



FEASIBILITY AND IMPACT OF BLOOD CONSERVATION IN CARDIAC SURGERY PATIENTS

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ABSTRACT

Blood conservation has become the concern and need of the hour especially in cardiac surgery as blood transfusion carries both risks and benefits. However, a significant number of blood and blood products are used irrespective of the need by most cardiac surgeons as a protocol and in the context of safe practice. Despite a large number of studies showing that there are evidences of transfusion reactions and complications and even increased mortality among transfused patients, there is no general consensus on it and still there are wide variations in transfusion practices. This study was done to evaluate the feasibility and impact of blood conservation in cardiac surgery. 96 adult patients who underwent routine cardiac surgeries in our hospital were studied. Various strategies were strictly followed to keep the intraoperative blood loss to minimum, prevent damage of blood cells, achieve ideal ACT and hemostasis at the end of surgery in order to avoid blood transfusion whenever possible and keep the requirement to minimum in the remaining patients. Out of 96 patients, 80 patients did not require any transfusion. Of the remaining 16 patients, who needed transfusion, only 2 cases needed more than 2 units of whole blood/PRBC transfusion along with minimal FFP and platelets. Hence this study proves that cardiac surgery in adults can be safely done with no or minimal utilisation of blood and blood products and with good patient outcome.

KEYWORDS : Blood conservation, Bloodless cardiac surgery, Permissive Anemia

INTRODUCTION:

There are mounting evidences for restrictive usage of blood transfusion in patients undergoing cardiac surgeries. However, there is no general consensus on appropriate use of blood transfusion for cardiac surgery (1). The transfusion guidelines are not uniformly applied. The blood transfusion depends highly on the informal institutional standards which further depends on the availability of blood products and individual surgeons continue to drive transfusion practice based on their clinical acumen. Apart from this there were studies suggesting that Cardiac surgery patients have higher five-year mortality compared with that of non-transfused patients even after correction for comorbidities and other factors. Hence this study was made as an attempt to minimise blood transfusion in cardiac surgery and to assess the outcome of the patients who underwent cardiac surgery.

AIM OF THE STUDY:

To study the feasibility of blood conservation in cardiac surgery and its impact on patient outcome

OBJECTIVES:

1. To minimise the use of blood and blood products in cardiac surgery
2. To devise strategies for reducing the use of blood and blood products
3. To study the impact of blood conservation on the post-operative course and patient outcome.

MATERIAL AND METHODS:

This case study is a prospective study undertaken in the department of cardio thoracic surgery, Rajiv Gandhi Government General Hospital, Chennai. Adult patients who underwent cardiac surgery in a single surgical unit under single operating team were studied to avoid surgeon to surgeon variation in operative strategies and transfusion practice.

Study period:

From July 2018 to February 2019

INCLUSION CRITERIA :

All adult patients who underwent regular cardiac surgeries in the concerned surgical unit with preoperative hemoglobin more than 12gms% were included in the study.

EXCLUSION CRITERIA :

1. Patients with hemoglobin less than 12gms%.
2. Patients undergoing complex aortic surgeries.
3. Patients who developed intraoperative bleeding complications.
4. Patients with significant liver and kidney failure

Sample size :

Based on the above inclusion and exclusion criteria 96 patients were studied during the study period.

METHODOLOGY :

Following strategies were followed in all the patients to minimise bleeding and use of blood products:

1. All patients were usually started on iron supplements 2 to 3 weeks prior to surgery and continued post operatively for 3 months.
2. Whenever possible, CABG is performed off pump. In on pump surgeries, cardiopulmonary bypass time was minimized to possible extent.
3. They were given 10mg/kg tranexemic acid at the time of induction of surgery. 2nd dose of tranexemic acid 10mg/kg was administered while weaning the patient off cardiopulmonary bypass.
4. Peroperatively, the usage of cardiomy suction was kept minimum. Surgical steps were carried out meticulously to avoid bleeding complications.
5. Before reversal of protamine, maximum possible volume of blood in the reservoir was reperfused back into the Patient through the aortic cannula. Preoperative ACT achieved in all cases by adequate reversal with protamine.
6. Hemostasis was thoroughly checked and achieved.
7. Pleural drain was avoided if the pleura was not opened during the surgery.
8. Inj. Furosemide was given as a routine at the end of the surgery in order to counterbalance the expected hemodilution during surgery.

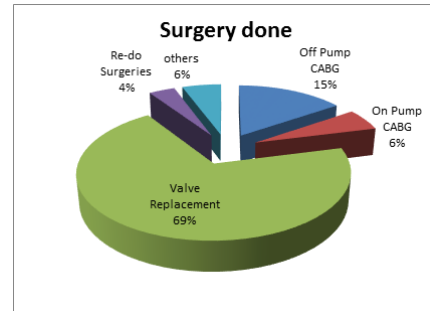
9. The cutoff value for blood transfusion post operatively was fixed as less than 9gms% of hemoglobin.

Re-do Procedures	2
Others	3

Data collection :

Following preoperative and postoperative details pertaining to the study were collected from all the patient records,

1. Age and sex of the patient
2. Diagnosis
3. Surgical procedure done
4. Preoperative Hemoglobin and platelet count
5. Hemoglobin and platelet count immediate post-op, at discharge and at 1 month follow up.
6. Total drain in the postoperative period
7. Whether the patient required blood and/or blood product transfusion
8. If required, number of units of blood and blood products transfused
9. Complications in the post operative period
10. Mortality in the post operative period and cause of death



The other surgeries included Atrial Septal defect closure and LA myxoma excision.

OBSERVATION AND RESULTS :

The collected data were then tabulated and analysed to assess the impact of blood conservation on the patient outcome. Following observations were made.

1. Age distribution :

Following is the age distribution of the patients studied. The youngest and eldest patient were 14 years and 75 years old respectively. The mean age was 42.5years.

4. Hemoglobin and platelet levels :

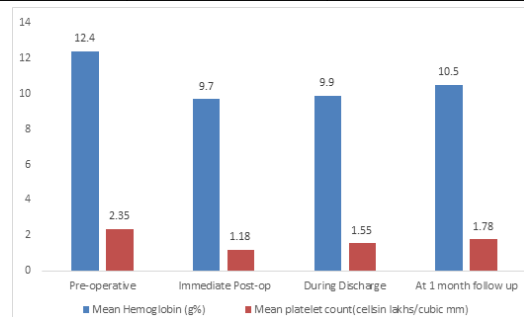
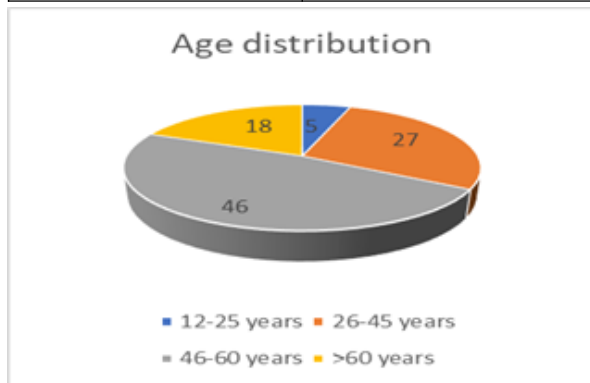
The mean hemoglobin and platelet levels in the preoperative and post operative period were as below,

Table 1

Age group	No. of cases(Total – 96)
12-25	5
26-45	27
46-60	46
Above 60	18

Table3

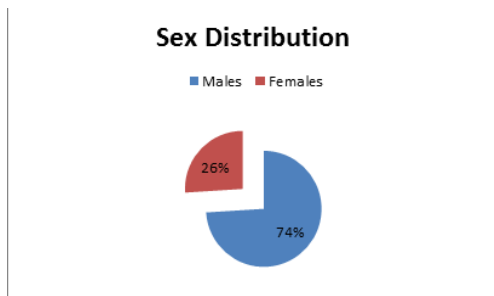
Timing	Mean Hemoglobin (gms%)	Mean platelet count(cells/cubic mm)
Pre-operative	12.4	2,35,000
Immediate Post-op	9.7	1,18,000
At Discharge	9.9	1,55,000
At 1 month follow up	10.5	1,78,000



2. Sex distribution : Of the 96 patients, 74 % were males and 26% were females.

5. Post surgical drain volume :

The mean surgical drain noted on first 24 hours post surgery was 280ml, the lowest one being 50ml and highest one measured 550ml. On the next 24 hours the average drain was 130 ml, the lowest measured 30ml and the highest measured 250ml. In most of the cases surgical drain were removed on day 3, while in the remaining cases on day 4 after surgery.



6. Blood and blood products transfused

Of the 96 patients, blood transfusion was not required in 80 patients(83%) and transfusion was done in remaining 16 patients(17%). Out of the 16 patients who required transfusion, only 2 cases needed more than 2 units of whole blood/PRBC transfusion along with few units of FFPs and Platelets. The average requirement units of blood and blood products are as below,

3. Nature of surgical procedures done :

Table 2

Surgery	No. of cases (Total – 96)
Off pump CABG	51
On pump CABG	3
Valve replacement	37

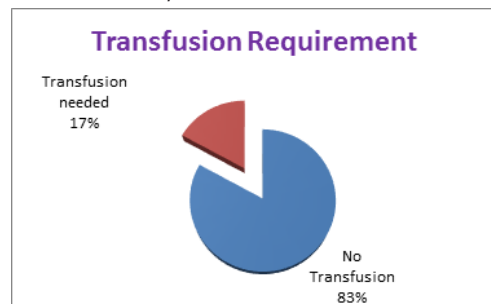


Table 4

Blood component type	Total Usage for the 16 patients (No. of units)	Mean Requirement
Whole blood/PRBC	21	1.3
FFP	11	0.6
Platelet	6	0.4

7. Morbidity :

The common complications noted postoperatively were seizures in 2 patients (of whom one is a known seizure disorder patient), CVA in 1 patient, transient AV block in 1 patient, atrial fibrillation in 7 patients and heart failure in 6 patients. None of these complications were due to the blood conservation strategies or minimized transfusion.

8. Mortality :

The mortality happened in 2 out of the 96 patients. The first patient underwent CABG with Mitral valve replacement, who died on day 6 due to refractory low cardiac output state. The second patient underwent double valve replacement and died of recurrent refractory ventricular arrhythmia on day 2. Both deaths were thus due to caused unrelated to blood conservation strategies or minimized transfusion.

DISCUSSION :

In any tertiary care hospital, cardiac surgeries amount for 10 to 15 percent of overall surgeries done in the hospital. However they consume almost 75 percent of the blood and blood product resource of the entire hospital. But the real fact is that blood must be viewed as a scarce resource that carries risks and benefits(2).

During Cardiac surgeries, the need for blood transfusion and the strategies followed in various institutions differ in accordance with the operating surgical team and the local availability of blood products. Minimising the blood transfusion is the most important need of the hour in order to avert the complications related to it such as TRALI and TRIM. Also there are many studies showing decreased long term survival in patients who underwent more of blood transfusion(3,4,5). Also there is increased risk of infections with too many blood transfusions(6).

Many centres continue to transfuse fixed number of blood and blood products intraoperatively and post operatively irrespective of the hemostasis, optimal ACT levels and minimal drain(5). From our study it is evident that the transfusion in most of the Cardiac surgeries could be minimised by simple interventions like preoperative oral supplementation of iron, usage of styptics such as tranexamic acid, achieving proper hemostasis and using residual pump blood(7,8). In this study, the mean level of haemoglobin level at discharge was $\geq 10\text{gms}\%$ in most of the cases, though during intraoperative period was as low as $6.5\text{gms}\%$.

Tolerance of "permissive anemia" is an important element of perioperative blood conservation strategy. The safety of tolerating perioperative anemia has been a significant deterrent for widespread application of blood conservation. Accordingly in our study, the patients were transfused only when the hemoglobin levels fall below $9\text{gms}\%$.

Shaw et al in their study have attributed transfusion of blood products as an independent risk factor associated with increased 5 -year mortality. Hence transfusion in cardiac surgeries should be limited to who are in critical need.

CONCLUSION :

From the present study, it could be concluded that cardiac surgery in adults can be safely done with a low utilisation of blood products and with good patient outcomes. Further improvement in minimal usage of blood and blood related

products would help in averting transfusion related complications in adults.

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