



Investigating the patient with renal colic

Each month we present authoritative advice on the investigation of a common clinical problem, specially written for family doctors by the Board of Continuing Medical Education of the Royal Australasian College of Physicians.

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Renal and ureteric stones are common and may present in a wide variety of ways. Renal colic is the classic presentation and is often associated with haematuria (either macroscopic or microscopic). Less classic presentations include vague abdominal pain, penile or labial pain, nausea and vomiting, and difficulty with micturition.

This article will discuss the investigation of patients who present with possible stone disease; neither further investigation of the cause nor management of the patient with stones will be addressed. Renal colic is primarily a problem to be treated surgically – particularly in the acute phase – and investigation and management are usually performed by a urologist.

Urine dipstick examination, microscopy and culture

Urine dipstick examination is fast, easy and cheap and can give a lot of useful information. Microscopic haematuria is frequently found; nitrites and leucocytes are sometimes seen when

infection is present (which is often seen with obstruction). A urine culture should be performed if there is any suggestion of infection.

Urine microscopy can confirm the presence of red and white cells found on dipstick examination and might reveal crystals, and it can help to rule out other renal problems (e.g. acute glomerulonephritis). It must be appreciated, however, that a normal dipstick or urine microscopy result does not rule out stone disease.

Biochemistry and haematology tests

Electrolytes, urea and creatinine levels should be checked because they will quickly show if any significant renal impairment is present. Serum calcium and uric acid should be checked on the same sample because raised levels might point to future investigations and be helpful in deciding on initial treatment.

A full blood count can be useful because a raised white cell level may indicate the need for earlier intervention.

IN SUMMARY

- Although haematuria is seen frequently with renal stones, a normal dipstick examination or urine microscopy result does not rule out stone disease.
- Measurement of electrolytes, urea and creatinine levels in serum will quickly show if significant renal impairment is present. Calcium and uric acid levels can be checked on the same sample.
- Noncontrast spiral CT is the investigation of choice for the patient with renal colic. It will also show up radiolucent stones (typically uric acid stones), which can easily be missed by other investigations.
- An intravenous pyelogram is a good test when spiral CT is not available.
- Abdominal ultrasound is the investigation of choice for pregnant women with renal colic.

Table. Radiological investigations for renal stones: a comparison

	Advantages	Disadvantages	Initial costs*
Gold standard Spiral CT	Speed and accuracy Cost effectiveness Ability to give alternative diagnoses and pick up radiolucent stones No contrast requirement	Increased radiation exposure Higher initial expense Limited availability	\$310.90
Silver standard Intravenous pyelogram	Ready availability Good accuracy	Requirement for contrast and intravenous injection Moderate radiation exposure	\$126.55
Bronze standard Abdominal ultrasound	Ready availability Reasonable accuracy No radiation exposure No contrast requirement Suitability for pregnant women	Lower accuracy than other radiological procedures Need for skilled technician and radiologist Additional expense if colour Doppler ultrasound is performed	\$86.70

* Procedural costs rebatable under Medicare.

Figures 1a and b. Noncontrast spiral CT scans. a (left). A stone is visible at the right vesicoureteric junction. b (right). Dilatation of the right lower pole calyx and upper ureter. Forniceal rupture leading to urinary extravasation and perinephric stranding are shown.

Radiological investigations

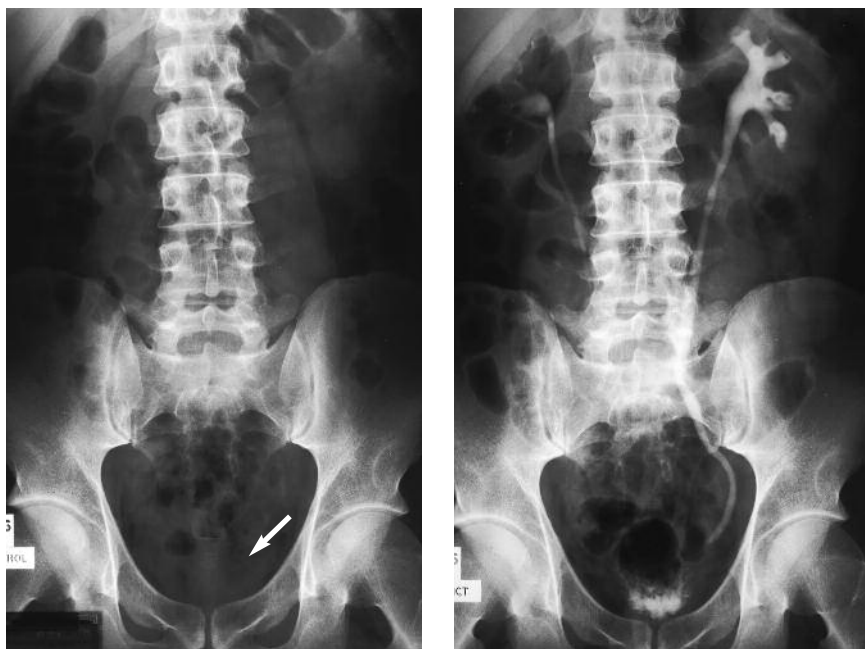
The most important radiological investigation is one that will show the presence, size and position of any stone, as well as any obstruction. The advantages, disadvantages and costs of three radiological procedures in current use – noncontrast spiral CT, intravenous pyelogram and abdominal ultrasound – are summarised in the Table.

Noncontrast spiral CT

Noncontrast spiral CT is currently the investigation of choice for the patient with renal colic. Numerous studies have shown this test to have high sensitivity, specificity and accuracy: a recent paper showed these to be 97%, 96% and 97%, respectively.¹ A noncontrast spiral CT scan will show small stones (i.e. less than 5 mm in diameter),



continued

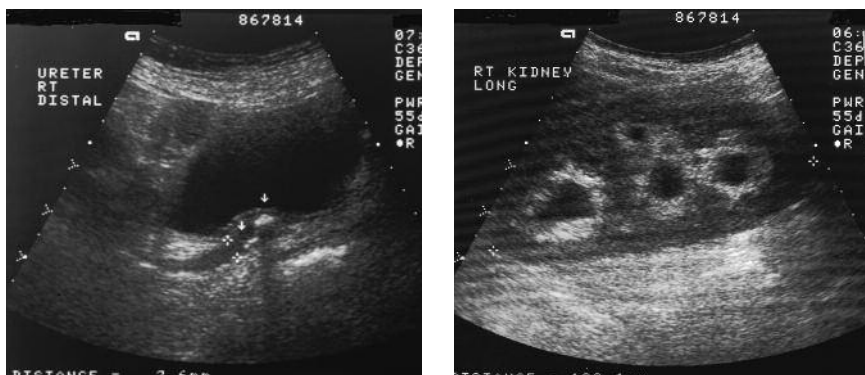


Figures 2a and b. Intravenous pyelogram. a (left). A control film showing the location of a ureteric calculus, 2 mm in diameter, on the left side (arrow). b (right). The post-micturition film shows distal ureteric obstruction at the site of the calculus.

and gives excellent siting of the stone (Figure 1a). It will also show up radiolucent stones (typically uric acid stones), which can easily be missed by other investigations.

A major advantage of noncontrast spiral CT is its ability to pick up alternative causes of the presenting symptoms. In a published investigation of 100 consecutive

patients with renal colic, 34 were found not to have stones – extraordinary lesions were found in 16 of these patients and were deemed to be the cause of the acute pain in 81% of the 16 cases.² Non-contrast CT will show up hydronephrosis, perinephric stranding or collections due to urine extravasation (Figure 1b), all of which would be relative indications for



Figures 3a and b. Abdominal ultrasound. a (left). Right ureteric calculi at the vesicoureteric junction. The largest stone is 7.6 mm in diameter. b (right). Dilatation of the right collecting system.

earlier surgical intervention.

A possible disadvantage of spiral CT is an increase in the radiation dose compared with an intravenous pyelogram. Some studies have suggested the dose is less than that of an intravenous pyelogram;³ others have suggested that it is two to three times higher.^{1,4} To put this in perspective, the likely increased radiation dose is not more than a passenger would receive on a flight between Sydney and Los Angeles.

Spiral CT has a higher initial cost. However, a study conducted at Royal North Shore Hospital in Sydney has shown a 44% decrease in costs associated with managing patients with the condition resulting from the reduced time spent in the emergency department.⁵ In addition, a 22% decrease in radiology costs was found because the accurate information that was quickly provided by spiral CT meant that only one radiological test was necessary.

If spiral CT is not available, an ordinary CT scan will give good information on renal stones. More information is obtained if both abdominal and pelvic CT scans are ordered, with and without contrast. Alternatively, an intravenous pyelogram or abdominal ultrasound will often be performed when spiral CT scanning is not available – the choice will depend on the availability of equipment and the expertise of the available technicians and radiologists.

Intravenous pyelogram

The intravenous pyelogram has been used for many years and was the gold standard before the availability of the spiral CT scan (see Figures 2a and b). A recent comparison found the sensitivity of intravenous pyelogram (52%) to be less than that of spiral CT (94%) but greater than that of ultrasound (19%); specificities of 97% were found for each of the three investigations.⁶

The intravenous pyelogram has the advantage of being readily available, but

disadvantages include radiation exposure, intravenous injection and the need to use a contrast agent. It should be carried out only after the serum creatinine level has been verified.

Abdominal ultrasound

Abdominal ultrasonography is readily available and presents no radiation or contrast risks. It is the investigation of choice for pregnant women with renal colic, and can safely be used for other patients (see Figures 3a and b).

An abdominal ultrasound is not as sensitive or accurate as the intravenous pyelogram or spiral CT.⁶ Partial and even complete obstructions are often missed, especially in the first 12 hours if the upper tract has not had time to dilate.⁷ The use of colour Doppler ultrasound improves accuracy but increases the expense and requires additional experience and expertise.

Conclusion

The best test for investigating a patient with renal colic is noncontrast spiral CT, which leads to a fast and accurate diagnosis and is cost effective. The intravenous pyelogram remains a good test if noncontrast spiral CT is not available. An abdominal ultrasound is the best test for pregnant women; however, its accuracy is not as high as that of spiral CT or intravenous pyelogram and depends heavily on the operator. **MT**

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