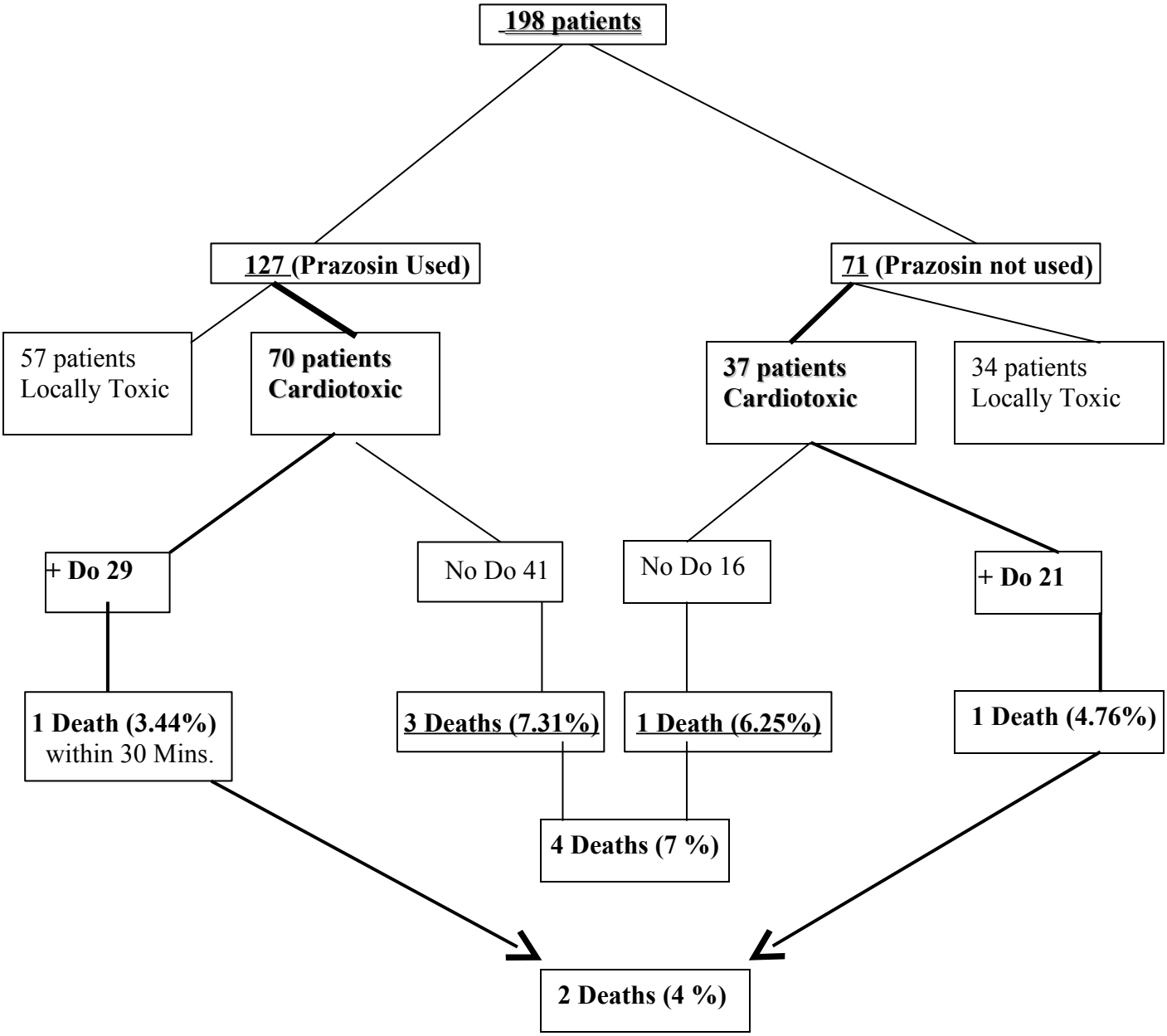
Table 4

Mortality in relation to drugs used in severe envenomation			
	Pr + no Do	No Pr + Do	Pr + Do
Severe envenomation	4	16	18
Expired	3	1	1
Percentage	(75%)	(6.25%)	(5.90%)

Fischer's exact = 0.031 (significant at 3% level)

This shows that mortality ratio of individuals dying due to envenomation is dependent on the type of treatment received, with mortality ratio lowest for Prazosin + Dobutamine group and highest for Prazosin, no Dobutamine group.

Table 5.



Do – Dobutamine
+ Do – Dobutamine used
No Do – Dobutamine not used.

Table 6:

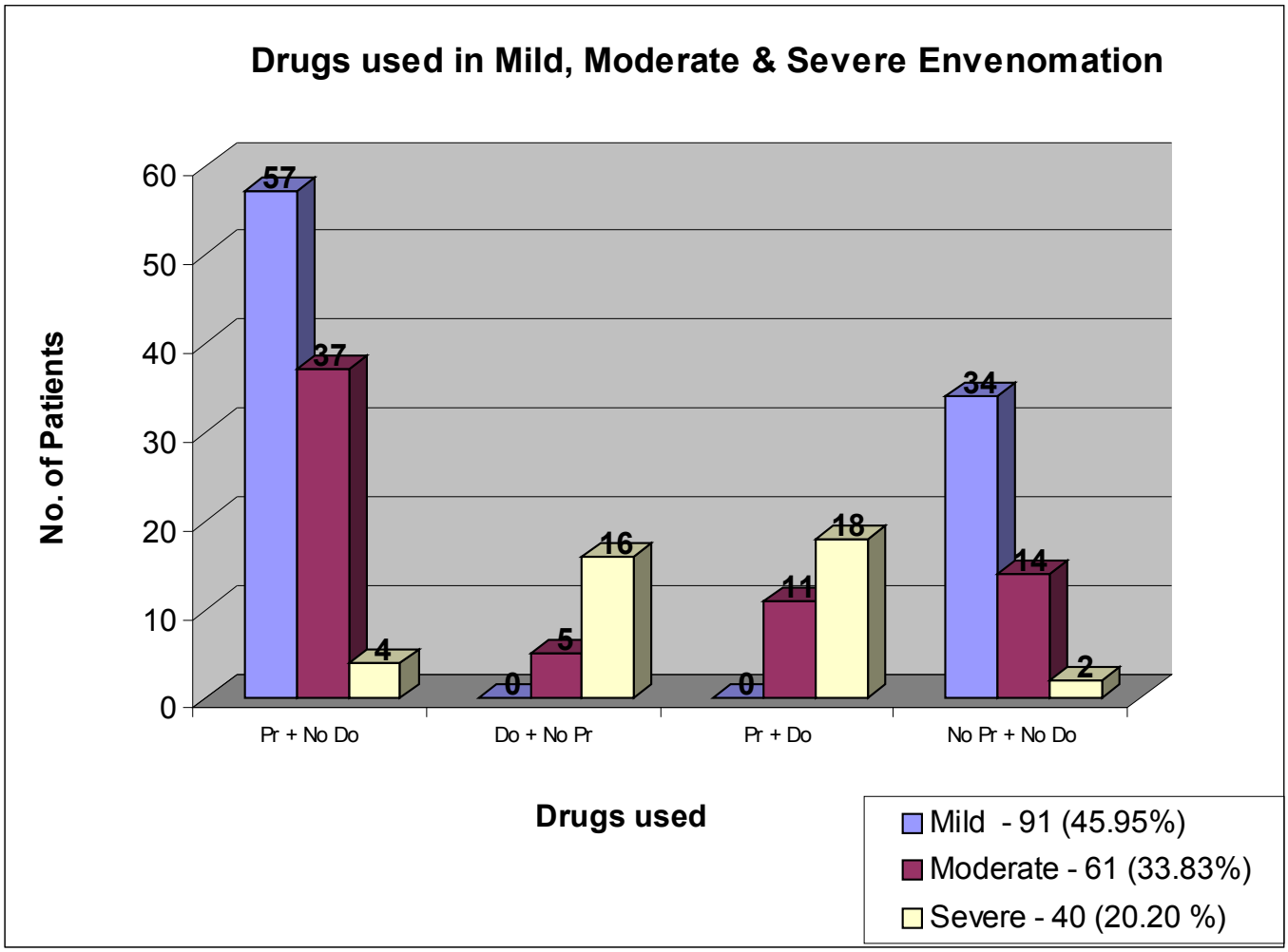
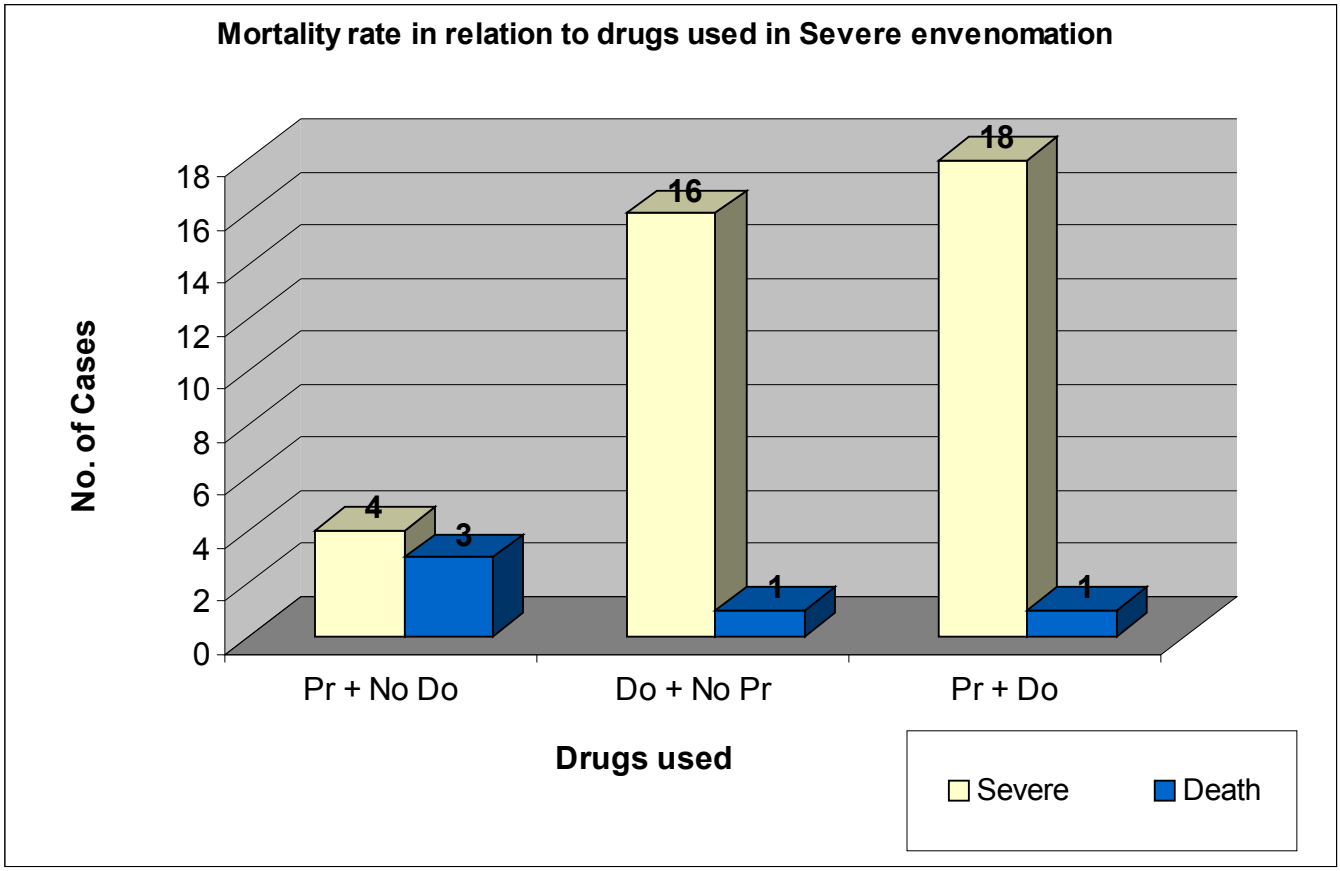
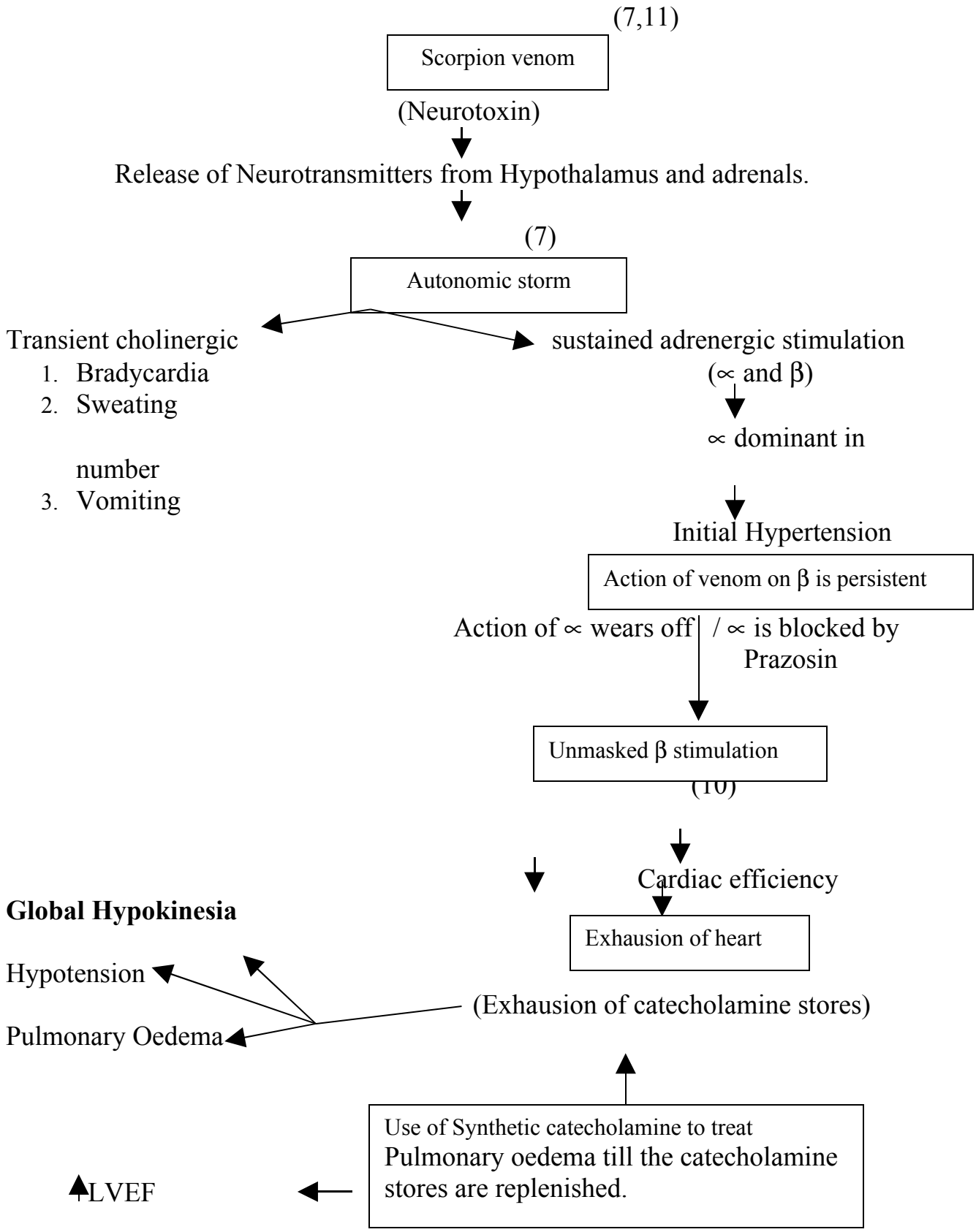


Table 7



Discussion:-

Scorpion venom is a neurotoxin. It's action is as follows:


(7,11)
Scorpion venom
(Neurotoxin)
Release of Neurotransmitters from Hypothalamus and adrenals.
(7)
Autonomic storm
Transient cholinergic
1. Bradycardia
2. Sweating
number
3. Vomiting
sustained adrenergic stimulation
(∝ and β)
∝ dominant in
Initial Hypertension
Action of venom on β is persistent
Action of ∝ wears off / ∝ is blocked by Prazosin
Unmasked β stimulation
(10)
Cardiac efficiency
Exhausion of heart
Global Hypokinesia
Hypotension
Pulmonary Oedema
(Exhausion of catecholamine stores)
Use of Synthetic catecholamine to treat
Pulmonary oedema till the catecholamine stores are replenished.
↑LVEF

Our results show that mortality is highest in Only Prazosin + No Dobutamine group and lowest in Prazosin + Dobutamine group. Use of Dobutamine is successfully reducing the number of deaths in Prazosin resistant cardiotoxic cases.

Thus, it shows that only ∝ blocking is not preventing further cardiac complications. β Receptors are responsible for LV dysfunction. Adrenergic storm gives rise to exhaustion of catecholamine stores and till the stores are replenished, Beta receptors are stimulated by using synthetic catecholamine.

There are multiple factors which influence the clinical presentation and final out come. There are host factors like body mass index, surface area and capacity of the host to neutralize the venom which may influence the final outcome. It also depends upon the factors related to scorpion, like species of the scorpion bitten, toxicity of the venom, amount of venom injected, Injection of the venom directly into circulation through intravenous route, number of stings, and role of ASV in scorpion stings other than Buthus tamulus & heterogencity of scorpions according to the toxicity of the venoms, role of tourniquet application to prevent dissemination of the venoms in circulation. These factors can be studied in future. As this is a retrospective study there are certain limitations regarding these host factors and scorpion factors which can be studied in detail in further studies and we may find a way to prevent progress of the disease after venomous scorpion stings.

Further study on use of cardio selective beta blockers (without intrinsic sympatho mimetic activity) at the onset of adrenergic phase is going on to prevent LV dysfunction in cardio toxic scorpion sting.

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