

101. Nephrolithiasis

Etiology

- Calcium oxalate stones are most common (65%); others include calcium phosphate, uric acid, and struvite (magnesium ammonium phosphate)
- Most often due to increased concentration of stone-forming material in urine either due to increased excretion or decreased urinary volume
- Calcium-containing stones are due to ↑ urinary calcium/oxalate excretion (i.e., excess calcium absorption from bone in primary hyperparathyroidism)
- Uric acid stones are common in patients with gout
- Struvite stones are usually due to urea-splitting organisms such as *Proteus*

Differential Dx

- Pyelonephritis
- Papillary necrosis
- Renal cell carcinoma
- Transitional cell carcinoma
- Back injury/spasm
- Broken ribs
- Herpes zoster
- Dissecting aortic aneurysm
- Biliary colic
- Pancreatitis

Epidemiology

- Incidence in US is less than 0.5%; lifetime incidence is 10%
- Males > females
- Whites > blacks
- Young to middle-aged adults
- Paradoxically, high dietary calcium intake may decrease the risk of stones as it forms ligands with dietary oxalate and phosphate

Signs/Symptoms

- Severe, acute, colicky flank pain
- Hematuria (stone in kidney) often with radiation to testicle or labia
- Severe, acute urethral pain (stone passing through urethra)
- Nausea/vomiting are common
- Dysuria, urgency, and frequency are less common
- Obstruction of ureter may result in anuria or acute renal failure in patients with a single functioning kidney; rarely, bilateral ureteral obstruction may occur
- Fever/chills and other constitutional symptoms if infection complicates the picture
- CVA tenderness

Diagnosis

- A history of flank pain and the presence of microscopic or gross hematuria mandates imaging studies
- Urinalysis, urine pH, and urine culture
- Spiral CT and abdominal films may be diagnostic if the stone is radio-opaque (Ca^{++} -containing stones, struvite, cysteine)
- Ultrasound and intravenous pyelogram for radiolucent stones, to better localize stones, and to detect obstruction
- Search for etiology of stone, especially if recurrent
 - Strain urine and send stone to the lab if possible
 - 24-hour urine collection for volume, pH, calcium, citrate, oxalate, phosphorus, uric acid, ammonium, magnesium
 - Serum chemistries and parathyroid hormone evaluation
 - Consider many systemic diseases that can contribute to development of urolithiasis (e.g., gout, enzyme deficiencies, malignancy, sarcoidosis)

Treatment

- Surgically active stone disease (passing a stone) is treated with hydration and analgesics (NSAIDs, narcotics)
- Stones too large to pass require external shock wave lithotripsy, cystoscopic or ureteroscopic laser lithotripsy, stenting, basket retrieval, or urolithotomy
- Admit to hospital if patient is unable to keep fluids down or pain is not adequately managed
- Treat infection if present (see UTI entry for choices)
- Prevention via increased water intake (>3 L/day)
- Directed treatment depending on type of stone
 - Limit sodium intake and thiazide diuretics for Ca^{++} -containing stones with hypercalciuria
 - Dietary oxalate reduction if hyperoxaluria
 - Alkalinize urine and allopurinol if hyperuricosuria
 - Penicillamine for cystinuria

Prognosis/Clinical Course

- 90% of stones <4 mm pass spontaneously
- <10% of stones >6 mm pass spontaneously
- Prognosis depends on the type of stone and the primary cause for stone formation
- Recurrence is very common—14% at one year after first stone and 75% at 20 years
- All patients should be counseled to increase water intake after passing their first stone