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RESEARCH ARTICLE

Predonated Autologous Blood Transfusion in Elective Orthopaedic Surgeries: Experience at a Tertiary Care Centre of North India

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Abstract

Autologous blood transfusion is the collection of blood from a single patient and retransfusion back to the same patient when required. . In orthopaedic surgery, **Turner** reported the use of autologous blood in various surgical procedures and, subsequently, **Cowell** reported its use in paediatric orthopaedics. In this study we included twenty patients who were scheduled for elective orthopaedic surgery and would require 1 unit of blood during surgery. Out of these 19(95%) were males and 1(5%) was female. Mean age of the patients was 35 years, range (20-50) years. 13 patients (65%) were transfused autologous blood during surgery and 7 patients(35%) were transfused on first post operative day. 8 patients(40%) had femoral shaft fractures, 5 patients(25%) had prolapsed intervertebral disc, 4 patients(20%) had tibial shaft fractures, 3 patients(15%) had forearm bones fractures. 2 patients(10%) had rare blood groups and they were particularly benefitted. Average 6 week post operative haemoglobin was 11.7 gm/dl. Mild adverse reactions were found in 1 patient (5%). None of the patients had any severe adverse reactions. In conclusion, autologous blood transfusion is safe, effective and economical, with benefits for both the surgeon and the patient. It is a procedure that can easily be adopted in any hospital.

INTRODUCTION

Autologous blood transfusion is the collection of blood from a single patient and retransfusion back to the same patient when required. [1,19] This is in contrast to homologous blood transfusion where blood from unrelated/anonymous donors is transfused to the recipient. The primary driving forces for the use of autologous blood transfusion are to reduce the risk of transmission of infection and to protect an increasingly scarce resource.[16] The first reported case was by **Duncan** in 1886. [5] However, it was not until 1921, when **Grant** described his experiences, that it became an accepted practice; its use was restricted to those patients with rare blood groups and patients for whom cross-matching was difficult. [9] Homologous blood transfusion was, and has remained, the principal means of blood replacement following operative blood loss. Autologous blood transfusion has been practiced intermittently in a number of specialized centres with favourable results. In orthopaedic surgery, **Turner** [18] reported the use of autologous blood in various surgical procedures and, subsequently, **Cowell** [4] reported its use in paediatric orthopaedics.

Autologous blood transfusion is extremely safe. [12] Advantages of autologous transfusion are numerous and include, decreased incidence of transmission of AIDS, Hepatitis, Syphilis, Brucellosis, Gram(–ve) infections. Protozoal diseases like Malaria, Toxoplasmosis, visceral leishmaniasis which are transmitted by homologous blood transfusion, can be negated by autologous blood transfusion .Apart from these, other advantages of autologous blood transfusion are early reticulocytosis and accelerated erythropoiesis. These patients are in the state of maximum stimulation of blood forming cells at the time of surgery so lag period between blood loss and stimulation of blood formation is reduced, as plasma value is completely replaced in 72hrs.There is relative hemodilution so better perfusion of tissues and reduced incidence of post operative thrombosis. Patient becomes familiar with hospital staff and surroundings for surgery, predonation of blood gives sense of self confidence. For rare blood groups it is difficult to find donors, so autologous blood transfusion can be very helpful in these situations. Cross- matching is not required; iso-immunisation to foreign protein is excluded; allogeneic blood is conserved for those who need it, particularly for emergencies. [2,8,14]

The greatest risk of autologous blood transfusion is clerical error and bacterial contamination of autologous unit. All the usual complications of blood donation/storage may occur, including bacterial contamination at collection and hemolysis, because of improper collection. Meticulous attention to standards can eliminate these problems. Up to 50% of predonated blood is unused; this wastage together with costs of transfusion results in higher cost per unit of blood in comparison with allogenic blood. [10]

Autologous blood can be stored by freezing. Frozen units are stored at temperature not more than -65 degree Celsius with glycerol added as cryoprotective. Frozen red cells are thawed and glycerol removed by washing before transfusing the patient.[3]

AIMS AND OBJECTIVES

The aim of the present study was to

1. Find out the advantages of autologous blood transfusion in elective orthopaedic surgeries
2. Find out the disadvantages of autologous blood transfusion in these patients
3. To help patients of rare blood groups for whom it is difficult to find donors

MATERIAL AND METHODS

This prospective study was conducted in the post graduate department of Orthopaedics Government Medical College, jammu in collaboration with Haematology department during the period from 1st Dec 2013 to 30th Sept 2014. Both male and female patients were included in the study. Each patient was planned for phlebotomy 5-7 days before the elective surgery. Predeposit autologous donation technique was chosen. [15]

Inclusion criteria :

- Patients with haemoglobin more than 11gm/dl
- Age 20 to 50 years
- Patients posted for elective surgeries
- Normotensive patients
- Only one transfusion anticipated

Exclusion criteria:

- Patients with haemoglobin less than 11gm/dl
- Patients who were suffering from cardiopulmonary and chronic renal disease
- Patients who had history of epileptic fits , hypertension or hypotension
- Patient less than 20 years and more than 50 years

Investigations like haemoglobin, haematocrit, reticulocyte count, platelet count, blood grouping ,fasting blood sugar, viral serology, PBF,ESR,BT,CT,PTI ,RFT,LFT were done prior to phlebotomy. After taking proper history, thorough physical examination, informed and written consent was taken from each patient. Phlebotomy was done with a18 gauge needle and 300 ml of blood was collected in plastic bags containing preservative in Haematology department. Patients blood pressure and pulse were recorded and monitored during phlebotomy and adverse effects were noted and classified according to **American red cross** criteria – as [7,10,11]

Mild - pallor, dysphoria, anxiety, light headache, tachpnoea
Moderate- progession from mild to unconsciousness
Severe - unconsciousness to convulsions

Stored blood was tested for HBS Ag, HIV, HCV and other diseases transmitted by blood. Autologous blood was used during surgery or after surgery. On 3RD Postoperative day,investigations(haemoglobin,haematocrit,reticulocyte count,BT,CT,PTI and platelet count) were done. These investigations were repeated at 2 weeks and 6 weeks after the surgery.

OBSERVATIONS

Twenty patients were included in this study. Out of these 19(95%) were males and 1(5%) was female. Mean age of the patients was 35 years, range (20-50) years. None of the patients had any associated comorbid condition. 13 patients (65%) were transfused autologous blood during surgery and 7 patients(35%) were transfused on first post operative day. 8 patients(40%) had femoral shaft fractures, 5 patients(25%) had prolapsed intervertebral disc, 4 patients(20%) had tibial shaft fractures, 3 patients(15%) had forearm bones fractures. 2 patients(10%) had rare blood groups and they were particularly benefitted.

Average prephlebotomy haemoglobin was found to be 11.6gm/dl. Average 2nd postphlebtomy day haemoglobin was found to be 10.4gm/dl. Average 3rd post phlebotomy day haemoglobin was found to be 10.0gm/dl. On 2nd week post operative follow up in outpatient department haemoglobin was again estimated and average was 11.5gm/dl. Average 6 week post operative haemoglobin was 11.7 gm/dl. Mild adverse reactions were found in 1 patient (5%). None of the patients had any severe adverse reactions. [Table 1]

DISCUSSION

In the present study it was felt that majority of the patients who are to undergo elective orthopaedic surgery which requires 1 units of blood, can participate in the programme of predeposit aotologous blood transfusion. Patients with a rare blood group, in particular, are benefitted from this programme. In the earliest reported case by **F.C Grant (1921) ,** [9] the indication for predeposit autologous transfusion was a surgery which required blood, rarity of blood group and the inability of the patient to pay for a donor. According to **Bernard Fantus (1937**), [6] any patient who is to undergo elective surgery can deposit blood 1-2 week before surgery to have it available in case it is needed during or after the operation.

In this study we included all those patients who were scheduled for elective orthopaedic surgery and would require 1 unit of blood during surgery. The patients had to have a haemoglobin level of 11gm/dl or more and haematocrit of 34%. All the patients were free of any serious cardiopulmonary or chronic renal disease. All patients were normotensive**. George Milles et al (1962),**[13] in one of the earliest studies of predeposit autologous transfusion considered all patients who were to undergo elective surgery and had haemoglobin of 11gm/dl or more with a haematocrit of 35% or more. Patients were screened for any coronary and cerebral insufficiency.

Age of the patients included in the present study was from 20 to 50 years, and 20 patients were included. **George Milles et al (1962),** [13] selected 53 patients who were between 20 to 47 years.

Phlebotomy of the patients was carried 5-7 days before surgery. In all the cases one phlebotomy of 300ml was done**. Toy et al (1987),**[17] recommended that donations be separated by approximately 7 days and the last unit be collected 72 hours or more before surgery.

Average prephlebotomy , 2nd postphlebotomy day, 3rd postphlebotomy day, 2nd week post operative ,6 week postoperative haemoglobins were 11.6 gm/dl, 10.4 gm/dl, 10.0 gm/dl, 11.5 gm/dl, 11.7 gm/dl respectively. **S E James MB FRCS M A Smith MB FRCS Department of Orthopaedics, St Thomas' Hospital, London** in their study found similar results which are 13.0 gm/dl, 12.3gm/dl, 10.9 gm/dl, 11.3 gm/dl on prephlebotomy day, one day preoperatively, 3rd post operative day, 10th post operative day respectively.

We found mild adverse reaction of donation in 1 patient (5%) and no severe adverse reactions at all. These findings were identical with other studies when compared**. Cowell at al (1972),**[4] reported 9.9 % mild and 0 severe reactions. **Mann et al (1986),**[12] reported 4% mild and 0 severe reactions.

CONCLUSION

In conclusion, autologous blood transfusion is safe, effective and economical, with benefits for both the surgeon and the patient. It is a procedure that can easily be adopted in any hospital. In this day and age, where an increased number of expensive tests have to be carried out on homologous blood prior to transfusion, it is surely better to use preventive measures and avoid complications by the use of autologous blood, where possible.

Autologous blood transfusion decreases the chances of transmission of infections .Rare blood group patients can be benifited for whom it is difficult to find donors for transfusion. It gives sense of confidence and satisfaction to the patient. Chances of mismatch reactions are reduced. Lag period between blood loss and

stimultation of blood formation is reduced. Disadvantages of bacterial contamination and clerical errors can be eliminated by meticulous attention to standards .We believe that this is a safe, effective and economical procedure which benefits both patients and medical staff, and its use should be more widespread. An autologous blood transfusion programme should only be complementary to the established blood transfusion programme. First, appreciate the concept; make further investigation with regard to cost benefit; motivate for the establishment of a transfusion committee, then policy; and sell the idea with facts. Let us speak to be heard!

	Present study
Total cases	20
Age in years	20-50
Male : Female	19:1
Type of elective orthopaedic surgery Femoral shaft fractures Tibial shaft fractures Intervertebral disc prolapse Forearm bones fractures	 8(40%) 4(20%) 5(25%) 3(15%)
Average prephlebotomy haemoglobin	11.6
Average 2nd postphlebotomy day haemoglobin	10.4
Average 3rd postphlebotomy day haemoglobin	10.0
Average 2nd week postoperative haemoglobin	11.5
Average 6th week postoperative haemoglobin	11.7
Adverse reactions during donation Mild Moderate Severe	 1(5%) 0 0

Table 1

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