Diagnosis of acute appendicitis during pregnancy: a systematic review

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CRD summary
This review evaluated the performance of computed tomography (CT) and magnetic resonance imaging (MRI) for the diagnosis of appendicitis in pregnancy. It concluded that MRI and CT appeared to be highly sensitive and specific and should be considered when ultrasonography is normal or inconclusive and appendicitis is suspected. These conclusions are representative of the limited data available.

Authors' objectives
To evaluate the performance of computed tomography (CT) and magnetic resonance imaging (MRI) for the diagnosis of appendicitis during pregnancy.

Searching
MEDLINE (1950 to August 2008) and MEDION were searched for studies published in English. Search terms were reported. Bibliographies of included studies and review articles were screened for additional studies.

Study selection
Studies of CT and/or MRI in pregnant patients with suspected appendicitis were eligible for inclusion. For studies of mixed populations, patients with other indications for imaging (not suspected appendicitis) were excluded from the analysis. Included studies used surgical pathology and/or clinical follow-up as the reference standard.

All included studies were retrospective case-control studies. All but one of the included studies used ultrasound examination before CT or MRI. Where reported, the mean gestational age ranged from 20.6 to 28.3 weeks. The majority of CT studies used helical scanners. The majority of MRI studies used 1.5 T scanners; three of the five MRI studies used contrast-enhanced techniques. The majority of included studies used appendix size of more than 7mm as a diagnostic criterion.

Two reviewers assessed studies for inclusion. Disagreements were resolved by consensus or consultation with a third reviewer.

Assessment of study quality
The authors did not state that they assessed study validity.

Data extraction
Absolute numbers of true positive (TP), true negative (TN), false positive (FP) and false negative (FN) test results were extracted for each included study. Where zero values occurred, a continuity correction of 0.5 was added to all values for that study, to allow calculation of sensitivity and specificity. Estimates of sensitivity, specificity, positive and negative predictive values, and positive and negative likelihood ratios (LRs), with 95% confidence intervals (CIs), were calculated for each study.

Data were independently extracted by two reviewers and cross-checked. Disagreements were resolved by consensus, or consultation with a third reviewer.

Methods of synthesis
Between study heterogeneity was assessed using $X^2$, $I^2$ and Cochran's Q tests. Where there was evidence of significant heterogeneity, pooled estimates were calculated using the DerSimonian-Laird random-effects model. Where no evidence of significant heterogeneity was found, the Mantel-Haenszel fixed-effect model was used. Separate summary receiver operating characteristic (SROC) curves were presented for CT and MRI. All analyses were conducted using Meta-Disc, version 1.4.
Results of the review

Computed tomography (CT) performance (three studies): The pooled estimate of sensitivity was 85.7% (95% CI 63.7 to 97) and the pooled estimate of specificity was 97.4% (95% CI 86.2 to 99.9). The pooled estimate of positive likelihood ratio was 10.1 (95% CI 3.4 to 30.1) and the pooled estimate of negative likelihood ratio was 0.21 (95% CI 0.05 to 0.88). There was no significant between study heterogeneity in sensitivity or specificity.

Magnetic resonance imaging (MRI) performance (five studies): One study was excluded from the analysis because it was unclear whether ultrasonography had been used prior to MRI. The pooled estimate of sensitivity was 80% (95% CI 44 to 98) and the pooled estimate of specificity was 99% (95% CI 94 to 100). The pooled estimate of positive likelihood ratio was 22.7 (95% CI 6.0 to 87.5) and the pooled estimate of negative likelihood ratio was 0.29 (95% CI 0.13 to 0.68). There was no significant between study heterogeneity in sensitivity or specificity.

Authors' conclusions

The review was limited by the small number and retrospective nature of the included studies. Considering these limitations, MRI and CT appear to be highly sensitive and specific for the diagnosis of appendicitis in pregnancy.

CRD commentary

The review addressed a clearly stated research question, defined by appropriate inclusion criteria. The search strategy was limited to two bibliographic databases and only published English language studies were included. This may have resulted in the omission of relevant data and the possibility of language and/or publication bias. Measures were taken to avoid error and/or bias in the review process.

No assessment of the methodological quality of included studies was made, but the small size and weak study design of included studies was noted. Details of participant characteristics and diagnostic methods were provided for included studies. The methods used to generate pooled estimates of diagnostic performance measures were reasonable for the data sets reported. It is worth noting that, although there were no statistically significant differences in performance measures between MRI and CT, the pooled estimates of sensitivity were considerably less precise than those of specificity for both imaging modalities.

The authors noted the weaknesses of their review and their conclusions are broadly representative of the limited data available.

Implications of the review for practice and research

Practice: The authors stated that use of MRI or CT should be considered, when the results of ultrasonography are normal or inconclusive and appendicitis is suspected, in pregnancy.

Research: The authors did not state any recommendations for future research.

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