A systematic review of the safety and effectiveness of fast-track cardiac anesthesia
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CRD summary
This review compared fast-track (low-dose opioids) and traditional (high-dose opioids) anaesthesia for patients undergoing coronary artery bypass grafting (CABG) or valve surgery. The authors found no evidence that fast-track regimens were associated with increased mortality or morbidity. Most of the participants were undergoing elective CABG and the results are likely to be reliable for this group.

Authors’ objectives
To determine whether fast-track cardiac anaesthesia (FTCA) is as safe as traditional cardiac anaesthesia (TCA) in terms of mortality and major morbidity.

Searching
The Cochrane Controlled Trials Register, MEDLINE and EMBASE (from 1988 to June 2000) were searched without any language restrictions. The keywords used for the MEDLINE search were reported. The authors also checked the reference lists of relevant studies, reviews and abstracts in major journals in anaesthesia and cardiac surgery.

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 comparing FTCA with TCA were eligible for inclusion. FTCA was defined by the use of a reduced dose of opioid (fentanyl, less than or equal to 20 microg/kg, or equivalent) compared with TCA (fentanyl, more than 20 microg/kg, or equivalent), and by the intention to achieve tracheal extubation in less than 10 hours. Nine of the studies included in the review used fentanyl for FTCA and one used sufentanil. One or more of enflurane, halothane, isoflurane or propofol were also used in the FTCA group. Fentanyl or sufentanil was used for TCA.

Participants included in the review
Studies of adult patients undergoing coronary artery bypass graft (CABG) or valve surgery with cardiopulmonary bypass were eligible for inclusion. All of the participants in the included studies were undergoing CABG, with the exception of one study that included patients undergoing CABG and/or valve surgery. The mean age of the participants ranged from 59 to 64 years and the proportion of males ranged from 74 to 92%.

Outcomes assessed in the review
The specified primary outcome was 30-day all-cause mortality. The secondary outcomes included myocardial infarction (MI), major sepsis, stroke, acute renal failure requiring dialysis or haemofiltration, prolonged intensive care unit (ICU) stay (5 or more days), major bleeding requiring surgical re-exploration, time to tracheal extubation, and total time in the ICU and in hospital. Some outcomes were not reported in all of the included studies.

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

Assessment of study quality
Primary studies were assessed for the masking of treatment allocation, losses to follow-up, method of randomisation, sample size and power calculation. Two reviewers independently assessed validity, with any disagreements being resolved by consensus.
Data extraction
Two reviewers independently extracted the data from trial reports, with any disagreements being resolved by consensus. Details of the patient population, type of surgery, anaesthetic regimen and outcomes were recorded. Authors of trial reports were contacted for additional information where necessary.

Relative risks (RRs) or weighted mean differences (WMDs), along with associated 95% confidence intervals (CIs), were estimated for mortality and major morbidity end points. When the median and range were reported for continuous outcomes, it was assumed that the mean was equivalent to the median and that the standard deviation was 25% of the range.

Methods of synthesis
How were the studies combined?
The studies were combined in a meta-analysis using the random-effects model of DerSimonian and Laird. Studies with no events in the FTCA and TCA groups were excluded from the meta-analysis. Two studies had more than one FTCA group and these groups were combined for the meta-analysis. A funnel plot of log odds ratio against standard error was used to test for bias.

How were differences between studies investigated?
Heterogeneity was investigated using the Q statistic with a threshold P-value of less than 0.1. If significant heterogeneity was found, its effect on the outcome measures was evaluated by a further analysis in which studies contributing to the heterogeneity were excluded. Sensitivity analyses were performed to evaluate the robustness of the results by allocation concealment (adequate versus unclear or inadequate) for all-cause mortality.

Results of the review
Ten RCTs with 1,787 participants were included in the review.

Allocation concealment was adequate in 5 of the 10 included studies. Intention-to-treat analysis and full follow-up occurred in 8 studies.

Based on the 6 studies with some surgical deaths, there was no significant difference in mortality rates between the FTCA and TCA groups: 12 out of 968 (1.2%) and 13 out of 474 (2.7%), respectively. The pooled RR for 30-day all-cause mortality was 0.51 (95% CI: 0.23, 1.13, P=0.099). Sensitivity analyses restricted to studies with adequate allocation concealment, or with the largest study excluded, did not give markedly different results. The FTCA and TCA groups did not differ significantly for MI (RR 1.00, 95% CI: 0.52, 1.94), major sepsis (RR 1.05, 95% CI: 0.11, 10.01), wound infection (RR 0.78, 95% CI: 0.08, 7.16), stroke (RR 0.74, 95% CI: 0.05, 10.56), acute renal failure (RR 2.92, 95% CI: 0.32, 27.1), prolonged ICU stay (RR 0.84, 95% CI: 0.27, 2.65), or major bleeding (RR 0.31, 95% CI: 0.06, 1.53). Significant heterogeneity was not found for any of the mortality and morbidity end points.

Time to tracheal extubation was significantly shorter in the FTCA group (WMD 8.1 hours, 95% CI: 3.7, 12.5, P<0.001) as was length of ICU stay (WMD 5.4 hours, 95% CI: 0.3, 10.5, P=0.039). There was no significant reduction in total hospital stay in the FTCA group (WMD 0.61 days, 95% CI: 0.28, 1.5, P=0.18). There was statistically significant heterogeneity (P<0.01) in the meta-analysis of time data, but the selective inclusion and exclusion of studies did not markedly alter the effect estimates.

The funnel plot showed no evidence of bias.

Authors' conclusions
There was no evidence of increased mortality or morbidity with FTCA techniques compared with traditional high-dose opioid techniques for cardiac anaesthesia.

CRD commentary
The review addressed a clear question, and the inclusion and exclusion criteria were clearly defined in terms of the interventions, participants, outcome measures and study designs. The search was adequate although the range of databases used was narrow and, as no efforts were made to identify unpublished studies, it is possible that some relevant studies could have been overlooked. The authors used appropriate criteria to assess the validity of the included studies and made use of this information in their analysis. Two independent reviewers carried out the data extraction and validity assessment, thus reducing the risk of bias and errors in the review process.

Appropriate details of the included studies were presented, although individual study results for mortality were omitted. Combining the results in a meta-analysis appears to have been appropriate. The authors used standard methods to test for possible bias in their results and to investigate heterogeneity. One of the included studies was much larger than the others, but the authors used a sensitivity analysis to show that omission of this study did not affect the results. The authors correctly highlighted that the absolute number of deaths was small and, therefore, the possibility of a false-negative result could not be ruled out. The great majority of participants underwent CABG and the results may not be applicable to other types of surgery (including non-elective surgery and surgery in higher risk patients). With these qualifications, the authors' conclusions are likely to be reliable.

Implications of the review for practice and research

Practice: The authors stated that when the results of this review were combined with the cost-benefits of FTCA, there was no strong justification for the use of high-dose opioids in anaesthesia for elective cardiac surgery with cardiopulmonary bypass.

Research: The authors stated that it would be desirable to conduct a large RCT to confirm the results of this review in relation to mortality.

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Other publications of related interest

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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.