Pump or no pump for coronary artery bypass: current best available evidence

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CRD summary
The author concluded that, compared with conventional coronary artery bypass grafting, off-pump coronary artery bypass surgery is associated with lower morbidity, similar graft patency and substantially lower costs. Given the limited information about the included studies and the methods used to select studies and extract data, the accuracy of the author's conclusions is uncertain.

Authors' objectives
To evaluate the safety and efficacy of off-pump coronary artery bypass surgery (OPCAB) in comparison with conventional coronary artery bypass grafting (CABG).

Searching
MEDLINE, EMBASE, the Cochrane Controlled Trials Register, the Cochrane Database of Systematic Reviews, DARE, Science Citation Index, Current Contents, NHS EED and HTA were searched from inception to December 2004; the search terms were reported. No language restrictions were applied. Bibliographies of relevant articles, scientific meeting abstracts and related journals were also searched to identify additional articles.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) were eligible for inclusion in the review.

Specific interventions included in the review
Studies evaluating OPCAB or minimally invasive direct coronary artery bypass on the beating heart with conventional CABG using cardiopulmonary bypass and cardioplegia were eligible for inclusion. Studies assessing mixed procedures, robotically assisted surgery or circulatory assist devices were excluded.

Participants included in the review
Studies of adult patients undergoing single- or multiple-vessel coronary bypass surgery were eligible for inclusion. Most of the included studies excluded high-risk patients.

Outcomes assessed in the review
Studies reporting at least one relevant clinical or economic outcome were eligible for inclusion. The following outcomes were extracted: systemic inflammation, blood losses, blood transfusion requirements, acute renal failure, myocardial dysfunction, atrial fibrillation, cerebral dysfunction, pulmonary dysfunction, gastrointestinal complications, length of hospital stay, mortality, costs, graft patency and quality of life.

How were decisions on the relevance of primary studies made?
The author did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
Study quality was assessed using published critical appraisal checklists appropriate for the study design. The checklists appraised the methodological quality of the following areas: objectives and hypothesis, measurement of observation used, presentation of results, analysis, discussion, interpretation and implementation. The author did not state how many reviewers performed the quality assessment.

Data extraction
The author did not state how the data were extracted for the review, or how many reviewers performed the data extraction.

Methods of synthesis
How were the studies combined?
The studies were combined narratively.

How were differences between studies investigated?
Differences in study populations and outcomes were discussed in the text and presented in the tables.

**Results of the review**
Sixty-seven RCTs were included in the review.

The systemic inflammatory response following OPCAB was less pronounced than that following CABG using cardiopulmonary bypass (15 studies, 582 patients).

OPCAB reduced peri-operative blood losses (11 studies) and fresh frozen plasma or platelets requirements (1 study).

Data relating to the effects on renal function were conflicting (3 studies).

Post-operative myocardial infarction occurred at a similar rate among study groups, while a faster recovery of myocardial metabolism and function and a lower need for inotropic agents was found after OPCAB (11 studies, 761 patients).

Post-operative atrial fibrillation was less frequent following OPCAB.

There were no differences in stroke and post-operative neurocognitive dysfunction (10 studies, 2,143 patients).

Three studies showed a similar degree of pulmonary dysfunction, while OPCAB seemed to offer some benefits in patients with pre-existing pulmonary disease.

OPCAB was associated with a significantly lower incidence of gastrointestinal complications (1 study).

Mortality and quality of life were comparable between study groups.

The length of hospitalisation was shortened with OPCAB compared with CABG.

Graft patency was similar in 3 studies but was decreased 3 months after OPCAB in a fourth study.

**Cost information**
OPCAB was less expensive than conventional CABG, owing to the lower complication rate, shorter intubation times and shorter hospital stay (5 studies).

**Authors' conclusions**
Compared with conventional CABG, OPCAB is associated with lower morbidity, comparable graft patency and substantially lower costs.

**CRD commentary**
This review addressed a well-defined question in terms of the study population, intervention and study design, while it used a broad definition of study outcomes. Several relevant databases were searched and attempts were made to identify unpublished studies, thereby limiting the potential for publication bias which was not evaluated in the review. No language restrictions were applied, which reduces the risk for language bias. It was not stated if the study selection, quality assessment and data extraction processes were performed in duplicate, therefore reviewer error and bias cannot be ruled out. Details about the included studies, in terms of study protocol, population and results from the quality assessment, were not presented; this makes it difficult to assess the appropriateness of the method of data synthesis and the accuracy of the interpretation of the results. In addition, while only RCTs were eligible for inclusion, the results from previous meta analyses were used to inform the overall conclusion.
Given the limited information about the included studies and the methods used for study selection and data extraction, the accuracy of the author's conclusions is uncertain.

**Implications of the review for practice and research**

Practice: The author stated that OPCAB should be universally adopted as a primary technique for surgical myocardial revascularisation.

Research: The author did not state any implications for research.

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**Other publications of related interest**


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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.