Optimal method of coronary revascularization in patients receiving dialysis: systematic review

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CRD summary
This meta-analysis compared patients on dialysis who underwent coronary artery bypass graft with patients who underwent percutaneous intervention in terms of short- and long-term risk of death. The authors concluded that decisions about coronary artery revascularisation in dialysis patients had not been based on sufficient evidence and called for well-designed randomised controlled trials. These conclusions are likely to be reliable.

Authors' objectives
To assess the short- and long-term risk of death in patients on dialysis who underwent coronary artery bypass graft (CABG) compared with percutaneous intervention (PCI). Also, to assess the effects of these procedures on myocardial infarction and the need for repeat revascularisation.

Searching
MEDLINE, DARE, Cochrane Central Register of Controlled Trials (CENTRAL), Experta Medica, BIOSIS Previews and other relevant databases were searched from inception to March 2008. There was no language restriction. Reference lists of retrieved papers and conference proceedings were reviewed. The search terms were reported.

Study selection
Randomised controlled trials and cohort studies that involved at least 10 patients who received haemodialysis or peritoneal dialysis were eligible for inclusion if they compared CABG with PCI for revascularisation of the coronary arteries. Trials of patients who received combination surgery such as valve and bypass surgery or with acute kidney injury that required urgent dialysis were excluded.

The percutaneous interventions used were percutaneous transluminal coronary angioplasty and percutaneous transluminal coronary rotational angioplasty, including the use of stents. Primary outcomes were short-term (30 day in hospital) and long-term (at least one year) mortality. Other outcomes considered were myocardial infarction and the need for repeat revascularisation. Mean length of dialysis varied from 16 to 79 months. The end-stage renal disease was adequately defined.

Two reviewers independently applied the inclusion criteria and resolved disagreements by discussion.

Assessment of study quality
The quality of the included trials was assessed based on published guidelines for prognostic studies. No details of the quality components and how each component was assessed were reported. Attempts were made to contact the primary author of each relevant article to check on accuracy of data and to provide additional missing data.

Two reviewers independently assessed quality in the included trials and resolved disagreements by consensus.

Data extraction
The number of events was extracted for each group and the relative risk (RR) and 95% confidence interval (CI) calculated. Where studies reported an adjusted relative risk, this was extracted with details of the variables adjusted for. When values were not provided in the primary studies, the number of events was estimated from Kaplan-Meier survival graphs. Publication bias was assessed by funnel plot and Egger's test.

Two reviewers independently extracted data and resolved disagreements by consensus.
Methods of synthesis
Studies were pooled using unadjusted relative risks as well as pooling of adjusted relative risks, where available, with a random-effects model. Heterogeneity between the trials was assessed by I² statistic. Meta-regression was undertaken adjusted for several study characteristics. A sensitivity analysis removed the two largest studies.

Results of the review
Seventeen observational studies (n=32,388) from five countries met the inclusion criteria. Patients (n=15,175) underwent CABG and PCI (n=17,213). Two studies involved 30,090 patients (93% of participants). The number of patients in the other studies ranged from 25 to 452.

Patients who received CABG were less likely to have single-vessel coronary artery disease (6% versus 46%) and more likely to have multi-vessel coronary artery disease (85% versus 53%) although the authors state that the two groups were similar for most relevant factors.

There was statistically significant greater risk of short-term (30 day in-hospital) mortality with CABG compared to PCI (RR 1.91, 95% CI 1.44 to 2.52; 13 studies, n=31,482).

Long-term cumulative mortality was lower after CABG compared to PCI (51.6% versus 59.5%; absolute difference 6.9%), (RR 0.93, 95% CI 0.88 to 0.98; 16 studies, n=31,931). Cardiovascular events were lower after CABG compared to PCI (20.3% versus 32.4%; absolute difference 12.1%), (RR 0.50, 95% CI 0.37 to 0.68; nine studies, n=15,115). There was statistically significant heterogeneity (p<0.01) for these outcomes.

The results did not substantially change when the two largest studies were removed from the analyses. A meta-regression did not demonstrate a significant association between any of the factors examined and mortality at short- or long-term.

Authors’ conclusions
Although decisions about the optimal method of coronary artery revascularisation in dialysis patients are undertaken routinely, the authors were surprised that few data had been published and called for well-designed RCTs.

CRD commentary
This review addressed a well-defined question in terms of participants, interventions, outcomes and study design. The search included appropriate electronic databases, but no attempts were made to retrieve unpublished studies and so relevant data might have been missed included. Two reviewers independently selected studies, extracted data and assessed the quality of the included studies to minimise bias and errors during the review process. Characteristics of individual studies were presented in detail. The risk of bias in the included studies was assessed using the Hayden criteria. The authors did not report how each quality component was assessed, which made interpretation of the results problematic. Potential sources of heterogeneity were explored and reported. Sensitivity analysis demonstrated that the results were robust to changes in the factors considered.

The authors’ conclusions were consistent with the evidence shown and are likely to be reliable.

Implications of the review for practice and research
Practice: The authors stated that given the variability among studies and their methodological limitations, few definitive conclusions about optimal method of revascularisation could be draw.

Research: The authors stated that there was a need for evidence from well-designed RCTs to inform physicians and patients’ decisions about coronary artery revascularisation.

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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.