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Original Research Article

A STUDY ON TRANSFUSION OF FRESH-FROZEN PLASMA AND PACKED RBC IN PATIENTS WITH SEVERE TRAUMA

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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 Glasglow 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 infiltrating (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). It is not uncommon for physical injury to be mild such as a, cut finger from opening a metal can or a broken bone from playing a sport. After a GP, wellness center, or emergency room treats an injury, the person can usually stay at homes. 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. Which is the main cause of incapacity and death among people under 35 years of age.Auto collisions alone are the primary reason, essentially in low-and-middle pay nations. Patients over 65 years 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). It is also necessary to measure the effect of post-injury hindrances, disabilities, and handicaps when evaluating the weight of injury. [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 violent 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. The initial formula-driven hemostatic revival proposes transfusion of FFP at a close to 1:1 proportion with RBC, thereby causing coagulopathy upon resuscitation and presumably reducing 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 in delivering the oxygen, the ideal red blood cells administration 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]

FFP transfusions are estimated to be given to 25 to 30% of critical care patients . Notwithstanding its shared characteristic, just 37% of the doctors in a new report accurately answered fundamental inquiries concerning FFP, which includes the volume of one unit. Among critical care patient such as those with severe trauma , one-half of all FFP transfusion were found to be 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 epidemicity.[6]

Other substantial complexity , such as transfusion-associated circulatory overload and transfusion-related acute lung injury are linked to blood immunogenicity which has been increasingly recognized in recent year(TRALI). TRALI is the commonest reason for transfusion-related mortality. For the most part TRALI has been entangled in two systems. These donor plasma antibodies identify human leukocyte antigens, causing complement initiation, endothelial damage, neutrophil activation, and lung capillary leak. Anti-human leukocyte antigens and anti-neutrophil antibodies are frequently detected in plasma from multiparous female donors, and the TRALI recurrence is higher in beneficiaries from female givers. To reduce the risk of TRALI , several country have implemented a male-only plasma approach, which has resulted in significant reductions in TRALI. Associations of physiologically active mediators emitted by lung and plasma endothelial cells are another potential tool. Acute hemolytic response from anti-A and anti- B antibodies, as well as hypersensitivity , are other important transfusion related difficulties.[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 Glasglow 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

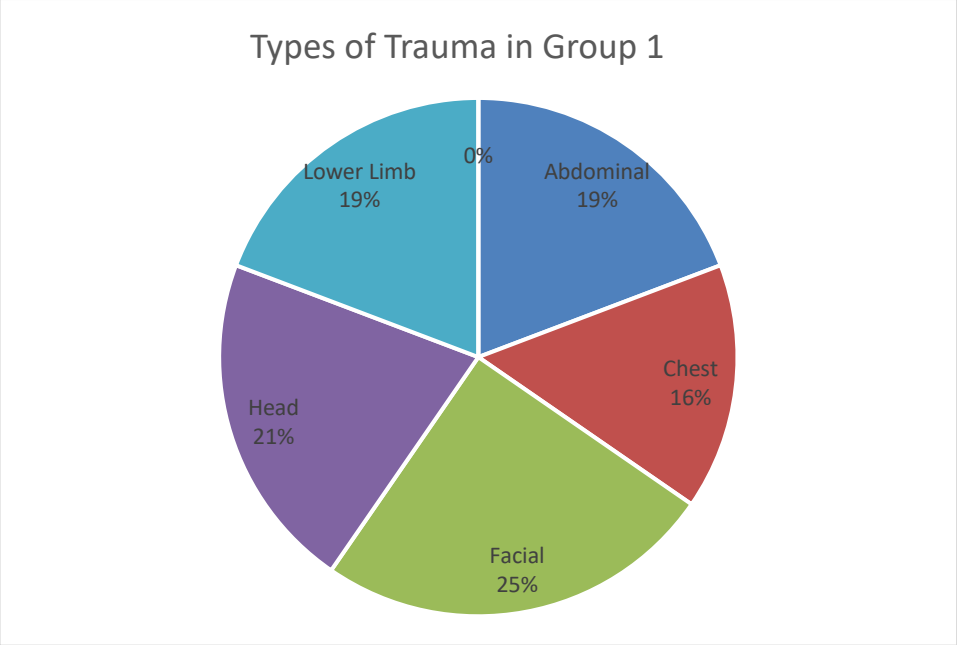

Figure 1: The types of trauma in Group 1

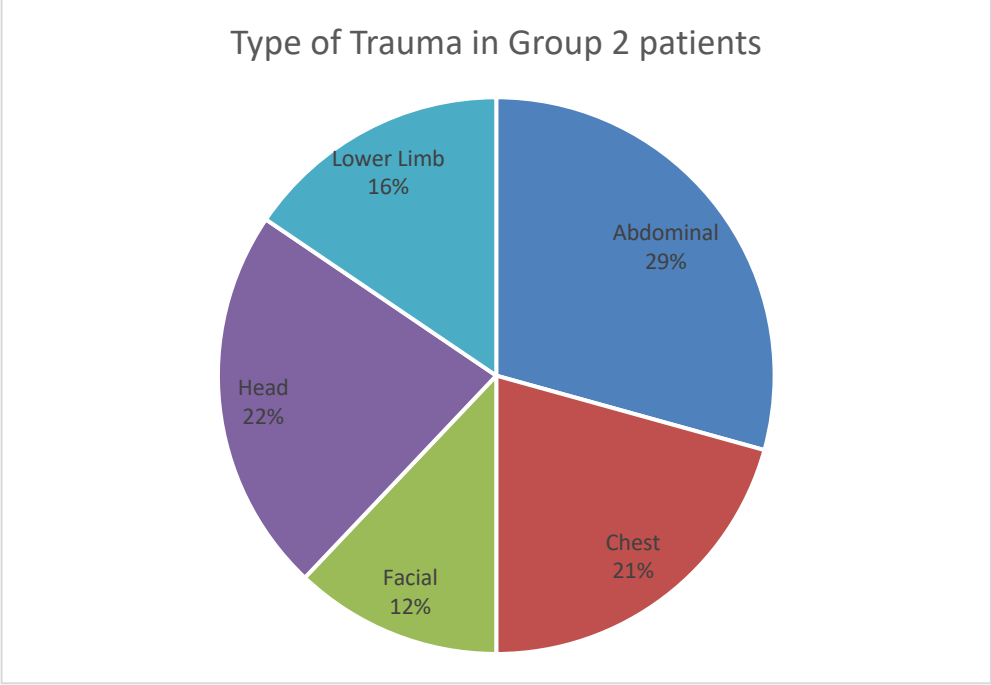

Figure 2: The types of trauma in Group 2

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).

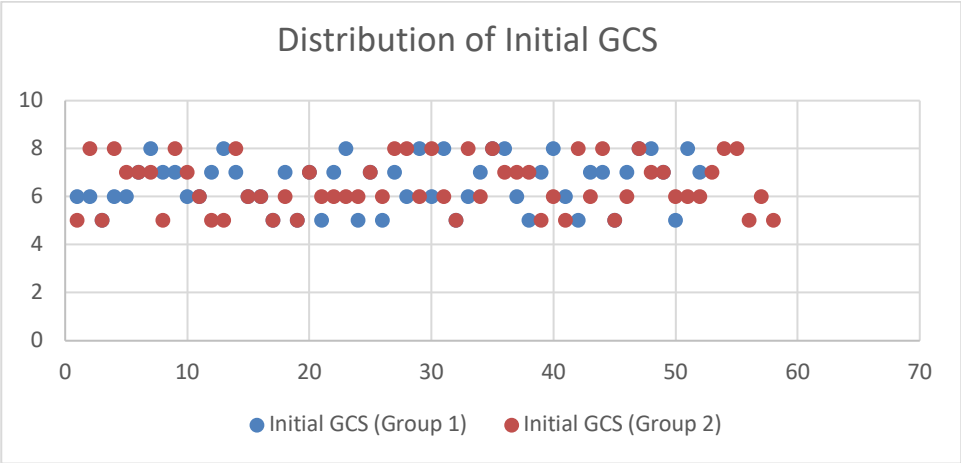

Figure 3: The distribution of initial GCS score in each patient

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.

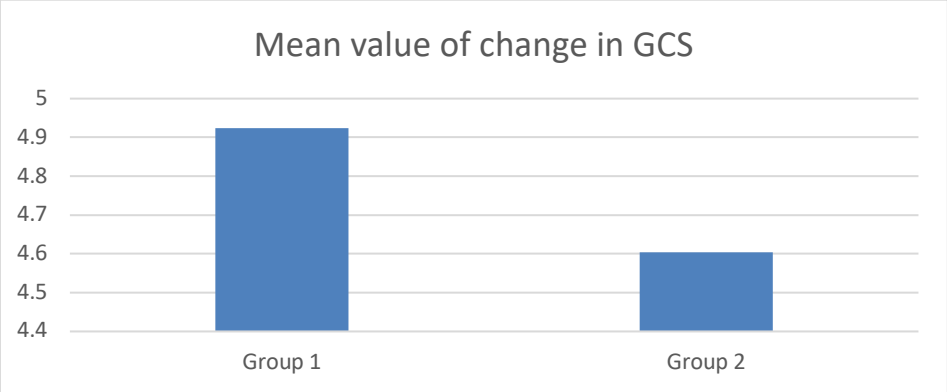

Figure 4: The mean value of GCS score change in each group

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.

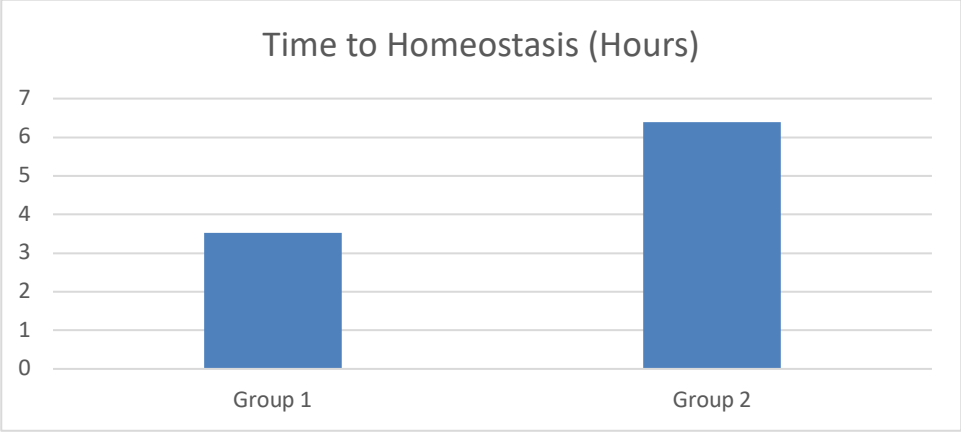

Figure 5: The time to reach homeostasis for patients of each group

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

The use of Fresh frozen plasma (FFP) for the treatment of major bleedings is demonstrated. Recent studies suggest that medical information on FFP is lacking, and that a significant portion of FFP transfusions in critical care are unethical.

Severe trauma is one of the most common reason for purchasing FFP. Current trauma resuscitation guidelines recommended that FFP be used to treat coagulopathy only after testing by research center, and only when apparent dilutional coagulopathy in present. The evidence for these criteria is limited , because bleeding from surviving body parts is a common cause of injury-related mortality. Continual examinations revealed that coagulopathy occurs almost immediately after an injury. In massive bleedings, a sophisticated early equation-driven haemostatic resuscitation advises tending to coagulopathy from the start with FFP at a close to 1:1 ratio 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 delay in thawing and starting FFP transfusion creates another crucial limit: the time it takes to start and reach the high FFP: RBC ratio. FFP should be begun early, preferably with the primary RBC unit near the commencement of resuscitation, according to early equation-driven resuscitation. Given that even research facilities direct resuscitation in the long term result in a high FFP: RBC proportion, the early execution of a high proportion is a key differential in formula-driven revival. To present, no studies have looked into the use of transfusion of pre-thawed FFP alongside the primary RBC units or the possibility of achieving the 1:1 ratio[8].

Typically, when massive bleeding is defined as transfusions over 24 hours, 80% of transfusions occur within the first 6 hours of hospitalization, so, Generally speaking, either bleeding decreases significantly or the patient dies. A study of 16 critical and 452 severe trauma patients from Emergency department of several Hospital found that early high FFP:RBC and platelet:RBC ratios promoted the development of 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. When treating patients with severe trauma ideal transfusion execution is essential. However, the relationship between an early, high transfusion ratio of fresh frozen plasma (FFP) to packed red Cells(PRBC) and survival remains unclear.[9]

An early, high ratio of FFP-to-PRBC in patients with severe bleeding after trauma led to dissecting the relationship between the ratio and all cause mortality 30days 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. To dissect 30-day mortality, a Cox relapse was used, with transfusion proportion as a period subordinate variable to represent survival tendancy. The vault was evaluated in 897 of the 12 217 patient remembered for it 7.3% ; median age ,38(29-54)years;639 (71.1%)men). The median injury severity score (interquartile range) was 34 (22-48), with a 33.6% 30 days death rate(301 patients).

A sum of 506 patients (56.4%) were given blood transfusion,with 391 (43.6%) receiving only a small amount. A high bonding percentage was associated with a lower 30-day mortality rate (risk proportion, 0.74; 95% CI, 0.58-0.94; P = .01). Even when only looking at patients who had all of the data, a greater transfusion proportion was linked to a lower 30-days mortality rate(risk proportion, 0.57; 95% CI, 0.33-0.97; P = .04). An early FFP-to-PRBC percentage of more than 1:1.5 was linked to increased 30-days survival among patients with severe bleeding following an accident in this Traumabase vault study. This finding supports the use of high FFP-to-PRBC transfusion proportions ahead of schedule in patients with severe trauma.[10]

Massive transfusions are frequently required when treating trauma patients with severs blood loss. For such patients, damage control resuscitation method can be used, but a suitable fresh frozen plasma: packed red platelet (FFP: PRBC) organization proportion must be established. Patients were divided into two groups based on the FFP: PRBC proportion: a high-proportion bunch(0.5) and a low-proportion bunch (0.5) when clinical records of 100 injury patients treated with huge transfusion were reviewed. The socioeconomics of economic of the patients, fluid and

transfusion volumes, research center qualities, complexities, and outcomes were all evaluated[11].

There were 68 patients in the high-proportion group and 32 in the low-proportion group. Between bunches, the amounts of FFP, FFP: PRBC, platelets, and crystalloids regulated, as well as the underlying diastolic circulatory blood pressure varied substantially. The high proportions group had circulatory system contaminations, and the thing that mattered was actually critical (P=0.028). According to

Kaplan-Meier plots, the high proportion group had a considerably higher 24-hr survival (71.9% versus 97.1%, P<0.001). In severe hemorrhagic trauma, raising the FFP: PRBC ratio to 0.5 or higher may improve survival prospects. Efforts to keep the circulatory system clean during the revival should be increased[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.

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