Stone Formers:

How to Sort Them Out and When to Refer

Kevin McLaughlin, MB ChB(Hons), MRCP(UK), PhD; Davina Tai, BE, MD; and David Sadler, MB ChB, FRCS, FRCR

Presented at the University of Calgary's Family Practice Review and Update, November 2007.

Ten per cent of males and 6% of females will develop kidney stones.[1] As was noted by Hippocrates, most symptomatic kidney stones will pass spontaneously without complication.

How is a kidney stone diagnosed?

Because several conditions may mimic symptomatic kidney stones, a broad differential diagnosis must be considered—this includes life-threatening emergencies, such as an abdominal aortic aneurysm or an ectopic pregnancy. Table 1 outlines some conditions which may mimic renal colic.

Classically, symptomatic kidney stones present with acute paroxysms of flank or loin pain. The location of pain may change as the stone migrates. Patients may also complain of other symptoms, such as:

- hematuria,
- dysuria,
- nausea and
- vomiting.

A relatively simple clinical prediction rule for diagnosing kidney stones has been validated (Table 2).[2] The gold standard for the radiologic diagnosis of kidney stones is a non-contrast helical CT scan, which has specificity close to 100%.[3]

In our case, Robert has hematuria on dipstick urine analysis and a CT scan (Figure 1) confirms the diagnosis of stones.

Meet Robert

Robert, 40, is a business man who presents to the ER with sudden onset, left-sided loin pain radiating to his groin.

He has not seen a physician in many years and has no significant past medical history.

He takes no medications except for a daily multivitamin.

Examination

- Robert is in obvious distress with a BP of 160/90 mmHg, a heart rate of 108 bpm and a temperature of 37.4°C
- Further examination reveals vague tenderness in the left lower quadrant (LLQ)

Table 1

Differential diagnosis of kidney stones

- Pyelonephritis
- Abdominal aortic aneurysm (AAA)
- Ectopic pregnancy
- Salpingitis
- Pelvic inflammatory disease
- Ovarian cyst
- Appendicitis
- Diverticulitis
- Bowel obstruction
- Pneumonia
- Pulmonary embolism

Table 2

Are this patient's symptoms due to kidney stones?

Symptoms	Points
Flank pain	1
Acute onset of pain	1
Hematuria	2
Radiological evidence of kidney stone	2
Total points	**Likelihood of stones**
4	90%
5	96%
6	98.5%

When should urology be consulted?

Referral to urology is rarely required as 80% to 90% of stones will pass without intervention. However, urgent urologic consultation is warranted for patients with urosepsis, acute renal failure, unrelenting symptoms, previous complications of stones and stones > 5 mm.[4] The five "Ps" for urgent urologic referral are summarized in Table 3.

How should the first kidney stone be managed?

In a patient who has passed a first calcium-containing stone, the likelihood of forming a second stone is approximately 15% at one year, 35% at five years and 50% at 10 years.[5] To avoid unnecessary intervention, the first kidney stone requires only a limited evaluation. Appropriate investigations at this stage include:

- stone analysis,
- serum creatinine,
- serum calcium and
- serum urate.

Radiologic follow-up should be arranged in six to 12 months to assess for the formation of asymptomatic recurrent stone formation.

To reduce the risk of recurrence, all patients should increase their fluid intake to > 2 L q.d., spaced evenly throughout the day. High fluid intake has been shown to decrease the rate of stone recurrence by approximately 50% over five years.[6] Patients should not reduce their calcium intake as this doubles the risk of recurrence over a five year period.[7] Reducing

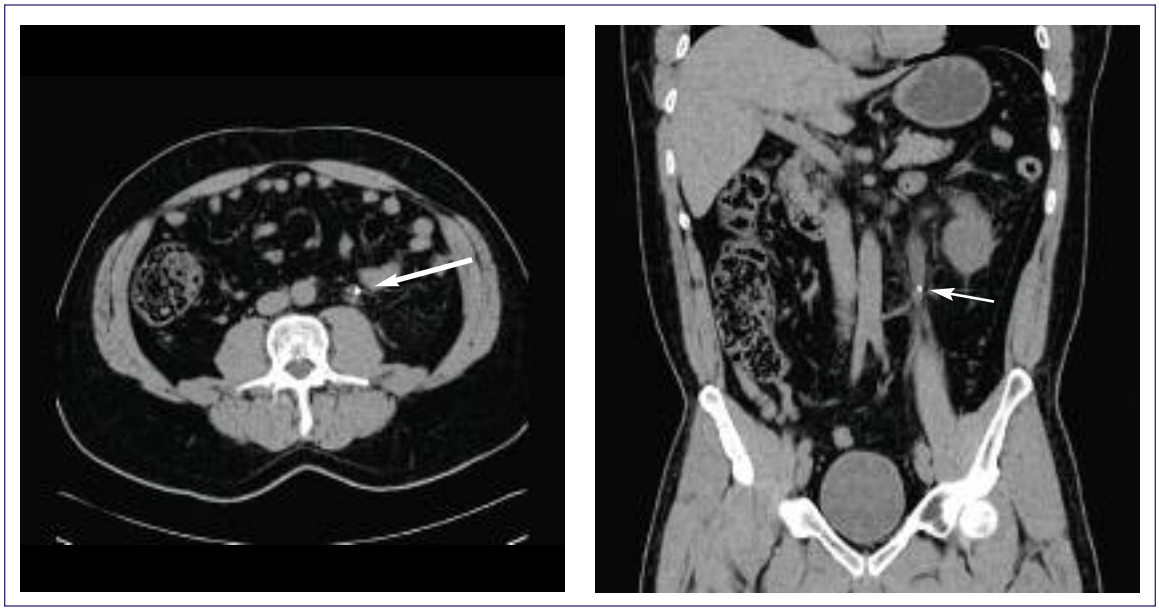

Figure 1. Non-contrast helical CT scan.

Table 3
Indications for urgent urologic referral: The 5 "Ps"

Pyrexia (urosepsis, pyonephrosis)
Post-renal failure
Persistent symptoms
Previous complications of stones
Pretty big stone (> 5 mm)

dietary calcium intake increases oxalate absorption from the GI tract, leading to increased urine oxalate excretion.

How should recurrent kidney stones be managed?

Patients who have recurrent stones, either symptomatic or radiological, should be screened for an underlying metabolic problem. This typically involves at least two 24-hour urine collections for quantification of:

- urine sodium,
- calcium,
- oxalate,
- citrate,
- urate,
- creatinine and
- volume.

Urine pH should also be measured on a random urine sample. Depending upon the underlying metabolic problem, additional preventative strategies may include:

- Thiazide diuretic for hypercalciuria
- Allopurinol for hyperuricosuria
- Potassium citrate for hypocitraturia
- Increased dietary calcium for enteric hyperoxaluria

Take-home message

1. Consider diagnostic emergencies, such as AAA or ectopic pregnancy
2. Diagnose based on clinical presentation (acute flank or loin pain, hematuria) and radiological imaging
3. Refer to urology if patient has 1 of the 5 "Ps"
4. Prevent stone recurrence with increased fluid and preserved dietary calcium intake and follow-up the first stone with radiological imaging in 6-12 months
5. Screen patients with recurrent stones for underlying metabolic problems

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Dr. McLaughlin is an Associate Professor, Division of Nephrology, Department of Medicine, University of Calgary, Calgary, Alberta.

Dr. Tai is a Nephrology Fellow, University of Calgary, Calgary, Alberta.

Dr. Sadler is a Clinical Assistant Professor, Department of Radiology, University of Calgary, Calgary, Alberta.

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