Etiology of Hypokalemic Paralysis in Korea: Data from a Single Center

Recognizing the underlying causes of hypokalemic paralysis seems to be essential for the appropriate management of affected patients and their prevention of recurrent attacks. There is, however, a paucity of documented reports on the etiology of hypokalemic paralysis in Korea. We retrospectively analyzed 34 patients with acute flaccid weakness due to hypokalaemia who were admitted during the 5-year study period in order to determine the spectrum of hypokalemic paralysis in Korea and to identify the differences in clinical parameters across the causes of hypokalemic paralysis. We divided those 34 patients into 3 groups; the 1st group, idiopathic hypokalemic periodic paralysis (HPP), the 2nd, thyrotoxic periodic paralysis (TPP), and the 3rd group, secondary hypokalemic paralysis (HP) without TPP. Seven of the patients (20.6%) were diagnosed as idiopathic HPP considered to be the sporadic form, and 27 patients (79.4%) as secondary HP. Among the patients diagnosed as secondary HP, 16 patients (47.1%) had TPP. Patients of secondary hypokalemic paralysis without TPP required a longer recovery time compared with those who had either idiopathic HPP or TPP. This is due to the fact that patients of secondary HP had a significantly negative total body potassium balance, whereas idiopathic HPP and TPP were only associated with intracellular shift of potassium. Most of the TPP patients included in our study had overt thyrotoxicosis while 3 patients had subclinical thyrotoxicosis. This study shows that TPP is the most common cause of hypokalemic paralysis in Korea. And we suggest that doctors should consider the presence of TPP in patients of hypokalemic paralysis even if they clinically appear to be euthyroid state.

Key Words: Hypokalemic periodic paralysis; Thyrotoxic periodic paralysis; Hypokalemic paralysis

Introduction

Hypokalemic paralysis is an important cause of acute flaccid paralysis that ranges from mild muscle weakness to severe paralysis with life-threatening cardiac arrhythmia and respiratory paralysis\textsuperscript{1,2}. A number of underlying etiologies have been described, such as thyrotoxicosis, renal tubular acidosis (RTA), Gitelman-syndrome, barium poisoning, diuretics and diarrhea; however, in some cases, it is difficult to identify the exact etiology of hypokalemic paralysis. Misdiagnosis may lead to mismanagement, interference in appropriate treatments, and to failure for the prevention of recurrent attacks.

Hypokalemic periodic paralysis (HPP) is the most common cause of hypokalaemic paralysis in Caucasians\textsuperscript{3}. HPP includes familial and sporadic form. Familial HPP is an autosomal dominant hereditary disorder while the cause of sporadic HPP remains unknown. Most cases of HPP in Western countries are the familial forms while most cases of HPP identified in Asians are sporadic\textsuperscript{4}. Most Asian patients of sporadic HPP have been diagnosed as idiopathic HPP, also called primary HPP. In Asian population, however, the most common cause of hypokalemic paralysis is the thyrotoxic periodic paralysis (TPP)\textsuperscript{5}. We are aware that there are only a few reported documents

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regarding the etiology of hypokalemic paralysis in Korea. In this study, we report a spectrum of underlying etiologies, clinical features, and consequences for the patients of hypokalemic paralysis admitted at a single center in Korea. We also identify the differences in clinical parameters in relation to certain causes of the hypokalemic paralysis to guide a selection of appropriate treatment strategies and to take preventive measures against recurrent attacks.

**Materials and Methods**

1. Patients and methods

We retrospectively identified 34 patients with acute flaccid weakness due to hypokalemia who were admitted to the Kyung-Hee Medical Center from Jan. 1, 2006 to the end of Dec. 2011. A definitive diagnosis of hypokalemic paralysis was confirmed based on the following criteria: (1) a transient and severe paralytic attack of the limb observed at the hospital by a physician, (2) hypokalemia during the paralytic attack(s) as defined by a serum potassium level: <3.5 mmol/L. Patients with Guillaine Barré syndrome, acute transverse myelitis, cerebrovascular attack, chronic kidney disease or end stage renal disease on dialysis were excluded. Patients whose chief complaint was not the paralysis of the limb were also excluded.

A detailed medical history was obtained and neurological examination was performed on all patients. The family history of similar disease was recorded such as reports of weakness, thyroid disease, drug intake, diarrhea, vomiting, hypertension, and kidney disease. Muscle strength was assessed on a scale of 0 to 5 with using the Medical Research Council (MRC) scale. On admission, complete blood counts, blood urea nitrogen (BUN), serum creatinine, serum electrolytes (sodium, potassium, bicarbonate, chloride, calcium, inorganic phosphate), and thyroid function tests (TSH, Free T4 and T3 level) were obtained in all patients. If hyperthyroidism was suspected, auto-antibodies such as anti-thyroglobulin (anti-TG) antibody, anti-thyroid microsomal antibody (TMS-Ab) and thyrotropin binding inhibitory immunoglobulin (TBII) were measured. Patients of hyperchloremic metabolic acidosis with normal anion gap in the absence of gastrointestinal loss and a fasting urine pH >5.5 were regarded as having RTA.

The presence of metabolic alkalosis (serum bicarbonate >29 mmol/L with hypokalemia (serum potassium <3.0 mmol/L), hypomagnesemia (serum magnesium <2.5 mg/dL), and hypocalciuria (urinary calcium <0.05 mmol/kg/day) were regarded as indicative of Gitelman syndrome.

The patients were initially divided into 2 groups; the first were patients of idiopathic hypokalemic periodic paralysis and the second were those diagnosed as secondary hypokalemic paralysis, including TPP, diuretics or licorice induced hypokalemic paralysis, Gitelman syndrome, primary hyperaldosteronism, and distal RTA (dRTA). Because TPP has been recognized as the most common cause of hypokalemic paralysis in Asia and the clinical characteristics of TPP are more similar to idiopathic HPP than other causes of secondary hypokalemic paralysis, so we further divided the second group into TPP and non-TPP secondary HP.

2. Statistical analysis

Continuous variables were expressed as mean ± standard deviation (SD) and were compared to using Student’s T-test or Kruskal-Wallis test. Categorical variables were compared to using the Chi-squared test or two-by-K test. All statistical analyses were conducted by using the SPSS 17.0 statistical software (Chicago, IL, USA). Differences were considered significant if the p-value less than 0.05.

**Results**

Those 34 patients with hypokalemic paralysis had a mean age of 38.59±16.92 years. Six were female. Seven of these patients (20.6%) were diagnosed as idiopathic hypokalemic periodic paralysis considered to be the sporadic form and 27 patients (79.4%) were categorized as