Meta-analysis of randomized trials on the efficacy of posterior pericardiotomy in preventing atrial fibrillation after coronary artery bypass surgery

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CRD summary
This review concluded that the addition of posterior pericardiotomy during coronary artery bypass surgery appeared to reduce the incidence of postoperative atrial fibrillation and supraventricular arrhythmia complications. Methodological flaws, the low quality of the included trials and the lack of information on patients mean the results of the review and the authors’ conclusions should be interpreted with some caution.

Authors' objectives
To evaluate the efficacy of posterior pericardiotomy in preventing atrial fibrillation and other supraventricular arrhythmias after coronary artery bypass surgery.

Searching
PubMed and the Cochrane Library were searched for relevant studies up to February 2009; some search terms were reported. Cardiology and cardiac surgery journals and some handbooks were also searched.

Study selection
Randomised controlled trials (RCTs) in which posterior pericardiotomy was compared with a control in adult patients undergoing cardiac surgery were eligible for inclusion. Eligible trials had to report on post-operative atrial fibrillation

Primary outcomes were atrial fibrillation and supra-ventricular arrhythmias. Secondary outcomes were pericardial effusion pleural effusion and pulmonary complications.

Included trials were conducted between 1995 and 2006. The mean age of included patients ranged from 57 to 64.2 years. Posterior pericardiotomy was performed in all the studies as a longitudinal incision running parallel and posterior to the phrenic nerve, extending from the left inferior pulmonary vein to the diaphragm (a technique described by Mulay et al). Aortic cross clamping times and cardiopulmonary bypass durations were similar for intervention and control groups within individual trials, but varied between trials ranging from 33 to 63 minutes; the duration of cardiopulmonary bypass ranged from 48 to 117 minutes. Patients were monitored during their time in hospital during the first 48 to 96 hours post surgery, then daily or as required.

The authors did not state how studies were selected, but they did state that the review was undertaken in line with the Cochrane Handbook of Systematic Reviews.

Assessment of study quality
Methodological quality was assessed independently by both reviewers using the Cochrane Collaboration criteria for assessing the risk of bias for sequence generation, allocation concealment, blinding of intervention, completeness of outcome data, and freedom from selective reporting and other biases. Drop-out rates of less than 5% were considered to be acceptable. Any disagreements were resolved by consensus.

Data extraction
Data were extracted by two reviewers independently to calculate odds ratios (OR) and 95% confidence intervals (CI) for the outcomes as reported in the included trials. Risk ratios were calculated for dichotomous data. The authors intended to calculate weighted mean differences for continuous data. Any disagreements were resolved by consensus.

Methods of synthesis
Pooled odds ratios, risk ratios and 95% confidence intervals were calculated using a Mantel-Haenszel random-effects model. Heterogeneity was assessed using the $\chi^2$ and $I^2$ tests. If low (non-important) heterogeneity was observed, a fixed-effect model was used to combine the data.
Meta-regression analyses were planned in the event of substantial heterogeneity of clinical and operative variables in the included trials, but could not be performed because of the limited number of trials and the paucity of clinical and operative data.

**Results of the review**

Six RCTs (n=763 patients) were included in the review, including 379 patients who received posterior pericardiotomy and 384 patients in control groups (table 1). Sequence generation was adequately reported in two trials. The authors stated that all included trials were free of selective reporting and other biases. Allocation concealment, blinding and completeness of outcome data were not reported.

Treatment with posterior pericardiotomy was associated with significantly lower cumulative incidence of atrial fibrillation (OR 0.33, 95% CI 0.16 to 0.69; six RCTs; $I^2$=68%) and supraventricular arrhythmias (OR 0.31, 95% CI 0.15 to 0.65; five RCTs; $I^2$=70%), but both outcomes were associated with significant heterogeneity.

There were fewer incidences of early pericardial effusion reported after posterior pericardiotomy (OR 0.10, 95% CI 0.04 to 0.28; four RCTs; $I^2$=67%) and late pericardial effusion (OR 0.04, 95% CI 0.01 to 0.21; four RCTs; $I^2$=0%). Early pericardial effusion was associated with significant heterogeneity.

There were no significant differences in pleural effusion or pulmonary complications between intervention and control groups.

**Authors’ conclusions**

The addition of posterior pericardiotomy during coronary artery bypass surgery appeared to reduce the incidence of postoperative atrial fibrillation and supraventricular arrhythmias. The marked reduction of postoperative pericardial effusion after this procedure suggested that pericardial effusion was one of the main triggers of atrial fibrillation occurring after cardiac surgery.

**CRD commentary**

The review addressed a clearly defined question. The criteria for the inclusion of studies in the review were stipulated. Two databases were searched, but the journals searched by the authors were not specified. The search did not include any attempts to identify unpublished studies, so there was a risk of publication bias. It was unclear if any language restrictions were applied to the search, so the risk of language bias was unclear. Steps were taken by the reviewers to minimise errors and bias at each stage of the review process.

There was little information provided on the patients and the control treatments used in the trials. There were discrepancies between the text and tables for the overall numbers of patients in the control and intervention groups. The authors correctly acknowledged the limitations of the data found in the small number of trials of low methodological quality and the lack of data provided on the use of prophylaxis for atrial fibrillation. There was some evidence of statistical heterogeneity. In addition, the trials were conducted over an 11-year period, during which medical practice may have changed. The authors acknowledged that the results were not conclusive and that further well-designed studies were required.

Overall, methodological flaws, the low quality of the included trials and the lack of information on patients mean the results of the review and the authors’ conclusions should be interpreted with some caution.

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

**Practice:** The authors stated that although posterior pericardiotomy is relatively easy to perform, it is not without complications.

**Research:** The authors stated that the risks of posterior pericardiotomy require further evaluation, particularly as there was a lack of data on postoperative haemodynamic stability, reoperation for bleeding or pericardial effusion, and potential atrial fibrillation-related complications including stroke, renal failure, extended in-patient stay and readmission.
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