



SCIENTIFIC LETTERS

Secondary hypokalemic paralysis in adult with hypertension[☆]



Parálisis hipopotasémica secundaria en adulto con hipertensión

Hypokalemic paralysis (HP) is a very uncommon condition. Few publications are available on the subject, and these are mainly case reports or small series. A patient with HP who experienced a complete recovery is reported.

A 62-year-old male Caucasian patient attended the emergency room for progressive strength loss. His clinical history included morbid obesity, high blood pressure (HBP), and dyslipidemia. The patient was a former smoker and drinker of 30–40 g/day of alcohol. He was taking amlodipine 5 mg/day, losartan/hydrochlorothiazide 50/12.5 mg/day, and simvastatin 20 mg/day.

The patient reported weakness in his lower limbs (mainly in the left) for the previous five days. The weakness occurred in the scapular girdle at two days, and in the hands the day before the consultation, with no sensory or sphincter disturbances. No fever or other clinical symptoms were reported in the days prior to onset. A physical examination found blood pressure (BP) of 180/76 mmHg, a heart rate of 89 bpm, a temperature of 36.7 °C, no speech disturbances, a flaccid areflexic tetraparesis with a flexor cutaneous plantar reflex. Sensitivity and the rest of the examination were normal. Supplemental tests performed included magnetic resonance imaging of the spine which ruled out a compressive–expansive condition, computed tomography of the brain with no relevant changes, and a lumbar puncture with no pathological findings. Laboratory tests at the emergency room revealed severe hypokalemia (1.91 mEq/L) with metabolic alkalosis (pH 7.57, HCO₃ 34.4 mmol/L, BE 19.4 mmol/L). An electrocardiogram (ECG) showed a corrected QT of 510 ms. Treatment was started with intravenous potassium (100 mEq during the first 24 h).

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In the ward, findings included BP 160/80 mmHg, 120 kg of weight, BMI of 40 kg/m², and no fever.

When questioned again, the patient reported that five months earlier a low-calorie diet (balanced, 52% carbohydrates, 18% protein, 1500 kcal), exercise, and alcohol cessation had been recommended. As a result, the patient had lost more than 20 kg (initial weight 143 kg, BMI 46). Persistent constipation had occurred as a consequence, and had led the patient to use a stimulating laxative (*Cassia angustifolia*). In addition, 15 days before the onset of the clinical picture the patient had been advised to drink daily herbal teas of hawthorn (HT [*Crataegus monogyna*]) and olive leaves to improve HBP control.

No changes were initially found on examination in the ward. Normal thyroid function, basal cortisol, creatinine 0.7 mg/dL, Na 144 mEq/L, Mg 1.8 mg/dL (1.56–2.55), and P 2.1 mg/dL (2.7–4.5), and persistent hypokalemia (2.1 mEq/L) were found upon admission. The creatine kinase (CK) level was 1175 IU/L (20–170), and the CK-MB level was 23 IU/L (0–24). Difficult to control HBP was also seen, and primary hyperaldosteronism was suspected. Drugs interfering with diagnosis were discontinued, and doxazosin only was used. The clinical signs and symptoms resolved and his potassium level normalized four days after admission. ECG normalized in 48 h. A probable multifactorial, secondary hypokalemic paralysis was suspected (due to the use of diuretics, laxatives, and HT tea).

The patient was discharged home with no symptoms, with doxazosin prescribed as the only antihypertensive, in order to rule out primary hyperaldosteronism. At the outpatient clinic, once his potassium level had normalized and on doxazosin alone, the aldosterone/PRA ratio was determined and found to be normal (5.7), as were the acid-base balance (ABB) and CKs. Primary hyperaldosteronism was therefore ruled out, and the suspected diagnosis was confirmed.

HP is an uncommon condition characterized by acute flaccid paralysis associated with hypokalemia. The causes of HP may be primary or secondary. Primary HP,¹ such as familial hypokalemic periodic paralysis (FHP), is autosomal dominant and occurs most often in Caucasians,^{2,3} usually before 25 years of age. A family history is usually found. According to the Burcet³ series, this is the most common cause of HP.

Secondary forms are more prevalent in elderly Asian patients with lower potassium levels and more marked clinical signs and symptoms.² The most common causes

include gastrointestinal and renal diseases, but their incidence varies depending on the series. Other causes reported include thyrotoxicosis, renal tubular acidosis (RTA), primary hyperaldosteronism (Conn's syndrome), Gitelman's syndrome, and viral infections such as dengue. Less common causes include Cushing's syndrome, Liddle's syndrome, massive liquorice intake, or some forms of congenital adrenal hyperplasia. In the Ravindra et al. series,² including 29 patients with HP, the most common cause was thyrotoxicosis, not always autoimmune. This is a rare complication of hyperthyroidism which occurs more commonly in Asians^{2,4} and is attributed to a dysfunction of the transmembrane Na-K-ATPase pump. In other series, the most common etiology was RTA and primary hyperaldosteronism.⁵ Cases of HP as a complication of hyperemesis gravidarum have also been reported.⁶

The pathogenesis of HP is unknown. Genetic predisposition could possibly play a role. Mutations in the genes of Ca (CACN1A5), Na (SCN4A), or K (KCNE3) channels have been related in FHP. In thyrotoxicosis and in some Asian populations, however, single nucleotide polymorphisms (SNPs) in the CACNA1S and GABRA3 genes have only been associated, unlike in FHP.^{7,8}

The classical clinical picture of secondary HP is similar to the one reported, consisting of acute flaccid paralysis associated with hypokalemia, metabolic alkalosis, and CK elevation. If the condition is severe, rhabdomyolysis may eventually occur.

Complete recovery usually occurs after potassium levels have been normalized.

When HP is suspected, a complete medical history should be taken down (history, drug intake; it is convenient to assess the use of homeopathic or herbal preparations).

Our patient used a laxative and a diuretic concomitantly with HT tea 15 days before the onset of the clinical picture. HT is used in alternative medicine as a positive inotropic and vasodilating agent with a mild diuretic effect.⁹ No case of hypokalemic paralysis associated with this plant has been reported in the literature, but it has been noted that it may cause hypokalemia when associated with hydrochlorothiazide and laxatives,¹⁰ as occurred in our patient.

Supplemental tests which should be requested include routine laboratory tests, paying special attention to Na, K, glucose, magnesium, chloride, ABB, phosphorus, calcium, renal, hepatic and thyroid function, CK, alkaline phosphatase, complete blood count, pH and electrolytes in 24h urine, ECG, which may show in severe hypokalemia ($K < 2.5$ mEq/L) a long QT and a prolonged U wave, and may even mimic an acute coronary syndrome. The treatment consists of oral or intravenous potassium replacement in severe cases, with immediate response and complete recovery in most instances.

The reported patient had secondary HP, which is exceptional in Caucasian patients. Adequate diagnosis is

important for early potassium replacement and for treatment of the triggering cause.

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