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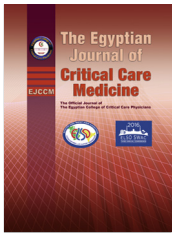

CASE REPORT

Successful use of ECLS in cardiopulmonary failure due to aluminum phosphide poising

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Abstract The use of ECLS in the treatment of poisoned patients has been recently reviewed by de Lange et al. [1], but a case of aluminum phosphide poising supported by ECLS has not been described yet.

We want to report a successful support with ECLS in a 6 year old child with severe cardiovascular failure due to aluminum phosphide poising

1. Introduction

Aluminum phosphide (AlP) is a commonly used pesticide because it is cheap and very effective. But it is also one of the most common causes of poisoning among agricultural pesticides. A lethal phosphine gas liberates when it comes in contact either with atmospheric moisture or with hydrochloric acid in the stomach and no effective antidote is existing. The mechanism of toxicity includes cellular hypoxia due to the effect on mitochondria, inhibition of cytochrome C oxidase and formation of highly reactive hydroxyl radicals [2–4]. The signs and symptoms are nonspecific and instantaneous. The toxicity of AlP particularly affects the cardiac and vascular tissues, which manifest as profound and refractory hypotension, congestive heart failure and electrocardiographic abnormalities [5,6]. The diagnosis of AlP usually depends on clinical suspicion or history and the management remains primarily supportive care. Early arrival, resuscitation, diagnosis, decrease the exposure of poison (by gastric lavage with $KMnO_4$, coconut oil), intensive monitoring and supportive therapy may result in good outcome. Prompt and adequate cardiovascular support is important and core in the management to attain adequate tissue perfusion, oxygenation and physiologic metabolic milieu compatible with life until the tissue poison levels are reduced and spontaneous circulation is restored. The use of IABP has been described [7,8], but not the possibility of ECLS.

2. Case report

We admitted a 6 year old boy, (28.6 kg) from another hospital with no tertiary care facilities for pediatrics showing rapid

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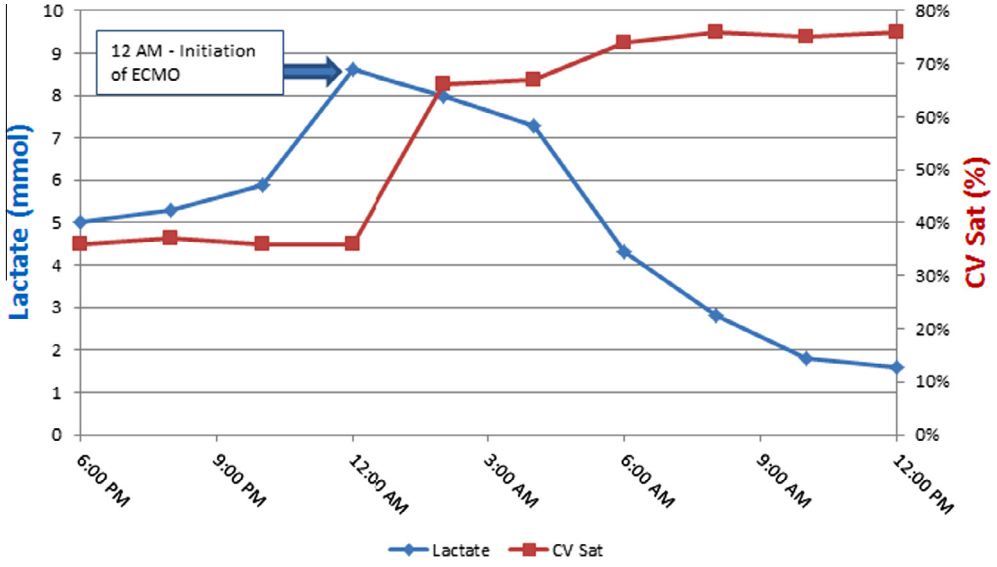
deterioration in his clinical condition after a 1 day history of vomiting and dehydration. The whole family showed similar symptoms, the older sister died before transferring her to our facility and the mother was commenced on IABP.

On arrival the child was on a non-rebreather facemask achieving Oxygen saturation of low 90's and already on inotropic support with Norepinephrine 0.1 mcg/kg/min and Dobutamin 5 mcg/kg/min. The blood gas showed a respiratory compensated metabolic acidosis and the ECHO done revealed an Ejection fraction of 15% with elevated Lactate of 5. We intubated the patient and added additional support with Epinephrine due to further hemodynamic deterioration. As conservative management did not show any improvement we commenced the boy on VA ECMO via neck cannulation (Maquet, Cardiohelp, Rotassist Set 2.8 and Qaudrox iD).

Indications for the ECMO support according to our institution were met as this is a cause of reversible cause of cardiopulmonary failure, poor central venous Saturation with 36%, EF of 15% despite inotropic support and rising lactate levels.

VA ECMO mode was chosen to support cardiac and pulmonary function. 100% ECMO support in this age group is calculated with 100 ml/kg/min = 2.8 l/min. Due to cannula size we were only able to achieve a flow of around 1.66 l/min which equals to 60% support. The lactate levels improved to normal within 8 h and the central venous saturation monitored remained above 70% shortly after the initiation of the ECMO (picture).



Due to acute kidney failure with elevated Creatine and Urea and low urine output we as well started RRT with CVHD via the ECMO circuit which was continued for 3 days on ECMO support before Kidney function improved again and CRRT could be stopped on ongoing ECMO support.

4 days after the initiation of ECMO support we phased one episode of malignant arrhythmia (Torsade de points) which required defibrillation and Amiodarone bolus plus continuous infusion. This episode lasted 20 min before a junctional rhythm could be restored and another 10 min until a sinus rhythm was established again. During the episode perfusion could be maintained by ECMO support.

The following days ECMO support was gradually weaned to 30% while close monitoring Ejection fraction, end-organ perfusion and central venous saturation (continuous monitoring on ECMO machine).

11 days after ECMO initiation we could successfully decannulate the patient from ECMO and on day 12 we were able to extubate the young boy.

10 days later the child was discharge from the hospital. The outcome findings on discharge were as follows

Neurologically: left sided hemiplegia, MRI showed a hemorrhagic infarction in the territory of the Right Middle Cerebral artery. MRA shows no evidence of dissection, stenosis or occlusion of the arteries which can be associated with ECMO cannulation.

The infarction can be a result of the cardiovascular collapse or atrial fibrillation or other cardiac pathology and symptoms associated with the sequelae of Aluminum phosphorus poisoning.

Cardiovascular: the ejection fraction improved to 70% on day 14 after ECMO initiation and remained there until hospital discharge. No antiarrhythmic medication was required at the time of discharge; the child left the hospital with being on Furosemide and Spironolactone.

Renal: renal parameters were in normal limits at the time of discharge.

3. Discussion

Guidelines for ECMO indications are clearly recommended by the ELSO Community, especially for pulmonary support. Wider use of ECLS in the sense of extended CPR becomes more famous in the western world as well, but so far there are very limited reports and even less recommendation of the use of ECLS in special situation occurring in the middle eastern/Asian World, such as Myocarditis due to Scorpion stings, Snake bites or supporting patients post poisoning. ARDS secondary to Malaria, Tuberculosis, Typhus, Dengue and other newer varieties of viral pneumonias offers exciting opportunities for the applications of this life-saving modality.

The recent creation of the South and West Asia Chapter of the ELSO as well as collection of data/case reports like ours will help the development of guidelines and recommendations which patient do benefit from initiation of ECLS as the courses of the initial cardiovascular or pulmonary failure are reversible and a good outcome can be expected.

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