Effect of arterial revascularisation on survival: a systematic review of studies comparing bilateral and single internal mammary arteries
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Authors' objectives
To compare survival for different methods of coronary artery bypass grafting, i.e. single and bilateral internal mammary artery (IMA) grafts.

Searching
MEDLINE from 1972 to 1999, and EMBASE from 1980 to 1999, were searched using the following terms individually and in combination: 'internal', 'mammary', 'thoracic', 'single', 'unilateral', 'bilateral', 'multiple', 'artery' and 'arteries'. The references of the identified articles were examined for further studies.

Study selection
Studies were included if they had at least 100 patients in each group, the median follow-up was at least 4 years, and proper survival analysis methods had been used.

Specific interventions included in the review
Single and bilateral IMA conduits were included.

Participants included in the review
Patients who had undergone a specified intervention, where there were sufficient data on the age, gender, ventricular function and diabetic status. Where stated, the participants' mean ages ranged from 50 to 65 years, and the proportion of men ranged from 78 to 89%. The proportion of diabetic patients ranged from 3 to 27%.

Outcomes assessed in the review
Survival was the primary outcome. This was defined as the time from operation to death from any cause. The incidence of re-intervention was a secondary outcome.

How were decisions on the relevance of primary studies made?
Two reviewers independently screened the abstracts for inclusion.

Assessment of study quality
The scheme used to assess quality was based on the Ottawa-Newcastle system (see Other Publications of Related Interest no.1), which rated aspects of cohort selection, cohort comparability, and validity of outcome. Two reviewers assessed the quality of all the included studies.

Data extraction
Two reviewers independently extracted the data and agreed on data inclusion after discussion.

Data were extracted on the following: the number of patients; the length of follow-up; the exclusion criteria; whether there were data available for the meta-analysis; the number of deaths; and the characteristics of the patients, i.e. age, gender, ventricular function, and diabetic status.

Methods of synthesis
How were the studies combined?
Seven studies where the baseline characteristics were comparable, or where multiple regression was used to adjust for
differences, were included in the meta-analysis. The log hazard ratios were extracted or estimated for each study using the method of Parmar et al (see Other Publications of Related Interest no.2). The weighted average log hazard ratio was calculated, weighted by inverse variance, using a random-effects model.

How were differences between studies investigated?
The authors state that there was no evidence of statistical difference between the results of the seven studies, without stating how this was assessed. A sensitivity analysis was undertaken, omitting three studies that were judged to be methodologically weak. Although the criteria for omission were not stated, two of these had the lowest quality ratings.

Results of the review
Ten studies met the inclusion criteria, none of which were randomised trials, and only one of which was clearly prospective. Three studies were excluded from the meta-analysis: two because they did not report patient characteristics and one because it did not adjust for non-comparable baseline prognostic factors. There were 15,962 participants in the seven remaining studies (4,693 underwent bilateral IMA and 11,269 underwent single IMA).

A significant reduction in mortality was attributed to bilateral IMA with a combined hazard ratio of 0.81 (95% confidence interval, CI: 0.70, 0.94).

Omitting the three methodologically weak studies gave a slightly stronger result of 0.76 (95% CI: 0.67, 0.86).

Two studies reported a lower rate of reoperation for bilateral IMA after 5 years, whilst another three studies reported a lower rate after 10 years. The largest and highest quality study found a significantly lower rate of reoperation: 8% for bilateral IMA versus 40% for single IMA, with a hazard ratio 0.27 (95% CI: 0.19, 0.37).

Authors' conclusions
The results are more uncertain than is indicated by the 95% CI since none of the studies were randomised controlled trials. Nevertheless, bilateral IMA grafts seem to give better survival rates than single grafts and would be of economic benefit to the health care system.

CRD commentary
The review question was clearly defined and the search strategy was reasonable. However, no attempt was made to identify unpublished studies, and this omission might have led to a bias toward positive results in the review. The validity assessment was clearly reported and the statistical analysis was appropriate. The discussion of the results was detailed and informative. Details of the included studies were confined to basic patient characteristics, and so do not enable the reader to assess other factors that may be relevant to the outcomes.

The authors' conclusions appear justified.

Implications of the review for practice and research
Practice: The authors state that although the evidence is not of the highest quality, there is a suggestion that bilateral IMA conduits improves survival compared with single IMA.

Research: The authors state that a randomised controlled trial with about 4,200 patients and a 10-year follow-up is required to reliably detect a 5% reduction in mortality at a 1% significance level.

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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.