Clinical diagnosis of kidney stones

Date written: January 2005
Final submission: March 2006
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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 relative 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 (≥19 year) and combined with the Cochrane sensitive search strategy for diagnostic studies. Date of searches: 20 August 2004.

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. hypercalcinuria, hyperuricosuria, hypocitraturia, hyperoxaluria, cystinuria)
• Hypercalcemia of any cause (e.g. hyperparathyroidism, malignancy, sarcoidosis, prolonged immobilization)
• Intestinal disease (e.g. Crohn’s disease, laxative abuse, jejunoileal 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).

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.
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%.3

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 a prospective study of 277 patients with acute flank pain, 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.12

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.11

In a retrospective review of UHCT, reports of 85% 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.14

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 hr of pain (in 66%) and normal appetite (in 46%). A computerized diagnostic scoring system achieved a sensitivity of 89% and a specificity of 99%.15

<table>
<thead>
<tr>
<th>Reference</th>
<th>Year</th>
<th>Subjects with flank pain</th>
<th>Percent with ureteric stones</th>
</tr>
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<tbody>
<tr>
<td>Ahmad et al.4</td>
<td>2003</td>
<td>213</td>
<td>68</td>
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<tr>
<td>Pummangura et al.5</td>
<td>2002</td>
<td>43</td>
<td>65</td>
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<tr>
<td>Hamm et al.6</td>
<td>2002</td>
<td>109</td>
<td>73</td>
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<td>Hammoud et al.7</td>
<td>2001</td>
<td>102</td>
<td>38</td>
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<tr>
<td>Shokeir &amp; Abdulmaaboud8</td>
<td>2001</td>
<td>109</td>
<td>48</td>
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<tr>
<td>Chen &amp; Zagoria9</td>
<td>1999</td>
<td>100</td>
<td>49</td>
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<tr>
<td>Fielding et al.10</td>
<td>1997</td>
<td>50</td>
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<tr>
<td>Smith et al.11</td>
<td>1996</td>
<td>292</td>
<td>34</td>
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</tbody>
</table>

UHCT, unenhanced helical CT scan.

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

Fever suggests either a separate diagnosis of urinary tract infection or coexisting urinary tract infection.16

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.16

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


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.
REFERENCES