

CASE REPORT

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Successful treatment of severe calcium channel blocker poisoning, new experience with the guidance of invasive hemodynamic monitoring in a 17-year-old girl: a case report

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Abstract

Background Calcium channel blocker poisoning is one of the most lethal cardiac drugs overdoses. Calcium and high-dose insulin infusion are the first-line therapy for symptomatic patients, and Intralipid emulsion infusion is useful for refractory cases.

Case presentation In this report, we describe a 17-year-old Iranian girl who took 250 mg of the drug for a suicidal attempt and presented with refractory hypotension and non-cardiogenic pulmonary edema treated successfully with the guidance of invasive hemodynamic parameters.

Conclusion For complicated cases, in addition to supportive care and adjuvant therapy such as high-dose insulin and Intralipid, it is mandatory to utilize advanced hemodynamic monitoring to treat hypotension in severe calcium channel blocker poisoning to guide the treatment.

Keywords Case report, Calcium channel blocker poisoning, Pulse contour cardiac output

Background

Serum ionized calcium has the main role in cardiovascular function. It acts via cardiac conduction, contraction, and preservation of vascular tone. Calcium channel blocker (CCB) overdose is rare but lethal in cardiovascular medication-related drug overdose [1, 2].

Conventional and unconventional interventions were used to treat an adolescent who ingested a life-threatening dose of amlodipine [2]. Still, these studies are more limited in children, mainly due to the lower prevalence of this poisoning at an early age; therefore, we inevitably use

adult studies when dealing with children referred with amlodipine poisoning.

Different treatment methods proposed for intoxication with this drug were based on amlodipine's pharmacological and clinical findings. These treatments include gastric decontamination, calcium, glucagon, intravenous lipid emulsion, high-dose insulin therapy, sodium bicarbonate, vasopressors, and methylene blue [3]. In some instances, studies have used unconventional but somewhat effective treatments, including electrical cardiac pacing and venoarterial extracorporeal membrane oxygenation (VA-ECMO) [4]. However, on the basis of the patient's condition, age, and the medical center facilities, a combination of these methods should be used. Due to the different treatment methods, the most critical part of deciding whether to continue treatment or use other treatment methods is to follow the patient's clinical response, as

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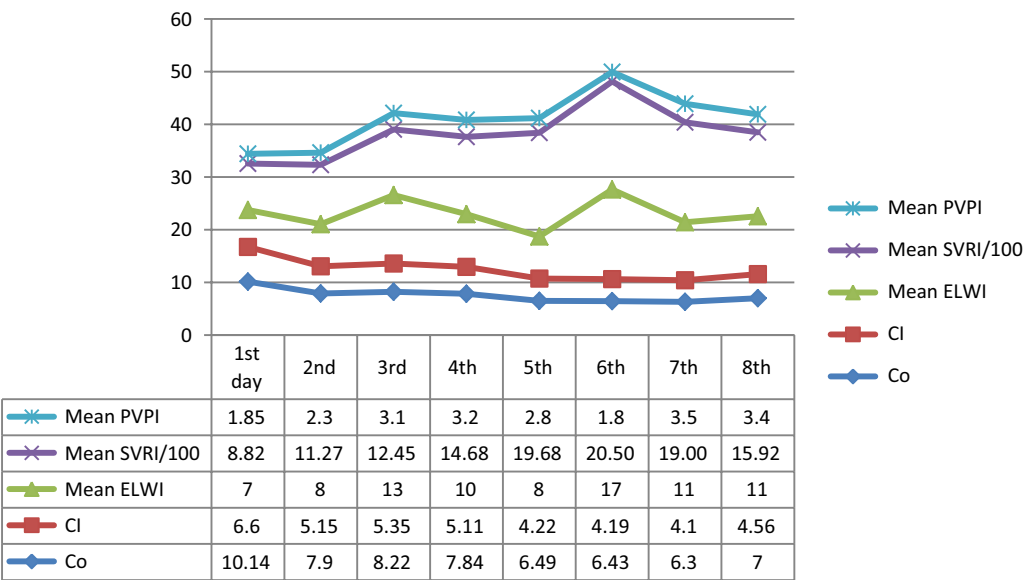


Fig. 2 Mean value of hemodynamic parameters during PICU care (PICCO analysis), *CI* cardiac index, *CO* cardiac output, *ELWI* extravascular lung water index, *PPVI* pulse pressure variation index, *SVRI* systemic vascular resistance index

we again administered Intravenous Lipid Emulsion (ILE) over 2 hours, and although it was about 26 hours after her admission, the hemodynamic parameters improved significantly (MAP and SVRI increased) (Table 1, Fig. 2); so there might be a role for delayed prescription of ILE in CCB overdose [10].

Amlodipine has a myocardial depressant effect via blocking L-type calcium channels to result in cardiogenic pulmonary edema. However, non-cardiogenic pulmonary edema also was seen in a few patients, but the mechanism of non-cardiogenic pulmonary edema is not precise. Some authors proposed that precapillary dilatation can increase pulmonary transudation and interstitial edema [11–13]. On day 3 of PICU admission, the pulmonary vascular permeability index and ELWI increased, and PaO₂ decreased, so a chest X-ray was taken to evaluate pulmonary edema. Our patient had a normal echocardiogram, and PiCCO parameters were not indicative of volume overload or cardiac function impairment (CI and CO were normal), but PVPI and EVLWI were increased, which indicated increased permeability of pulmonary vessels and interstitial edema; all data were in favor of non-cardiogenic pulmonary edema.

Hemodynamic management, hydration, and selecting the type of inotrope or vasopressor are challenging in treating CCB poisoning. We cannot solely rely on clinical data that could be misleading, so early transferring to ICU invasive hemodynamic monitoring in severe cases is vital.

In addition to supportive care and adjuvant therapy, such as high-dose insulin and Intralipid, it is

mandatory to utilize advanced hemodynamic monitoring to treat hypotension in severe CCB poisoning to guide treatment.

Abbreviations

DBP	Diastolic blood pressure
ILE	Intravenous Lipid Emulsion
AKI	Acute kidney injury
BP	Blood pressure
CCB	Calcium channel blocker
CI	Cardiac index
CVP	Central venous pressure
ER	Emergency room
EVLWI	Extravascular lung water index
GCS	Glasgow Coma Scale
GEDI	Global end-diastolic index
GEDV	Global end-diastolic volume
GEF	Global ejection fraction
HR	Heart rate
ITBI	Intrathoracic blood volume index
ITBV	Intrathoracic blood volume
MAP	Mean arterial blood pressure
PiCCO	Pulse contour cardiac output
PICU	Pediatric intensive care unit
PPV	Pulse pressure variation
PPVI	Pulse pressure variation index
SBP	Systolic blood pressure
SCvO ₂	Central venous oxygen saturation
SSV	Stroke volume variation
SVRI	Systemic vascular resistance
SVV	Stroke volume variation
VA-ECMO	Venoarterial extracorporeal membrane oxygenation

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