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Comparative Study-Transfusion of Platelets in Various Thrombocytopenic Disorders

[1]Pushpraj Singh Baghel, [2]Vishwanath Mohire, [3]Chhavi Dwivedi and [4]Kamal Raj Singh Baghel

[1]Department of Pathology, N.S.C.B. Medical college Jabalpur M.P., India
[2,3]Department of Cardiac Anaesthesia, Super Speciality Hospital N.S.C.B. Medical college Jabalpur M.P., India
[4]Department of Anaesthesiology Super Speciality Hosptal N.S.C.B.Medical college Jabalpur M.P., India

ABSTRACT

Platelets provide the first line of defence during the hemostatic process by formation of a hemostatic plug upon vessel injury that begins with apprehending circulating Platelets on exposed collagen and continues with the recruitment of additional Platelets into a growing Platelets mass that will eventually be stabilized with cross-linked fibrinogen. Advances in platelet collection, storage and transfusion have decreased the morbidity of such therapies, and death form haemorrhage is now an unusual occurrence, despite the larger number of patients being treated aggressively. This study have shown comparable post transfusion increments, and haemostatic effect using the platelet components, however in all thrombocytopenic disorders platelets transfusion is not necessary but some time it is contraindicated. To evaluate and compare the role of Platelets transfusion in various thrombocytopenic disorders along with establishing the rationality of Platelets transfusion in various thrombocytopenic conditions. Hospital based prospective cohort study carried out in the Department of Pathology, N.S.C.B. Medical College and hospital Jabalpur, MP. Patients of all age group with thrombocytopenic disorder were included whereas Patient with haemophilia, related coagulation disorders and local infection at veni puncture site were excluded. Platelets separation was done By component separating centrigugal machine form multiple randomdonor. Platelets count was done by automated cell counter and Manually by neubaur's chamber. In this study some routine tests were carried out before and after transfusion to test the haemostatic effect These test are- Bleeding Time, Clotting Time and Prothrombin Time. Out of 76 cases 48 were male and 28 were female, and in these maximum no of Cases were of 20 to 29 year of age. after platelets transfusion In Leukemia, Myelodisplastic Syndrome, Megaloblastic Anemia, Drug Induced Thrombocytopenia, Dengue patients, changes in Total leucocyte count, clotting time, Prothombin time is not significant (p value is more then 0.05). But in Platelets count and Bleeding time, significant changes occur (p- value is less then 0.05). Platelets provide first line defence during haemostatic process by formation of a haemostatic plug upon vessel injury. Appropriate use of platelets transfusion is essential for prevention of bleeding because it can create many transfusion related problems.

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Key Words
Platelet, Thrombocytopenia, Anaemia, Fever, Haematological Changes

Corresponding Author
Kamal Raj Singh Baghel,
Department of Anaesthesiology Super Speciality Hosptal N.S.C.B. Medical college Jabalpur M.P., India

Author Designation
[1,2,4]Associate Professor
[3]Assistant professor

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INTRODUCTION

Platelets provide the first line of defence during the hemostatic process by formation of a hemostatic plug upon vessel injury that begins with apprehending circulating Platelets on exposed collagen and continues with the recruitment of additional Platelets into a growing Platelets mass that will eventually be stabilized with cross-linked fibrinogen . Formation of a Platelet plug occurs at sites of vascular injury when circulating Platelets apprehend, and are activated by, exposed collagen and vWF that binds the Gp1bα subunit of the von Willebrand factor receptor (vWfR), allowing the accumulation of a PLT monolayer followed by binding collagen through GPVI and a2ß1 intergrin. Ligand binding to vWF or GPVI initiates inside-out signals that activate Platelets integrin aIIbß3, to bind fibrinogen to mediate firm adhesion and aggregation.

Advances in platelet collection, storage and transfusion have decreased the morbidity of such therapies, and death form haemorrhage is now an unusual occurrence, despite the larger number of patients being treated aggressively. Platelet transfusions are expensive, and are associated with a number of side effects including febrile or allergic transfusion reactions, transmission of bacterial and viral infections, circulatory congestion, transfusion-related acute lung injury and alloimmunization.

If cause of thrombocytopenia is decreased production of Platelets, platelet transfusion therapy is usually beneficial due to near normal platelet survival in vivo, but if thrombocytopenia is due to increased platelet destruction or sequestration, Platelet survival is shortened and hence in severe bleeding, benefit of platelet therapy is low. It is necessary to ascertain the cause of thrombocytopenia Platelets product available for transfusion are whole blood derived platelets concentrates and Aphaeresis, recently use of aphaeresis platelets ahs increased. Aphaeresis platelets are prepared form a single donor which minimized donor exposure as well as help blood centre to maintain platelets inventory properly.

When histo-compatible platelets are required for patients refractory to random donor transfusion, platelets for subsequent transfusion should be form selected donors and, thus, single-donor platelets are the only platelet product that is available for these transfusions.-In general, single-donor platelets cost 50% to 75% more than an equivalent does of pooled PCs. However, whole-blood platelets must be pooled at the time of transfusion, which adds staff time and costs. In addition, most current platelet aphaeresis procedures produce a leuko depleted platelet product, whereas whole-blood platelets are not usually leuko reduced at the time of collection and must be subsequently filtered to remove leukocytes. This study have shown comparable post transfusion increments, and haemostatic effect using the platelet components, however in all thrombocytopenic disorders platelets transfusion is not necessary but sosme time it is contraindicated.

MATERIAL AND METHOD

This is a hospital based prospective cohort study carried out in the Department of Pathology, N.S.C.B. Medical College and hospital Jabalpur, MP, to evaluate and compare the role of Platelets transfusion in various thrombocytopenic disorders along with establishing the rationality of Platelets transfusion in various thrombocytopenic conditions. Patients of all age group with thrombocytopenic disorder were included whereas Patient with haemophilia, related coagulation disorders and local infection at venipuncture site were excluded. Platelets separation was done By component separating centrifugal machine form multiple random donor. Platelets count was done by automated cell counter and manually by neubaur's chamber. In this study some routine tests were carried out before and after transfusion to test the haemostatic effect These test are- Bleeding Time, Clotting Time and Prothrombin Time.

RESULTS AND DISCUSSIONS

In this study 76 case were included of various disease with Thrombocytopenia, out of 76 cases 48 were male and 28 were female, and in these most of the cases were of 20 to 29 year of age.

Out of 76 cases only in 7 cases abnormal platelets found, these are two cases of Myelodysblastic Syndrome, one case Megaloblastic anaemia, Two case of Immune Thrombocytopenic Purpura, one cases of P.U.O and one case in Viral Infection. Rest in all studied cases Normal Morphology Platelets seen. Random donor platelet transfusion was done in all 76 cases out of which 69 cases were transfused prophylactically and in 7 cases therapeutic platelets transfusion was carried out. In two cases ABO incompatible platelets transfusion was done, no case was reported for febrile or allergic reaction, Transfusion related acute lung injury, alloimmunization and transmission of bacterial and viral infections. During The study Blood sample was collected after 6 hour to 24 hour of Platelets transfusion.

After platelets transfusion In Leukemia, Myelodisplastic Syndrome, Megaloblastic Anemia, Drug Induced Thrombocytopenia, Dengue, Malaria, Chemotherapy/Radiotherapy induced Thrombocytopenia, Aplastic anaemia patient changes in Total leucocyte count, clotting time, Prothombin time is not significant (p-value is > 0.05) but in Platelets count and Bleeding time, significant changes were seen (p-value is < 0.05). in cases of Disseminated intravascular coagulation patient after

Table 1: Distribution of studied cases according to various Disease (n-76)

S.NO.	Name of Disease	No of cases	Pe
1	Leukaemia	5	6
2	Myelodisplastic syndrome	4	5
3	Megaloblastic anaemia	5	6
4	Drug induced thrombocytopenia	7	9
5	Dengue	7	9
6	Liver Disorder	4	5
7	Chemotherapy/Radiotherapy induced Thrombocytopenia	7	9
8	Malaria/P.U.O.	12	15
9	Viral infection	4	5
10	Immune thrombocytopenic Purpura	2	2
11	Disseminated-intravascular Coagulation	3	3
12	A Plastic Anaemia	2	2
13	Miscellaneous Disease (Epistaxis, snakebite, burn, hyperspleenism ets)	16	21
	Total	76	10

Table 2: Combined result of Study Report of Platelets Transfusion in all cases

	Before Transfusion (n-76)	After transfusion (n-76)	p-value (signifi cance)
T.L.C.	9350.14		
(+/- 7880.48)	9489.54+/-8331.17	P>0.05	
Platelets count	23750+/-8338.065	30287.50+/-9098.191	P<0.05
Bleeding Time	12.51+/-4.26	11.67+/-3.38	P>0.05
Clotting Time	9.13+/-4.03	8.47+/-3.53	P>0.05
Prothombin Time	15.39+/-4.83	14.68+/-4.3	P>0.05

platelets transfusion changes in Total leucocyte counts was not significance (p value is > 0.05) but in Platelets count, Bleeding time, clotting time, Prothombin time significant changes were seen (p-value is < 0.05).

Effect of Platelets Transfusion in all cases: Mean result of overall changes after platelets transfusion in Total leucocytes counts, Bleeding time, clotting time, Prothombin time was not significant (P value is > 0.05). But in Platelets count, significant changes occur (p-value is < 0.05).

This study has shown comparable post transfusion increment in platelets count and changes in haemostatic parameter in various thrombocytopenic disorders. This study shows that in Leukaemia patient, changes after platelets transfusion in Total leucocytes count, clotting time, Prothombin time is not significance (p-value is more then 0.05), But significant changes occur in Platelets count and Bleeding time, (p-value is less than 0.05), Bleeding time is decreased and Platelets count is increased after platelets transfusion the results correlate well with the study of Schiffer CA *et al*.[1] reported in patients with leukaemia who received Platelets transfusion. In this study threshold level for prophylactic platelet transfusion was up to 20000/µL of Platelets count, and rises in platelets count after prophylactic platelet transfusion was 22,600+/- 5128 to 33000+/- 4062, thus the increment in platelets count was 3000-5000/µL per unit of P.R.P transfusion, and changes in bleeding time was noted to be decreased from 14 to 11 minute. Another study by the panel of Slichter *et al*. [2] shows that threshold for prophylactic platelet transfusion in adults was 10000/µL, receiveing therapy for acute leukaemia, an d for paediatric age group threshold level for prophylactic platelet transfusion was 20,000/µL. In this study, result of platelet ransfusion in Myelodysplastic Syndrome was similar to Slichter *et al.*[2] study performed in Many of such patients and have shown minimal or no significant bleeding for long periods of time despite low platelet counts even up to 10000/µL. In this study patient of Megaloblastic Anaemia after paltelets transfusion shows significant changes in Platelets count and bleeding time significant change occur (p-value is less than 0.05) Shanwell A *et al.*[3]. Showed in their study on 29 such cases, out of which 72% cases presented with thrombocytopenia and prolonged bleeding time. 44% cases were selected for prophylactic platelets transfusion. In this study platelets transfusion was given to 7 patient of Dengue After platelets transfusion significant changes were seen in Platelets count and bleeding time (p-value is less than 0.05) . Schooneman F *et al*.[4] studied 1973 dengue patients admitted to department at Tan Tock Seng Hospital Singapore. out of the 1973 patients, 1666 had a platelet count >20×103 platelets/µL, and 51 patients had bleeding and/or received platelet transfusion when the platelet count was >20×103 platelets/µL, the conclusion was that not nay significant results came out of prophylactic transfusion in Dengue Patient. In cases of disseminated intravascular coagulation significant changes were seen platelets count, bleeding time, clotting time, and prothombin time shows significant changes (p-value is less than 0.05) Gulliksson H *et al*[5] found reduction in the platelet count as a feature in up to 987% of DIC cases with the platelet count <50 ×109/1 in approximately 50% . A low platelet count correlates strongly with markers of thrombin generation, because thrombin-induced platelet aggregation is mainly responsible for platelet consumption.

patient of Aplastic anaemia also showed significant changes in Platelets count and Bleeding time, significant changes occur (p-value is less than

0.05) Many patients of aplastic anaemia have minimal or no significant bleeding for long periods of time despite low platelet counts. Many of these patients can be observed without prophylactic transfusion, reserving platelet transfusions for episodes of haemorrhage or during times of active treatment. Wallace *et al*.[6] , found that daily blood losses in stools form patients with aplastic anaemica were 9±7 mL when platelet counts is 5,000/µL to 10,000/ µL but increased to 50 ± 20 mL when count goes below to 5,000/ µL. In this study patients with chemotherapy/ radiotherapy induced thrombocytopenia shows no significant changes in total leucocytes counts, bleeding time, clotting time and prothombin time after platelets transfusion (p value is more then 0.05). But in Platelets count, significant changes occur (p-value is less than 0.05) Snyder EL *et al*.[7] showed that thrombocytopenia in cancer patients was due to bone marrow failure during Radiotherapy/chemotherapy/drug-induced thrombocytopenia. In this study prophylactic transfusion was given in thrombocytopenic patient not only on platelets count basis but also on clinical basis. In this study increment in platelets count after transfusion was 3000 – 5000/ µL per unit of P.R.P.

CONCLUSION

Platelets provide first line defence during haemostatic process by formation of a haemostatic plug upon vessel injury. Appropriate use of platelets transfusion is essential for prevention of bleeding because it can create many transfusion related problems. In this study over all increment in platelets count and changes in bleeding time is seen after platelets transfusion in most of the conditions, in majority of the cases there is no significant changes in other haemostatic parameter. Platelets transfusion is expensive and associated with number of side effects, hence haphazard transfusion of platelets should be avoided.

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