A systematic review and economic evaluation of magnetic resonance cholangiopancreatography compared with diagnostic endoscopic retrograde cholangiopancreatography


CRD summary
The review assessed the diagnostic performance of magnetic resonance cholangiopancreatography (MRCP) compared with the reference standard of endoscopic retrograde cholangiopancreatography (ERCP) for a range of conditions manifest as biliary obstruction. There was considerable variation in results between studies. The authors' conclusion that MRCP was likely to be an accurate test for choledocholithiasis was a reasonable interpretation of the available data.

Authors' objectives
To compare the clinical and cost effectiveness of magnetic resonance cholangiopancreatography (MRCP) with endoscopic retrograde cholangiopancreatography (ERCP) for the investigation of biliary obstruction.

Searching
Thirteen electronic bibliographic databases were searched: MEDLINE, EMBASE, BIOSIS Previews, CINAHL, Science Citation Index, Social Sciences Citation Index, Cochrane Database of Systematic Reviews, DARE, HEED, NHS EED and NHS HTA. No language or publication restrictions were applied. The reference lists of relevant articles were scanned and various internet-based resources were interrogated. A full list of sources searched and search strategies applied was provided in Appendixes 1 to 3 of the report.

Study selection
Randomised controlled trials (RCTs), non-randomised prospective test accuracy studies, systematic reviews and economic evaluations that compared MRCP with ERCP in adult patients with suspected biliary obstruction or dilation were eligible for inclusion. Accepted outcome measures were measures of test accuracy (sensitivity, specificity and likelihood ratios), patient acceptability and adverse events. Studies that involved pancreatic ductal abnormalities were excluded. Non-English language papers were excluded.

All included studies, except one study of patient satisfaction, were test accuracy studies. Where reported, the mean age of participants ranged from 49 to 71 years. Most studies were conducted in majority female populations. Most studies reported the condition under investigation and these included: obstruction, biliary disease, neoplasm, primary sclerosing cholangitis (PSC), and common bile duct stones or choledocholithiasis. Most studies used ERCP or equivalent (intra-operative cholangiography, percutaneous trans hepatic cholangiography or surgery) as the reference standard. The rest used final diagnosis. ERCP always formed a major part of the final diagnosis.

Full copies were obtained for all papers that appeared relevant or that could not be assessed from the abstract alone. The authors did not report how many reviewers were involved in study selection.

Assessment of study quality
The methodological quality of included studies was assessed using a 10-item published checklist for studies of diagnostic or screening tests. The checklist assessed external validity and relevance of the test, validity of the reference standard and normal range, reporting of operating characteristics of the test including reliability and avoidance of work-up and expectation biases (application of tests independently of the results of other tests and blinding of interpreters to other results).

The author's stated neither how quality assessment was conducted nor how many reviewers were involved in the process.

Data extraction
Data on suspected condition and diagnosis, as well as measures of test performance (sensitivity, specificity, likelihood ratios, positive and negative predictive values, accuracy and prevalence) were extracted by one reviewer using a standard form. Where these were not reported and sufficient data were available, point estimates and 95% confidence intervals (CIs) were calculated for test performance measures. Data on adverse effects and patient satisfaction were also extracted, where reported.

Methods of synthesis
Data were stratified by condition investigated.

Where there was no evidence of variation in test performance with diagnostic threshold (threshold effect), sensitivities and specificities were pooled using an approximation to the inverse variance method. Likelihood ratios were pooled using the Mantel-Haenszel method. In both cases, between-study heterogeneity was assessed using the $\chi^2$ test.

Where there was evidence of a threshold effect, summary receiver operating characteristic (SROC) curves were estimated using the Moses and Littenberg method.

Results of the review
Twenty eight test accuracy studies (approximately 2,500 participants) were included in the review. Failure rates were reported for both tests. No studies were included where MRCP informed the decision on whether to conduct ERCP. Most (25 out of 28) of included studies reported at least partial blinding of the assessors.

Test performance:
Choledocholithiasis (15 studies). Median sensitivity for all studies was 0.91 (range 0.50 to 1.00). Median specificity for all studies was 0.96 (range 0.83 to 0.99). Significant between-study heterogeneity was present in both cases. Median positive likelihood ratio was 23.96 (range 5.44 to 64.78). Median negative likelihood ratio was 0.09 (range 0.00 to 0.51). Significant between-study heterogeneity was observed for negative likelihood ratios.

Malignancy (three studies) sensitivities ranged from 0.81 to 0.86 and specificities ranged from 0.92 to 1.00.

Further results were reported.

Adverse effects:
No study reported adverse effects associated with MRCP. Six studies reported adverse effects associated with ERCP (mainly pancreatitis). Most other studies did not report any information.

Cost information
The overall expected cost gain associated with the use of MRCP in preference to ERCP was £149 (£325 to -£15). The overall expected QALY (Quality Adjusted Life Year) gain was 0.011 (0.000 to 0.030).

Authors’ conclusions
There was some evidence that MRCP was an accurate investigation compared with ERCP; the evidence was stronger for choledocholithiasis than for malignancy. The limited evidence available suggested that patients preferred MRCP. The baseline estimates suggested that use of MRCP would result in reduced costs and improved quality of life compared with ERCP, but these results were subject to considerable uncertainty.

CRD commentary
The review assessed the diagnostic performance of MRCP compared with ERCP for a range of conditions manifest as biliary obstruction. Appropriate inclusion criteria were itemised. But, there was some confusion around whether ERCP was treated as a comparator or as the reference standard; ERCP or ERCP combined with other tests appeared to be treated as the reference standard throughout. The search strategy was comprehensive and unrestricted, although studies that were not in English were excluded at a later stage, which re-introduced the possibility of language bias. Reporting of the review process was limited and it is unclear whether measures were taken to minimise error and bias. The
methodological quality of included studies was assessed using appropriate criteria and considered in the interpretation of results. The reporting of results focused on mean values and ranges rather than summary estimates, which was appropriate given the demonstrable between-study heterogeneity within data sets. The authors' conclusion that MRCP was likely to be an accurate test, particularly for choledocholithiasis, was a reasonable interpretation of the available data: the range of likelihood ratios reported by individual studies suggested that it may be a more useful test for ruling-in than for ruling-out disease.

Implications of the review for practice and research

Practice: The authors did not state any implications for practice.

Research: Good quality studies that compared ERCP and MRCP with final diagnosis were needed to determine the relative accuracy of the two tests; such studies should address the full range of target conditions. More research was needed on ways to improve patient satisfaction (for example, reducing claustrophobia in MRCP) and ways to determine which patients would benefit most from which test. Studies were needed to assess the potential impact of increased demand for MRCP on availability and cost.

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