

## Clinical diagnosis of kidney stones

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### GUIDELINES

No recommendations possible based on Level I or II evidence

### SUGGESTIONS FOR CLINICAL CARE

(Suggestions are based on Level IV evidence)

- The majority of incidentally diagnosed kidney stones remain asymptomatic on medium-term follow-up.
- The presence of absence of haematuria is not sufficiently sensitive or specific to confirm or exclude the diagnosis of ureteric calculi.
- Urine should be strained for 48 h following an episode of ureteric colic and any calculi submitted for chemical analysis.
- A history of risk factors increases the risk of stone recurrence.

### BACKGROUND

Kidney stones are usually asymptomatic but may present with loin pain, dysuria or haematuria during ureteric passage. Lower ureteric stones may cause relatively more bladder irritative symptoms (dysuria, frequency). Alternative causes for flank pain unrelated to ureteral obstruction, or extra-ureteric causes of ureteric obstruction, need exclusion. Unenhanced helical computed tomography scan (UHCT) is currently the imaging mode of choice for acute flank pain, but has not been compared with urethroscopy. No 'gold standard' diagnostic test exists.

### SEARCH STRATEGY

**Databases searched:** Medline (1966 to July Week 4, 2004). MeSH terms and text words for kidney stones were combined with MeSH terms and text words for clinical symptoms and diagnostic imaging. The results were then limited to an adult population ( $\geq 19$  year) and combined with the Cochrane sensitive search strategy for diagnostic studies.

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### WHAT IS THE EVIDENCE?

No randomized controlled trials are available.

A total of 201 references were identified, with 17 selected as relevant. Studies using plain radiograph or intravenous urography (IVU) as the diagnostic standard, studies failing to distinguish ureteric from renal stones, case studies, reviews and articles in foreign languages were excluded.

#### Risk factors

The presence of risk factors increases the risk of recurrent stone formation, although the majority of stone formers have none identifiable. Risk factors and conditions associated with renal calculi include:

- Male sex, family history of renal calculi, obesity and the metabolic syndrome
- Primary metabolic abnormalities (e.g. hypercalcaemia, hyperuricosuria, hypocitraturia, hyperoxaluria, cystinuria)
- Hypercalcaemia of any cause (e.g. hyperparathyroidism, malignancy, sarcoidosis, prolonged immobilization)
- Intestinal disease (e.g. Crohn's disease, laxative abuse, jejunioileal bypass), renal tubular acidosis (Type 1), gout, recurrent urinary tract infection
- Chronic volume depletion (e.g. inadequate intake or hot climates)
- Urological anatomic abnormalities promoting urinary stasis, and
- Drug use (loop diuretics, antacids, acetazolamide, indinavir, corticosteroids, theophyllines, aspirin, allopurinol, vitamins D & C).<sup>1</sup>

A precipitating factor may be present: volume depletion (including recent diuretics, hot weather, heavy physical exercise) or increased protein intake.

### Natural history of asymptomatic kidney stones

The majority of renal stones remain asymptomatic over 3–5 years follow up.

After a mean follow up of 33 (1–61) months, 24 (12%) of 195 Japanese patients with asymptomatic microscopic haematuria and renal calculi on ultrasonography required urological management.<sup>2</sup>

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After a mean follow up of 32 months, 34 (32%) of 107 Canadian patients with asymptomatic urolithiasis on ultrasonography developed renal colic, with a cumulative 5-year event probability of 48.5%.<sup>3</sup>

#### Clinical diagnosis of ureteric colic

Ureteric colic is classically among the most painful of emergency presentations. Typically, pain of varying intensity is felt in the flank and radiates towards the groin. When the stone is lodged distally in the ureter (ureterovesical junction), there is no flank pain. Low-grade or intermittent flank pain can occur with stones in the renal pelvis. However, flank pain is not a specific symptom of ureteric calculi.

In patients with acute flank pain referred for UHCT, ureteric stones are found in 34–73% of examinations (Table 1).

The presence or absence of haematuria is not sufficiently sensitive or specific for the diagnosis of ureteric calculi.

In 195 patients with flank pain, kidney stones on UHCT and concurrent urine testing, the sensitivity of haematuria (>1 RBC/hpf) for kidney stones was 89% and specificity 29%. Of patients with flank pain but no haematuria, 26% had a stone. Eight of 18 with proven non-renal abdominal pain had haematuria.<sup>12</sup>

In a prospective study of 277 patients with acute flank pain, UHCT and concurrent urine testing, haematuria had a positive predictive value (PPV) of 61%, negative predictive value (NPV) of 72% and accuracy of 62% in predicting stone disease.<sup>13</sup>

In a retrospective review of UHCT, reports of 950 patients with acute flank pain and concurrent urine microscopy, haematuria had a sensitivity of 84%, specificity of 48%, PPV of 72% and NPV of 65% for the presence of kidney stones.<sup>14</sup>

Prospective structured clinical data was collected on 1333 Finnish patients with acute flank pain between 1978 and 1984, as part of a survey of over 10 000 patients by the Research Committee of the World Organization of Gastroenterology. Renal colic was diagnosed by plain abdominal X-ray, IVU, laboratory investigation, clinical decision or

follow up in 59 of the 1333 cases. Using multivariate logistic regression, the most significant independent predictors of renal colic were haematuria (>10 RBC/hpf, seen in 75%), loin tenderness (in 86%), <12 h of pain (in 66%) and normal appetite (in 46%). A computerized diagnostic scoring system achieved a sensitivity of 89% and a specificity of 99%.<sup>15</sup>

Fever suggests either a separate diagnosis of urinary tract infection or coexisting urinary tract infection.<sup>16</sup>

#### Stone analysis

The patient should filter urine to capture the stone with each voiding. This can be done through gauze, a nylon stocking, or filter paper (e.g. a coffee filter). Stone analysis is necessary to confirm the stone type and facilitate specific preventative therapy.<sup>16</sup>

#### SUMMARY OF THE EVIDENCE

No randomized clinical trials exist that examine the clinical diagnosis of renal calculi.

#### WHAT DO THE OTHER GUIDELINES SAY?

**Kidney Disease Outcomes Quality Initiative:** No recommendation.

**UK Renal Association:** No recommendation.

**Canadian Society of Nephrology:** No recommendation.

**European Best Practice Guidelines:** No recommendation.

#### INTERNATIONAL GUIDELINES

**American Urological Association:**<sup>17</sup> The management of ureteral calculi, Baltimore 1997. Deals with surgical management of ureteric calculi, rather than clinical diagnostic approach.

**British National Health Service: PRODIGY Guidelines:**<sup>16</sup> Renal colic – acute. [http://www.prodigy.nhs.uk/renal\\_colic\\_acute](http://www.prodigy.nhs.uk/renal_colic_acute). Last revised July 2002. Good primary practitioner guide to background and management of acute ureteric colic.

#### IMPLEMENTATION AND AUDIT

No recommendation.

#### CONFLICT OF INTEREST

Mark Thomas has no relevant financial affiliations that would cause a conflict of interest according to the conflict of interest statement set down by CARI.

#### SUGGESTIONS FOR FUTURE RESEARCH

No recommendation.

**Table 1** Prevalence of ureteric stones on UHCT in patients with flank pain

Reference	Year	Subjects with flank pain	Percent with ureteric stones
Arinad <i>et al.</i> <sup>4</sup>	2003	213	68
Ponnangura <i>et al.</i> <sup>5</sup>	2002	43	65
Hamm <i>et al.</i> <sup>6</sup>	2002	109	73
Hammoud <i>et al.</i> <sup>7</sup>	2001	102	38
Shokeir & Abdulmaaboud <sup>8</sup>	2001	109	48
Chen & Zagoria <sup>9</sup>	1999	100	49
Fielding <i>et al.</i> <sup>10</sup>	1997	50	58
Smith <i>et al.</i> <sup>11</sup>	1996	292	34

UHCT, unenhanced helical CT scan.

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