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A Child with Atypical Celiac Disease and Recurrent Urolithiasis

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A young boy with prior constipation developed recurrent severe calcium phosphate kidney calculi, sometimes sufficient to cause acute kidney failure and hydronephrosis. After several major surgeries, food allergies were determined by serum immunoglobulin E testing, and when he finally went on a gluten-free diet, he stopped forming calculi and has had no surgeries related to kidney calculi since. Hyperoxaluria was not identified in this child by 24-hour urine analysis, unlike most other reports of kidney calculus formation in individuals with gluten intolerance.

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Case Report

INTRODUCTION

Urolithiasis is unusual in children in North America, though its incidence may be rising rapidly based on a retrospective report from a single center in New York.[1] Gluten intolerance and celiac disease are both extremely common in people of European descent. Enteric hyperoxaluria secondary to celiac disease promoting kidney calculi has been reported in adults and children.[2-5] This raises the concern that more children with various forms of gluten intolerance may be at risk of kidney calculus formation. I present a very rare case of a child with gluten intolerance, possible atypical celiac disease, and recurrent calcium phosphate calculi with hyperoxaluria resolved by gluten avoidance.

CASE REPORT

In September 2005, a 3-year-old Caucasian boy developed his first kidney calculus episode associated with acute kidney failure (serum creatinine, 3.7 mg/dL), severe dehydration, and vomiting. He had a 5-mm calculus on the left and a 8-mm calculus on the right obstructing both ureters. Bilateral nephrostomy tubes were placed and serum creatinine fell to 0.8 mg/dL. Three days later, bilateral ureteral stents were placed. The calculi were determined to be entirely calcium phosphate. He ultimately had laser lithotripsy to remove the calculi. The stents and nephrostomy tubes were removed 10 days thereafter. Two weeks later, he was shown to have bilateral nephrocalcinosis. He was started on potassium citrate, 16 mEq twice daily, a multivitamin with iron, and a low sodium diet. This and other kidney calculus events the child suffered are summarized in Table 1. Renal tubular acidosis was ruled out by normochloremia and absence of metabolic acidosis.

The patient was seen at the Bastyr Center for Natural Health and he was tested for serum immunoglobulin (Ig) E and IgG_4 to foods by enzyme-linked immunosorbent assay and found to have elevated levels reactive against wheat, dairy, soy, goat milk, egg, rye, spelt, lamb, and peanut. He had never exhibited anaphylactic reactions to any foods. It was recommended that he avoid wheat, dairy, soy, and beef, but there was a misunderstanding and he only decreased these in the diet instead of completely eliminating them.

On November 1, 2005, the patient presented to my clinic with daily cyclic abdominal pain; nonbloody diarrhea; recurrent, multiple, bilateral calcium phosphate kidney calculi; and attention deficient hyperactivity disorder. He lived with his adoptive parents—his biological aunt and her husband. He was well below typical growth levels for his age at 17 kg. His sister (or possibly

Table 1. Kidney Calculus Events Summary

Date	Event	Treatment
21 Sept to 15 Oct 2004	Acute bilateral stones, acute renal failure	Bilateral nephrostomy tubes, stents, and laser lithotripsy
2 Nov 2004	Bilateral nephrocalcinosis	Potassium citrate, multivitamin with iron, increased fluids, low sodium diet
10 Dec 2004	Acute bilateral stones	Medically managed
5 Feb 2005	Right distal steinstrasse	Right ureteral stent, cystoscopy
28 April 2005	Right distal steinstrasse	Stent replaced, Cook stone extractor basket placed, balloon dilation of R distal ureter
12 May 2005	Acute right stone	Stent removed
2 July 2005	Acute right stone	Medically managed
17 Aug 2005	Right ureteral stricture	Right double J ureteral stent placed
10 Jan 2006	Acute left stone	Medically managed
15 Jun 2006	Very mild acute stone episode	Naturopathically managed

his half-sister) was also below the 50th percentile for growth for her age though she exhibited no digestive or kidney problems. He had not been breast fed and developed colic soon after birth. He had a chronically dilated colon and constipation since infancy and was put on polyethylene glycol to control this. At the initial and all subsequent visits he exhibited normal intelligence and motor function.

For pain control, tissue healing, and enhancement of digestive function, he was given a combination of hydroethanolic and glycerin extracts of herbs, 1 mL, 3 times per day, as outlined in Table 2. He was also given magnesium citrate, 250 mg twice daily. Genetic testing ruled out Dent disease.[6] A 24-hour spectroscopic urinalysis showed that he had hypercalciuria, hypocitraturia, and hypomagnesuria without hyperoxaluria. Though he did not test positive for classic celiac disease serology, a trial removal of gluten led to significant improvement, and after many months, a cessation of forming calculi and having acute calculus episodes. He has not had any surgery related to kidney calculi since going off gluten.

DISCUSSION

No prior cases of calcium phosphate calculi responsive to gluten elimination in a child or adult were located in the medical literature. It seems likely from the history that bowel problems, apparently related to food allergies including gluten intolerance, led to abnormal absorption of nutrients (excessive calcium and phosphorous with low citrate) that caused this patient's recurrent kidney calculi, though some unusual genetic syndrome with digestive and kidney problems cannot be ruled out at this point. Children with atypical kidney calculi and digestive problems should be tested for celiac disease and food allergy testing of some kind as part of their program of determining the cause of urolithiasis.

Calcium phosphate kidney calculi form initially around a nidus of brushite or $CaHPO_4 \cdot 2H_2O$ in the usual acidic urine associated with such types of

Table 2. Ingredients of a Combination of Hydroethanolic and Glycerin Extracts of Herbs

Latin Binomial	English Name	Part Used	Preparation	Role in Formula	% in Formula
Calendula officinalis	calendula	Flower	glycerite	Tissue healing, inflammation modulating	20
Nepeta cataria	catnip	flowering top	glycerite	Flavor enhancer, calming	20
Centella asiatica	gotu kola	entire plant	glycerite	Antifibrotic, calming	15
Galium aparine	cleavers	flowering top	glycerite	Mild diuretic, tissue healing	15
Matricaria recutita	chamomile	Flower	tincture	Inflammation modulating, calming	10
Glycyrrhiza glabra	licorice	Root	fluid extract	Inflammation modulating, flavor enhancer, formula synergizer	10
Eupatorium perfoliatum	boneset	flowering top	tincture	Immune stimulant, bitter digestive enhancer	5
Achillea millefolium	yarrow	flowering top	glycerite	Inflammation modulating, bitter digestive enhancer	4
Pulsatilla occidentalis	western anemone	flowering top	tincture	Strong analgesic	1

calculi.[7] Supersaturation of the urine with calcium and phosphates are a necessary precursor to this event, but are not sufficient to explain calculus formation. In the current case, the patient is believed to either have a defect in absorption of one or both of these compounds in the gut, or a defect in renal handling of these compounds, resulting in supersaturation. This patient was not tested for classic absorptive hypercalciuria but his improvement off of gluten argues against that diagnosis.[8] Formation of so-called Randall plaques on the basement membranes of the loop of Henle and elsewhere in the nephron suggests a complex interplay of urine components, organic compounds, and cellular structures.[9] Most recently, the protein component of calcium phosphate calculi has been analyzed and the vast majority of the hundreds involved are part of inflammatory pathways.[10]

CONFLICT OF INTEREST

Dr Yarnell is part-owner of Heron Botanicals, Inc, which produced the herbs administered to the patient in this case.

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