RENAL CALYCEAL MICROLITHIASIS

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Abstract- Hematuria is one of the most common genitourinary findings in children and extensive evaluation frequently fails to establish its etiology. A known cause of hematuria in children is nephrolithiasis. Ultrasound is a good method for diagnosis, but calculi less than 5 mm in diameter may not have a posterior shadow. Calyceal microlithiasis (CM) is characterized by presence of hyperechogenic spots less than 3 mm in diameter in renal calyces that are recognized by high resolution ultrasound. In this report, 200 children presenting with microscopic or macroscopic hematuria, dysuria, pyuria and recurrent urinary tract infection, occurring alone or in combination, underwent renal ultrasound at 3.5 MHZ and 7.5 MHZ. Although in 117 cases renal ultrasound at 3.5 MHZ reported normal findings, renal ultrasound at 7.5 MHZ revealed CM in 63.6% of patients presenting with hematuria. There was a history of urolithiasis in one first or second degree relative of 72.4% of the patients. Hypercalciuria was presented in 9.6% and hyperuricuria in 32% of the patients. We recommend that children who are either at greater risk of renal stones, or are highly suspected to be so, be referred for renal ultrasound screening at 3.5 and 7.5 MHZ concurrently.

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Key words: Calyceal microlithiasis, children urolithiasis, hematuria

INTRODUCTION

The true prevalence of urolithiasis in children has often been underestimated (1) and different prevalences have been reported (2).

Recognition of children at greatest risk for urolithiasis may allow early detection or prevention of stone formation. Ultrasound examination with a 7.5 MHZ ultrasound probe frequently can reveal hyperechogenic spots 3 mm or less in diameter in renal calyces. This microlithiasis may possess a posterior shadow. Calyceal microlithiasis (CM) possibly represents the first step in calculus formation. The finding of CM may explain a number of symptoms and signs (such as hematuria, dysuria, recurrent urinary tract infection and/or pyuria), thus reducing further invasive diagnostic procedures (3).

Our goal was to determine the frequency of hyperechogenic spots of less than 3 mm in diameter in renal calyces, CM, in our referral patients.

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MATERIALS AND METHODS

This study is based on 200 children (82 boys and 118 girls), aged 2 mo to 14 y (mean 5.7 y), seen as outpatients in our clinic from April 7, 2000 to February 14, 2001, because of hematuria, dysuria, pyuria and/or recurrent urinary tract infection (UTI). This research was conducted in accordance with the Helsinki Declaration in ethical issues.

CM was diagnosed through ultrasound examination with a 7.5 MHZ probe. We used a

Toshiba sonolayer with a sound linear of 7.5 MHZ equipment. CM was defined as hyperchogenic spots in renal calyces which often had a posterior shadow. Twenty four hours calcium, uric acid, oxalate, citrate and creatinine excretion were measured in all patients with CM. Qualitative measurement of urinary cystine was performed by the nitroprusside test to exclude cystinuria. Hematuria was defined as five or more RBC per high power field in a centrifuged urine sample on at least two occasions. A blood sample was taken for calcium, uric acid and bicarbonate measurement.

We considered hypercalciuria as urine calcium excretion > 4 mg/kg body weight per day, hyperuricuria as urine uric acid excretion > 10.8 mg/kg body weight per day and hyperoxaluria as urine oxalate excretion > 0.57 mg/kg body weight per day. Hypocitraturia was considered as urine citrate excretion < 2 mg/kg body weigh per day (4-6).

RESULTS

We found CM in 117 of the total 200 patients, most of whom presented with hematuria. Of 117 patients with CM, 9 patients also had a kidney stone greater than 5 mm in diameter at the time of diagnosis and 24 patients had past histories of lithotripsy or passage of stones. Overall presenting symptoms were hematuria (microscopic or macroscopic hematuria) in 68 (58.8%), dysuria in 13 (11%), pyuria in 24 (20.5%) and recurrent UTI (in normal urinary tract anatomy) in 12 (10%) of cases. These symptoms occurred alone or in combination. Of 128 patients with hematuria, 82 (63.6%) had CM in ultrasound, and of 72 patients without hematuria, 35 (48.6%) had CM (P = 0.05, Chi squire = 3.84). Twenty seven patients presented with dysuria, 24 with pyuria and 20 with recurrent UTI, of whom 13 (48%), 11 (58.5%) and 12 (60%) had CM in renal ultrasound, respectively. There was no significant difference in any of these groups. Serum creatinine, calcium and uric acid were normal in all 117 patients. Hypercalciuria was present in 9.6%, hyperuricuria in 32% and hyperoxaluria in 25% of them. One case of cystinuria was diagnosed by amino acid chromatography. He had a positive nitroprusside test. Twenty two percent of patients had hypocitraturia.

DISCUSSION

For the first time La Manna *et al.* reported 196 children aged 0.9-15 years in whom renal ultrasound examination revealed hyperecogenic spots less than 3 mm in diameter in renal calyces. They called that finding “calyceal microlithiasis”. There was a history of urolithiasis in at least one first or second degree relative. Their presenting symptoms were recurrent abdominal pain, dysuria and hematuria. Hematuria was the presenting symptom in 41% of their patients and hypercalciuria was found in 75 patients (3, 7).

From April 2000 to February 2001, 200 patients presenting with hematuria, dysuria, pyuria and recurrent UTI were referred to our pediatric nephrology clinic. All of them underwent renal ultrasound with a sound probe of 7.5 MHZ. CM was defined as hyperechogenic spots in renal calyces.

The sonographic feature of the small hyperechogenic spots in their location in renal calyces is different from the more general medullary distribution seen in nephrocalcinosis. Important clinical features of CM are high prevalence of urolithiasis within families and heterogenicity of the presenting symptoms. A positive family history of urolithiasis was found in 72.4% of our patients. In La Manna’s study the family history of urolithiasis was reported in 70.4% of their patients.

CM as well as urolithiasis represent a spectrum of various clinical situations. Some cases of CM are due to underlying metabolic abnormalities. CM may be the first step in calculus formation. Moreover, it appears that the calculi (especially microcalculi) may easily pass in urine and/or get reduced in size. We encouraged our patients to increase their water intake and prescribed potassium-citrate solution for them. If metabolic abnormalities were present they were treated, which may have contributed to the elimination and/or the reduction in size of microcalculi. The interesting finding was the relation between hematuria and CM. In our patients 63.6% with hematuria had CM on ultrasound. Stapleton *et al.* reported two children with recurrent renal colic and gross hematuria that required analgesics, although no calculi were recovered (8). It is likely that colics without passing of stones are associated

with microcalculi. It is well established that urolithiasis may represent the long term consequence of hypercalciuria and hyperuricuria associated with hematuria (9). CM may also be associated with hematuria alone without evidence of hypercalciuria and hyperuricuria (3). The prevalence of idiopathic hypercalciuria is reported to be between 9% to 26% of all cases of urolithiasis in children (9,10).

We recommend that children who are either at greater risk of renal stones or are highly suspected to be so, be referred for renal ultrasound screening at 3.5 and 7.5 MHZ concurrently.

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