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CASE REPORT

Cystine Urolithiasis in Early Childhood

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Abstract Urolithiasis in children is rare with reported incidence of 1.8 per 1000 children. A metabolic cause is identifiable in 40–50% of children with stones and is considered when multiple, recurrent and bilateral. Cystinuria is an important preventable cause of urolithiasis. We present an infant with recurrent gross hematuria due to cystine urolithiasis for its rarity.

Keywords Chromatography · Cystinuria · Dibasic aminoaciduria · Staghorn calculus

Introduction

Urolithiasis in children is rare with reported incidence of 1.8 per 10,000 children [1]. Early identification of a metabolic cause of urolithiasis and management are essential to prevent progression to renal failure. Cystinuria is an autosomal recessive disorder of impaired reabsorption of cystine and other dibasic amino acids namely ornithine, lysine and arginine in the renal proximal convoluted tubule and jejunum. Crystallization of L-cystine in the acidic pH of urine with renal calculus formation is the only known clinical effect of cystinuria [2]. About 6% of all pediatric urolithiasis are due to cystine [3]. We present a child with cystine urolithiasis for its rarity.

Case Report

A 20 months old female child born of non-consanguineous parentage presented with recurrent gross hematuria of 2 months duration. Her blood pressure, growth, development and clinical examination were normal. Urine microscopy showed plenty of erythrocytes under high power examination. Urine culture yielded no growth. Abdominal sonogram showed mild left hydroureteronephrosis with multiple calculi within bilateral pelvicalyceal system of the kidneys. The largest calculus measured 1.6 cm in the left ureter about 6 cm from pelvi-ureteric junction. This was also made out on kidney, ureter and bladder X-ray study (Fig. 1a). There was no family history of renal stones. Serum electrolytes, calcium, phosphorus, uric acid and renal function tests were normal. Arterial pH was normal. Urine calcium creatinine ratio was normal. Paper chromatography of urine revealed presence of cystine among other amino acids. Urine cyanide nitroprusside test was positive for cystine (> 75 mg/L). Urine aminoacidogram by high power liquid chromatography showed elevated Cystine at 159.3 nmoles/mg creatinine (11–133). Urinary alanine—1898.2 (101–1500), citrulline—109.3 (< 57), tyrosine—572.9 (38–479) and phenylalanine—325.5 (34–254) expressed in nmol/mg creatinine were also mildly elevated indicating aminoaciduria. Levels of other dibasic amino acids were normal. Laparoscopic left uretero-lithotomy was done which yielded a dumbbell shaped stone measuring 2 × 1 cm, pale yellow in color and irregular surface (Fig. 1b). Stone analysis showed presence of

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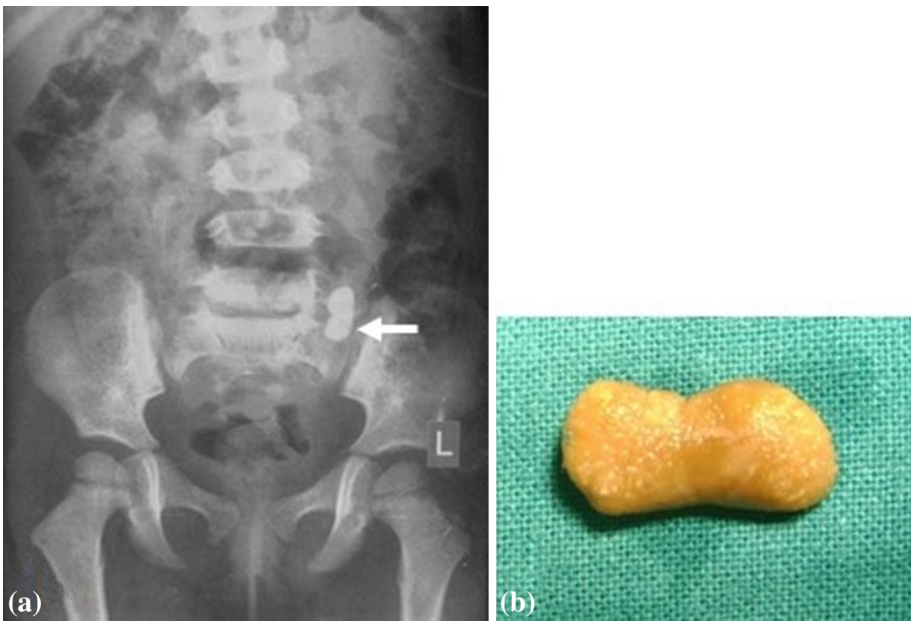

Fig. 1 **a** Kidney, ureter and bladder X-ray study showing a radiopaque shadow of ureteric calculus in the lower third of the ureter. **b** Dumbbell shaped stone measuring 2 × 1 cm retrieved during uretero-lithotomy

cystine, calcium oxalate, uric acid and ammonia. Child was started on oral potassium citrate to maintain an alkaline urinary pH. On follow-up, sonogram showed dissolution of majority of the stones with few persisting fragments over 4 months. There was no hematuria or new stone formation. Urine paper chromatography of either parent was normal.

Discussion

Genetic disorders and infection with or without urinary tract malformations are important contributory factors to pediatric urolithiasis [4]. A metabolic cause is identifiable in 40–50% of children with stones. Preliminary investigations in the index case ruled out idiopathic and secondary causes of hypercalciuria or a parathyroid disorder. Chromatography of urine and examination of stone suggested cystinuria. Cystine stones can occur in young children and is bilateral. Multiple relapses are possible and recurrent stone formation necessitates repeated urological interventions [5, 6]. Other than infection, cystinuria is an important cause of staghorn calculi. Mutations in *SLC3A1* and/or *SLC7A9* genes in heterozygous or homozygous states results in variable excretion of cystine either in isolation or along with other dibasic amino acids. Though there was mild elevation of other amino acids seen in the index case, the clinical presentation or the quantitative estimation did not suggest Fanconi syndrome seen in several metabolic conditions including cystinosis and tyrosinmeia. The aminoaciduria other than cystinuria seen in this child was probably due to tubular dysfunction from recurrent urolithiasis and will require follow up. Potassium citrate to maintain urine pH between 7 and 7.5 is the preferred first line therapy to prevent calculi formation. Sodium bicarbonate is not recommended as it increases cystine excretion. Penicillamine and captopril are useful in refractory cases.

To conclude, recognition of cystinuria is important as it is one of the few preventable causes of pediatric urolithiasis.

Compliance with Ethical Standards

Conflict of interest The author declares that they have no conflict of interest.

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