Treatment of boric acid poisoning in two infants with Continuous Venovenous Hemodialysis (CVVHD)

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Boric acid poisoning in children is a relatively frequent single-substance intoxication mainly concerning children younger 5 years of age. It has a low volume of distribution and, after oral ingestion, it is rapidly absorbed and distributed throughout body water, with highest concentrations in brain and liver; more than 90% is excreted unchanged by the kidneys with a mean half-life of 21 hours.

The symptoms can appear after several hours: they generally consist of gastrointestinal disorders, dehydration, erythrodermic rash and neurological impairment. There is not a correlation between blood levels, clinical appearance and prognosis. In severe cases of intoxication death can occur one to several days after the onset of symptoms, caused by shock, renal failure or neurological complications.

Treatment consists of rapid elimination of the absorbed substance, but treatment of choice is still controversial. Dialysis is part of the available elimination techniques for the chemical-physical characteristic of boric acid.

We reported two cases of boric acid intoxication after accidental ingestion of milk formula prepared by an aqueous saturated solution. Both patients were treated with Continuous Venovenous Hemodialysis (CVVHD).

**Case 1**

A 5.5 kg three-old-month infant, referred to our Pediatric Intensive Care Unit (PICU) 9 hours after accidental ingestion of 3.6 g of boric acid with moderate dehydration, tachycardia, tachypnea, and anuria. After rehydration, in consideration of persistent oliguria and the elevated amount of toxic ingested, CVVHD was started 14 hours after boric acid ingestion and performed for 36 hours. It resulted in elimination of 767.4 mg of boric acid in the dialysate (mean kₜ: 28.8 mL/min or 167.5 mL/min/1.73 m²) and a decrease in serum boric acid levels from 257 to 2.1 micrograms/mL.

**Case 2**

A 3.5 kg 40-day-old infant was transferred to our PICU 12 hours after last ingestion of boric acid, wrongly administered in the milk for 3 consecutive meals (approximately 9 g) in the previous 24 hours. She vomited immediately after the third ingestion and moderate dehydration with acidosis was reported. Patient was treated with intravenous fluids to obtain hyperhydration and induce forced diuresis. In this case, CVVHD was started approximately 21 hours after the last meal and it was continued for 38 hours, with a boric acid elimination in the dialysate of 213.9 mg (mean kₜ: 15.1 mL/min or 130.7 mL/min/1.73 m²) and a reduction of blood levels from 171.8 to 4 micrograms/mL.

In both cases it was not possible to determine the total amount of boric acid excreted by urine. However, the contribution of dialysis to boric acid elimination is to be considered elevated, given the high clearance. It resulted in an important decrease of potentially dangerous blood levels of boric acid.

The patients were discharged from the PICU on 7th and 9th day of hospitalization without important clinical sequalae.

In conclusion, CVVHD is a suitable and efficient elimination technique in infants intoxicated with boric acid.