Introduction

- Extreme metabolic alkalosis (EMA) is rarely encountered acid-base disturbance with a high mortality rate.\(^1\)
- Optimal management is challenging and the upper limit of human pH tolerance remains controversial.

Case Presentation

HPI:
- A 47-year-old female with metastatic ovarian cancer complicated by a small bowel obstruction received a palliative venting gastrostomy tube.
- She presented to the Emergency Room one week later with intractable nausea and vomiting and reported severe anxiety and diffuse muscle spasms.

Past Medical History:
- BRCA1+ metastatic ovarian cancer s/p hyperthermic intraperitoneal chemotherapy
- Malignant small bowel obstruction
- Pelvic deep vein thrombosis

Past Surgical History:
- Total abdominal hysterectomy/
- Omentectomy

Vitals/Exam:
- Afebrile, HR 89, BP 78/47, RR 22, SpO2 100% on room air.

Hospital Course

- Severe hypokalemia, hypochloremia, and metabolic alkalosis were noted on initial chemistries and ABG.
- Intravenous potassium and fluid resuscitation were initiated. Three liters of normal saline were given to attempt induction of a hyperchloremic metabolic acidosis and correct the profound hypochloremia.
- Shortly thereafter, the patient became unresponsive and was found to have pulseless electrical activity.
- Return of spontaneous circulation was achieved after one round of CPR without defibrillation and she was neurologically intact.
- Nephrology was consulted and the decision to initiate corrective intravenous acid therapy was made. Hydrochloric acid was unavailable on hospital formulary; thus, arginine hydrochloride infusion, 150 mEq over 30 minutes, was initiated.
- Multiple doses of lorazepam and fentanyl were simultaneously administered to address the respiratory alkalosis caused by the patient’s anxiety and atypical hyperventilation.
- After six hours of acid infusion, repeat venous blood gas analysis noted pH=7.48, pCO2=63 mmHg, and bicarbonate=47 mmol/L. A repeat laboratory analysis demonstrated normalization of her potassium to 4.6 mmol/L.

Clinical Follow Up

- After our patient’s metabolic derangements were stabilized, additional history revealed she had misunderstood her previous discharge instructions and vented her gastrostomy tube up to five times daily before readmission.
- Subsequently, palliative care was consulted and our patient was discharged from the hospital two days later on home hospice.

Discussion

- Metabolic alkalosis occurs due to decreased bicarbonate excretion, an increase in bicarbonate production, or H\(^+\) ion loss.\(^1\)
- Diuretic use and loss of chloride-rich gastric acid are common etiologies.\(^1,2\)
- EMA is typically characterized by neuromuscular irritability, hypoventilation, seizures, and fatal cardiac arrhythmias associated with a markedly elevated serum bicarbonate.\(^2\)
- Assessment of volume status and hypochloremia guide the decision to trial intravenous fluid replacement.\(^1,2\)
- Rare cases of survival have been documented in patients presenting with an arterial pH approximating 7.9.\(^1,2\)
- Alkalosis severity correlates strongly with prognosis; mortality is nearly 45% when arterial pH exceeds 7.55 and 80% when the pH exceeds 7.65.\(^3\)

Teaching Points

- Assessment for and correction of underlying hypovolemia is essential to EMA treatment.
- Intravenous acid therapy is a safe and effective adjunctive method to correct EMA. Its use is warranted if end-organ manifestations are observed and rapid reversal is desired.
- Effective patient-physician communication remains one of the most crucial but underutilized means of prevention.

References