Retrograde autologous priming and allogeneic blood transfusions: a meta-analysis
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CRD summary
The authors concluded that retrograde autologous priming (RAP) significantly reduced allogeneic red blood cell transfusions in adult patients who underwent cardiac surgery. The review included low-quality trials and was not robust to removal of certain trials from the analysis; hence caution is warranted when interpreting the authors’ conclusions.

Authors' objectives
To assess the effects of retrograde autologous priming (RAP) on reducing allogeneic packed red blood cell transfusions in adult cardiac surgery.

Searching
MEDLINE, EMBASE, Science Direct, CINAHL and The Cochrane library were searched to 2007 and Scopus was searched to 2006. Search terms were reported. Reference lists of relevant articles were searched.

Study selection
Randomised controlled trials (RCTs) of RAP compared with a prospective control group were eligible for inclusion. Trials had to report on rates of red blood cell transfusions.

The included trials all compared RAP with a control group in patients who underwent cardiac surgery, predominantly coronary-artery bypass graft (CABG), along with valve surgery, reoperation and other cardiac surgery. Most trials implemented a strict transfusion protocol. Half of the studies employed an intraoperative autologous blood transfusion device in every cardiac surgery case. Half of the studies reported the routine use of antifibrinolytics.

The authors did not state how many authors undertook the selection process.

Assessment of study quality
Study validity was assessed using the Jadad score of five quality factors such as randomisation, blinding and withdrawals.

The authors did not state how many reviewers performed the quality assessment.

Data extraction
Data were extracted on numbers of patients and numbers of units of transfused red blood cells intraoperatively and over the entire hospital stay. These were used to calculate weighted mean differences (WMD) and odds ratios (OR) depending on the data type.

The authors did not state how many reviewers performed data extraction. Discrepancies were resolved by consensus (which indicated that at least two authors were involved).

Methods of synthesis
The pooled odds ratios and weighted mean differences, together with 95% confidence intervals (CI) were calculated using an inverse variance-weighted random-effects meta-analysis. Statistical heterogeneity was assessed using the $I^2$ statistic. Sensitivity analysis was performed eliminating one trial at a time to check the robustness of pooled estimates.

Results of the review
Six RCTs were included in the review (n=691 patients). Sample sizes ranged from 20 to 222 patients. Trial quality was generally poor: Jadad scores ranging from 0 to 2 (median 1.5) out of a maximum of 5. There was no evidence of statistical heterogeneity in any analyses except intraoperative red blood cell transfusions (OR analysis), which showed
moderate heterogeneity ($I^2=48\%$). Mean prime volume was 1519.8mL for the control group and 596.5mL for the RAP group ($p<0.0001$).

**Intraoperative red blood cell transfusions:** There was a statistically significant 64% reduction in the number of patients transfused intraoperative red blood cells in the RAP group compared with the control group (OR 0.36, 95% CI 0.13 to 0.94; four trials, n=557 patients). There was no significant difference between RAP group and control for the number of intraoperative red blood cells transfused (one trial, n=222 patients).

**Total hospital stay red blood cell transfusions:** There was a statistically significant 74% reduction in the number of patients transfused red blood cells over the total hospital stay in the RAP group compared with the control group (OR 0.26, 95% CI 0.13 to 0.52; two trials, n=160 patients). There was a statistically significant reduction in the total number of units of red blood cells transfused over the whole hospital stay for patients in the RAP group compared with the control group (WMD -0.60, 95% CI -0.90 to -0.31; four trials, n=294 patients).

Sensitivity analyses indicated that the results for intraoperative red blood cell transfusions were not robust to removal of single trials; removal of either one of the two trials that demonstrated the most benefits with RAP negated the statistical benefit of the pooled result.

**Cost information**
Assuming a mean adjusted cost per unit for red blood cells of $2000, it was possible that a 500-case cardiac programme could reduce costs by $90,900 per year for intraoperative red blood cell transfusions and $250,000 per year for total hospital stay red blood cell transfusions with the application of RAP.

**Authors' conclusions**
RAP significantly reduced allogeneic red blood cell transfusions, but the six trials may have been biased and safety could not be assessed.

**CRD commentary**
Inclusion criteria for the review were broadly defined and several relevant sources were searched. The restriction to published literature may have caused relevant unpublished studies to be missed; publication bias was not assessed. It was unclear whether the search included languages other than English, so there may have been potential for language bias. The authors did not state how many reviewers performed study selection, data extraction and quality assessment; this was likely a factor of poor reporting as there was mention that discrepancies in data extraction were resolved by consensus. Validity assessment was undertaken using the 5-point Jadad scale, which indicated that the included trials were poor quality. Some details about the included studies were provided. However, further information about the study samples used and outcomes from the validity assessment would have helped interpretation of the results. A random-effects meta-analysis was undertaken, which appeared appropriate. Statistical heterogeneity and sensitivity analysis were explored. However, sensitivity analysis indicated that the results were not robust to removal of either of the two trials that showed the greatest benefit with RAP, so the pooled results may not have been reliable. The review generally suffered from poor reporting, possibly due to space constraints. The authors acknowledged that there may have been bias in the trials. The inclusion of low-quality trials together with the lack of robustness of the meta-analyses limits the reliability of the authors' conclusion that RAP significantly reduced allogeneic red blood cell transfusions, hence caution is warranted when interpreting the findings.

**Implications of the review for practice and research**
The authors did not state any implications for practice and research.

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**Bibliographic details**
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.