CRD summary
The authors concluded that, compared with percutaneous coronary intervention, off-pump coronary artery bypass surgery reduces the need for re-intervention for ischaemia, the recurrence of angina and major coronary adverse events at 1 to 5 years. Overall, this was a well-conducted review and the authors’ conclusions are likely to be reliable.

Authors’ objectives
To compare off-pump coronary artery bypass surgery (OPCAB) with percutaneous coronary intervention (PCI).

Searching
MEDLINE, the Cochrane CENTRAL Register, EMBASE, Current Contents, DARE, NEED and HTA were searched from inception to May 2006; the search terms were reported. No language restrictions were applied. In addition, related articles were tracked and reference lists, abstracts of scientific meetings and related journals were screened. Published and unpublished studies were sought.

Study selection
Study designs of evaluations included in the review
Blinded and unblinded randomised controlled trials (RCTs) were eligible for inclusion in the review.

Specific interventions included in the review
Studies that compared OPCAB on the beating heart (via thoracotomy or a minimally invasive method) with PCI (with or without stenting) were eligible for inclusion. Studies that evaluated hybrid procedures (OPCAB plus PCI) or robotically assisted surgery were excluded. In most of the included studies, left anterior descending stenting was compared with left internal thoracic artery-to-left anterior descending anastomosis.

Participants included in the review
Studies of adults with single- or multiple-vessel coronary artery disease that was suitable for revascularisation with either OPCAB or PCI were eligible for inclusion. All but one of the included studies was in patients with single-vessel disease. The mean age of the participants was 58 to 59 years, 33% were female, 22% were diabetic, 31% had a history of myocardial infarction, 32% were smokers and 61% had hyperlipidaemia.

Outcomes assessed in the review
Studies that assessed a relevant clinical or economic outcome were eligible for inclusion. The primary review outcome was the need for re-intervention for ischaemia (defined as the need for either PCI or coronary artery bypass grafting during the study). Numerous potential secondary outcomes were listed.

How were decisions on the relevance of primary studies made?
Two reviewers independently selected the studies.

Assessment of study quality
Two reviewers independently assessed validity using the Jadad criteria, which related to randomisation, blinding and completeness of follow-up. The maximum possible score was 5 points. Any disagreements were resolved by consensus.

Data extraction
Two reviewers independently extracted the data. Any disagreements were resolved by consensus. Where required, authors were contacted for clarification of data. Data for dichotomous outcomes were extracted as odd ratios (ORs) with 95% confidence intervals (CI). For continuous outcomes, mean differences were extracted. The outcomes were
generally assessed in hospital, at 6 months and at 1 to 5 years.

**Methods of synthesis**

How were the studies combined?

Pooled ORs and 95% CIs were calculated for dichotomous data and pooled weighted mean differences (WMDs) and 95% CIs for continuous data. The fixed-effect Mantel-Haenszel method was used in the absence of significant heterogeneity and the random-effects DerSimonian and Laird method used in its presence. Where statistically significant differences between treatments were found, the absolute risk reduction and the number-needed-to-treat were calculated. Funnel plots were used to assess the potential for publication bias.

How were differences between studies investigated?

Statistical heterogeneity was assessed using the I-squared statistic, taking values greater than 50% as indicative of significant heterogeneity. A number of subgroup analyses were proposed but the results of these were not reported.

**Results of the review**

Six RCTs reported in 11 publications were included (n=989).

The median Jadad score was 3 out of 5 (range: 2 to 3). Five studies scored maximal points for randomisation. None of the studies reported blinding and none scored full points for the reporting of withdrawals.

Significant heterogeneity was found for re-intervention at 6 months, recurrence of angina at 6 months and hospital length of stay.

OPCAB was associated with a significant reduction in re-intervention for ischaemia at 1 to 5 years compared with PCI (OR 0.24, 95% CI: 0.15, 0.40; based on 5 RCTs; I-squared 0%), but there was no significant difference between treatments in re-intervention in-hospital or at 6 months.

Compared with PCI, OPCAB was associated with a significant reduction in the recurrence of angina at 1 to 5 years (OR 0.54, 95% CI: 0.34, 0.87), major adverse coronary events at 1 to 5 years (OR 0.44, 95% CI: 0.30, 0.63), and coronary stenosis at 6 months (OR 0.31, 95% CI: 0.18, 0.55), and a significant increase in event-free survival at 1 to 5 years (OR 2.32, 95% CI: 1.62, 3.32) and at 6 months (OR 2.53, 95% CI: 1.50, 4.27).

Hospital stay was significantly increased among patients allocated to OPCAB compared with PCI (WMD 4.03, 95% CI: 2.37, 5.70).

No significant difference was found between treatments in death, myocardial infarction, stroke and in-hospital wound complications.

Two studies measured quality of life. One study reported a significant improvement in quality of life associated with PCI compared to OPCAB at 1 month, but reported no significant difference at 1 year. The other study reported statistically significant improvements associated with OPCAB among only three domains of four quality-of-life instruments.

Funnel plots showed no evidence of publication bias.

**Cost information**

Three studies reported economic outcomes. One study reported increased costs over 6 to 12 months’ follow-up associated with OPCAB compared with PCI. Two studies assessed incremental cost-effectiveness and reported widely differing results: one reported an incremental cost of –EUR 97,767 per quality adjusted life-year (QALY), while the other reported an incremental cost of +£44,600 per QALY.

**Authors’ conclusions**

OPCAB reduced the need for re-intervention for ischaemia, the recurrence of angina and major coronary adverse events at 1 to 5 years compared with PCI.
CRD commentary
The review question was clear with respect to the participants, intervention, outcomes and study design. Several relevant sources were searched and attempts were made to minimise publication and language bias. Methods were used to minimise reviewer error and bias in the study selection, validity assessment and data extraction processes. Validity was assessed using specified criteria and the results reported as scores on individual quality criteria. Statistical heterogeneity was assessed and the studies were appropriately pooled using meta-analysis. Overall, this was a well-conducted review and the authors' conclusions are likely to be reliable.

Implications of the review for practice and research
Practice: The authors did not state any implications for practice.
Research: The authors stated the need for further research comparing the effects of OPCAB and PCI on quality of life and health system resource utilisation. Future studies should also evaluate drug-eluting stents.

Funding
Department of Anesthesia and Perioperative Medicine, University of Western Ontario; Canadian Coordinating Office of Health Technology Assessment, HTA Capacity Building Grant.

Bibliographic details

PubMedID
17320555

DOI
10.1016/j.jtcvs.2006.11.019

Indexing Status
Subject indexing assigned by NLM

MeSH
Aged; Angioplasty, Balloon, Coronary /methods /mortality; Cause of Death; Confidence Intervals; Coronary Artery Bypass, Off-Pump /methods /mortality; Coronary Stenosis /diagnosis /mortality /therapy; Female; Humans; Linear Models; Male; Middle Aged; Minimally Invasive Surgical Procedures /methods /mortality; Postoperative Complications /mortality; Probability; Prognosis; Randomized Controlled Trials as Topic; Risk Assessment; Survival Analysis; Treatment Outcome

AccessionNumber
12007001009

Date bibliographic record published
07/02/2008

Date abstract record published
01/09/2008

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.