Specificity of MR angiography as a confirmatory test of carotid artery stenosis

Authors' objectives
To estimate from available literature the specificity (true-negative rate) of magnetic resonance (MR) angiography for detecting severe carotid artery stenoses, when applied as a confirmatory test after screening with duplex Doppler sonography.

Searching
MEDLINE was searched for English language articles published between 1990 and 1994 using the index terms 'carotid artery'; 'carotid artery stenosis'; 'carotid arteries, MR'; 'carotid arteries, sonography'. References in the identified articles were also examined.

Study selection
Study designs of evaluations included in the review
Studies were excluded if the method of measuring stenosis was not specified, or if less than 20 patients were included in the study.

Specific interventions included in the review
Only studies of MR angiography as a confirmatory test of carotid artery stenosis, in which the cut-off points for 'normal', 'mild', 'moderate' and 'severe' stenosis were defined were eligible for inclusion in the review. No details of MR techniques were specified in the inclusion/exclusion criteria or reported in the review.

Seven articles provided data that could be configured to match the categories of stenosis used in the North American Symptomatic Carotid Endarterectomy Trial (NASCET). The definition of severe stenosis was different across primary studies: severe stenosis was defined as greater than 70% constriction in 7 studies, greater than 80% in 4 studies, greater than 75% in 2 studies, or greater than 60% in 3 studies, and one study used a definition of greater than 70% constriction for severe stenosis and 50 to 69% for moderate stenosis.

Reference standard test against which the new test was compared
Studies were required to compare MR with conventional film screen or selective digital subtraction angiography.

Participants included in the review
The included participants were patients with a positive diagnosis of carotid artery stenosis according to the results of sonographical test.

Outcomes assessed in the review
Studies were excluded if the test results could not be entered into a contingency table, based on degree of stenosis, for determination of specificity.

The primary outcome measure for the review was calculated the specificity (true-negative rate) of MR angiography for detecting severe carotid artery stenoses, when applied as a confirmatory test after screening with duplex Doppler sonography. The revised specificity was based on the vessels in the moderate stenosis category.

How were decisions on the relevance of primary studies made?
Two reviewers independently evaluated the relevance of the primary studies, and any disagreements were resolved by a third reviewer.

Assessment of study quality
The authors do not state that they assessed validity.
Data extraction
The authors do not state how the data were extracted for the review, or how many of the reviewers performed the data extraction.

Data were extracted on findings (category of stenosis) at conventional and MR angiography.

Data on normal and mildly stenosed vessels, as diagnosed by conventional angiography, were excluded from the analysis, as it was deemed unlikely that these would produce false positive sonography results.

Methods of synthesis
How were the studies combined?
A narrative synthesis was undertaken and the mean specificity for MR angiography was calculated.

How were differences between studies investigated?
Between-study heterogeneity was not formally assessed and was not discussed in any detail in the text.

Results of the review
Seventeen primary studies, with an unspecified number of participants, were included in the review.

The reported specificity of MR angiography ranged from 64 to 100% before revision, and 15 of the 17 articles had specificity values above 75%. Following revision, revised specificity (based on vessels with moderate stenoses) ranged from 18 to 100% (the value of 100% was derived from a study detailing eight moderate stenoses). Seven of 17 studies had MR angiographic specificity of greater than 75%, whilst 9 of the 17 articles had specificities of less than 60%.

The mean specificity for MR angiography including all negative vessels (86.9% +/- 10.6%) was significantly higher than the mean revised specificity (62% +/- 24.5%), (p<0.0001).

Authors' conclusions
To base specificity values for MR angiography, as a confirmatory test of carotid artery stenosis, on studies that include nondiseased vessels incurs spectrum bias. The actual specificity for MR angiography as a confirmatory test remains unknown, but it is lower than that reported in the literature.

CRD commentary
The review addressed a clear research question, and the inclusion/exclusion criteria for primary studies were well defined. Restriction of the search to MEDLINE and English language articles is likely to have resulted in incomplete retrieval of the available published data. In addition, no attempt to identify unpublished data was reported, and the potential impact of publication bias was not assessed.

The validity of the included studies was not assessed, making the impact of methodological flaws in the primary studies upon the overall findings of the review difficult to assess. Only limited details of the review process and of the individual included studies were reported.

A narrative summary seems appropriate given the apparent heterogeneity of the included studies and the lack of reported detail on participant characteristics (which may have evidenced further heterogeneity). Given the problems of study heterogeneity outlined, the summation of data from individual studies to provide an overall mean specificity was inappropriate.

The authors conclusions were reasonable given the lack of available data

Implications of the review for practice and research
Practice: The authors state that the results of their review suggest that the specificity of MR angiography is relatively poor for a population of vessels screened as positive for disease by sonography, calling into question the practice of recommending carotid endarterectomy on the basis of concordant findings at sonography and MR angiography.

Research: The authors state that future research should distinguish between ipsilateral and contralateral vessels for any examined population to allow appropriate calculations of specificity.

Bibliographic details

PubMedID
8883649

Original Paper URL
http://www.ajnr.org/cgi/reprint/17/8/1501.pdf

Indexing Status
Subject indexing assigned by NLM

MeSH
Bias (Epidemiology); Carotid Arteries /pathology /ultrasonography; Carotid Stenosis /classification /diagnosis /ultrasonography; False Positive Reactions; Humans; Magnetic Resonance Angiography /statistics & numerical data; Predictive Value of Tests; Sensitivity and Specificity; Ultrasonography, Doppler, Duplex

AccessionNumber
11996001623

Date bibliographic record published
31/10/1998

Date abstract record published
31/10/1998

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.