Routine Blood Transfusion should not be "routine" in Cardiac Surgery

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Objective: To determine if open-heart surgery can be performed in a public hospital in Pakistan without the use of routine blood transfusions. Considering the high prevalence of Hepatitis B and C in the donor population, decreased use of donated blood is the best protection against these and other transfusion transmitted infections. **Design:** Cross sectional observational study. **Place and duration of study:** This study was conducted at cardiac surgery department, Mayo Hospital Lahore. It included patients operated from January 2006 to September 2006. Duration of study was 9 months. **Material and Methods:** Total of 106 patients undergoing open-heart surgery were included in the study. These were all adult patients operated during the first nine months of 2006 by a single group of surgeons. Patients who were re explored for bleeding or had complicated postoperative course or who did not survive the operation were excluded. All the pump blood after cessation of cardiopulmonary bypass was transfused to the patient. Intra and post-operative allogeneic blood transfusions were given based upon strict transfusion criterion. Any patient who received 1 unit of blood[1] or 2 units of blood with post operative haemoglobin of 11 gram per 100 ml or more than 11gram per 100 ml or more than 2 units of blood with post operative haemoglobin of 12 gram per 100 ml or more than 12 gram per 100 ml was considered to have received unnecessary transfusions [2]. **Results:** 67 patients (63.21%) did not receive any blood transfusions. 32 Patients, (30.19%) were transfused 2 units of blood. 7 (6.60%) patients received more than two units of blood. 8 (7.55%) patients received unnecessary transfusions. **Conclusions:** Blood transfusions can be eliminated in most routine cardiac operations. As appropriate drugs and technology like cell savers and in pump haemo-concentration devices become available to us, the number of patients receiving blood transfusions can most likely be decreased further.
Key words: Blood transfusion, Open-heart surgery, Pump blood.

The benefits of blood transfusions are widely described and accepted. However, the blood is expensive and carries risks. Many factors like shortages of blood and blood products, costs, risk of infection, and risk/benefit ratio to the patient, have made the medical community to reassess the guidelines for transfusion. Cardiac surgery is a major user of allogeneic blood and blood products. In United States cardiac surgery utilizes 20% of all blood transfusions [3,4]. Blood conservation techniques being used in cardiac surgery are safe and effective but transfusion rates in cardiac surgery remain high[5,6,7] as bleeding after cardiopulmonary bypass is considered to be a problem due to altered coagulation[8]. However, many patients undergoing open-heart surgery receive unnecessary blood transfusions[1,2]. This practice of routine transfusions needs to be re evaluated, as there are risks involved with the use of allogeneic blood and blood products [4,7,9]. These risks are transfusion reactions due to ABO incompatibility, immunologic complications[10] and transmission of infectious diseases[4,11,12] especially HIV[13], Hepatitis B and C[14]. Both these forms of viral hepatitis are very common in our country. The screening coverage for both these and other transfusion-transmitted diseases is not 100 % in developing countries [15,16]. In addition, employees of most of the blood banks in developing countries are reluctant to take history of IV drug abuse and high-risk sexual behaviour[16]. All this places the recipient of blood at increased risk of transmission of transfusion-transmitted diseases. Moreover, safe blood is a precious gift from blood donors and we should avoid its wastage in unnecessary transfusions.

Patients and methods

This observational study was conducted at cardiac surgery department, Mayo Hospital Lahore. Total of 106 patients (Figure 1) were included in the study. All the adult patients undergoing open-heart surgery being operated by a single group of surgeons were included. The patients re explored for bleeding or had complicated postoperative course or who did not survive the operation were excluded from the study. Preoperative haemoglobin, bypass time, cross clamp time and postoperative haemoglobin were the variables studied with need of donor blood transfusion. All the pump blood was transfused to the patients after cessation of cardiopulmonary bypass. Patients were transfused donor blood only if postoperative haemoglobin fell below 8 gram per 100 ml[17], or excessive postoperative bleeding or signs and symptoms of anaemia appeared.

Results

Out of 106 patients, 67(63.21%) did not receive any blood transfusions, 32(30.19%) were transfused with two units and remaining 7(6.60%) got more than two units of blood transfusions per-operatively or postoperatively (Fig 2). 8(7.55%) patients received unnecessary transfusions. Pearson correlation (Table 1) was used and it was found that the patients with higher preoperative haemoglobin (p=.031) and shorter bypass times (p=.000) were the patients in whom routine use of blood during cardiac surgery can be avoided.
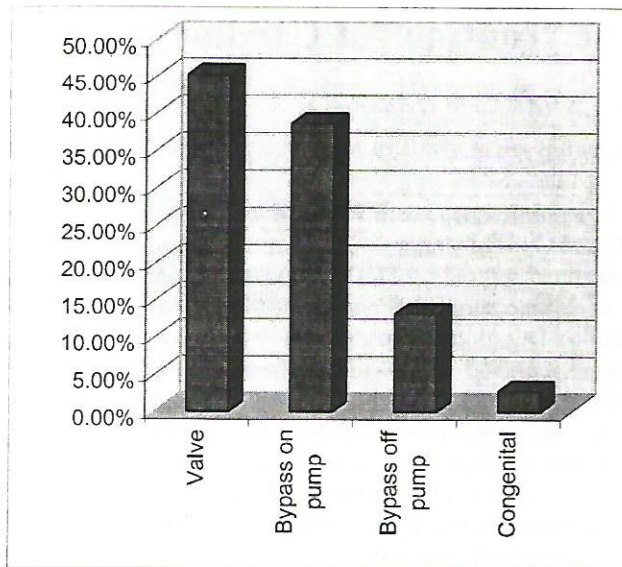
Fig 1: This graph shows that 14(13.21%) patients had Off Pump CABG, 41(38.68%) had conventional CABG, 48(45.28%) had valve surgery and 3(2.83%) had surgery for congenital heart disease.
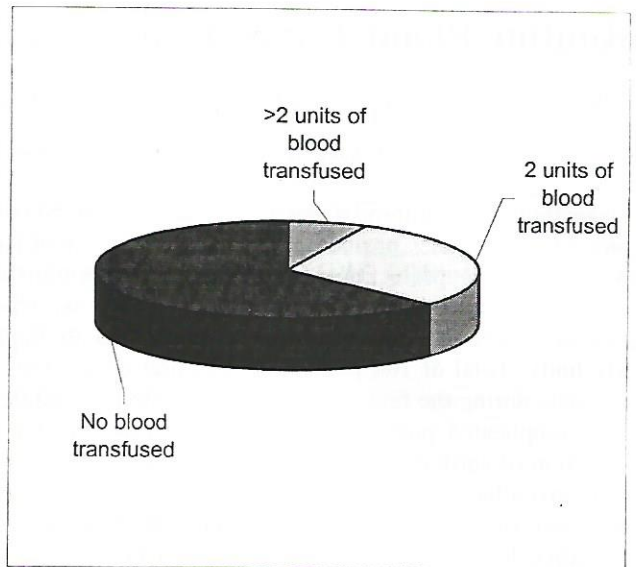

Figure 2: This graph shows that 67(63.21%) of the patients did not receive any blood, 32(30.19%) received 2 units of blood and 7(6.60%) patients received more than 2 units of blood.

Table 1: Correlation of blood transfusion with preoperative haemoglobin and bypass time.

		Transfusion	Bypass time	Preoperative Hb
Transfusion	Pearson Correlation	1	.377(**)	-.210(*)
	Sig. (2-tailed)		.000	.031
	N	106	92	106
Bypass time	Pearson Correlation	.377(**)	1	.019
	Sig. (2-tailed)	.000		.854
	N	92	92	92
Preoperative Hb	Pearson Correlation	-.210(*)	.019	1
	Sig. (2-tailed)	.031	.854	
	N	106	92	106

*Correlation is significant at the 0.05 level (2-tailed).   **Correlation is significant at the 0.01 level (2-tailed).

Discussion

Allogeneic blood transfusion in human beings started in 1818 by James Blundell, a British obstetrician. He performed first successful transfusion of human blood to a patient for postpartum bleeding. Between 1825 and 1830, he performed ten documented transfusions, five of which proved beneficial to his patients and published these results. In 1901 Karl Landsteiner, an Austrian physician documented the first three blood groups A, B, and O based on red blood cell antigen. In 1902, a fourth group AB was added by A Decastrello and A Sturli. In 1907 Hektoen suggested cross matching blood between donors and patients to exclude incompatible mixtures. Now the blood is grouped for ABO and Rh factor compatibility and tested for transfusion-transmitted infection like HIV, Hepatitis B and C routinely and for other infection like Chagas disease[18] if required.

Blood transfusions form an essential component of modern health care. Used correctly it is beneficial as it saves the lives and can improve health. However, it should be used only when absolutely necessary as inappropriate use leads to shortages of blood and blood product[4,9,12]. In addition it puts the recipients to the hazards of blood transfusions. Unnecessary transfusions lead to extra burden on blood banks in terms of costs and labour[3]. The transfusion should only be deemed appropriate when it is used to treat condition leading to significant morbidity and mortality that cannot be managed effectively by other means. In cardiac surgery we can avoid unnecessary blood loss by blood conservation. The haemodilutional effect of cardiopulmonary bypass can be overcome by use of pump haemo-concentration devices.

Transfusion reactions should now rarely occur. Adverse reactions during or after blood transfusions occur in 1 to 6 % of the recipients[19]. Many of these reactions are clinically of no consequence. However, a small group of adverse reactions like acute lung injury, renal injury and myocardial injury are responsible for serious illness and even death.

The risk of transfusion-transmitted diseases like HIV, Hepatitis B and C, Malaria[20], Chagas disease, leishmania etc is higher than transfusion reactions especially in

developing countries with poor blood programmes. The employees of blood banks are shy to ask the donors about IV drug abuse and high-risk sexual behaviour[16]. The blood banks are regularly utilizing paid donors[16]. In addition, the appropriate equipment and reagents to screen for HIV and hepatitis C are not available in many blood banks [16]. These all lead to increased risk of transmitting transfusion related infections.

Postoperative infections are result of interactions between the infecting organism, surgical technique, and host defence mechanisms. Blood products impair many host defence mechanisms. Initially the transfused white blood cells were thought to be responsible for this impaired response. Now other factors like effects of free serum iron, the blood storage time, and presence of bioactive substances like inhibitors of metalloproteinase-1 in stored blood have been implicated [10].

Conclusions

1. Blood transfusions can be avoided in most routine cardiac operations.
2. Restricting the use of blood and blood products in routine cardiac operations can attain significant decreases in costs of procedure.

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