Acute Kidney Injury with Hyperlactatemia: Clues to a Hidden Problem

Lesão Renal Aguda com Hiperlactacidemia: Pistas para um Problema Escondido

Keywords: Acute Kidney Injury; Adolescent; Ethylene Glycol/poisoning; Hyperlactatemia; Suicide, Attempted
Palavras-chave: Adolescente; Etilenoglicol/envenenamento; Hiperlactacidemia; Lesão Renal Aguda; Tentativa de Suicídio

Intoxications in children are usually unintentional ingestions. When faced with altered mental status and an incongruent medical history a high degree of suspicion is warranted when investigating a possible intended intoxication.

We present a case of an adolescent male, previously healthy, who presented to the pediatric emergency department with a 12-hour history of headache, abdominal pain, vomiting, lethargy, confusion and altered speech. The physical examination revealed depressed mental status with confused and unintelligible speech, tachypnea, hypertension (144/92 mmHg) and tachycardia (128 beats/minute).

Laboratory evaluation (Table 1) showed acute kidney injury (AKI), severe hyperkalemia, hyperphosphatemia, hypermagnesemia and severe high anion gap metabolic acidosis (pH 7.04, pCO₂ 15.4 mmHg, HCO₃⁻ 7.4 mmol/L, base excess -24.7 mmol/L, anion gap 37 mmol/L) with hyperlactatemia (268 mg/dL). Common toxicological tests were negative. Emergent treatment was immediately started with improvement of potassium levels and metabolic acidosis (pH 7.31, HCO₃⁻ 16.7, base excess -11.4, lactate 208 mg/dL), and stable urine output (33 mL/h) and serum creatinine levels.

The AKI investigation revealed calcium oxalate crystals on urinalysis, diffuse increased cortical echogenicity and increased cortical-medullary differentiation on renal ultrasound and crystal nephropathy on the renal biopsy. The patient consistently denied having ingested any toxic substances but further investigation revealed social isolation and depression in the previous months, and a suspicious pink fluid found in his bedroom that was revealed to be ethylene glycol. Ultimately, he confessed to having drunk 250 mL of antifreeze fluid with suicidal intent.

On day two, due to worsening renal function (serum creatinine 7.27 mg/dL), he underwent dialysis. Further investigation revealed the presence of calcium oxalate crystals in the renal biopsy, confirming the diagnosis of ethylene glycol poisoning.

Table 1 – Laboratory evaluation at hospital admission and subsequent 24-hour evolution

<table>
<thead>
<tr>
<th></th>
<th>At admission</th>
<th>3-hours after admission</th>
<th>24-hours after admission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemoglobin (g/dL)</td>
<td>18.6</td>
<td>17.4</td>
<td>13.8</td>
</tr>
<tr>
<td>Leucocytes (µL)</td>
<td>43 500</td>
<td>47 400</td>
<td>18 800</td>
</tr>
<tr>
<td>Creatinine (mg/dL)</td>
<td>2.00</td>
<td>3.62</td>
<td>7.27</td>
</tr>
<tr>
<td>Urea (mg/dL)</td>
<td>63</td>
<td>87</td>
<td>160</td>
</tr>
<tr>
<td>Potassium (mmol/L)</td>
<td>6.5</td>
<td>8.1</td>
<td>4.1</td>
</tr>
<tr>
<td>Sodium (mmol/L)</td>
<td>144</td>
<td>140</td>
<td>147</td>
</tr>
<tr>
<td>Chloride (mmol/L)</td>
<td>109</td>
<td>110</td>
<td>105</td>
</tr>
<tr>
<td>Phosphate (mg/dL)</td>
<td>5.6</td>
<td>5.5</td>
<td>6.7</td>
</tr>
<tr>
<td>Magnesium (mg/dL)</td>
<td>2.3</td>
<td>2.5</td>
<td>2.4</td>
</tr>
<tr>
<td>Serum osmolality (mOsm/kg)</td>
<td>-</td>
<td>296</td>
<td>-</td>
</tr>
</tbody>
</table>
When intoxication was confirmed, given the time of ingestion, the first treatment option would be fomepizole, which blocks alcohol dehydrogenase, which is responsible for the metabolism of ethylene glycol (half-life of three to nine hours). Another option would be ethanol, whose affinity is 100 times higher for alcohol dehydrogenase compared to ethylene glycol. Whenever there is renal failure, severe metabolic acidosis, severe electrolyte imbalance, very high ethylene glycol concentrations (> 50 mg/dL) and an osmolar gap above 10 mOsm/L, acute renal replacement therapy (hemodyalisis or hemofiltration) must be initiated.

In our case, continuous veno-venous hemodiafiltration was the more readily available treatment option when intoxication was confirmed, given the time of ingestion. Therefore, it is extremely important to promptly initiate adequate treatment to achieve a favourable outcome.

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PREVIOUS AWARDS AND PRESENTATIONS

This case was presented at the 22nd National Congress of Pediatrics from October 26th to 28th of 2022, in Porto, Portugal.

AUTHOR CONTRIBUTIONS

SIA, SO: Design and conception of the work.
EM, FA: Critical review of the work.

PROTECTION OF HUMANS AND ANIMALS

The authors declare that the procedures were followed according to the regulations established by the Clinical Research and Ethics Committee and to the Helsinki Declaration of the World Medical Association updated in 2013.

PATIENT CONSENT

Obtained.

COMPETING INTERESTS

The authors have declared that no competing interests exist.

REFERENCES


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