

Original Article

Blood Component Therapy in Trauma

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ABSTRACT

Background: Injury is the leading cause of life years lost, and hemorrhage is responsible for 40% of all trauma deaths and is commonly associated with coagulopathy, necessitating the use of blood and blood components. With logistical issues and concerns regarding safety of fresh whole blood because of the abbreviated less-sensitive technologies involved in testing, component therapy has emerged as an effective alternative to fresh whole blood in civilian settings. This study aims to study the outcomes of trauma patients requiring blood transfusion in an emergency setting of a tertiary care hospital.

Materials and Methods: This is a 1-year retrospective study conducted at a tertiary care multispecialty hospital from July 2013 to June 2014. During the period, 1352 patients presented to the emergency department; their blood usage and mortality were studied.

Results: Of the 1352 patients who presented with trauma due to road traffic accidents, history of fall, and assault, only 107 (7.9%) needed hospitalization due to grievous injuries. Of the hospitalized patients, only 16 (15%) needed blood component transfusions and 6 of them died giving a mortality rate of 5.6%. Five of the six deceased patients had a high prothrombin time ratio over 1.5, but only two of them received fresh frozen plasma transfusions. The mortality rate of 5.6% (6/107) was lower compared to other similar studies.

Conclusion: Medical management probably plays a more important role than transfusion of blood in acute trauma cases. Although conventional protocols where transfusion is carried out after laboratory tests for coagulopathy have yielded good survival rates, use of newer point-of-care testing such as thromboelastogram and improved communication between the blood users and blood banks coupled with a good massive transfusion protocol (MTP) will help in better management of bleeding associated with trauma. Adequate randomized controlled studies to demonstrate the superiority of 1:1:1 MTP as opposed to conventional protocols are lacking.

KEY WORDS: *Acute traumatic coagulopathy, blood component, massive transfusion, trauma*

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INTRODUCTION

Injury is the leading cause of life years lost, and uncontrolled hemorrhage is the leading cause of potentially preventable death.^[1] Traditionally, crystalloids, colloids, and whole blood have been used to treat bleeding associated with trauma. While fresh whole blood has all components needed to stop bleeding, it is neither currently available in most transfusion centers nor safe to transfuse fresh whole blood after abbreviated testing (immunochromatographic rapid testing for infections). Hence, the alternative is to treat hemorrhage using a combination of safely tested blood components readily available in the blood bank.^[2] Damage control resuscitation involves rapid control of surgical bleeding by early and increased use of red blood cells (RBCs), plasma, and platelets in a 1:1:1 ratio. Contrary to popular belief, the current studies limit the use of crystalloids.^[3]

Hemorrhage is responsible for 40% of all trauma deaths and is commonly associated with coagulopathy,^[4] necessitating the use of blood components and not whole blood. Blood bankers

have propagated blood components as the way forward for management of trauma. Concerns about logistics, safety and relative efficacy of whole blood versus component therapy have argued against the use of whole blood in most settings.^[5]

In the absence of fresh whole blood, massive transfusion protocols (MTPs) in an appropriate ratio of blood components are probably the method of choice in civilian settings.

MATERIALS AND METHODS

This is a retrospective study of trauma patients over a 1-year period from July 2013 to June 2014 carried out at a tertiary care multispecialty hospital. A total of 1352 patients presented to emergency department due to trauma. The hospital transfusion service had an MTP and massive transfusion (MT) card for

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initiation of the same. The MTP of the center advocated the use of red cells and fresh frozen plasma (FFP) in a ratio of 1:1 with addition of platelets based on laboratory evidence of thrombocytopenia. However, MTP being a new concept, the MT card was seldom used and the clinicians relied on clinical and laboratory evidence for transfusion.

RESULTS

Of the 1352 patients who presented to emergency department with trauma, only 107 (7.9%) needed hospitalization and 6 of them (5.6%) succumbed to injuries or their complications. Of these 107 patients, 16 (14.9%) patients needed red cell transfusions with 1–6 units of red cells and only 3 (2.8%) received 2–6 units of FFP. Pretransfusion hemoglobin was below 7 g/dl in 5 patients and below 8 g/dl in 6 patients [Figure 1]. In the remaining 5 cases, red cells were transfused to control the bleeding pending availability of laboratory tests. Road traffic accidents, history of fall, and assault were the leading causes of trauma among the hospitalized patients. Most trauma patients (83.2%) were men and were in the age group of 20–50 years [Figure 2]. Head injuries were the leading cause for hospitalization, followed by extremities and facial injuries [Figure 3]. Five of the six deceased patients had a high prothrombin time (PT) ratio over 1.5, but only two of them received FFP transfusions. Use of platelets be it random donor platelet or single donor platelet was scanty and sporadic.

DISCUSSION

The hospital has an attached blood bank with availability of blood components round the clock and no deaths occurred due to nonavailability of blood. As a policy, the hospital does not use whole blood fresh or old as the institution feels that it is more important to ensure supply of safe tested blood components by ELISA and NAT, rather than resort to rapid testing to give fresh blood, and hence, blood components were the only modality of treatment in addition to routine medical management. There was also a defined MTP to issue red cells and plasma in a ratio of 1:1 and also an MT card to initiate the MTP. However, these were not consistently put into use at times of emergency. Overall blood usage among trauma patients was low with only 14.9% of trauma patients needing transfusion. This suggests that good medical management is probably more important than blood transfusions. It is not clear if lack of platelet usage can be attributed to the protocol which left it to the discretion of the clinician or absence of adequate workup to detect and treat it.

While in our study [Figure 1] only 14.9% of trauma patients needed red cell transfusions, another study has shown that 8% of trauma patients require RBC transfusion, and only 2–3% of them receive an MT.^[6] Statistical analysis of red cell usage was performed using GraphPad software and 2 × 2 contingency table which gave a Chi-square value of 4.793 and a two-tailed *P* value of 0.0286, showing that the results were statistically significant.

In this study, five cases of trauma-induced coagulopathy with high international normalized ratio resulted in death [Figure 4].

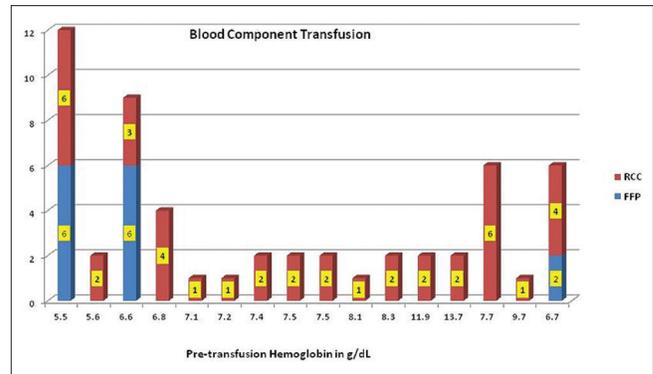


Figure 1: Number of units of packed red blood cells and fresh frozen plasma transfused and the pretransfusion hemoglobin

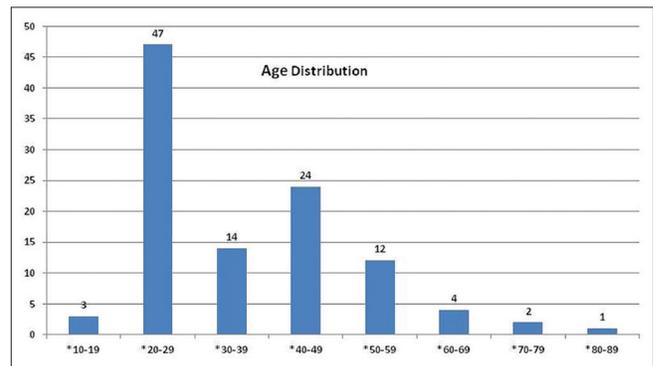


Figure 2: Age distribution of the trauma patients

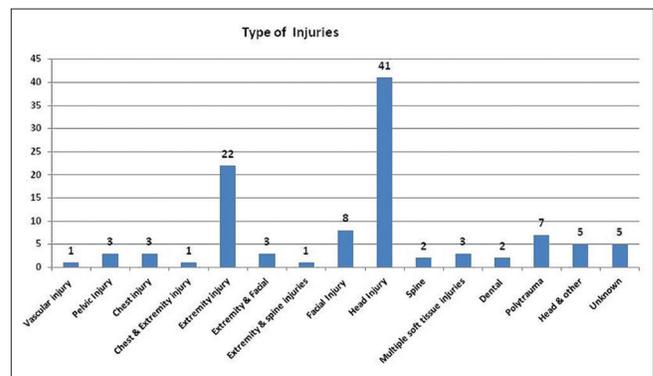


Figure 3: Types of injuries

A PT ratio of >1.2 is clinically a relevant definition of acute traumatic coagulopathy (ATC).^[7] Conventional MT guidelines such as ours may underestimate the optimal plasma and platelet to RBC ratios. While it can be argued that use of FFP and platelets early in the management of trauma might have led to better outcomes, mortality rate in this study was 5.6% compared to other centers where it ranged from 11.4% to 27%.^[6,8] Statistical comparison of the mortality rates was done using (GraphPad Software, Inc.7825 Fay Avenue, Suite 230 La Jolla, CA 92037 USA) <https://www.graphpad.com/quickcalcs/contingency1.cfm> and 5 × 5 contingency table, and the Chi-square value was 37.0062 and *P* value was 0.0001 showing statistical significance.

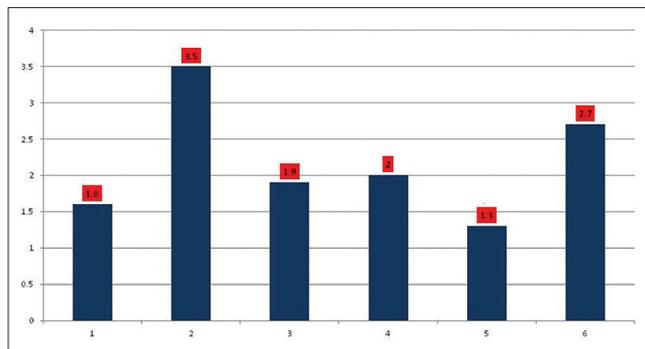


Figure 4: International normalized ratio of the 6 deceased patients (5 out of 6 patients had an international normalized ratio of >1.5)

CONCLUSION

Medical management probably plays a more important role than transfusion of blood in acute trauma cases as shown by lower mortality in the current study. Blood components especially red cells given early are life-saving. Although it is evident from other studies that increasing the ratio of plasma and platelets to red cells is beneficial,^[9] the exact ratio is still unknown and needs evaluation. Whether addition of FFP and platelets early in treatment would have improved outcomes is difficult to say. However, they are seldom used early in hospitals using conventional protocols as coagulation studies take time. In such cases, use of newer point-of-care testing techniques such as thromboelastogram may help in early detection of ATC and prompt intervention.^[10] Improved communication between the emergency department, intensive care units, blood centers, and laboratory coupled with a method for initiation of MTP will help in better management of bleeding associated with trauma. There are no randomized controlled studies to demonstrate the superiority of 1:1:1 MTP as opposed to conventional protocols which largely depend on clinical and laboratory evidence.

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Nil.

CONFLICTS OF INTEREST

There are no conflicts of interest.

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