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Hypercalcemic crisis resulting from near drowning in an indoor public bath

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Patient: Male, 66
Final Diagnosis: Hypercalcemic crisis
Symptoms: Near drowning state
Medication: —
Clinical Procedure: —
Specialty: Critical care medicine

Objective: Challenging differential diagnosis

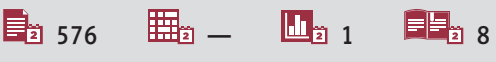
Background: Hypercalcemic crisis, generally caused by malignancy or primary hyperparathyroidism, is a life-threatening emergency that can result in multi-organ failure. Lowering the patient's calcium level immediately and determining the correct etiology are essential.

Case Report: We report a case of hypercalcemic crisis with a novel etiology. A 66-year-old male presented to the emergency room in cardiac arrest with a ventricular arrhythmia after being discovered submerged in an indoor public bath. He underwent cardioversion and was emergently intubated. Computed tomography showed bilateral pulmonary edema, suspected from water aspiration. Laboratory data revealed severe hypercalcemia and mild hypernatremia. Following three days of continuous hemodiafiltration, serum Ca decreased to and remained within normal limits. We concluded the etiology of hypercalcemia was absorption of Ca resulting from aspirated water.

Conclusions: Near drowning can be a cause of hypercalcemic crisis. For cases of near drowning, it is important to investigate the source of the aspirated water and consider electrolyte abnormalities in the diagnosis.

Key words: hypercalcemia • near-drowning • emergency • hot springs

Full-text PDF: http://www.amjcaserep.com/download/index/idArt/889279



Bakcground

Hypercalcemic crisis, generally caused by malignancy or primary hyperparathyroidism, is a life-threatening emergency that can result in multi-organ failure. Lowering the patient's calcium (Ca) level immediately on presentation and determining the correct etiology are essential.

Case Report

A 66-year-old male with a history of alcoholism presented to the emergency room in cardiac arrest with a ventricular arrhythmia after being discovered submerged in an indoor public bath while under the influence of alcohol. He underwent cardioversion twice in the ambulance. On arrival, he was unconscious. His blood pressure was 157/68 mmHg and oxygen saturation was 74% while breathing oxygen at 10 L/minute through a reservoir mask. He was emergently intubated. Electrocardiogram revealed bradycardia at 30 to 40 beats per minute.

Computed tomography (CT) showed bilateral pulmonary edema, suspected from water aspiration (Figure 1). Laboratory data revealed severe hypercalcemia and mild hypernatremia. The serum level of sodium (Na) was 149 mmol/L, potassium 2.6 mmol/L, albumin-corrected total Ca 5.7 mmol/L, ionized Ca 2.84 mmol/L, and phosphate 1.03 mmol/L. Urinary Ca excretion was 2.0 mmol/mmol creatinine, and phosphate excretion was 0.0 mmol/L.

Following three days of continuous hemodiafiltration, serum Ca decreased to and remained within normal limits. His mental state and respiratory status improved, and bradycardia did not recur.

We investigated the cause of the hypercalcemia. The patient had no diagnosed history of hypercalcemia and was not currently taking any medications or vitamin D. Laboratory tests revealed intact parathyroid hormone (PTH) was suppressed (1.2 pmol/mL), PTH-related peptide was undetectable, 1,25-dihydroxyvitamin D_3 was within normal limits (69.8 pmol/L). Tumor markers did not elevated. A whole body CT did not reveal any malignancies or bone metastases. We determined that malignancy-associated hypercalcemia and primary hyperparathyroidism were unlikely. Further investigation revealed that the indoor public bath contained natural spring water with a Ca concentration of 102.3 mmol/L and Na of 234.9 mmol/L, a substantially high level in Japan. We concluded the etiology of hypercalcemia was absorption of Ca resulting from aspirated water.

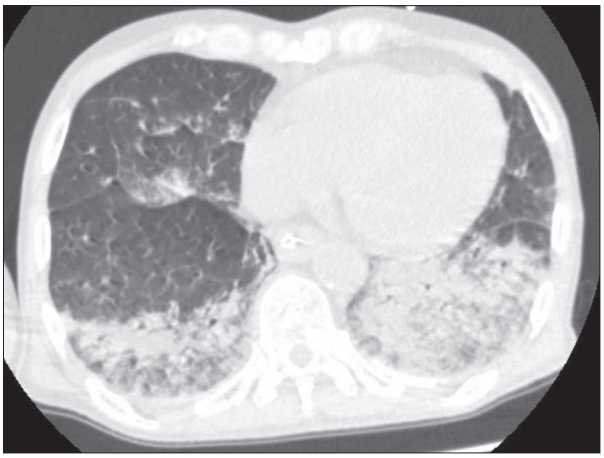


Figure 1. Computed tomography (CT) at admission revealed bilateral pulmonary edema.

Discussion

In cases of near drowning, electrolyte abnormalities are unusual even in the sea, and subsequent hypercalcemia is rare [1]. However, several authors have reported severe hypercalcemia resulting from near drowning in the Dead Sea, which contains an extremely high concentration of minerals (approximately 400 mmol/L of Ca) [2–4]. Machi et al. described a case of hypercalcemia resulting from aspiration rather than swallowing at an outdoor public bath [5]. In our case, the Ca concentration at the site of the near drowning was approximately four times higher than that of Machi et al.

The biological properties of the lung, including the large surface area of the alveolar epithelium and the short distances involved in gas exchange, result in rapid absorption of external agents [6]. Further, a study of acute oral Ca loading in healthy volunteers did not cause overt hypercalcemia [7]. Thus, based on the evidence, we determined that hypercalcemia was caused by not gastrointestinal absorption but alveolar absorption.

According to the World Health Organization, the number of deaths resulting from drowning in Japan is markedly higher than in other advanced countries [8].

In a country with a strong culture of regular bathing, drowning in baths, especially among the elderly, is a major contributing factor. Although electrolyte imbalances in cases of near drowning are scarce, our case of near drowning resulted in hypercalcemic crisis.

Conclusions

For cases of near drowning, it is essential that the source of the water aspirated is investigated and electrolyte abnormalities are considered in the diagnosis.

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