

Baking Soda Pica Causing Ventricular Fibrillation

Chenxi Song, MD; Nathan Hitzeman, MD
Sutter Health Family Medicine Residency Program

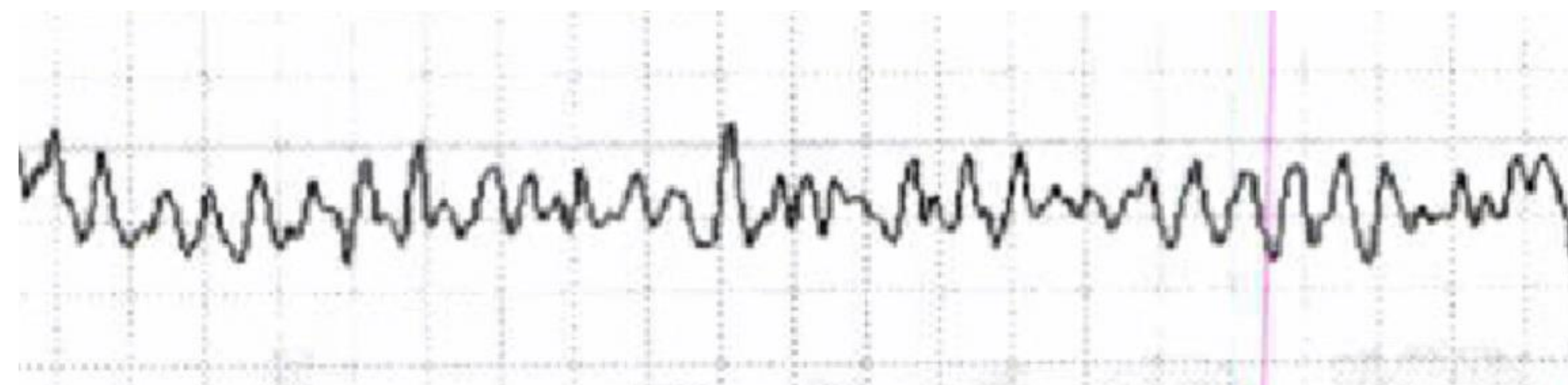
Introduction

Pica is the repeated ingestion of nonfood substances. Examples include ice, starch, and baking soda. Although baking soda is a common household item, if taken in excess, it can cause severe metabolic derangements and lead to adverse outcomes. Presented here is a patient who experienced ventricular fibrillation due to hypokalemia secondary to baking soda pica.

Case Presentation

A 37-year-old woman was brought to the hospital following cardiac arrest. She had been pulled over by the police for driving inappropriately on the road, and then she suddenly became unresponsive.

Upon EMS arrival, she was found to be in ventricular fibrillation and managed per ACLS protocol with subsequent return of spontaneous circulation. Downtime was approximately 20 minutes. She was intubated and transferred to the hospital.

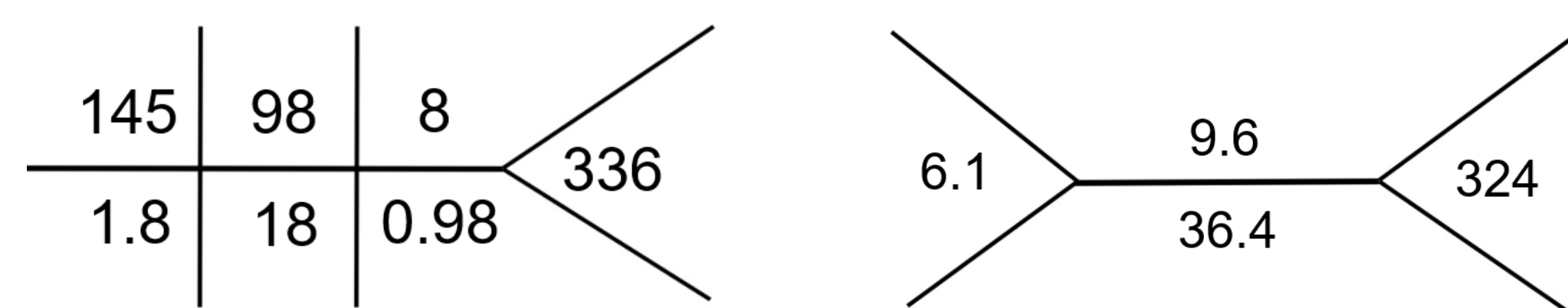


Patient's EKG from EMS report showed ventricular fibrillation.

Initial physical exam was notable for

- Vitals: BP 116/69, HR 91, T 96.6 F, RR 27, SpO₂ 99% on 100% FiO₂
- Neurological exam: pupils 4mm and nonreactive. Cough and gag reflexes present. Mild withdrawal to pain. Glasgow Coma Scale 3.

Pertinent admission laboratory and imaging results are shown below.



Arterial Blood Gas
Patient on 100% FiO₂

| | |
|-------------------------------|------------|
| pH | 6.96 |
| P _{CO2} | 43.2 mmHg |
| P _{O2} | 271.6 mmHg |
| HCO ₃ ⁻ | 9.6 mmol/L |

Magnesium 2.2 mg/dL

Lactate 22.7 mmol/L

Urine toxicology positive for
• Benzodiazepine
• Opiates

Blood alcohol level <10 mg/dL

Chest X-ray, CT brain and cervical spine did not show notable abnormalities.

EEG did not show evidence of clinical or subclinical seizures.

Hospital Course

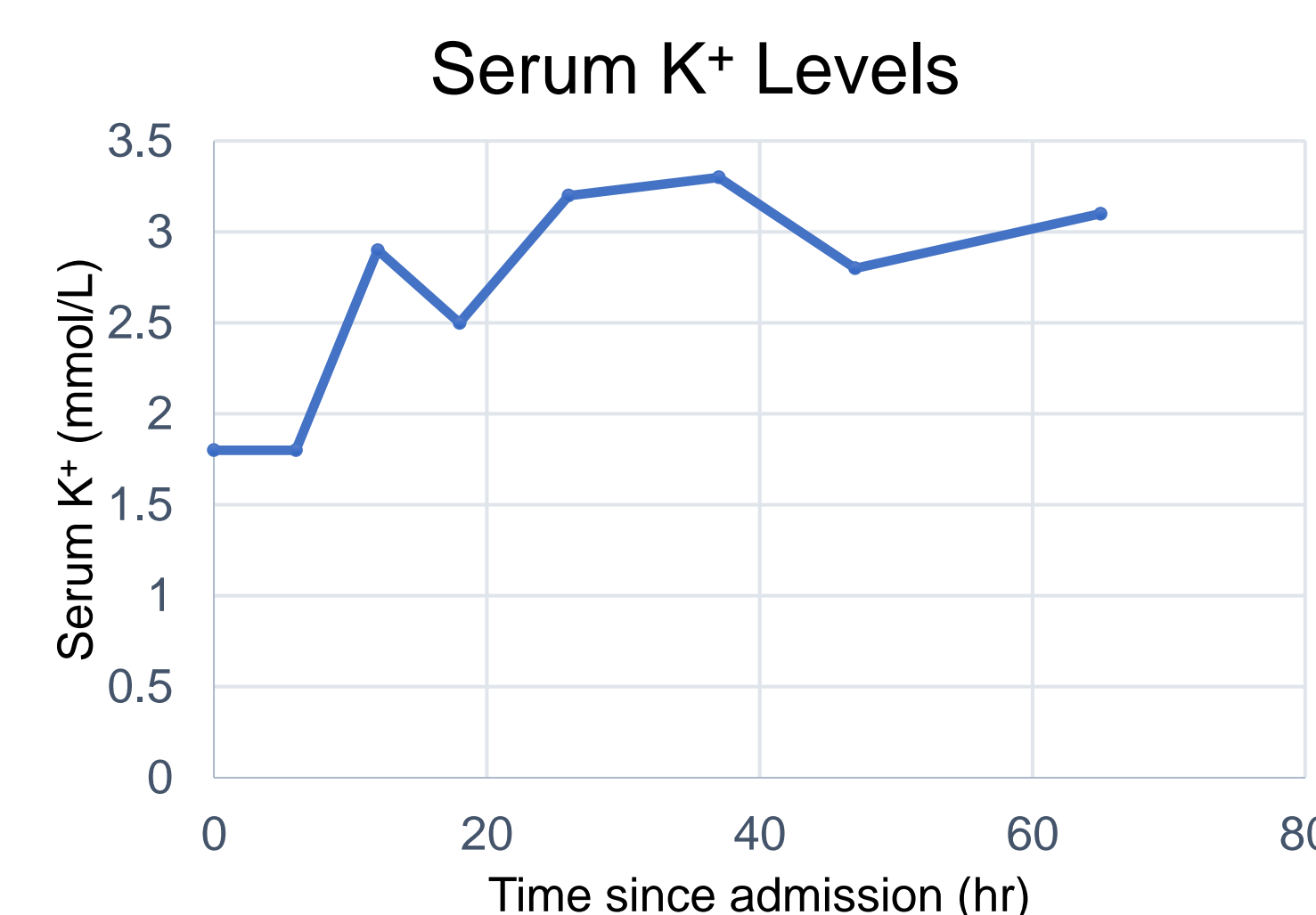
The patient's cardiac arrest was attributed to her low potassium of 1.8 mmol/L. She was placed on cardiac monitoring and started on potassium repletion. Her clinical status improved, and she was extubated on hospital day 2. A repeat arterial blood gas showed improvement in her acid-base status but mild metabolic alkalosis. During workup for her hypokalemia, it was discovered that the patient had been ingesting an abundance of baking soda for years.

The patient began ingesting baking soda 11 years ago during her second pregnancy. She was found to have iron-deficiency anemia at that time, and iron supplements helped with cravings. She had ingested baking soda intermittently since then and began to ingest large quantities during her most recent pregnancy one year ago and continued to do so postpartum. At the time of her cardiac arrest, she was consuming half a can of baking soda daily. Of note, the patient was found to have normocytic anemia during hospitalization. Workup including iron, folate, and vitamin B₁₂ levels were all within normal limits.

Medical history is notable for a history of depression and polysubstance use. The patient denied taking medications or attempting overdose on the day of the event. Family history is notable for several relatives who use baking soda regularly for heartburn.

After an extensive discussion with the patient regarding the cause for her cardiac arrest, the patient expressed that she would stop ingesting baking soda in the future.

The patient's hypokalemia improved with repletion, and she did not have any additional arrhythmias during hospitalization. On hospital day 4, the patient left the hospital against medical advice.



The patient's serum potassium gradually improved during her hospitalization.

Arterial Blood Gas
Patient on 2L O₂

| | |
|-------------------------------|-------------|
| pH | 7.472 |
| P _{CO2} | 39.7 mmHg |
| P _{O2} | 97.4 mmHg |
| HCO ₃ ⁻ | 27.9 mmol/L |

Arterial blood gas on hospital day 2 showed mild metabolic alkalosis.



Discussion

Pica, the persistent ingestion of non-nutritive substances, is often associated with anemia and pregnancy^{1,2}. The patient presented in this case has those risk factors. Additionally, having family members who regularly ingest baking soda might have played a role in normalizing this behavior.

Baking soda contains a significant amount of sodium and bicarbonate. When consumed in large quantities, it can lead to metabolic derangements including hypernatremia, hypokalemia, and metabolic alkalosis, causing cardiac, respiratory, and neurologic events^{3,4}.

Metabolic alkalosis is usually seen when the kidneys are unable to adequately excrete excessive bicarbonate. The patient in this case presented with anion gap metabolic acidosis due to the cardiac arrest she had experienced prior to admission. She demonstrated metabolic alkalosis upon returning to baseline on hospital day 2, suggesting that even though her renal function was normal, she still had metabolic alkalosis secondary to chronic and significant baking soda ingestion.

Hypokalemia, the most common serious complication of baking soda intoxication, is due to the combined effect of alkalosis causing intracellular shift of potassium and bicarbonate diuresis leading to potassium loss⁵. Hypokalemia can cause significant QT prolongation which increases the risk of torsade de pointes, ventricular fibrillation, and sudden cardiac death. In this patient, severe hypokalemia led to ventricular fibrillation.

It is important for physicians to screen for and educate patients about pica, as patients may not always be aware of its deleterious effects. Family physicians have the advantage of developing long-term relationships with patients and are well suited to identify behaviors such as pica. It may be beneficial to inquire about pica during prenatal care and evaluation for anemia. A thorough medical, family, and social history, along with continued patient education and support, improves patient care and prevents adverse outcomes.

Acknowledgment

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References

- Corbett RW, Ryan C, Weinrich SP. Pica in pregnancy: does it affect pregnancy outcomes. MCN Am J Matern Child Nurs. 2003;28(3):183-191.
- Lumish RA, Young SL, Lee S, et al. Gestational iron deficiency is associated with pica behaviors in adolescents. J Nutr. 2014;144(10):1533-1539.
- Hailemariam F, Finn V, Betancourt B, et al. Severe metabolic alkalosis from acute baking soda ingestion presenting with acute respiratory failure and ischemic stroke. Emergency Medicine: Open Access. 2018;8(1).
- Scolari Childress KM, Myles T. Baking soda pica associated with rhabdomyolysis and cardiomyopathy in pregnancy. Obstet Gynecol. 2013;122(2):495-497.
- Al-Abri SA, Olson KR. Baking soda can settle the stomach but upset the heart: case files of the Medical Toxicology Fellowship at the University of California, San Francisco. J Med Toxicol. 2013;9(3):255-258.