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Case Report Open Access

Seizure Associated with Hyponatremia Possibly Related to the Use of Polyethylene Glycol and Electrolytes Preparation

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Introduction

Osmotic laxative preparation combining polyethylene glycol (PEG) and electrolytes (sodium and potassium chloride, sodium bicarbonate and sodium sulphate) are frequently used in diagnosis colonoscopy [1,2]. Various preparations of PEG that need to be diluted in water are available. Potential advantage of their use over other preparations is the absence of electrolyte and fluid disturbances, since they do not induce ion or water absorption or secretion compared with other bowel preparations available [1-4]. The present report relates the case of a 53-year-old woman presenting with seizures related to severe electrolyte disturbances following the intake of a polyethylene glycol and electrolytes based laxative.

Abreviations:

ADH: Antidiuretic Hormone; CK: Creatinine Kinase; ECG: Electrocardiography; PEG: Polyethylene Glycol; SCr: Serum Creatinine; SIADH: Syndrome of Inappropriate Antidiuretic Hormone Secretion; SSRI: Selective Serotonin Reuptake Inhibitor

Case Report

The patient presented to the emergency room (ER) with severe nausea, vomiting, diarrhoea, fatigue and vertigo only a few hours after taking a PEG and electrolytes preparation (70 g per sachet) for a colonoscopy planned the next day. The patient diluted the preparation with 240 millilitres instead of the recommended 1000 millilitres (the exact amount taken by the patient is unknown).

She has a medical history of hypertension, osteoporosis, psoriatic arthritis, asthma and is not known to have any active neoplasia nor history of neoplasia. She has a known allergy to latex and to cefprozil. She was following a low-salt diet (daily consumption not known) and was currently taking, without any recent change, irbesartan, chlorthalidone, atenolol, potassium chloride and denosumab (ProliaMD, indicated for postmenopausal osteoporosis in Canada) (dosage and posology not available). No information is available regarding the use of natural or over-the-counter products.

Physical examination on admission revealed tender abdomen with mild epigastric pain, signs of dehydration and decreased reactivity to commands. Her vital signs were taken and revealed a blood pressure of 150/86 mmHg, a heart rate of 79 bpm, a respiratory rate of 20 and normal body temperature. She was then started on antinausea and rehydration treatment. No electrolytes measure was performed at this time.

Two hours after admission, electrolytes and serum creatinine values were available and showed hypokalemia (K^+=2.5 mmol/L), hyponatremia (Na^+=115 mmol/L) and normal kidney function (SCr=53 mmol/L). An ECG was done, showing a corrected QT interval of 557 ms without conduction anomaly. An hour later, the patient had generalized tonic-clonic seizures that spontaneously resolved after approximately one minute. All current medications were then withheld and potassium supplements and hypertonic saline were started to increase her potassium and sodium levels over the next few days (aiming a sodium correction of maximum 10 mmol/L per day).

A CT scan was performed and showed cerebral oedema. Other possible causes of hyponatremia, relevant with presentation, such as hypothyroidism (TSH=1.34 mUI/L) and adrenal insufficiency (morning cortisol=774 nmol/L) were ruled out (no information was available regarding evaluation of other causes of hyponatremia). Serum and urinary osmolality were measured (Urinary Na^+=116 mmol/L, Urinary K^+=23,7 mmol/L, Urinary osmolarity=323 mmol/L, Serum osmolarity=249 mmol/L) to assess the presence of syndrome of inappropriate antidiuretic hormone secretion (SIADH), but the values reported were deemed biased and unusable by the use of hypertonic saline and diuretics in previous hours.

For the next 24 hours, the patient remained stable, with abnormal neurologic functions. She had some psychomotor impairment and disorientation that resolved the next day. She also presented rhabdomyolysis caused by seizing that was treated with sodium bicarbonate in continuous infusion. The patient presented no renal complication of muscle lysis even though the creatine kinase (CK) was elevated (peak at 73910 U/L).

The patient was discharged at her request after her electrolyte disturbances and neurological symptoms were resolved and her CK was normalizing. The patient's usual medication, including irbesartan, potassium chloride and chlorthalidone were discontinued and a follow-up visit was planned three months after the episode (laboratory data for follow-up visit not available). The final diagnostic, as of hospitalization summary, was acute severe hyponatremia probably caused by PEG and electrolytes preparation over chronic hyponatremia (though no baseline sodium was available) induced by possible SIADH secondary to chlorthalidone and low-salt diet.

Discussion

Although hyponatremia usually causes no symptoms, it can induce severe neurologic impairment, including coma and death, secondary to cerebral oedema [5-7]. The severity of clinical presentation is closely related to the extent and speed of sodium reduction. The impact of the PEG and electrolytes preparation on the severity of electrolyte disturbances for this patient can be explained by many contributing factors.

First, the dilution of the powder was not made according to package instructions. The resulting solution was hypertonic and hyperosmolar. Second, it was suspected that the patient had chronic low levels of sodium because of her low-salt diet and the use of chlorthalidone [5-7]. Third, while PEG preparation is known to induce diarrhea, the patient presented with abnormally profuse diarrhea, which may have been a consequence of incorrect dilution. Last, hypokalemia may be explained by the vomiting the patient experienced before her admission to the ER, though it seems unlikely since the patient was on potassium supplements and irbesartan, an angiotensin receptor blocker known to increase potassium levels [6].

The severe hyponatremia of the patient may have been induced by the antidiuretic hormone (ADH). Many stimuli induce secretion of this hormone such as increased serum osmolarity, hypoxemia, nausea and vomiting [7-10]. It exerts its action by increasing water permeability of collecting ducts in the kidney, which then reduces diuresis [5,8]. Acute loss of fluid by vomiting and diarrhoea in our patient caused a hypovolemic and hyperosmolar state, which possibly stimulated ADH secretion (no available value). This combined with the ongoing fluid and electrolytes loss induced by the PEG preparation then caused hypoosmolarity. Chlorthalidone, by blocking sodium reabsorption in the distal tubules [5,6], contributed to the acute disorder and may have been the cause of chronic hyponatremia for this patient, causing a possible syndrome of inappropriate secretion of antidiuretic hormone, though no SIADH could be diagnosed during hospitalization. Because the patient was stable before taking PEG and had no previous history of severe hyponatremia, other causes of SIADH were not evaluated for this case since the presentation suggested a link with the intake of the PEG preparation and chronic use of diuretics. The result of the Naranjo algorithm score was 3, which means this episode is a possible adverse drug reaction to PEG and electrolytes preparation [11].

There are, to our knowledge, only few cases of PEG-related hyponatremia in the medical literature. Clinical manifestations of this disorder reported to date include changes in behavior, seizures, cerebral oedema and death [12-16]. Common to our case and other reported cases are concomitant hypokalemia, use of drug that may cause electrolyte disturbances (including SSRIs, thiazide diuretics and bisacodyl) and inadequate use of preparation (incorrect dilution of PEG product or excessive free water intake) [12-15]. The majority of patients in reported cases had no permanent consequences of severe hyponatremia, but one patient kept gait abnormality and chronic fatigue and one older patient died [13-16]. Severe hyponatremia, a potentially life-threatening complication of PEG administration, is poorly reported in the literature.

Conclusion

Even though PEG-based laxative preparation presents a very low risk for electrolyte disturbance and is theoretically safe, electrolytes values could be monitored in selected patients. Patients taking medication that may present with electrolyte disturbances (including diuretics, electrolyte supplements, renin-angiotensin-aldosterone system inhibitor) and patients with increased risk of renal, electrolyte or fluid disturbances would benefit from a closer follow-up when using laxative for a colonoscopy procedure. Pharmacists can help by explaining the correct use of these products, identifying patients at higher risk of electrolyte abnormalities, insuring correct management of medications to minimize complication and contacting prescribing doctors, if needed, to assure appropriate electrolytes follow-up.

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