Hypercalciuric Value of Random Urine Sodium/Potassium Ratio and Relation with Salt and Potassium İntake

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Introduction

Hypercalciuria is the most common etiology of urolithiasis in children and adults (1-4). The management of hypercalciuric children consists of high fluid intake and dietary salt restriction (5). A few article on adults had shown to an inverse correlation between urinary potassium and urinary calcium excretion (6). Previous investigation in children also found inverse correletion between two, but concluded that it is limited number of children. The aim of the present study was to investigate the value of urinary sodium/potassium (UNa/K) ratio versus urinary calcium/creatinine (UCa/Cr) ratio for diagnosing hypercalcuria in healthy children and to evaluate correlation between UCa/Cr and UNa/K ratio and to determine the efficacy of low-Na/high-K diet on both UCa/Cr and UNa/K ratio in patients with hypercalcuria.

Material and methods

The study consisted of two parts.

In the first part 135 children (64 girls, 71 boys) whose age ranged between 7-12 (mean. 9.3 + 7.4) years old were assigned in the study. The urinary excretion of Na, Ca, K and Cr was evaluated in spot urine samples for Ca/Cr (mg/mg) and Na/K (mEq/mEq) ratio. Hypercalcuria was defined as urinary Ca/Cr ratio upper than 0.21 and urinary Ca excretion upper than 4 mg/kg/day. In the second part, 133 children with idiopathic hypercalcuria (71 girls, 62 boys) whose age ranged between 1-19 (mean 10.2 + 10.34) years were investigated to determine efficacy of low-Na/high-K diet. Low Na (800-1200 mg/day) and high K (2000 mg/day) diet was given for 12 months and concomitantly their intake of daily water was increased 1.5 times normal. Values for both plasma and spot urine samples Na, K, Ca and P levels of all participants were obtained before treatment and thereafter at monthly during the study period and UCa/Cr and UNa/K ratios were calculated. Urinary Na, K, Ca and Cr analyzed by Falcor 300 device (Menarini Diagnostics Corporation kits). Statistical analysis of data was conducted using ''Pearson Test'' and Wilcoxon dependent pair test''. P values <0.05 was regarded as statistically significant.

Results

Healthy children's uCa/Cr ratio was 0.10 + 0.11, UNa/K ratio was 3.1 + 2.0. and significant correlation was found between UCa/Cr and UNa/K ratios (r=0.53, p<0.001).

In second part of the study, UCa/Cr ratio was 0.51 + 0.74 and UNa/K ratio was 5.4 + 3.2 and correlation was found between UCa/Cr and UNa/K ratios (r=0.17, p=0.004) in patients with idiopathic hypercalcuria.

Table 1: UCa/Cr and UNa/K of patients in pre-diet and post-diet period.

	Pre-diet	Post-diet	P
Ca/Cr (0-4th month)	0.51 + 0.74	0.22 + 0.14	<0.001
Ca/Cr (0-8th month)	0.51 + 0.74	0.15 + 0.0.8	<0.001
Ca/Cr (0-12th month)	0.51 + 0.74	0.0.25 + 0.08	0.097
Na/K (0-4th month)	5.42 + 3.22	3.36 + 2.49	<0.001
Na/K (0-8th month)	5.42 + 3.22	2.33 + 1.70	<0.001
Na/K (0-12th month)	5.42 + 3.22	1.43 + 1.43	<0.001

Both UCa/Cr and UNa/K ratios were decreased significantly after the first month with dietary therapy (p<0.001).

Discussion

Urinary stone formation is a common, troublesome, and costly medical problem. Accordingly, UCa excretion correlates with the prevalence of urinary stone disease (7). UNa and UK have opposite relationships with UCa excretion; high UNa is associated with high UCa, while high UK is with low UCa (7, 8). Alexies et al showed that a marked direct relationship was found between UNa/K and UCa/Cr in healthy children. Recently Cirillo et al has shown that adults with a high random UNa/K caused by high high Na and/or low K excretion are at higher risk of developing urinary stone disease (9). In our study, UCa/Cr ratio is well correlated with UNa/K ratio both in healthy and hypercalciuric children. The diet is very important in treatment of idiopathic hypercalciuria. Initial magement of hypercalciuric children consists of high fluid intake and dietary salt restriction (5) Because, Na intake is a main factor influencing urinary excretion of Ca. In North America, the dietary changes recommended only mean providing the child with a healthier diet with less salt and more fruit, vegetable, diary products (10, 11). A few articles on adults had alluded to inverse relationship between UK And UCa excretion, as reported (12, 13). An increase in dietary K reduced UCa excretion and causes Ca balance to become more positive, suggesting that K either directly or indirectly promotes renal Ca retention and inhibits net bone resorption (8, 12). Another effect of K is to cause renal phosphate retention, which inhibits renal synthesis of calcitriol, and subsequently, intestinal Ca absorption (14). In a study, a low-Na/high-K diet in 7 persistently hypercalciuric children re-

sulted in decrese in UNa/K ratio and UCa/Cr ratio. (15). In our study, both UCa/Cr and UNa/K ratios were decreased significantly after the first month with dietary therapy in 133 hypercalciuric children.

As a result:

- Urinary Ca/Cr ratio is well correlated with urinary Na/K ratio both in healthy and idiopathic hypercalcuric children. Thus urinary Na/K ratio may serve as an ancillary diagnostic tool for diagnosis and follow-up of children with idiopathic hypercalcuria.
- Prolonged calcium restriction is harmful in children with idiopathic hypercalcuria. Dietary compliance is low with Na restricted diet but high K diet may cause better dietary compliance with improvement in taste.

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