Platelet-rich plasmapheresis: a meta-analysis of clinical outcomes and costs

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Authors' objectives
To examine the impact of platelet-rich plasmapheresis (PRP) prior to cardiopulmonary bypass surgery on clinical outcomes.

Searching
"Standard medical online searches" as well as Cochrane Collaborations "optimal MEDLINE search strategy" using appropriate keywords (not stated) were used to identify studies. Handsearching of libraries and appropriate journals was also carried out. Bibliographical abstracts were searched under PRP, sequestration, cost and economic analysis for CPB, as well as trade names. Reference sections and bibliographies of all retrieved articles were carefully examined for additional studies. Refereed proceedings were also examined for appropriate abstracts providing data. Only published or abstracted literature with data results, in the English language, published or produced between 1990 and 1996 was included.

Study selection
Study designs of evaluations included in the review
Specific study design criteria were not stated. However, included studies had to compare either treatment with PRP to no treatment or compare different levels of PRP.

Specific interventions included in the review
Platelet-rich plasmapheresis (PRP) compared with no treatment.

Participants included in the review
Patients undergoing cardiopulmonary surgery. Studies were not included if the patient population consisted of solely redo surgeries.

Outcomes assessed in the review
Red blood cell use, platelet use, fresh frozen plasma use, probability of transfusion, postop myocardial infarctions, postop cerebrovascular accidents, re-operation for bleeding, hours to extubation, hours in intensive care unit, and hospital length of stay.

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

Assessment of study quality
The author does not state that they assessed validity.

Data extraction
The number of reviewers who abstracted data from the primary studies was not stated.

Methods of synthesis
How were the studies combined?
Studies were combined using a random-effects model.

How were differences between studies investigated?
Tests for heterogeneity were not reported.

**Results of the review**

Twenty studies comprising 1068 PRP patients and 652 non-PRP patients were included in the review. The study designs of included studies were not stated.

All probabilities favoured the platelet-rich plasmapheresis (PRP) group patients. The difference between effect sizes for PRP vs non-PRP groups were all significantly different from zero. Patients in the PRP group use 90.4% fewer units (2 less units) of packed red blood cells, 65.3% fewer units (1.5 less units) of fresh frozen plasma, and 86.5% fewer units (1.5 less units) of platelets than patients in the control group. Patients in the PRP group spend 16.1% fewer (13 less) hours in intensive care and they spend 15.2% fewer, or 1 a less, days in the hospital. Even though the difference in effect sizes is statistically significant for extubation (3.0% less hours to extubation), the difference is small in terms of clinical significance.

PRP patients are 27.4% less likely to need reoperation for bleeding and are 78.5% less likely to experience a cerebral vascular accident.

Five studies that sequestered less than the suggested therapeutic dose, i.e. less than 20% to 30%, make the result of use of PRP across studies smaller if they are not included.

**Cost information**

The review provides an example of how initial expenditure on technology used during cardiopulmonary bypass (CPB) results in overall cost savings.

Improved clinical outcomes from PRPs result in 25.4% lower costs per patient on whom PRP is used.

Costs were calculated for each separate outcome and every category demonstrated a greater cost for non-PRP patients when compared to PRP patients. Expected total costs for the outcomes considered for a patient not receiving PRP was US $16,532.46 and for patients in the PRP group, US $12,329.44. Thus the total cost savings were estimated to be US $4,203.03.

**Authors' conclusions**

The data provided here furnish evidence that use of PRP in CPB results in an improvement in all clinical outcomes analysed: blood product usage, length of stay, intensive care stay, time to extubation, incidence of cardiovascular accident, and incidence of reoperation. The most striking differences occur in use of all blood products, particularly packed red blood cells. These improved outcomes provide cost savings for patients in the PRP group when compared to non-PRP patients.

**CRD commentary**

The author presents a well defined research question. Inclusion and exclusion criteria were appropriate.

The literature search strategy was fairly thorough, although the keywords used in the database searches were not stated. The validity of the included studies was not assessed and the study designs were not reported. Consequently, some of the primary studies could be of poor quality. Tests for heterogeneity were not performed before the studies were combined, and no details of the individual studies were presented, making it difficult to assess clinical heterogeneity. Therefore, it is not clear whether the studies were combined appropriately.

The conclusions follow from the results, but both should be interpreted with caution, due to the possibility that poor quality studies and heterogeneity could be present.

**Implications of the review for practice and research**
The author suggests that further research with larger numbers of patients and more extensive collection of clinical outcomes would likely provide outcome and cost information with increased significance and accuracy.

**Funding**
Medtronic Inc.

**Bibliographic details**

**PubMedID**
10181006

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Blood Transfusion /adverse effects; Blood Transfusion, Autologous /economics /methods; Cardiopulmonary Bypass; Cost Savings; Costs and Cost Analysis; Critical Care; Diagnosis-Related Groups /economics; Erythrocyte Transfusion; Hemostasis, Surgical; Humans; Incidence; Intubation, Intratracheal; Length of Stay; Medical Laboratory Science /economics; Myocardial Infarction /prevention & control; Plasmapheresis /economics /methods; Platelet Transfusion /economics /methods; Reoperation; Risk Factors; Treatment Outcome

**AccessionNumber**
11998005576

**Date bibliographic record published**
30/04/2000

**Date abstract record published**
30/04/2000

**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.