

Autologous Blood Transfusion in Cardiac Surgery Reduces Donor Blood Requirement

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ABSTRACT

Aim: To see if use of autologous blood transfusions (ABT) compared with no autologous blood transfusion reduces donor blood transfusions in patients undergoing cardiac surgery in a public hospital in Pakistan.

Design: Experimental study.

Place and duration of study: Cardiac Surgery Department, Mayo Hospital/K. E. Medical University Lahore. Duration of study was 18 months from January 2006 to October 2007.

Material and methods: A total of 200 consecutive patients undergoing open-heart surgery were included in the study. These were all adult patients with preop haemoglobin of ≥ 12.5 gram/100ml operated by a single group of surgeons. The patients who were reexplored for bleeding or had complicated postop course or who did not survive the operation were excluded. All of the pump blood after cessation of cardiopulmonary bypass was transfused to the pt. Patients were divided into two groups with alternate patient going into respective groups. Group A (100 pts.) in whom one unit of blood was withdrawn after induction. This unit of blood was transfused to the pt as autologous blood after cessation of cardiopulmonary bypass, when the effects of heparin were being reversed by Protamine. Group B (100 pts.) in whom no blood was taken to be used later as autologous blood. Intra & postop allogeneic blood transfusions were given based upon strict transfusion criterion.

Results: Only 16% pts in group A required postop whole blood transfusion compared to 33% pts in group B (p-value=0.017) indicating significantly lower need of donor blood transfusion in group A. However, there was no statistically significant difference in other recorded variables such as preop haemoglobin (14.58 ± 1.56 vs 14.22 ± 1.10 , p-value:0.083), postop haemoglobin (10.40 ± 1.72 vs 10.47 ± 1.53 , p-value:0.781), bypass time (65.79 ± 21.57 vs 67.22 ± 24.08 ; p-value:0.714) and cross-clamp time (39.74 ± 17.34 vs 41.46 ± 16.86 ; p-value:0.551) when group A was compared to group B respectively.

Conclusion: Autologous blood transfusion is a highly effective method to reduce the need for periop donor blood transfusion in pts undergoing cardiac surgery. This practice could be of enormous value in pts undergoing cardiac surgery in the developing world considering the context of population with high prevalence of hepatitis B&C and other blood transfusion related infectious diseases.

Key words: Blood transfusion, open-heart surgery, pump blood.

INTRODUCTION

Cardiac surgery is a main user of donor whole blood and blood products. Upto 20-30% of all donor blood transfusions are being used by cardiac surgery^{1,2}. The transfusion rates in cardiac surgery remain high in spite of different blood conservation techniques being used^{3,4} as bleeding after cardiopulmonary bypass is due to altered coagulation⁵. Donor blood is expensive and carries risks. These risks include transfusion reaction due to ABO incompatibility, immunologic complications⁶ and transmission of infectious diseases^{7,8} like HIV⁹, Hepatitis B and C¹⁰. It is therefore essential to find ways and means of reducing the donor blood transfusions in patients undergoing cardiac surgery.

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PATIENTS AND MEHODS

This experimental study was carried out in department of cardiac surgery, Mayo Hospital/King Edward Medical University, Lahore, Pakistan from January 2006 to October 2007. Total of 200 consecutive patients were included in the study. All the adult patients undergoing open-heart surgery by a single group of surgeons were included. Patients with preoperative haemoglobin of ≤ 12.5 grams per decilitre, patients who were re explored for bleeding or had complicated postoperative course or did not survive the operation were excluded. All the pump blood after cessation of cardiopulmonary bypass was transfused to the patient. Patients were divided into two groups. Group A included 100 patients in whom one unit of blood was withdrawn after induction of general anaesthesia while central venous line was being inserted by the anaesthetist. The blood was stored in theatre and was transfused to the patient as

autologous blood after cessation of cardiopulmonary bypass after the effects of heparin were reversed by protamine. Group B included 100 patients in whom no autologous blood was withdrawn. Intra and post-operative allogeneic blood transfusions were given only if postoperative haemoglobin fell below 8 grams per decilitre¹³ excessive postoperative bleeding or sign and symptoms of anaemia appeared. Data was analysed using SPSS and student t test was applied as test of statistical significance.

RESULTS

In group A, 16 percent of patients required postoperative whole blood transfusion (Fig.1) while in group B, 33 percent patients required postoperative whole blood transfusion (Fig. 2) (p-value=0.017), showing significantly lower donor blood requirements in group A.

Fig.1: Donor blood requirement in Group A

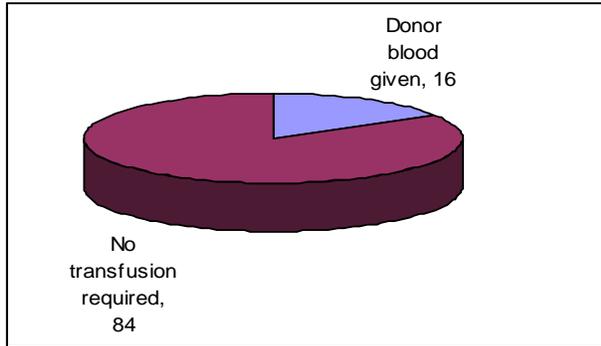
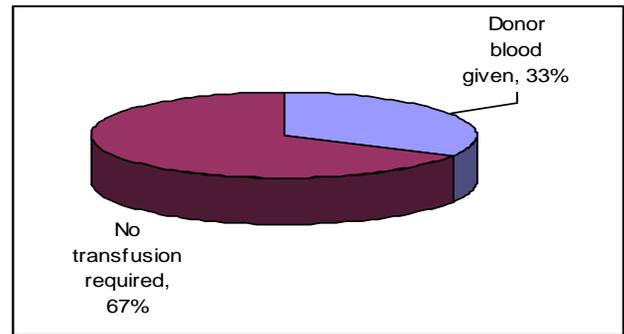
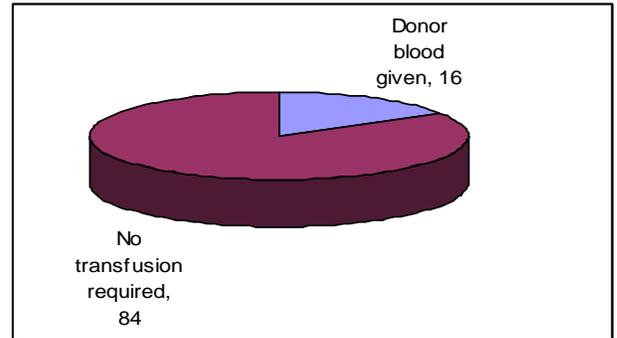


Fig. 2: Donor blood requirement in Group B



In addition the number of units of donor blood transfused in group A was significantly lower than that transfused in group B (0.44±1.08 vs. 0.84±1.38 units respectively; p-value:0.048). The other recorded variables like preoperative haemoglobin, postoperative haemoglobin, bypass time and cross clamp time showed no statistically significant difference in the two groups. (Table 1).

Table 1:

Variable	Group A	Group B	P-value
Preoperative Haemoglobin	14.58±1.56	14.22±1.10	0.083
Postoperative Haemoglobin	10.40±1.72	10.47±1.53	0.781
Bypass Time	65.79±21.57	67.22±24.08	0.714
Cross Clamp Time	39.74±17.34	41.46±16.86	0.551

The cardiac surgery is unique in that there are coagulation abnormalities leading to increased postoperative bleeding after open heart procedures¹¹. These coagulopathies result from use of heparin to prevent clotting after initiation of cardiopulmonary bypass, reduction in number and function of platelets¹², fibrinolysis¹¹ and hemo-dilution leading to decreased concentration of clotting factors.

In developing countries like ours, the viral hepatitis B and C are very common¹³ and the screening coverage of these and other transfusion related infections is not 100 percent^{14, 15}. In addition the test used to screen blood for different infections are not 100 per cent sensitive and uncommon viruses

like Hepatitis G, E and HTLV and diseases like leishmaniasis are not screened for routinely¹⁶. The employees of most of the blood banks in developing countries are reluctant to take history of IV drug abuse and high-risk sexual behaviour¹⁴ leading to high risk donors to donate blood and putting the recipient at higher risk. The healthy donors do not have adequate knowledge of Hepatitis B, C and HIV infections¹⁷. So it is very important to discourage the usage of donor blood to avoid transmission of these diseases.

Another reason for discouraging the use of donor blood is expenses incurred on collection of donor blood. These expenses occur on grouping and

cross match, storage, screening tests for hepatitis B and C and HIV, and the pays of the personal working in blood banks.

The different methods of decreasing donor blood transfusions in patients undergoing cardiac surgery include reversal of effects of heparin with proper dose of protamine and repeating the dose of protamine if ACT is prolonged due heparin rebound phenomenon¹⁸. The hemo-dilution¹⁹ can be prevented by discouraging the use of colloid like gelatin for replacing the intravascular volume as it stays in the vascular compartment for longer period of time. The platelet dysfunction requires platelets which are present in fresh blood or platelet concentrates. Autologous blood drawn at induction of anaesthesia is the safest form of fresh blood containing normally functioning platelets and clotting factors.

Finally, there should be low threshold for starting donor blood transfusion²⁰. Donor blood should only be given if the patient haemoglobin falls below 8 grams per 100 ml or if signs and symptoms of anaemia appear.

CONCLUSION

The autologous blood transfusion is an effective method of reducing donor blood requirements in patients undergoing cardiac surgery thereby reducing the risk of spread of infectious diseases especially Hepatitis B and C.

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