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Original Article

Transfusion Support in Leukemic Children-An Institution Based Study

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ABSTRACT

Background: In 30 patients with denovo acute myeloid and lymphoid leukemia (FAB classification), we compared the effectiveness of RBC and Platelet transfusion and the relation to increment of the transfused component was analyzed. Materials and Methods: This study was conducted in the Department of hematology, Institute of Child Health for a period of one year. All acute leukemic children in the age group of 1-12 years, diagnosed as acute lymphoblastic leukemia and acute myeloid leukemia requiring transfusion support was included in the study. Pre and post transfusion Hemoglobin level and platelet count were estimated. No of Packed Red cell and platelet units transfused were analyzed and post transfusion increment was analyzed. Results: Two hundred and fifty episodes of component transfusion given to 30 leukemic children were analyzed. Fifty two of them were packed red blood cells and 198 of them were platelets. There was a significant rise in platelet increment and hemoglobin increment post transfusion. Conclusion: All leukemic children who were transfused showed significant clinical improvement showing that there is a need for transfusion support in this group. Though transfusions were based purely on clinical signs and no transfusion trigger followed, there is a significant clinical improvement with transfusion of blood components in leukemic children. There were no cases of transfusion transmissible infections during the course of the study.

1. Introduction

Platelets play a vital role in the normal hemostatic activity and platelet transfusions are widely used for the management of bleeding in thrombocytopenic leukemic patients [1, 2]. Patients with acute leukemia undergoing induction chemotherapy have prolonged thrombocytopenia, because of the cytotoxic therapies they receive and also of their underlying disorder. Bleeding is a frequent complication in leukemic children that occurs even after prophylactic or therapeutic platelet transfusion. [3].

A reliable platelet count and appropriate clinical evaluation of the leukemic patients showed that a significantly lower threshold is needed more for therapeutic transfusion than for prophylactic transfusion [4]. The general recommendation has been that platelets should be given at counts less than 50,000/μL for any hemostatic changes. There have been various studies that demonstrate a threshold of 10,000/μL is almost safe [5].

Most of the centers now use a trigger of 10,000/μL to transfuse platelet products in patients who have chemotherapy induced thrombocytopenia. Guidelines for transfusion do exist, but variability in their application, particularly in children, remains as a big concern [6,7]. Acute Leukemic children during therapy receive on an average 80 110 unit of platelets and 20 - 40 units of red cells [8].

The present study was undertaken to find the transfusion support in leukemic children and to evaluate its clinical effectiveness in them.

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2. Materials and Methods

This study was conducted in the Department of hematology, Institute of Child Health for a period of one year. The study population included children diagnosed as acute leukemia in the age group of 1 - 12 years. All acute leukemic children diagnosed as acute lymphoblastic leukemia (ALL) and acute myeloid leukemia (AML) (FAB classification) requiring transfusion support was included in the study.

Non-leukoreduced and non-irradiated blood components were used. All platelets transfused were Random Donor Platelets (RDP). Pre and post transfusion Hemoglobin level and platelet count were estimated using Calibrated Automated hematology analyser (Sysmex 4000). Post transfusion count was done after one hour of transfusion by collecting 2 ml of blood in an EDTA tube. Variables like age, sex, blood group, clinical features, hemoglobin level, platelet count, hematocrit, signs of bleeding were studied. Number of packed red cell and platelet units transfused were analyzed.

Statistical analysis:

Statistical analysis was done with SPSS software version 17. Univariate and multivariate analysis was done. Paired t-test and Chi-square test was employed to detect any significant correlation between different variables.

3. Results

Two hundred and fifty episodes of transfusion given to 30 leukemic children were analyzed. Amongst 30 children, 23 (76.67%) were males and 7 (23.33%) were females (fig 1). Among leukemias, 22 (73.33%) were ALL and 8 (26.67%) were AML (fig 1). 40% of children belonged to O group while none of them were Rh negative (fig 2). Hepatomegaly and splenomegaly were common among the clinical features and 22% of patients presented with bleeding (fig 3).

All the children had varying hemoglobin and platelet levels at presentation. A total of 250 transfusions were transfused amongst which 52 of them were packed red blood cells and 198 of them were platelets. Of the 198 random donor platelet transfusion episodes, 47 were single unit, 33 were double units and 16 episodes were more than 3 units at a time.

As evident from the Table 1, there was a mean difference of 1.12 grams % between the pre transfusions and post transfusion hemoglobin level ($p < 0.0001$ by paired t-test) making the post transfusion hemoglobin rise significant.

Pre and post transfusion platelet count analysis were done for single unit transfusion, double unit & more than two units transfusion separately (Table 1). It was found that there was a mean difference of 4.98X103µl/L between the pre and post platelet count in single unit transfusion (95% CI 30.48 to 48.25 for pre transfusion and 35.35 to 53.35 for post transfusion; $P < 0.0001$). There was a mean difference of 9.79X103 µl/L platelets between the pre and post platelet count after double units transfusion (95% CI 27.48 to 43.67 for pre transfusion and 36.95 to 53.79 for post transfusion; $P < 0.0001$). There was a mean difference of 11.24X103 µl/L platelets between the pre and post platelet count for those who received more than 2 units (95% CI 16.99 to 38.43 for pre transfusion and 27.08 to 50.83 for post transfusion; $P < 0.0001$).

No case of infections were noted in the present study.

Figures and Tables:

Fig 1: Age and Gender distribution of Leukemic children

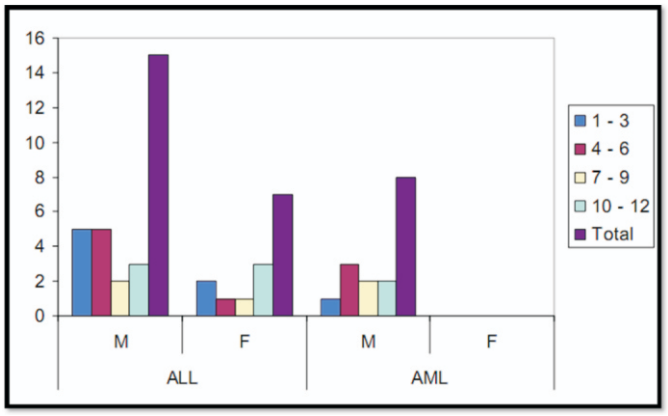

Fig 2: Distrubtion of leukemia amongst various blood groups

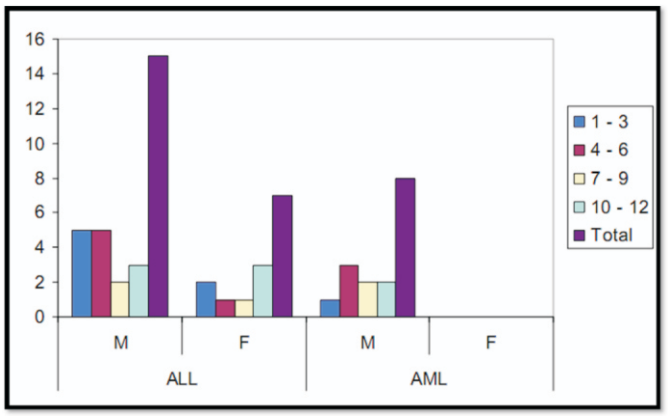

Fig 3: Distribution of Clinical features in AML & ALL

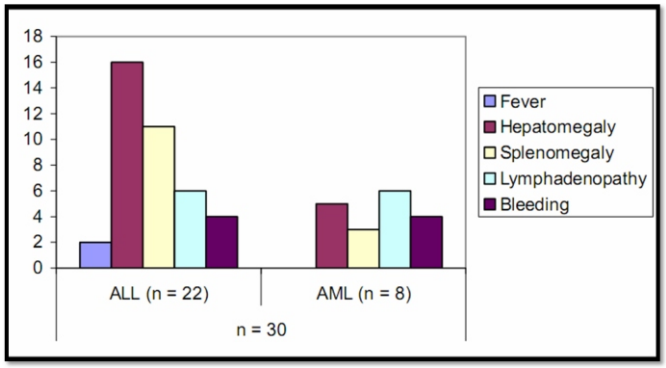

Table 1: Analysis of component transfusions in the present study

Component	Sample size	Pre- transfusion	Post transfusion	P value	Paired t test statistics
Packed Red cells Mean hemoglobin	52	6.7346	7.8558	P<0.0001	16.846
Single unit platelet transfusions	47	39.3745	44.3553	P<0.0001	17.572
Double unit platelet transfusions	51	35.5843	45.3784	P<0.0001	19.448
Three or four unit platelet transfusions	15	27.7133	38.9600	P<0.0001	4.880

4. Discussion

Acute leukemias are malignancies arising due to the clonal proliferation of abnormal hematopoietic cells leading to disruption of normal marrow function resulting in increased number of blast cells > 20% [9].

The incidence of different types of leukemia varies with age throughout the world. In India, Tyagi et al reported that leukemias are the most common cancer affecting the children accounting for 25 35% of malignancies. The majority of them were ALL as was seen in this study too[7,10,11].

Amongst blood groups, O blood group was the commonest, followed by A group, which is similar to other studies where Leukemias and ABO blood groups were studied [12,13].

Out of 198 random donor platelets given in the present study to 30 leukemic children, 17 of them received less than 5 units, 9 of them received 5 to 10 units and 4 of them received more than 20 units. Dose was calculated based on prophylactic transfusion requirement (platelet count & bleeding episodes) and was one platelet concentrate per 10 kg of body weight.

The number of platelet transfusions has increased more than transfusion of other blood components in leukemic patients primarily because of more aggressive chemotherapies producing acute and prolonged thrombocytopenia. High et al in 21 patients with acute leukemia found that fever preceded hemorrhage in 10 of the 13 patients who experienced bleeding [14,15]. In our study, 2 out of 30 patients (6.3%) had fever and among these two, one had bleeding episode with a platelet count of <5000/L.

The most controversial aspect of platelet transfusion therapy involves the delineation of the level at which prophylactic platelet transfusion should be administered. In clinical practice it is difficult to evaluate the efficiency of platelet transfusion due to the fact that (a) severe bleeding due to thrombocytopenia alone is rare (b) Mortality due to hemorrhage in thrombocytopenia is not common. Ancliff et al reported that platelet transfusion should never be based solely on transfusion thresholds. Patient factors like the primary disease, presence of bleeding, fever should also be considered [14,15].

Out of 198 transfusion episodes given, 8 patients (28.5%) presented with bleeding. In this study 4 of them presented with a platelet count of <5000/μL. In this study the clinical signs presented by the leukemic children bleeding and fever were analyzed with the platelet count below and above 5000 per μL and the odds ratio calculated were found to be significant. Bleeding was significantly present when platelet count was less than 5000/μL.

Although routine platelet transfusions result in low mortality because of reduced hemorrhage, the wide spread use of a certain threshold platelet count for prophylactic transfusions has led to increasing demand for platelet concentrates and also carries risks and adverse events similar to other blood products. In the present study, all were negative for transfusion transmissible infections, and two of them experienced febrile non-hemolytic transfusion reactions.

In our study there was platelet increment in all the transfusion episodes and there was no refractoriness. Platelet increments in different studies have been different with an average per unit of 4.5 to 10 X103 and our study was within this normal range. The overall platelet increment is comparable to other studies [15,16,17,].

In the present study, clinical improvements were the main consideration for platelet related transfusions and also packed red cell transfusions, routine transfusions carried out by the physicians without adhering to guidelines needs to be seriously considered due to limited availability of components for a developing country and also the associated infections and immunological reactions risks [18,19].

5. Conclusion

The use of platelets has radically improvement the clinical managements of patients with acute malignancies and any death due to hemorrhage is now rare. All leukemic children who were transfused in the study showed significant clinical improvement showing that there is a need for transfusion support in this group. Most common blood component used in this study was platelets (79%) and the remaining were red cells (21%).

Transfusions were based purely on clinical signs and no transfusion trigger was followed. Platelet transfusions are not without risk as there is significant morbidity and mortality secondary to bacterial contamination, viral infections and also transfusion associated acute lung injury. Steps to further optimize and refine platelet transfusion dose or prophylaxis must undergo rigorous evaluation by more studies to assess the use of prophylactic transfusions, the rate and severity of complications and quality of life indices with a careful weighing in of benefits and adverse events.

5. References

[1] Torunn OA, Oystein B, Wentzel-Larsen T and Hervig T. Therapeutic efficacy of platelet transfusion in patients with acute leukemia: an evaluation of methods. Transfusion 2010;50:766-75.

[2] Joan aid and Miguel Lozano. Lower or higher doses for prophylactic transfusions: results of a meta analysis of randomized controlled trials. Transfusion 2007; 47: 464-70.

[3] Valleri CR, Khuri S, Ragno G. Non surgical Bleeding diathesis in Anemic Thrombocytopenic patients: Role of Temparature, Red Blood Cells, Platelets and Plasma Clotting proteins. Transfusion 2007; 47:205s-247s.

[4] Jurg GJ, Burger US, Jorgfehr A, Schaffner. Safety of stringent prophylactic platelet transfusion policy for patients with acute Leukemia. The Lancet 1991; 338: 1223-26.

[5] Colin RC, Swindell R, William R, Rajesh C. The frequency of bleeding complications in patients with haematological malignancy following the introduction of a stringent prophylactic platelet transfusion policy. Br J Hematol 2002;118:677-82

[6] N.M.Heddle. Controversy concerning platelet dose. ISBT science series 2007; 2:220-25.

[7] Swaminathan R, Rama R, Shantha V. Childhood cancers in Chennai. Int J cancer 2008; 122:2607-11.

[8] Paten E. Controversies in transfusion medicine. Prophylactic platelet transfusion revisited after 25 years. Transfusion 1992; 32; 4:381-385.

[9] Richard EB, Robert MK, Hal BJ: Nelson Text Book of Pediatrics. ed 17, W.B. Saunders 2006.

[10] Tyagi BB, Manoharan N, Raina V. Childhood cancer incidence in Delhi 1996-2000. Indian journal of medical and paediatric oncology 2006; 27:13-18

[11] D' costa GG, Siddiqui HN, Pradhan RM. Pattern of leukemias: a ten year incidence study of 242 cases. Journal of postgraduate Medicine 1989; 35; 4:191-5.

[12] Alavi S, Ashraf H, Rashidid A, Hosseini N, Abouzari M, Naderifar M. Distribution of blood groups in childhood acute leukemia. Pediatric hematology-oncology 2006;23(8):611-17.

[13] Shirley R, Desai RG. Association of leukemia and blood groups. J Med Gen 1965; 2(3):189-91.

[14] Alan D Michelson. Platelets. 2nd ed. Academic Press;2007.p.1277

[15] Ancliff PJ, Machin SJ. Trigger factors for prophylactic platelet transfusion. Blood Rev 1998;12:234-38

[16] Higby DJ, Cohen E, Holland JF and Sinks L. The Prophylatic treatment of thrombocytopenic Leukemic patients with platelets: a double blind study. Transfusion 1974; 14:440-46.

[17] Heckman KD, Weiner GJ, Davis CS, Strauss RG, Jones MP, Burns CP. Randomized study of prophylactic platelet transfusion threshold during induction therapy for adult acute leukemia: 10,000/microL versus 20,000/microL. J Clin Oncol 1997;15:1143-49

[18] Stanworth SJ, Hyde C, Brunskill S, Murphy M. Platelet transfusion prophylaxis for patients with hematological malignancies: where to now? British journal of hematology 2005;131:588-95.

[19] Stroncek DF, Rebulla P. Platelet transfusions. Lancet 2007; 370:427-38.