Ethylene Glycol Poisoning Complicated by Cerebral Edema - Is Hemodialysis Safe?

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Background

Hemodialysis (HD) is crucial treatment for severe ethylene glycol (EG) poisoning. EG toxicity is also associated with cerebral edema. We present a patient with severe EG toxicity who had evidence of cerebral edema and received HD, with a poor outcome.

Case presentation

- 17-year-old male presented unresponsive, last seen well 19 hours prior.
- Initial Vitals: T 36.2C, HR 101, RR 29, BP 145/97, SpO2 98% on RA
- PE: Dry mucus membranes, GCS 8, no focal deficits.
- Initial labs: pH 6.90, HCO_3 <10 mEq/L, pCO_2 18 mmHg, K 6.6 mEq/L, Cr 1.81 mg/dL, and osmolar gap 42 mOsm/kg.
- A lactate gap was noted: VBG lactate >16 mmol/L, serum lactate 3.3 mmol/L. CT head was unremarkable.
- He was intubated, given calcium gluconate, insulin/dextrose and started on bicarbonate infusion
- Transferred to a tertiary care facility.

Figure 1

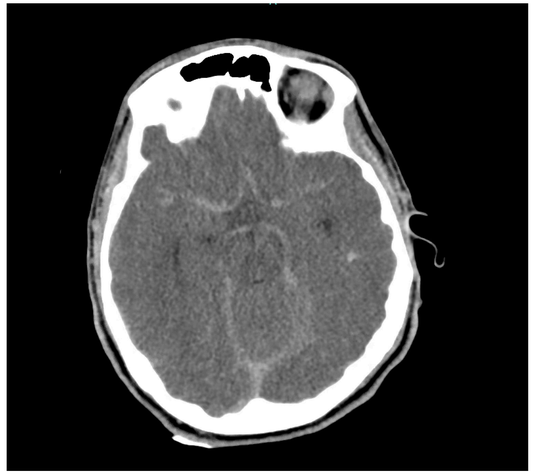

Figure 1: Head CT prior to initiation of HD. Shows global effacement of cerebral sulci and basal cisterns, concerning for cerebral edema and elevated ICP.

Figure 2

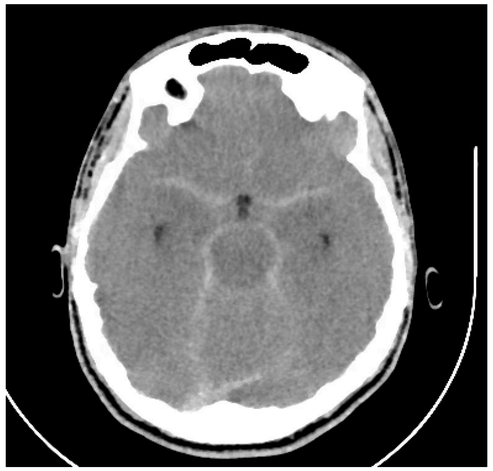

Figure 2: Head CT post arrest showing pseudosubarachnoid hemorrhage, indicative of worsening cerebral edema, elevated ICP, and hypoxic injury, no definitive herniation.

Hospital Course

- Patient's clinical and laboratory picture suggested EG toxicity.
- Therapy was initiated with fomepizole, thiamine, and pyridoxine; nephrology was consulted for urgent HD.
- Repeat head CT ~38 hours after last seen well showed global effacement of cerebral sulci and basal cisterns, concerning for cerebral edema (Figure 1).
- Hypertonic saline was added to bicarbonate infusion and HD was initiated ~41 hours after last seen well.
- Approximately 20-30 minutes after initiation of HD, patient became hypertensive to 200s/100s and HR dropped from 110s to 70s.
- Pupils were dilated and non-reactive, prompting concern for herniation. Patient became pulseless with asystole.
- After 10 minutes, ROSC achieved after epinephrine, lidocaine, calcium, and mannitol.
- Repeat head CT (Figure 2) with pseudosubarachnoid hemorrhage, worsening cerebral edema, no definitive herniation.
- Post-arrest, patient had no cough or gag; pupils remained fixed and dilated.
- Family ultimately decided to withdraw care and patient passed away.
- After five days, EG level resulted 59.1 mg/dL, drawn ~27 hours after last seen well.

Discussion

- HD can exacerbate cerebral edema through dialysis disequilibrium syndrome caused by rapid removal of urea.
- Additionally, a rapid rise in serum pH with HD can cause a paradoxical increase in intracellular acidosis, worsening cerebral edema.
- However, HD is the treatment of choice for severe EG toxicity and can be lifesaving.
- In this case, the patient's decompensation may have been related to worsening cerebral edema.
- Further investigation is needed regarding the use of HD in poisoned patients with cerebral edema.