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DIFFERENTIATING AMONG RENAL STONES

Renal stone disease is the reason for many patients each year to see a physician or to be admitted to a hospital for treatment or evaluation, so a familiarity with the frequency of the various types of stone disease and their clinical presentation is helpful to the physician.

Renal stone disease is a fairly common cause of hospitalization, accounting for approximately 1 out of 1,000 hospital admissions per year. It occurs most commonly in otherwise healthy 18- to 45-year-old men, and the recurrence rate is almost 100% within 20 years after the first stone. The most common renal stone is the calcium-containing type, found in 75% of all patients with renal stone disease. Less common types include triple phosphate stones (struvite), which occur in 10% to 15% of the cases; uric acid stones, also present in 10% to 15% of the cases; and cystine or xanthine stones, which have a frequency of less than 1%.

CALCIUM STONES

Calcium stones are composed of either calcium oxalate or, less commonly, calcium phosphate. Calcium phosphate stones may indicate chronically alkaline urine, chronic urinary infection, renal tubular acidosis, or primary hyperparathyroidism. Both types of calcium stones occur more frequently in patients who have high urinary concentrations of calcium, uric acid, or oxalate, or a deficiency of crystal inhibitors such as citrate.

It is important to remember that elevated levels of uric acid can be associated with calcium stones as well as uric acid stones. Other risk factors for calcium stone disease include chronic dehydration or low urine volume and inflammatory bowel disease with fluid loss through the gastrointestinal tract.

Idiopathic hypercalciuria, the increased urinary excretion of calcium (>300 mg/24 hours in men, >250 mg/24 hours in women), is the most common of the conditions associated with calcium stone disease, occurring in 60% to 70% of cases. This disease is characterized by low to low-normal levels of serum phosphate and hyperabsorption of calcium from the gut. Less common associated conditions include hyperoxaluria (oxalate excretion exceeding 40 mg/day), hyperuricosuria (uric acid >750 mg/day), and hypocitraturia (<300 mg/day). Urinary citrate, which inhibits calcium precipitation by forming a soluble salt with calcium, tends to exist in higher levels in women than in men. This may account for the increased frequency of renal stone disease in men.

TRIPLE PHOSPHATE STONES

Triple phosphate stones, composed of magnesium ammonium phosphate and calcium phosphate, often appear as staghorn calculi, and they almost always occur in the presence of infection. As a rule of thumb, when the urine is alkaline and its sediment contains white cells and bacteria, the stones are struvite. Infection is rarely the sole abnormality of recurrent struvite stones, however. Usually an anatomical abnormality of the urogenital tract is present.

URIC ACID STONES

There is a common misconception that uric acid stones occur only in patients with a history of hyperuricemia or gout. Although they occur in 22% of patients with primary gout and 42% of patients with secondary gout, this accounts for only a small percentage of the total number of cases. The stones are radiolucent but may present as a filling defect in areas of contrast on an intravenous pyelogram. Patients who have persistently acidic urine (pH<5.0) are especially prone to this disease. The stones will not develop in an alkaline environment.

CYSTINE STONES

Cystine stones form as a result of cystinuria, a genetic disorder (autosomal-recessive) that causes increased urinary secretion of the amino acids arginine, lysine, ornithine, and cystine. Cystinuria can be detected by

the nitroprusside test. Typically occurring in patients in their 20s or younger, cystine stone disease is characterized by the presence of staghorn calculi, even in the absence of infection; urinary sediment comprised of hexagonal cystine crystals in acidic urine; semi-opaque, bilateral stones that typically occur in aggregates; and urinary cystine excretion >100 mg/day.

It is important to recognize the conditions associated with renal stone disease, since early identification of the underlying metabolic derangement and prompt intervention can reduce the chances of stone recurrence.

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