Blood Transfusion Practices in Military Medicine

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Abstract

Background: This observational study was conducted in a small, 45 bed border static hospital, located in a field area, where no blood bank facilities were available. The present study was conducted to elucidate the blood transfusion practices of this hospital. **Methods:** A retrospective analysis of all blood transfusions performed in this hospital between Dec 2004 and Dec 2006 was carried out. The data collection included blood group patterns, common indications, haemoglobin levels and complications of blood transfusion. Inferences were based on available data and relevant statistical analysis.

Result: A total of 246 blood transfusions were administered to 79 recipients during the study period. Only one patient had an Rh negative blood group. The most frequently transfused blood group was A Rh positive. Majority of transfusions were administered to surgical cases and the commonest indication was gunshot wounds with haemorrhagic shock. The mean haemoglobin at admission was 8.93 g/dl. The mean number of blood transfusions per patient was 3.13. No haemolytic or other transfusion reactions occurred in any of the transfusions.

Conclusion: This study demonstrates that blood transfusions can be safely administered in field conditions despite constraints of not having a blood bank.

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Key Words : Blood transfusion practices; Haemoglobin; Anaemia

Introduction

Transfusion of blood in field conditions is challenging, where neither a blood bank nor adequate blood storing facilities exist.

We conducted an observational study in a 45 bedded border static hospital located in a field area with an aim to elucidate the blood transfusion practices. The importance of this study lies in the fact that safe transfusion practices are possible even in field conditions with limited resources as exemplified by this study. We also discuss the advantages of fresh blood transfusions performed in field.

Material and Methods

A retrospective analysis of all blood transfusions performed in our hospital between Dec 2004 and Dec 2006 was carried out. All available records during the study period were scrutinised from the anaesthesia register, blood transfusion and haematology registers, blood demand forms (AFMSF-27) and reaction forms (AFMSF-88).

Medical and surgical cases where blood was transfused during this period were included in the study. The data collection included total number of recipients and donors and their blood group patterns, common indications of blood transfusion, quantity of blood transfused per patient, haemoglobin levels in recipients at admission, 6-12 hours following admission (or second sample haemoglobin

estimation, whichever documented), packed cell volume within the first 24 hours of admission and documented side effects (as on reaction form). Inferences were based on available data and relevant statistical analysis.

Results

A total of 246 blood transfusions were administered to 79 recipients during the study period. All the donors were army personnel. The blood groups of the recipients and donors are displayed in Fig. 1 & 2. Only one patient had an Rh negative blood group of AB Rh negative. The most frequently encountered blood group in recipients was A Rh positive. The most transfused blood group was A Rh positive, totaling 87 units, followed by B Rh positive at 86 units.

The majority of transfusions were administered to surgical cases (Fig.3) and the commonest indication was gunshot wounds with hemorrhagic shock, followed by multiple splinter injuries with haemorrhage caused by improvised explosive devices. The most common medical indication for blood transfusion was upper gastrointestinal bleed, followed by anaemia due to various medical causes (Table 1).

Blood transfusions were administered either in the ICU (n=50) or the operation theatre (n=29). The mean haemoglobin at admission was 8.93 g/dl. The mean second sample haemoglobin level 6-12 hours later was 8.28 g/dl and the mean of lowest packed cell volume (PCV) within 24 hours of admission was 25.27% (Table 2). The mean number of blood transfusions per patient was 3.13 (Table 3). The maximum

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number of blood transfusions given to a single patient was 13 units. The number of single unit transfusions was 15. No haemolytic or other transfusion reactions occurred in any of the transfusions.

Discussion

Blood transfusions have come a long way since the discovery of the ABO blood group system by Karl Landsteiner in 1901 to the present times when Transfusion medicine has been accepted as a separate sub speciality [1]. With growing emphasis on use of specific blood components for appropriate and rational use of blood, the use of whole blood is fast becoming restricted to neonatal exchange transfusions. Military medicine is the only other area where due to field conditions blood component therapy is not routinely advocated [2].

In this hospital standard blood transfusion practices were followed, with an exception of blood storage for which facilities do not exist. Majority of the patients transfused belonged to the surgical category. Amongst medical cases severe upper gastrointestinal haemorrhage was the commonest indication for blood transfusion. The average haemoglobin levels in these patients was lower than those of surgical causes of acute haemorrhage (Table 2).

It has been argued that a young and healthy patient with normal cardio-respiratory function may easily compensate for anaemia (either chronic or acutely

induced by haemorrhage) whereas at an identical hematocrit value elderly patients with cardiac disease may have serious problems with surgery or anaesthesia. This has led to greater emphasis on overall medical judgement rather than specific laboratory values [3,4]. There has been a school of thought that believes that haemoglobin levels only should be the basis of blood transfusions [4]. In our study majority of the blood transfusions were administered by the anaesthesiologist, the transfusion trigger has been a mix of clinical and laboratory parameters. Interestingly the mean haemoglobin levels of the second sample which was taken six to twelve hours later in most cases showed a dip in surgical cases despite single or multiple blood transfusions and an increase in medical cases (Table 2). The fall of mean haemoglobin levels in surgical cases can be attributed to the fact that, when haemoglobin levels was estimated on admission in these set of patients, presumably the body's protective mechanism ensured vasoconstriction and haemoconcentration leading to spuriously high haemoglobin levels. This subsequently fell due to fluid resuscitation causing haemodilution and ongoing haemorrhage till haemostasis was achieved. Thus we recommend that a transfusion trigger of a single laboratory value for blood transfusion should be avoided and an overall clinical judgement should be made. Despite this a large number (15 out of 79 recipients) of single unit transfusions were administered probably because of a higher transfusion trigger particularly in young patients - a practice that is to be condemned.

The use of type-specific blood in acute emergency cases has been reported to be a reasonably safe and valid use of blood bank resources [4]. The risk of transfusion- transmitted HIV infection with a unit of screened blood is 1/800,000 [5]. With advent of more comprehensive testing and donor screening, the incidence of HIV has been reduced to nearly 1:1000000 [6].

Haemolytic transfusion reactions is the commonest cause of transfusion related deaths, the other two being

Table 1

Indications of blood transfusion

Conditions requiring blood transfusion	Percentage of total cases
Head injury	2
Leukaemia	2
Road traffic accidents	2
Bleeding per rectum	4
Cold surgery	9
Anaemia	11
Gastro intestinal bleed	12
IED blast	21
Gunshot wounds	37

Fig. 1 : Number of recipients of various blood groups

Fig. 2 : Donor blood groups

Fig. 3 : Blood transfusion for medical and surgical causes

Table 2
Haemoglobin levels

	Initial Hb gm% (mean)	Second Sample Hb gm% (mean)	PCV % < 24h
All cases	8.93	8.28	25.27
Surgical cases	9.81	8.70	26.54
Medical cases	8.06	8.80	24

septic transfusions and transfusion-related acute lung injury [7]. When blood is needed in an acute emergency, only the immediate phase of crossmatching and screening for the above infections is carried out. However for the second unit onwards, the incubation phase which detects antibodies in the Rh system is also performed [4]. The antiglobulin test is rarely performed.

The requirement of crossmatching blood itself has been questioned. It has been documented that ABO-Rh typing alone results in a 99.8% chances of compatible transfusion, addition of antibody screen increases safety to 99.94% and a crossmatch increases this to 99.95% [4]. Using this protocol, we did not have any transfusion related adverse reaction.

What makes blood transfusion challenging here is the fact that no blood storage facilities are available. So donors are bled on an as and when required basis. This is possible when proper blood group registers are maintained by local units. The blood samples are collected and tested single handed in order to avoid any errors. Blood is collected in standard blood collection bags with 49 ml of CPDA as the anticoagulant. Transportation and storage of blood under field conditions is very demanding. Air transportation is an excellent mode provided it is feasible. Blood transport boxes are used for storage and transportation of blood, maintaining a cold chain at 2-6 degree centigrade for up to seven days. In forward surgical centres blood storage cabinets running on generators are used for storage of blood [2]. However where these facilities are not available transfusion of fresh blood is the answer.

Many advantages of transfusion of fresh blood in field vis-à-vis stored blood are postulated. Firstly the incidence of hypothermia is negligible as blood is transfused at near body temperature. It is presumed that 2, 3 DPG levels tend to be normal in fresh blood, thus oxygen delivery to tissues is much better than that of stored blood [8]. Since platelets are fresh, they are less liable to damage and dilutional thrombocytopenia and no coagulation abnormalities were observed in our study. Hyperkalaemia due to the use of stored blood for transfusion did not occur in our study and lastly the advantage of giving whole blood to volume depleted patients cannot be over emphasised.

Table 3
Details of blood transfusion

	Number of blood transfusions per patient (mean)	Maximum number of transfusions	Minimum number of transfusions
All cases	3.11	13	1
Surgical cases	3.18	13	1
Medical cases	3.17	11	1

Transfusing stored allogenic red cells could be harmful under some circumstances [9]. Current risks of red cell transfusion have been described in a recent review [10]. The disadvantages of transfusion transmitted diseases in the window period such as HIV or HBsAg cannot be totally excluded with the rapid screening methods used in field conditions. The shortcomings of this retrospective study include small sample size, non availability of demographic data and inability to evaluate mortality and morbidity outcome after blood transfusion.

Conflicts of Interest

None identified

Intellectual Contribution of Authors

Study Concept : Lt Col A Shankar, Lt Col Y Singh
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