Percutaneous coronary intervention with vs without on-site cardiac surgery backup: a systematic review and meta-analysis

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CRD summary
The authors concluded that patients with ST-elevated myocardial infarction who underwent primary and non-primary percutaneous coronary intervention at centres with and without on-site cardiac surgery back-up had similar risk of inhospital mortality or early coronary artery bypass graft. Some potential methodological limitations in the review process means that the reliability of this conclusion is unclear.

Authors' objectives
To compare the safety of percutaneous coronary intervention (PCI) with and without on-site cardiac surgical back-up.

Searching
The Cochrane Library, EMBASE and MEDLINE were searched to July 2009. Search terms were reported. The bibliographies of articles and reviews were scanned to identify further studies. Abstracts and non-English articles were excluded.

Study selection
Randomised controlled trials (RCTs) and observational studies that compared percutaneous coronary intervention (PCI) performed with and without on-site cardiac surgery back-up (where the centre was unable to perform coronary artery bypass graft) were eligible for inclusion. The primary outcomes of interest were in-hospital mortality (or 30-day mortality) and early coronary artery bypass graft. Early coronary artery bypass graft was defined as an emergency procedure, within 24 hours of PCI or in-hospital.

Studies were conducted in the United States, Sweden, Portugal and Norway. Most were multi-site studies. Where reported, the median age of included patients ranged from 59 to 66 years and a high proportion were men.

Two reviewers carried out the study selection. Disagreements were resolved by consensus.

Assessment of study quality
The authors did not refer to any quality assessment of included studies.

Data extraction
Data were extracted to enable the calculation of odds ratios (OR) and 95% confidence intervals (CI).

The authors did not state how many reviewers carried out the data extraction.

Methods of synthesis
In the primary analysis, effect sizes were statistically pooled in a random-effects meta-analysis using the DerSimonian and Laird method. Statistical heterogeneity was assessed using Q and $I^2$. Stratified analyses were conducted according to primary PCI (the treatment of acute ST-segment elevation myocardial infarction) or non-primary PCI. Sensitivity analysis was performed by removing one study at a time to determine any influential effect. Publication bias was assessed using a funnel plot and by Egger's test. Secondary analysis included studies without comparison groups that performed PCI in centres without on-site surgical back-up.

Results of the review
Eleven studies were included in the primary analysis. Nine studies (eight observational studies and one RCT; 106,089 patients) reported data on primary PCI. Seven studies (six observational studies and one RCT; 910,422 patients) reported data on non-primary PCI. Eighteen studies were included in the secondary analysis.

When centres with and without on-site cardiac surgery back-up for primary PCI were compared, there were no
statistically significant differences in the risk of in-hospital mortality (OR 0.93, 95% CI 0.83 to 1.05; I²=14%) or early coronary artery bypass graft rate (OR 0.87, 95% CI 0.68 to 1.11; I²= 40%); heterogeneity was low. Similar non-significant differences were reported for comparisons of non-primary PCI in terms of increased risk of in-hospital mortality (OR 1.03, 95% CI 0.64 to 1.66; I²= 89%) and early coronary artery bypass graft (OR 1.38, 95% CI 0.65 to 2.95; I²=87%); substantial heterogeneity was reported.

There was substantial variation in outcomes amongst the studies conducted without comparison groups that performed PCI in centres without on-site surgical back-up.

Sensitivity analysis did not alter the main findings. The authors stated that there was no evidence of publication bias.

**Authors' conclusions**

Patients with ST-elevated myocardial infarction who underwent primary PCI at centres without on-site cardiac surgery back-up had a similar risk of in-hospital mortality or early coronary artery bypass graft as those who had surgical back-up. Similar results were noted for patients who underwent non-primary PCI, but substantial heterogeneity indicated that there was variation in outcomes in centres where surgical back-up was not available.

**CRD commentary**

The review question was clear and inclusion criteria were potentially replicable for all aspects apart from participants. A range of electronic data sources were used to identify the studies. It was not clear whether unpublished material was sought and it appeared that language restrictions were applied so there was potential for bias and relevant studies might have been overlooked. The selection of studies was conducted with sufficient attempts to minimise error and bias, but the same could not be inferred for data extraction.

The absence of any reported quality assessment precluded judgement about the reliability of the studies. Reliance on largely observational data was acknowledged by the authors as a limitation of the review. There was little information on participant characteristics, and the extent of clinical heterogeneity was unclear. Statistical heterogeneity was assessed, and the methods of synthesis appeared appropriate (at least for the analysis of primary PCI). The author's conclusion reflected the overall evidence presented in primary and secondary analyses. Methodological and reporting limitations identified above meant that the reliability of the authors' conclusion should be treated with caution.

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

**Practice**: The authors stated that all PCI centres without cardiac surgery back-up should address quality improvement and monitor procedures closely for safety and efficacy.

**Research**: The authors did not state any implications for research.

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