Accuracy of endoscopic ultrasound to diagnose nodal invasion by rectal cancers: a meta-analysis and systematic review

Puli SR, Reddy JB, Bechtold ML, Choudhary A, Antillon MR, Brugge WR

CRD summary
The review assessed diagnostic performance of endoscopic ultrasound for detecting nodal metastases in rectal cancer. Limitations in the review process and analytical methods meant that the pooled estimates of diagnostic accuracy measures may be unreliable. The authors’ statement that endoscopic ultrasound is an important and accurate diagnostic tool for evaluating nodal metastasis of rectal cancers is not adequately supported.

Authors’ objectives
To assess the diagnostic accuracy of endoscopic ultrasound in staging nodal metastasis of rectal cancers.

Searching
MEDLINE, EMBASE, CINAHL, HealthSTAR, ACP journal club, DARE, Cochrane Central Register of Controlled Trials (CENTRAL) and International Pharmaceutical Abstracts were searched to January 2008. Search terms (which included methodological search terms for diagnostic accuracy studies) were reported. Only English-language studies were included.

Study selection
Studies that were of endoscopic ultrasound and which used surgical histology as the reference standard were eligible for inclusion; nodal invasion was defined as spread to perirectal lymph nodes. Only studies that reported sufficient data to construct 2x2 contingency tables (numbers of true positive, false negative, false positive and true negative results) were included.

Two authors preformed the literature searches independently. The method of study selection was not specified.

Assessment of study quality
The methodological quality of included studies was assessed using the 14-item Quality Assessment of Studies of Diagnostic Accuracy Included in Systematic Reviews (QUADAS) tool. The QUADAS tool assesses adequacy of some aspects of study reporting, as well as potential for spectrum bias, verification or work-up biases, review biases (adequacy of blinding) and disease progression bias.

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

Data extraction
Data were extracted to calculate sensitivity and specificity, positive and negative likelihood ratios and diagnostic odds ratios of endoscopic ultrasound, with 95% confidence intervals (CIs), to diagnose nodal invasion of rectal cancer.

Two authors independently extracted data into an abstraction form. Disagreements were resolved by consensus.

Methods of synthesis
Pooled estimates of sensitivity, specificity, positive and negative likelihood ratios and diagnostic odds ratios were calculated using both the Mantel-Haenszel fixed-effect model and DerSimonian and Laird random-effects model.

Studies were grouped into three time periods (1986 to 1994, 1995 to 2000 and 2001 to 2008) to standardise change in endoscopic ultrasound technology, experience of endoscopist and endoscopic ultrasound criteria for lymph node involvement over time.

Between-study heterogeneity was assessed using the Cochrane Q test and illustrated by plotting summary receiver
operating characteristic (SROC) curves.

Impact of publication bias was assessed using Egger and Begg-Mazumdar tests. Funnel plots of standard error versus log diagnostic odds ratio were constructed.

Results of the review
Thirty five studies (n=2,732) were included in the review. All the studies fulfilled four to five out of 14 QUADAS criteria.

The pooled estimate of sensitivity for endoscopic ultrasound in diagnosing nodal involvement by rectal cancers was 73.2% (95% CI 70.6 to 75.6). The pooled estimate of specificity was 75.8% (95% CI 73.5 to 78.0).

The pooled estimate for positive likelihood ratio was 2.84 (95% CI 2.16 to 3.72), and for the negative likelihood ratio was 0.42 (95% CI 0.33 to 0.52).

The pooled estimate for diagnostic odds ratio was 7.87 (95% CI 5.31 to 11.66).

There was no evidence of statistically significant between-study heterogeneity or publication bias. Estimates were similar for fixed-effect and random-effects models. Pooled estimates of diagnostic accuracy measures did not change significantly over time.

Authors' conclusions
Endoscopic ultrasound is an important and accurate diagnostic tool for evaluating nodal metastasis of rectal cancers, but this meta-analysis shows that sensitivity and specificity of endoscopic ultrasound are moderate. Further development of endoscopic ultrasound technologies and diagnostic criteria are needed to improve performance.

CRD commentary
The objective of the review was to assess diagnostic performance of endoscopic ultrasound for detecting nodal metastases in rectal cancer. Broad, but appropriate, inclusion criteria were defined. A range of sources was searched to identify relevant studies. Use of methodological search terms for diagnostic accuracy studies may have limited the sensitivity of searches and resulted in potential loss of relevant data. The apparent exclusion of studies on the basis of language of publication raised the possibility of language bias. Measures were applied to reduce error/bias during the data extraction process; it was unclear whether similar measures were applied at all stages of the review. The methodological quality of included studies was assessed using an appropriate tool, but reporting of results of this assessment was very limited and did not inform interpretation of the overall findings of the review. There was a general lack of detail in reporting of characteristics of included studies. The authors reported no evidence of statistically significant between-study heterogeneity for any of the diagnostic accuracy measures reported, but the SROC curve presented suggested that simple pooling of sensitivities and specificities as presented was unlikely to have been appropriate. The summary estimates reported indicated at best moderate diagnostic performance and as such the authors' conclusion that endoscopic ultrasound is an important and accurate diagnostic tool for evaluating nodal metastasis of rectal cancers is an over-interpretation.

Implications of the review for practice and research
Practice: The authors stated that endoscopic ultrasound was an important and accurate diagnostic tool for evaluating nodal metastasis of rectal cancers.

Research: The authors stated that further refinement in endoscopic ultrasound technologies and diagnostic criteria were needed to improve diagnostic accuracy.

Funding
Not stated.

Bibliographic details

PubMedID
19219506

DOI
10.1245/s10434-009-0337-4

Original Paper URL
http://www.springerlink.com/content/dr4g1234354267x4/

Indexing Status
Subject indexing assigned by NLM

MeSH
Endosonography; Humans; Lymph Nodes /pathology /ultrasonography; Lymphatic Metastasis; Neoplasm Staging; Rectal Neoplasms /pathology /secondary /ultrasonography; Sensitivity and Specificity

AccessionNumber
12009104770

Date bibliographic record published
05/08/2009

Date abstract record published
31/03/2010

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.