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MANAGEMENT OF SEVERE SCORPION STING AT RURAL SETTINGS: WHAT IS THE ROLE OF SCORPION ANTIVENOM?

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Dear Sir,

Mesobuthus tamulus (Indian red scorpion), a lethal species, flourished in western Maharashtra, Pondicherry, Madurai, Tamil Nadu, Chennai, Bellary and Kurnool, districts of Andhra Pradesh, states of India, where 30%-40% fatality (due to acute pulmonary edema) was reported in the past (4,15,16).

Mesobuthus tamulus venom is a potent sodium channel activator resulting in autonomic storm (4). Iberitoxin content of venom inhibit the calcium-dependent potassium channels (17). Clinical manifestations, such as vomiting, profuse sweating, priapism in male, cool extremities, hypertension, hypotension, bradycardia, tachycardia, ventricular premature contraction, transient runs of ventricular tachycardia, transient coronary sinus rhythm, pulmonary edema accompanied by marked tented T-waves, ST segment depression, acute myocardial infarction-like pattern, left bundle branch block, and prolongation of QTc interval (400-650 milliseconds).

Clinical effects caused by venoms are due to the release of autopharmacological agents into the circulation (4,13). Pharmacokinetic analysis of experimental data on the venom distribution showed that its uptake by the tissue compartment is rather rapid, with estimated half-life of 5.6 minutes; its concentration showed a continuous rise, reaching a peak level within 37 minutes (14).

It is interesting to note that, irrespective of different species of scorpions, similar clinical manifestations have been reported (2,11). It confirms that the lethal fraction of venom from different species of scorpion has similar effects on the autonomic nervous system.

Various regimens tried to alleviate the cardiovascular and autonomic nervous systems effects of venom: betablocker, calcium channel blocker, atropine, diuretic, steroids, antihistamines, lytic cocktail, insulin and glucose, captopril, and antivenom (9).

Scorpion antivenom is a specific antidote to the venom actions, irrespective of the neutralization of circulating venom by the antivenom; the majority of cases need supportive treatment to alleviate the cardiovascular effects (6). Abroug *et al.,* from Tunisia, reported no benefits in the routine administration of scorpion antivenom after sting, irrespective of clinical severity (1). *Mesobuthus* antivenom did not reverse the cardiovascular effects of venom in a report from India (6). Twenty-one severe scorpion sting cases aging 3-56 (average 22) years were reported within 30 minutes to 21 hours (average 3.5) after sting. All of them had clinical manifestations of autonomic storm. They received scorpion antivenom by the intravenous route and were closely observed for clinical manifestations; out of these, 12 had persistent raised blood pressure; 8 developed pulmonary edema, of which 2 had massive life-threatening pulmonary edema; 1 had hypotension with tachycardia; and 2 died. None of the patients benefited by scorpion antivenom in our series.

Alpha-receptor stimulations play major role in the clinical manifestations evoked by scorpion sting. Alpha-receptor stimulation causes hyperkalemia and hyperglycemia (by inhibiting insulin secretion). Angiotensin II stimulates alpha receptors in the myocardium and coronary spasm resulting in accumulation of free radicals, which are injurious to myocardium, initiating lethal ventricular arrhythmias and sudden deaths (3,10).

Prazosin, a post adrenergic receptor blocker, has 1000-fold more affinity to alpha-1 receptors. 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 (10). Prazosin reduces preload and left ventricular load, without raising the heart rate and rennin secretion. As a potent inhibitor of phosphodiesterase, prazosin causes accumulation of cGMP (a second messenger of nitric oxide) in vascular endothelium and myocardium, and inhibits the formation of inositol triphosphate; as a result of this action, myocardial responses to sympathetic stimulation are attenuated. It also activates calcium dependent potassium channels inhibited by the venom (10). Prazosin enhances insulin

secretion, resulting in the correction of hyperglycemia and hyperkalemia, it also helps to combat the anoxic myocardium similar to glucose, insulin, and potassium drip (8).

In India, since the advent of prazosin, the fatality due to severe scorpion sting is reduced to less than 1% (7,12).

Irrespective of prazosin, 4%-8% of the patients (particularly children) developed marked tachycardia (140-240 per minute) with pulmonary edema, air hunger, and warm extremities; these patients recovered with dobutamine drip (8-11 microgram/kg/minute) over 12-36 hours.

Cardiovascular morbidity and mortality depends on the time interval between sting and administration of prazosin. Those cases (2%) had massive life-threatening pulmonary edema necessitating rapid unloading of heart by intravenous sodium nitroprusside (3-5 microgram/kg/minute) drip (9).

Training in the appropriate use of prazosin and the protocol of indications for its use were arranged at primary health centers and general hospitals. In one year, 51 peripheral doctors treated 3,522 severe scorpion-sting cases with oral prazosin; from these, 13 (0.3%) died (5 -12)

Thus, prazosin is a pharmacological and physiological antidote to the venom action. In this regard, it replaced the scorpion antivenom, which is not advocated for *Mesobuthus tamulus* envenoming anymore. Prazosin is as good as specific scorpion antivenom and number of specific antivenoms available but of uncertain efficacy. Ancillary treatment with prazosin is crucial in severely envenomed patients; it is cheap, easily available, and free from anaphylaxis (18)

Recently, Dr Bosnak (Email: mbosnak@dicle.edu.tr), from the Pediatric Intensive Care Unit, Department of Pediatrics, Medical School, Dicle University, Diyarbakir, Turkey, reported that out of 30 children with severe scorpion sting admitted to the Pediatric Intensive Care Unit and treated with prazosin, one died.

Thus, irrespective of different species of scorpion, prazosin acts as a pharmacological and physiological antidote to scorpion venom actions; as a result of this, it saves millions of dollars of tropical and subtropical countries, essential for preparation of scorpion antivenom (scorpion venom, animals, laboratories and scientific hours).

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