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Case Report

# Acute Heart Failure due to Severe Scorpionism and the Usefulness of Levosimendan in an Infant. Case Report

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## Abstract

Acute heart failure is a potentially fatal presentation of severe scorpionism in pediatrics. We describe the case of an 11-month-old boy who, having suffered a scorpion sting, is admitted to the PICU due to acute cardiac failure that evolves refractory to conventional treatment and presents a good clinical response to treatment with levosimendan.

***Keywords:*** *Severe Scorpionism; Acute Heart Failure; Levosimendan; Pediatrics*

## Introduction

Scorpion sting poisoning or scorpionism is a public health problem in tropical and subtropical countries, potentially serious and lethal, but preventable and treatable. In the last decades in Argentina, notifications and cases of death have increased significantly, especially by Tityus trivittatus [1,2].

Severe scorpionism is defined by the presence of systemic symptoms of neurological, cardiovascular and respiratory failure [3]. Children especially those under 2 years of age, are more susceptible to serious complications [4,5]. Acute heart failure secondary to severe scorpionism is probably due to massive catecholaminergic, direct cytotoxic and ischemic phenomena [6].

As conventional cardiovascular support in cases of severe scorpionism, positive inotropic and inodilatory drugs such as dobutamine and milrinone are used respectively [4]. Levosimendan, a positive inotropic calcium sensitizer in its binding with troponin C of the myocardium, has been studied for its efficacy and safety in the treatment of perioperative low cardiac output syndrome in congenital heart diseases and dilated cardiomyopathy in pediatrics [10,11].

As far as we know, this is the first case report of an infant with acute heart failure due to severe scorpionism where levosimendan was used when conventional support treatment failed.

## Case Report

An 11-month-old boy previously healthy, that lived 170 km away from the Children's Hospital of Santa Fe, suffered from a scorpion sting on his right foot, 4 hours before admission to our hospital. He developed inconsolable crying and vomiting, he was taken to nearby health center where he received anti-scorpion venom. The accident occurred during summer while the child was at home.

At the ED of the Children's Hospital of Santa Fe, the child had altered sensorium (GCS 14/15), pallor, grunting. HR: 146 bpm, BP: 116/86 mmHg, RR: 80 rpm, oxygen saturation 98% with mask, temperature 36°C. His general condition deteriorated, patient developed obtundation (GCS 12/15), and weak peripheral pulses (central pulse was present). So he was transferred to PICU.

The patient was attached to mechanical ventilation. Central venous and arterial lines were inserted for invasive hemodynamic monitoring and inotropic support with dobutamine and milrinone.

Laboratory data on admission: pH: 7.40, $pCO_2$: 23 mmHg, $PO_2$: 101 mmHg, $NaHCO_3$: 14.5 mmol/L, BE: -8, Hgb: 12 g/dl, WBC: 33000 (N64%/L26%), CK: 1550 IU/L, amylase level: 1489 IU/L, lactate 10 mg/dl, blood glucose 2.95 mg/dl. Chest x-ray: normal cardiothoracic index < 0.5 (CTI), congestive hilums (Figure 1). EKG: Altered repolarization (Figure 2). Echocardiogram: decreased left ventricle (LV) function, Fractional Shortening (FS) 15%. No pericardial effusion.

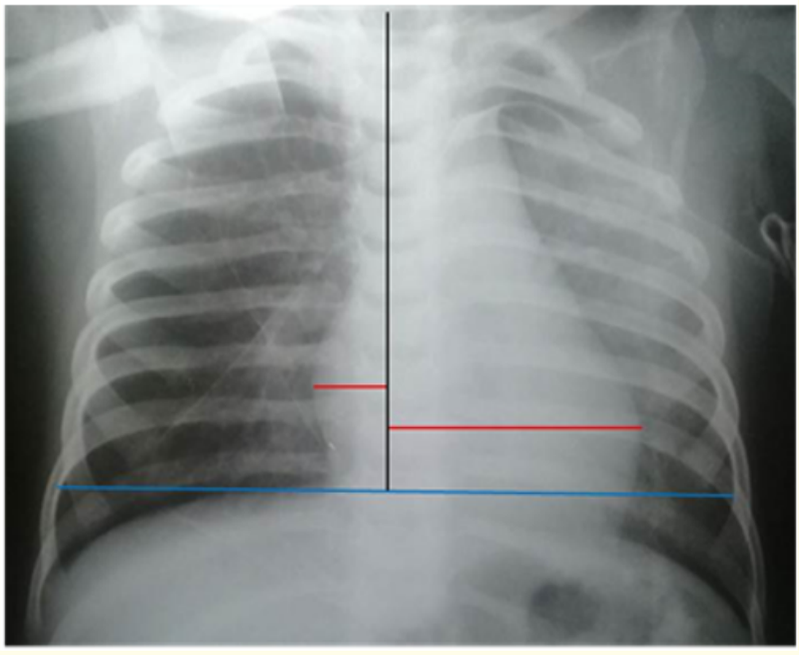

***Figure 1:*** *Chest x-ray on admisssion: CTI < 0.5 congestive hilums.*

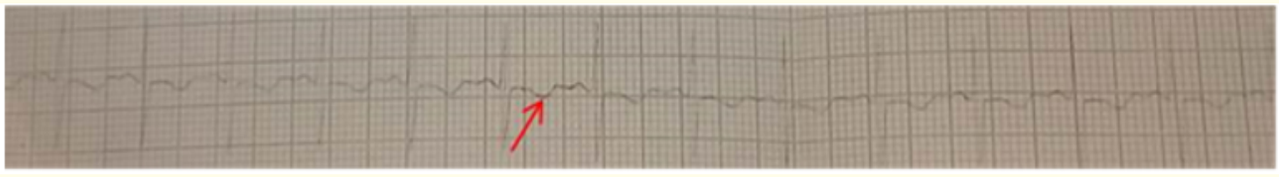

***Figure 2:*** *EKG on admission: DII, altered repolarization (red arrow).*

On day 2 in PICU, the patient remained unstable, with persistent tachycardia (180 - 200 bpm), BP: 50-77 (MAP), pallor and difficult management fever, He required high inotropic support of milirinone/dobutamine. Repeated echocardiography showed very reduced LV function (FS < 15%).

On day 3 due to refractoriness to conventional treatment, levosimendan was started at a loading dose of 6 gammas/kg in 15 minutes and maintenance of 0.1 gammas/kg/min IV. After 24 hours of levosimendan infusion we noted hemodynamic improvement, decreasing inotropic support, lactate and CK levels (Figure 3).

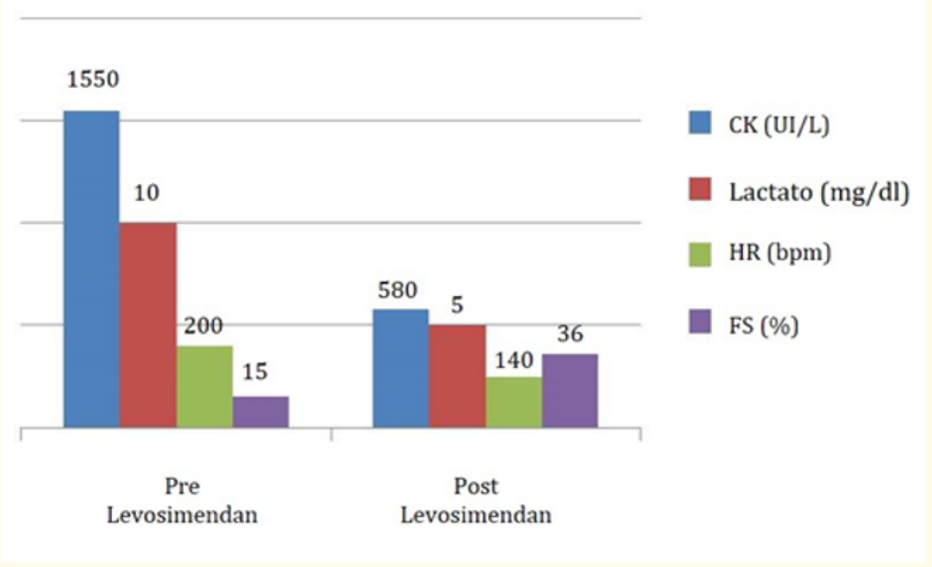


***Figure 3:*** *Bar graphic that represents the change, in a schematic way in clinical and analytical variables, pre and post levosimendan infusion.*

On day 5 of hospitalization, the echocardiographic control showed good LV function (FS36%). patient was extubated without complications and the patient transferred from PICU to pediatric ward.

## Discussion

In Argentina, reports of severe poisoning by scorpion stings have increased, with an overall mortality of 6 per 1000 registered cases. In the emergency service of our Children's Hospital of Santa Fe, in a 5 years period (2012 - 2017) were registered around 200 to 260 scorpion sting envenomation consultations per year, being mostly mild cases, with the highest incidence between the spring and summer months, all of them by *Tityus trivittatus.*

Pediatric patients are at increased risk of serious complications. A better prognosis has been observed in patients who received antivenom and were admitted to the PICU in an adequate time and manner [4,5,9].

The toxicity of scorpion venom is due to a combination of neuro and cardiotoxic peptides, among other components, which act by depolarizing voltage-gated Na and K channels, triggering a massive catecholamine discharge. Acute heart failure secondary to severe scorpionism is probably due to massive catecholaminergic, direct cytotoxic, and ischemic phenomena [2,11].

Abroug., *et al.* in Tunisia, studied a cohort of adult patients with *Androctonus australis* sting envenomation, performing echocardiography and cardiac catheterization, resulting in serious systolic and diastolic ventricular disfunction, mainly of LV objectified by reduction of fractional shortening (FS) and ejection fraction, low cardiac output and edema acute lung [6].

Hering., *et al.* in Brazil, found decrease FS with dilatation of LV and pulmonary edema in young people biting by *Tityus serrulatus* [7].

Sagarad., *et al*. in India, evaluated the use of echocardiography within 6 hours of admission to ED for scorpion stings (57% of patients were under 12 years old) and conclude that it is a useful tool in the emergency to evaluate LV function and to guide the treatment in cases of severe dysfunction [8].

Levosimendan, a positive inotropic calcium sensitizer in its binding with troponin C of the myocardium, shows lusitropic effect improving LV relaxation time and filling [13] by no increasing the myocardial O2 consumption and has been studied for its efficacy and safety in the treatment of perioperative low cardiac output syndrome in congenital heart diseases and dilated cardiomyopathy in pediatrics [10,11].

Vilaboa Pedrosa C., *et al*. in Spain, studied 32 pediatric patients in which levosimendan was used in the perioperative period of congenital heart disease, dilated cardiomyopathy and cardiogenic shock of other etiologies, considering it a safe and effective strategy in these patients [10].

Magliola R., *et al.* in Argentina, performed a prospective study in a pediatric cardiovascular intensive care unit, where infused levosimendan in 14 patients with low refractory cardiac output in the postoperative period of congenital heart disease, concluding that its use is safe and effective [11].

In our case, we indicated levosimendan on day 3 of evolution in the PICU due to cardiac failure refractory to conventional treatment with milrinone/dobutamine and markedly impaired FS, obtaining improvement in clinical and analytical variables 24h after levosimendan infusion started (Figure 3). Loading and maintenance doses were indicated as in the low postoperative cardiac output of congenital heart diseases. No significant adverse effects were obtained and the patient left PICU with normal cardiac function.

## Conclusion

Acute heart failure is a potentially fatal presentation of severe scorpionism in children. Although there are no studies that demonstrate the experience with levosimendan in these cases, given the safety and efficacy studied in other etiologies of cardiac failure in pediatrics, it can be taken into account as a therapeutic alternative when the conventional support treatment fails.

## Conflict of Interest

The authors report no conflicts of interest or funding sources.

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