Diagnostic accuracy of noncontrast computed tomography for appendicitis in adults: a systematic review

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CRD summary
This well-conducted review concluded that non-enhanced computed tomography (CT) had high sensitivity and specificity for the diagnosis of acute appendicitis in the adult population and was adequate for clinical decision making in the Emergency Department. The authors’ conclusions reflected the data presented and are likely to be reliable.

Authors’ objectives
To assess the accuracy of non-contrast computed tomography (CT) for diagnosing acute appendicitis in adults in the emergency department setting.

Searching
MEDLINE, EMBASE, the Cochrane Library, DARE, HTA, the American College of Physicians Journal Club, and Emergency Medicine Abstracts were searched to up March 2008. No language or publication status restrictions were applied. Search terms were reported. The full search strategy was reported in an appendix (e1). Weekly update searches were conducted in MEDLINE to March 2009. Bibliographies of included studies and previous systematic reviews were screened for additional articles.

Study selection
Studies that assessed non-contrast helical (multi-slice) scanner CT diagnosis of adult patients who presented or were referred to the Emergency Department with acute abdominal pain and suspected acute appendicitis, but who were not immediate candidates for surgery, were eligible for inclusion. Studies with a mix of adult and paediatric patients were excluded, unless separate data were reported for those aged 16 years and over. Included studies were required to use an appropriate reference standard for confirmation (surgery or pathological assessment of surgical specimen) or exclusion (two week uneventful clinical follow-up) of acute appendicitis in all patients.

The age range of patients in included studies ranged from 16 to 86 years; the median prevalence of appendicitis was 39.3% (range 20.1 to 84.5%).

Two reviewers independently assessed studies for inclusion and disagreements were resolved by a third reviewer.

Assessment of study quality
The methodological quality of included studies was assessed using the QUADAS (Quality Assessment of Diagnostic Accuracy Studies) tool, which assessed aspects of reporting quality, generalisability, selection bias, verification biases, blinding, disease progression bias, and handling of withdrawals and indeterminate results.

The authors did not state how many reviewers performed the quality assessment.

Data extraction
Data were extracted on the numbers of true positive, false negative, false positive and true negative CT results. Sensitivity and specificity estimates, with 95% confidence intervals (CIs), were calculated for each study.

Data were extracted independently by two reviewers using a standardised form; disagreements were resolved by consensus and consultation with a third reviewer.

Methods of synthesis
Pooled estimates of sensitivity and specificity, with 95% confidence intervals, were calculated using a random-effects
model; positive and negative likelihood ratios were calculated from these summary estimates. A summary receiver operating characteristic curve was constructed.

A sub-group analysis was planned to compare the results of multi-slice CT scanners (4, 16, or 64 slice) with those of dual slice scanners. In addition, repetition of the primary analysis, using a bivariate random-effects regression model, was also planned.

Results of the review
Seven studies (n=1,060 patients), were included in the review. QUADAS quality assessment indicated that all seven studies avoided disease progression bias (had acceptable time delay between index test and reference standard); six/seven studies were subject to potential differential verification bias (different reference standards used to confirm positive and negative test results); one study reported laparoscopic confirmation in all participants; two studies reported details of indeterminate results and withdrawals.

The pooled estimate of sensitivity was 92.7% (95% CI 89.5 to 95.0) and the pooled estimate of specificity was 96.1% (95% CI 94.2 to 97.5). The positive likelihood ratio was 24 and the negative likelihood ratio was 0.08. Summary receiver operating characteristic analysis indicated no significant threshold effect.

The small size and number of studies precluded any meaningful subgroup analysis; the bivariate random-effects method failed to converge.

Authors’ conclusions
Non-enhanced CT had high sensitivity and specificity for the diagnosis of acute appendicitis in the adult population and was adequate for clinical decision making in the Emergency setting.

CRD commentary
The review addressed a clearly stated research question, defined by appropriate inclusion criteria. A wide ranging literature search was conducted, without restriction by language or publication status, maximising the potential for full retrieval of available studies. Measures were taken to minimise error and/or bias throughout the review process.

The methodological quality of included studies was assessed and reported in full. The meta-analytic methods applied were appropriate to the data set.

The authors’ conclusions reflected the data presented and are likely to be reliable.

Implications of the review for practice and research
Practice: The authors stated that non-enhanced CT has high sensitivity and specificity for the diagnosis of acute appendicitis and should be considered as an alternative to contrast CT, particularly in patients with contraindications to contrast, such as those at risk for contrast-induced nephropathy.

Research: The authors made no recommendations for future research.

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Record Status
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.