A STUDY ON TRANSFUSION OF FRESH-FROZEN PLASMA AND PACKED RBC IN PATIENTS WITH SEVERE TRAUMA
Dr Natraj Shankar Sadaful
Dep of Emergency Medicine Assistant Professor, Vedantaa Institute of Medical Science, Saswand, Dhundalwadi, Palghar, Maharashtra

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Corresponding author: Dr Natraj Shankar Sadaful
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Abstract
Introduction: Traumatic injury is brought about by different forces from outside of the body, which can either be obtuse or infiltrating. Severe traumatic injury is the 6th driving reason for death around the world. Patients over 65 years old are an undeniably impacted bunch. Massive haemorrhage is among the most difficult issues in critical care, influencing severe trauma patients, surgical patients, obstetric patients, and gastrointestinal patients. After a much debate, the current guidelines recommend that the combination of Fresh-Frozen Plasma (FFP) and Packed Red Blood Cells (pRBC) should be infused. But still, there is a confusion and debates around the world regarding the ratio of FFP and pRBC usage.

Aims and Objectives: The study intends to find out the efficacy of FFP and pRBC combination infusion in the ratio of 1:1 and 1:2 in critical patients of trauma.

Materials and Methods: The study is retrospective design which was conducted during the period of 6 months. The patients ranged between 16 years and 82 years old. The study considered 110 patients. Upon arrival, the patients were assessed primarily by Glasgow Coma Scale and its change after the infusion. Other factors that are considered for assessment were time required for homeostasis, 24-hours mortality rate, 30-days mortality rate and hospital stay duration. This combination was either given in 1:1 ratio or in 1:2 ratio. The patients who received the combination of FFP and pRBC in 1:1 ratio was classified as Group 1 while the patients who received the combination in 1:2 ratio was classified as Group 2.

Results: The study found that the change is much significant in Group 1 as compared to Group 2 as the mean value of change in GCS score in Group 1 is much higher than the mean value of change in GCS score in Group 2 patients. It was also found that the Group 2 patients required more hours for reaching homeostasis as compared to the patients of Group 1.

Conclusion: The study concludes that FFP and pRBC in the ratio of 1:1 was found to have better outcomes as compared to Group 2 patients and should be considered to be current guideline to be used as first line infusion management in trauma patients.

Keywords: ffp, packed red blood cells, trauma, infusion.

Introduction

Traumatic injury is brought about by different forces from outside of the body, which can either be obtuse or infilraining (sharp). Obtuse injury incorporates falls, streetcar accidents; crush wounds, attacks (punches, kicks), and burns. Entering injury includes shooting, stabbing, or falling onto a sharp item (known as impalement). A physical injury can be generally minor, for example, cutting a finger while opening a metal can or breaking a bone during a game. While these can be agonizing or uncomfortable, the individual can as a rule stay at home once the injury is treated by a GP, wellbeing center, or emergency department. Be that as it may, severe trauma can be more serious, expecting admission to a medical clinic for appraisal, treatment, and recovery.[1]

The full degree of wounds isn't generally obvious when a patient initially shows up at the clinic, and they might expect an inside and out assessment and different tests (like scans and x-rays) or operations in the initial days after trauma. The seriousness of an injury is determined utilizing a scoring framework - the injury severity score (known as ISS). This score is determined reflectively once all wounds have been analyzed. A few patients with serious wounds might require intensive care or expert treatment which might require an exchange to another clinic. [2]

Severe traumatic injury is the 6th driving reason for death around the world. Among those under 35 years old, it is the main source of death and incapacity. Auto collisions alone are the primary reason, essentially in low-and-middle pay nations. Patients over 65 years old are an undeniably impacted bunch. For comparable degrees of injury, these patients have double the death pace of youthful people, because of the presence of significant comorbidities and related therapies, and are bound to pass on from unexpected issues late during medical clinic affirmation. No around the world, normalized definitions exist for archiving, detailing, and looking at information on seriously harmed injury patients. The most well-known injury scores are the Abbreviated Injury Scale (AIS), the Injury Severity Score (ISS), and the Trauma and Injury Severity Score (TRISS). Archiving the weight of injury additionally requires


assessment of the effect of post-injury hindrances, disabilities, and handicaps. [3]

Massive haemorrhage is among the most difficult issues in critical care, influencing severe trauma patients, surgical patients, obstetric patients, and gastrointestinal patients. In trauma, a new series of review clinical examinations proposes that early and aggressive utilization of FFP at a 1:1 proportion with red blood cells (RBC) further develops endurance in instances of haemorrhage. Since bleeding is straightforwardly liable for 40% of all trauma-related death, this technique - otherwise called hemostatic damage control or formula-driven resuscitation - has gotten significant consideration around the world. This early formula-driven hemostatic revival proposes transfusion of FFP at a close to 1:1 proportion with RBC, hence tending to coagulopathy from the start of the resuscitation and conceivably lessening mortality. By and by, this system requires quick admittance to enormous volumes of defrosted universal donor FFP, which is trying to execute. [4]

Since the focal pathophysiology of hemorrhagic shock due to severe trauma is the failure of oxygen delivery, the ideal administration of red blood cells is the main part of resuscitation. generally, transfusion of red blood cells including crystalloids is required when Blood loss is more noteworthy than 25% to 30%. Ensuring a prepared stock of type 'O' blood that can be promptly conveyed to the bedside can be lifesaving in the quickly exsanguinating patient.[5]

Estimates express that 25 to 30% of all critical care patients get FFP transfusions. Notwithstanding its shared characteristic, just 37% of the doctors in a new report accurately answered fundamental inquiries concerning FFP, including the volume of one unit. A review on transfusion practices proposed that one-half of all FFP transfusion to critical care patients such as in severe trauma is improper.[6]

FFP and packed RBC transfusion have a chance of transmitting infectious diseases, yet once in a while. Screening and microorganism inactivation decreased transmission rates of HIV to 1:7.8 million, of hepatitis C infection to 1:2.3 million, and of hepatitis B infection to 1:153,000 units transfused. In the UK, worries over Creutzfeldt-Jakob disease - an intriguing yet quickly moderate spongiform encephalopathy - prompted leukocyte depletion in all blood products and proposals to utilize FFP from areas of low endemicity.[6]

Other significant complexities connect with blood immunogenicity, progressively perceived throughout recent many years, especially transfusion-related acute lung injury (TRALI) and transfusion-associated circulatory overload. TRALI is the commonest reason for transfusion-related death. Two systems have for the most part been embroiled in TRALI. These donor plasma antibodies respond with human leukocyte antigens, causing complement initiation, endothelial damage, neutrophil activation, and lung capillary leak. Anti-human leukocyte antigens and anti-neutrophil antibodies are regularly found in plasma from multiparous female givers, and the TRALI recurrence is higher in beneficiaries from female givers. To limit the gamble of TRALI, a male-only plasma strategy has been taken on in numerous nations - with stamped decreases in TRALI. One more potential instrument includes associations of biologically active mediators input away plasma and lung endothelial cells. Other significant transfusion-related inconveniences incorporate acute hemolytic response from anti-A and anti-B antibodies, and hypersensitivity[6]

Aims and Objective

The study intends to find out the efficacy of FFP and pRBC combination infusion in the ratio of 1:1 and 1:2 in critical patients of trauma. The study also aimed to find out the assessment by utilizing several parameters like GCS improvement, time to reach homeostasis, mortality rates at 24-hours and 30-days interval and duration of hospital stay in each case.

Materials and Methods

The study is retrospective design which was conducted during the period of 6 months. The study considered the patients who were brought to the Emergency Department. The patients ranged between 16 years and 82 years old. The study considered 110 patients. The study included patients who were brought to the hospital with various types of trauma. Upon arrival, the patients were assessed primarily by Glasgow Coma Scale and its change after the infusion. Other factors that are considered for assessment were time required for homeostasis, 24-hours mortality rate, 30-days mortality rate and hospital stay duration. The patients were given Fresh Frozen Plasma (FFP) and Packed RBC (pRBC) in combination. This combination was either given in 1:1 ratio or in 1:2 ratio. The patients who received the combination of FFP and pRBC in 1:1 ratio was classified as Group 1 while the patients who received the combination in 1:2 ratio was classified as Group 2.

Results

The age of patients in Group 1 is 45.48±20 years old while in Group 2 patients was found to be 47.60±21.20 years old. The male-female ratio was 55.45% male and 44.55% of patients was females. According to the infusion combination received, the patients were classified as Group 1 and Group 2, as mentioned earlier. There were 52 patients in Group 1 while 58 patients were present in Group 2. The patients sample had various types of trauma, ranging from, head injury, injury to face, chest injury, abdominal injury and lower limb injury including fractures in femur, tibia or fibula. The distribution of types of trauma in Group 1 and Group 2 is shown in Figure 1 and Figure 2, respectively.
After the arrival of each patient, they were assessed by determining GCS score. Randomly, they were given FFP and pRBC in the ratio of either 1:1 or 1:2. The study found the distribution of initial GCS score to be almost similar in both the group (Figure 3).
After the intervention (infusion of FFP and pRBC), GCS score was again determined in each patient, according to the protocol of the hospital. The study found that the change is much significant in Group 1 as compared to Group 2 as the mean value of change in GCS score in Group 1 is much higher than the mean value of change in GCS score in Group 2 patients.

![Figure 4: The mean value of GCS score change in each group](image)

The patients were also assessed by recording the time needed for homeostasis. It was found that the Group 2 patients required more hours for reaching homeostasis as compared to the patients of Group 1. Figure 5 reveals the mean value of time required (in hours) for each group to reach homeostasis.

![Figure 5: The time to reach homeostasis for patients of each group](image)
The study also determined that 24-hours mortality rate was 6.5% in Group 1 and 8.2% in Group 2 while 30-days mortality rate was 8% in Group 1 and 9.2% in Group 2. Although, the mortality rates had less significant difference between the two groups, it was revealed that the mortality rate of Group 1 patients had less mortality rate as compared to the patients of Group 2. The duration of hospital stay in Group 1 was 25±18 days and 29±17 days.

**Discussion**

Fresh frozen plasma (FFP) is shown for the administration of massive bleedings. Late reviews propose doctor information on FFP is deficient and a big part of the FFP transfusion in critical care is unseemly. Severe trauma is among the biggest purchasers of FFP. Current trauma resuscitation rules prescribe FFP to address coagulopathy solely after analysis by research facility tests, regularly when obvious dilutional coagulopathy as of now exists. The proof supporting these rules is restricted and bleeding remaining parts is a significant reason for injury-related death. Ongoing examinations exhibited that coagulopathy happens right off the bat in injury. A clever early equation-driven haemostatic resuscitation proposes tending to coagulopathy from the get-go in enormous bleedings with FFP at a close to 1:1 proportion with packed red blood cells. Ongoing review reports recommend such a technique altogether diminishes mortality, and its utilization is bit by bit extending to nontraumatic bleedings in critical cases.[7]

The deferral to thaw and start FFP transfusion prompts another significant limit: timing to start and arrive at the high FFP: RBC proportion. Early equation-driven resuscitation recommends that FFP ought to be started early, preferably with the primary RBC unit toward the beginning of resuscitation. Taking into account that even research facilities direct resuscitation in the long run outcomes in a high FFP: RBC proportion, a basic distinction in formula-driven revival is the early execution of a high proportion. No investigations to date have given an account of transfusion pre-thawed FFP alongside the primary RBC units or on an opportunity to arrive at the 1:1 proportion. Snyder and partners expressed that the opportunity to the main RBC was 18 minutes from appearance, while the primary FFP was transfused over 1 hour after the fact.[8]

Normally the meaning of massive bleeding as transfusions more than 24 hours overlooks the way that 80% of all enormous transfusions happen inside the initial 6 hours of hospitalization, so, all things considered, either bleeding diminishes considerably or the patient dies. A multicentre study including 16 ERs, 452 massively bleeding severe trauma patients, and transfusion rates in 6 hours of hospitalization (rate <1:4, pace of 1:4 to 1:1 and rate ≥1:1) inferred that early high FFP: RBC and platelet: RBC proportions further developed endurance. Despite limits, remembering huge contrasts for the standard Glasgow coma scale and thus the seriousness of head wounds between gatherings, the review gives better proof that arriving at high FFP:platelet: RBC proportions within the early hours of admission is related with mortality decrease. Ideal transfusion execution is essential while treating patients with severe trauma. Notwithstanding, the relationship of an early, high transfusion proportion of fresh frozen plasma (FFP) to packed red platelets (PRBC) with survival stays unsure.[9]

The study was led to dissecting the relationship of an early, high FFP-to-PRBC proportion with all-cause 30-day mortality in patients with severe bleeding after trauma. A cohort study examined the information from a multicenter public French injury vault, Traumabase. Overall, 897 patients with serious bleeding after injury were distinguished utilizing the accompanying standards: (1) got at least 4 units of PRBC during the initial 6 hours or (2) collapsed suddenly from hemorrhagic shock before getting 4 units of PRBC. Qualified patients were isolated into a high-proportion bunch, characterized as an FFP-to-PRBC proportion more than 1:1.5, and a low-proportion bunch, characterized as an FFP-to-PRBC proportion of 1:1.5 or less. The proportion was determined utilizing the combined units of FFP and PRBC got during the initial 6 hours of the executives. A Cox relapse model was utilized to dissect 30-day endurance with the transfusion proportion as a period subordinate variable to represent survivorship predisposition. Of the 12 217 patients remembered for the vault, 897 (7.3%) were examined (middle [interquartile range] age, 38 (29-54) years; 639 [71.2%] men). The middle (interquartile range) injury severity score was 34 (22-48), and the general 30-day death rate was 33.6% (301 patients). A sum of 506 patients (56.4%) went through transfusion with a high proportion and 391 (43.6%) with a low proportion. A high bonding proportion was related with a huge decrease in 30-day mortality (risk proportion, 0.74; 95% CI, 0.58-0.94; P = .01). While just breaking down patients who had total information, a high transfusion proportion kept on being related with a decrease in 30-day mortality (risk proportion, 0.57; 95% CI, 0.33-0.97; P = .04). In this investigation of the Traumabase vault, an early FFP-to-PRBC proportion of more than 1:1.5 was related to expanded 30-day survival among patients with extreme bleeding after an injury. This outcome upholds the utilization of ahead of schedule, high FFP-to-PRBC transfusion proportions in patients with severe trauma. [10]
transfusions, patients were partitioned into 2 gatherings as indicated by the FFP: PRBC proportion: a high-proportion (≥0.5) and a low-proportion bunch (<0.5). The patient socioeconomic, fluid and transfusion amounts, research center qualities, complexities, and results were examined and looked at. [11]

There were 68 patients in the high-proportion and 32 in the low-proportion bunch. There were genuinely huge contrasts between bunches in the amounts of FFP, FFP: PRBC, platelets, and crystalloids regulated, as well as the underlying diastolic circulatory blood pressure. Circulation system contaminations were noted distinctly in the high-proportion bunch, and the thing that matters was genuinely critical (P=0.028). Kaplan-Meier plots uncovered that the 24-hr survival rate was altogether higher in the high-proportion bunch (71.9% versus 97.1%, P<0.001). In severe hemorrhagic trauma, raising the FFP: PRBC proportion to 0.5 or higher may expand the possibilities of survival. Endeavors to limit circulation system contaminations during the revival should be expanded.[12]

Conclusion

The study concludes that all the parameters analyzed was found to support Group 1 intervention., that is, FFP and pRBC in the ratio of 1:1 was found to have better outcomes as compared to Group 2 patients. Hence, it is suggested that a trauma patient in emergency department should be preferred to give combined infusion of FFP and pRBC in the ratio of 1:1. The authors also suggest to conduct more studies based on this similar topic on larger sample with varied population. The combination FFP and pRBC in the ratio of 1:1 can be considered to be current guideline to be used as first line infusion management in trauma patients.

References