The accuracy of noncontrast helical computed tomography versus intravenous pyelography in the diagnosis of suspected acute urolithiasis: a meta-analysis

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Authors' objectives
To determine the accuracy of noncontrast helical computed tomography (NHCT), compared with that of intravenous pyelography (IVP), for the diagnosis of acute urolithiasis.

Searching
Two reviewers searched MEDLINE and EMBASE (from 1994 to 2000) independently and in a blinded fashion; the search terms used were reported. The MEDLINE search was restricted to English language publications. In addition, two reviewers handsearched five named journals (1994 to 2000) independently and in a blinded fashion. The references of all articles found were also checked.

Study selection
Study designs of evaluations included in the review
Prospective diagnostic cohort studies were eligible for inclusion. NHCT was performed before IVP in all of the included studies.

Specific interventions included in the review
Studies that compared NHCT with IVP directly in the same patients were eligible for inclusion. Both investigations had to be conducted on the same day.

Reference standard test against which the new test was compared
The reference standard was clinical follow-up. Studies in which follow-up occurred in at least 80% of patients were eligible for inclusion.

Participants included in the review
The participants were patients with suspected acute urolithiasis. The inclusion criteria specified that the patient population should include all those likely to have the disease, and should not preferentially include those with a higher pre-test probability of a positive diagnosis.

Outcomes assessed in the review
No outcome measures were specified in the inclusion criteria. The outcome measures used in the review were positive and negative likelihood ratios (LRs), calculated from 2x2 tables.

How were decisions on the relevance of primary studies made?
Two reviewers independently assessed the studies for relevance. Any disagreements not resolved by discussion were referred to a third reviewer.

Assessment of study quality
Validity was assessed as part of the process of selecting studies for the review. The following criteria were used: prospective study of both NHCT and IVP; patient population includes all those likely to have the disease; no preference for patients with higher pre-test probability of disease; both investigations conducted on the same patient on the same day; description of the methods used to perform the tests and criteria used in their interpretation; all films assessed independently by at least two radiologists; radiologists were blind to the clinical findings in each case; reference standard was clinical follow-up; and follow-up had to occur in at least 80% of the patients. Only studies that met all the criteria were included in the review. Two reviewers independently assessed the studies for validity as part of the process of selecting studies for the review. Any disagreements not resolved by discussion were referred to a third reviewer.
Data extraction
Data were extracted to form two separate 2x2 tables (one for NHCT and one for IVP) for each study. The authors calculated positive and negative LRs and associated 95% confidence intervals (CIs) from individual 2x2 tables. The authors did not state how many reviewers performed the data extraction.

Methods of synthesis
How were the studies combined?
The LRs were log-transformed and used to derive pooled estimates of positive and negative LRs for NHCT and IVP. The data were analysed using general linear models with test (NHCT or IVP) as a fixed factor and trial as a random factor. The dependent variable (positive or negative LR) was weighted by the inverse of the variance.

How were differences between studies investigated?
The main effect of the trial was used to test for between-study heterogeneity. The level of significance was set at 0.05.

Results of the review
Four prospective diagnostic cohort studies (296 participants) were included in the review.

For individual studies, the positive LRs ranged from 8.52 (95% CI: 1.89, 38.40) to 61.05 (95% CI: 3.90, 955.56) for NHCT and from 5.53 (95% CI: 1.20, 25.53) to 23.84 (95% CI: 1.53, 370.20) for IVP. The negative LRs ranged from 0.01 (95% CI: 0.00, 0.22) to 0.07 (95% CI: 0.03, 0.18) for NHCT and from 0.15 (95% CI: 0.08, 0.27) to 0.52 (95% CI: 0.40, 0.68) for IVP. In all studies, the positive LR was higher and the negative LR lower for NHCT compared with IVP. The pooled positive LRs were 23.15 (95% CI: 11.53, 47.23) and 9.32 (95% CI: 5.23, 16.61) for NHCT and IVP, respectively, while the pooled negative LRs were 0.05 (95% CI: 0.02, 0.15) and 0.33 (95% CI: 0.23, 0.48). The differences between NHCT and IVP were statistically significant for both pooled measures (F(1,3)=10.923, P=0.046 for positive LR; F(1,3)=27.599, P=0.013 for negative LR). There was no statistically significant between-study heterogeneity for either positive LRs (F(3,3)=4.478, P=0.125) or negative LRs (F(3,3)=4.833, P=0.114).

Authors’ conclusions
NHCT is significantly more accurate than IVP for the diagnosis of acute urolithiasis.

CRD commentary
The review addressed a clear question, and the inclusion and exclusion criteria were defined in advance. The number of keywords used for searching MEDLINE and EMBASE was small, and it is therefore possible that some relevant items could have been missed. In addition, the restriction of the MEDLINE search to items published in English raises the possibility of language or publication bias; the authors did not formally assess the risk of publication bias. The search and selection of studies for the review were performed independently by two reviewers, thus reducing the risk of bias during the review process. Validity was addressed as part of the process of selecting studies for the review. The criteria used addressed selection bias (prospective studies, all eligible patients included, no preference for those with higher pre-test probability of disease), verification bias (all participants received both index tests and the reference standard of clinical follow-up), incorporation bias (clinical follow-up was independent of the results of NHCT or IVP), disease progression bias (both tests were performed on the same day) and review bias (blinded assessment of films). The specificity of the inclusion criteria may limit the generalisability of the review conclusions. NHCT was performed before IVP in all the included studies. As the authors pointed out, this could have resulted in a bias in favour of NHCT if the patient passed a stone after NHCT, but before the IVP examination. However, both tests were conducted on the same day, which reduces the risk of this bias.

The restriction of the review to studies meeting specified quality criteria, the absence of significant between-study heterogeneity, and the agreement between the pooled LRs and the results of individual studies support the reliability of the authors’ conclusions.
Implications of the review for practice and research
The authors did not state any implications for practice or further research.

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.