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Case Report

Familial Hypokalemic Periodic Paralysis: A Case Report

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ABSTRACT

Hypokalemic periodic paralysis is characterized by recurrent attacks of skeletal muscle weakness with related hypokalemia which is a rare genetic disorder. There might be a limited weakness for some groups of muscle, or it might appear as severe muscle paralysis. The muscle cells increase the uptake of potassium, hence the decreasing of potassium's mechanism. The case of a clinically diagnosis familial hypokalemia periodic paralysis in a 9-year-old boy that we report is established in this proband that settle the consensus diagnosis criteria for primary hypokalemia periodic paralysis according to previous review that's been published.

Keywords: paralysis; hypokalemia; periodic; familial.

INTRODUCTION

Hypokalemic Periodic Paralysis (HPP) is a peripheral nerve and muscle emergency.[1] HPP occurs due to decreased potassium levels with manifestations of acute non-traumatic limb weakness. HPP is characterized by episodic flaccid paralysis attacks of varying intensity and duration.[1,2]

Hypokalemia can occur when the serum K+ concentration is below 3.5 mEq/L. This decrease in serum potassium concentration can cause various complaints, such as weakness, nausea and vomiting, to serious complaints such as heart problems that lead to death. The most common complaint encountered in clinical practice is limb paralysis.[1,2]

Hypokalemic Periodic Paralysis (HPP) is a rare neuromuscular disorder. The incidence of HPP is estimated to be 1 in 100,000 population.[1,3,4] There are two types of HPP, namely inherited or familial HPP and acquired HPP. Cases of acquired HPP can be found in cases of thyrotoxicosis, which can also be called thyrotoxic periodic paralysis.[5] The genetic characteristics of familial

HPP are: (a) autosomal dominant inheritance; (b) onset at peripubertal age; (c) can affect all races, most predominantly Asian; (d) male to female risk ratio is 2:1; and (e) 50% of people with carrier genes have mild or asymptomatic symptoms.[6] Serial case reports of periodic paralysis hypokalemia are still rare. We report a serial case of familial periodic paralysis hypokalemia. The discussion is in aspects of clinical features, diagnostic approach, and management.

CASE REPORT

We report a case of Familial Periodic Paralysis Hypokalemia (FPPH) in a 9-year-old boy. A 9-year-old boy presented to the hospital with acute 8-hour limb weakness. The weakness was not preceded by trauma, excessive carbohydrate consumption, or strenuous exercise. The child was previously in good health, and did not take any medications regularly.

On examination, the patient was found to be conscious and able to communicate well. Similar complaints have been experienced four times in the last two years. The patient had been admitted to the same hospital and diagnosed with periodic paralysis hypokalemia. On physical and neurological examination, the patient had normal vital signs, afebris, with bilateral arm muscle strength 3 out of 5 on the MRC (Medical Research Council) scale, and leg muscle strength 2 out of 5 on the MRC scale. There were no sensory complaints, physiological reflexes were slightly decreased, and no pathological reflexes and clonus were found. Weakness of the legs and arms was dominated by the proximal muscles. The patient's mother and siblings were treated several times with similar symptoms, with a diagnosis of periodic paralysis hypokalemia. The criteria for clinical diagnosis of FPPH in the patient were established according to recent studies.[4] This was done when no genetic test was performed, or the genetic test was negative. In our patient, points 1-4 were all met.

Renal function, urine pH, and thyroid hormone examination were within normal limits. FT4 was 1.23 IU/ml (0.350 - 4.940) and TSHS was 14.20

pmol/L (9.00 - 19.05). Potassium level on arrival was 2.24 mmol/L (3.5 - 5.1). Thorax examination was within normal limits and ECG showed minimal T depressed. Other lab results were normal. The patient received intravenous pump KCl infusion therapy, oral supplementation, and spironolactone 25 mg per day. The patient had optimal recovery after 48 hours of hospitalization. At the time of discharge, the patient could be independent, and there was no persistent weakness.

Table 1. Clinical diagnosis criteria for Familial Periodic Paralysis Hypokalemia[4]

1	Two or more attacks of muscle weakness with documented serum K < 3,5 mEq /L, or
2	Documented single-degree familial onset of muscle weakness, and
3	Three of the following six criteria: - Onset in the 1st or 2nd decade - Attack duration > 2 hours, more than one extremity - Precipitants (high carbohydrate diet, stress, heavy exercise) - Improves with potassium supplementations - First-degree family history of similar illness - Positive exercise test result
4	Other possible causes of hypokalemia have been excluded (e.g. impaired renal function, renal tubular acidosis, excessive laxansia, thyrotoxicosis).

DISCUSSION

We report a case of Familial Periodic Paralysis Hypokalemia (FPPH) in a 9-year-old boy whose diagnosis was established by clinical and laboratory means. Insufficient potassium intake, displacement of potassium into cells, or increased potassium loss can cause hypokalemia.[6,7] (see figure 1).

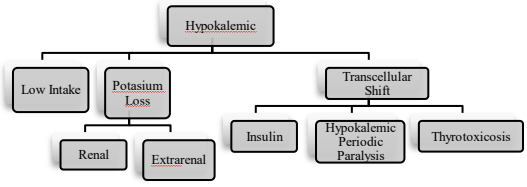

Figure 1. Differential diagnosis of hypokalemia

In cases of periodic paralysis hypokalemia, the attack occurs acutely. Neuromuscular weakness is rapid as potassium suddenly enters the cells, causing plasma potassium levels to drop to 1.5 - 2.5 mEq/L. In cases of periodic paralysis hypokalemia, the most common triggers reported are after exercise, stress, or a high carbohydrate meal. Conditions causing epinephrine or insulin secretion can trigger hypokalemia. Hypokalemia is often accompanied by

hypophosphatemia and hypomagnesemia. [7]

Familial Periodic Paralysis Hypokalaemia (FPPH) is an autosomal dominantly inherited monogenic disorder. Some cases may occur sporadically.[6] The frequency of attacks varies widely, ranging from once in a lifetime to several times a week. Familial periodic paralysis hypokalaemia is more common in males than females, and attacks that occur in females are milder.[5,6]

Familial PPH is caused by the redistribution or transfer of extracellular to intracellular potassium.[6] In familial PPH, it is thought that mutations of genes encoding ion channel gates, namely the SCN4A, CACNL1A3, and KCNE3 genes, occur.[5,8,9] A condition that can be referred to as channelopathy. The mutations cause abnormalities in potassium ion channel function which leads to prolonged excitation of muscle cells.[9]

Most of the subjects with periodic paralysis hypokalemia had a family history of similar diseases in their parents. This is consistent with the reported cases. Offspring of subjects with periodic paralysis hypokalemia have a 50% risk of inheriting the pathogenic variant gene. The penetrance rate is 90% in males, and lower in females.[9,10] Genetic testing is not part of routine clinical care. Multi panel genetic testing which includes CACNA1S, SCN4A can be done. The proportion of periodic paralysis hypokalemia associated with CACNA1S gene variants is 40-60%, for SCN4A is between 7-14%.[10]

The clinical features of potassium depletion vary widely, and the severity depends on the degree of hypokalemia. Symptoms are rare unless potassium is less than 3 mEq/L. Myalgia, weakness or muscle cramps of the lower extremities are the most common complaints that can be experienced.[6] More severe hypokalemia may result in progressive weakness, hypoventilation and complete paralysis. Severe potassium depletion can increase the risk of arrhythmias and rhabdomyolysis. The classification of the severity of hypokalemia is as follows: (a) mild hypokalemia: serum

levels of 3-3.5 mEq/L; (b) moderate hypokalemia: serum levels of 2.5-3 mEq/L; and (c) severe hypokalemia: serum levels < 2.5 mEq/L. Hypokalemia <2 mEq/L is usually accompanied by cardiac abnormalities and can be life-threatening. [6,10] In the reported case, the hypokalemia experienced was severe.

The diagnosis of periodic paralysis hypokalemia should be considered in patients with only muscle weakness involving one or both limbs with sudden onset, areflexia, no change in consciousness, and laboratory evidence of hypokalemia.[5] In periodic paralysis hypokalemia episodes will recur from weeks to years.[6]

Management of periodic paralysis hypokalemia focuses on the relief of acute symptoms and prevention of subsequent attacks.[8] To estimate the replacement potassium level, it is necessary to rule out causative factors, such as insulin and medications. In this case, the patient received combined oral and parenteral drug therapy. Oral potassium replacement is safest but is poorly tolerated as it may cause irritation to the stomach.[6,7]

CONCLUSION

Periodic Paralysis Hypokalemia (PPH) is the most frequent form of periodic paralysis. We report a case of Periodic Paralysis Hypokalemia (PPH) based on clinical algorithm diagnosis.

ETHICS

Verbal informed consent was obtained from the patient's parents. No information regarding the patient's identity was disclosed.

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