Original Article

Outcome Of Donor Parameters On The Yield Of Single Donor Platelet Aphresis By Intermittent Flow Cell Separator: In Tertiary Care Hospital

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Abstract

Introduction: Use of single donor platelets (SDP) has increased by radical change over past few years. SDP not only increase the quality of product in terms of decreased cellular contamination but also increases the overall yield of platelet collected. However various donor parameter exerts their effect on yield of single donor platelet apheresis.

Materials and Methods: The present study included the outcome of 50 SDPA procedures that were conducted on Haemonetics MCS+ intermittent flow cell separator (Haemonetic Corporation). It employs single venous access utilizing closed collection apheresis kits with efficient leuko reduction.
Study was undertaken at blood bank M.Y. Hospital associated with M.G.M. Medical College, Indore, and a tertiary care Central Government Teaching Institute from may 2022 to July 2022.

Results: Mean platelet count of Donor was 198.6± 27.39. Platelet yield also show statistical significant correlation with HCT (p=o.oo4, r= 0.402) and age (p= 0.042, r= 0.402), No such correlation seen between platelet yield and Heamoglobin (P= 0.0201, r= 0.162).

Conclusion: The possibity of obtaining higher platelet yield reduces the frequency of platelet transfusion and number of donor exposures with important consequent clinical and economic advantages.

Keywords: Apheresis, Platelet yield, Single donor platelet(SDP), Parameters.

INTRODUCTION:

Platelet Transfusions are used for the treatment and prevention of bleeding in patients with decreased number and function of platelets.(1) Platelet transfusion in thrombocytopenic patients remains one of the most important support measures available as treatment success depends on rational use of platelet transfusion.(2) Platelets for transfusion are provided by platelet concentrates, which are obtained either by PRP/PC or buffy coat method from whole blood or by apheresis.(3) Apheresis is a procedure in which separation of blood components is performed by centrifugation, filtration or combination of both. This procedure is usually accomplished by removing venous whole blood from the body, separating the blood into cellular and non-cellular (plasma) parts or "fractions", collecting the desired part and returning the remaining blood to the donor. (4) In Plateletpheresis, platelets are separated and other constituents of blood are returned back into the donor. It is intended to collect a large number of platelets from an individual, thereby providing more consistent product with fewer donor exposures for the patient.(5)

Platelet recovery in a patient is influenced by the transfused dose of platelets which in turn is dependent on the platelet yield.(6) It has been shown that transfusion of high yield platelet products could reduce transfusion requirements of thrombocytopenic patients with consequent reduction in transfusion transmitted diseases, transfusion reactions and possibly alloimmunization. (7-8)

MATERIAL AND METHOD:-

The present study included the outcome of 50 SDPA procedures that were conducted on Haemonetics MCS+ intermittent flow cell separator (Haemonetic Corporation) .It employs single venous access utilizing closed collection apheresis kits with efficient leuko reduction.
Study was undertaken at blood bank M.Y. Hospital associated with M.G.M. Medical College, Indore, and a tertiary care Central Government Teaching Institute from may 2022 to July 2022. Donor undergoing an occasional apheresis procedure must meet the same criteria as a whole blood donation as per Director General Health Services guidelines.(9)

1. Age between 18-60 years
2. Platelet count more than or equal to 150- 200 × 109 /L
3. Hemoglobin levels more than or equal to 12.5 gm/dl and donor body weight more than or equal to 60 kg
4. No consumption of non-steroidal anti-inflammatory drugs and acetyl salicylic acid in the last 3 days with absence of any illness
5. Time gaps of at least 3 months since last whole blood donation and time gaps of at least 3 days since last platelet pheresis donation.
6. Adequate venous access
7. Written informed consent will be obtained before the procedure.
8. Tests for Hemoglobin, ABO Rh and TTI (Human immunodeficiency virus (HIV) 1, 2 antibodies and hepatitis B surface antigen, hepatitis C antibody, malaria and syphilis).

Donors who were motivated to donate by apheresis method requested to fill the donor questionnaire. Donors were subjected for clinical examination. Hemoglobin was measured by sysmex kx21 hematology analyzer. Blood pressure and pulse rate were recorded. Blood sample from donor was sent for platelet count estimation by cell counter to hematology analyzer. Blood flow rate for all platelet pheresis were maintained at 45– 90 ml/min with anticoagulant (ACD-A) ratio of 12:1. At least 1% of all apheresis units underwent quality control. Though the machine calculated the platelet yield of SDP unit. It was also confirmed manually. To calculate the yield as well as to run the quality control, approximately 1 ml sample from each bag was collected in EDTA (K2 EDTA) following stripping of the tube segment. The samples were allowed to be mixed thoroughly over a mechanized blood mixer for quarter of an hour and then evaluated by Sysmex KX 21 hematology analyzer. Platelet content and cellular contaminants were determined. Before each procedure was undertaken, samples from donor were similarly evaluated for hemoglobin (Hb), total leukocyte count (TLC), hematocrit.

RESULTS:

During the study period, Total of 50 (Mean age of Donor 32.30 ± 7.74.), Donors underwent plateletpheresis procedures on intermittent flow cell separator (Haemonetics MCS+). Platelet yield predicting donor variables included in the study were age, haemoglobin concentration, haematocrit, and platelet count. The mean yield was 3.19 ± 0.48x10 11 Per UNIT. Mean platelet count of Donor was 198.6± 27.39. Platelet yield also show statistical significant correlation with HCT (p=o.oo4, r= 0.402) and age (p= 0.042, r= 0.402) .No such correlation seen between platelet yield and Heamoglobin (P= 0.0201 ,r= 0.162) .

Similar result were seen by Priyanka Solanki et al(10) . Same result also seen in Neetu kukar et al(11) but in this study negative correlation was seen between platelet yield with HCT and age.

Table 1: The age and hematological parameters of healthy donors is enlisted

Parameter	Range	Mean ± SD
Age (Yr.)	19- 51yr	32.30 ± 7.74
Hemoglobin(gm/dl)	12.4- 16.1	14.23 ± 1.02
Haematocrit(%)	33 – 53.2	41.76 ± 4.49
Plateletyield(×1011/unit)	3.0- 4.49	3.96 ± 0.56

Table 2: Platelet yield distribution among plateletpheresis donor

Platelet yield (×10 11/unit)	No. of Donors	% of Donors
3.0-3.49	7	14
3.5-3.99	19	38
4.0-4.49	19	38
> 4.49	5	10

Table 3: Pearson Correlation of donor hematological parameters with the platelets yield

	Platelet yield	Haemoglobin	HCT	Age (%)
Platelet yield	1	r=0.201 P=0.162	r=0.402(S) P=0.004	r=0.289(S) P=0.042
Haemoglobin	r=0.0201 P=0.162	1	r=0.509(S) P=0.000	r=-0.077 P=0.595
HCT	r=0.402(S) P=0.004	r=0.509(S) P=0.000	1	r=-0.139 P=0.355
Age(yr.)	r=0.289(S) P=0.042	r=-0.077 P=0.595	r=-0.139 P=0.355	1

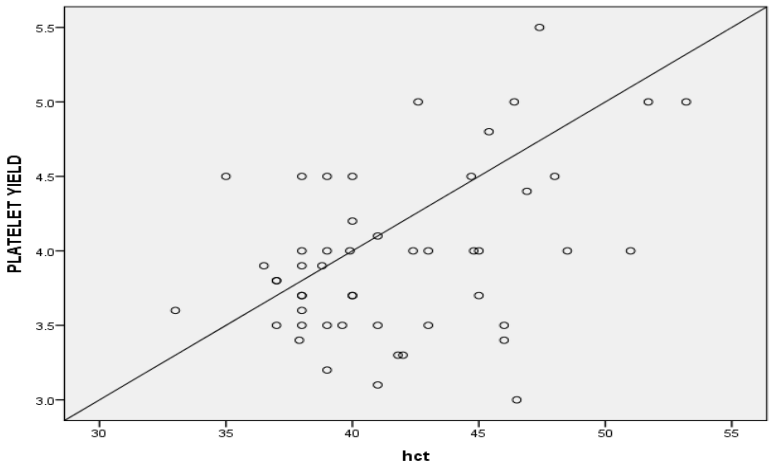

Figure:1 EFFECT OF HAEMOGLOBIN ON PLATELET YIELD

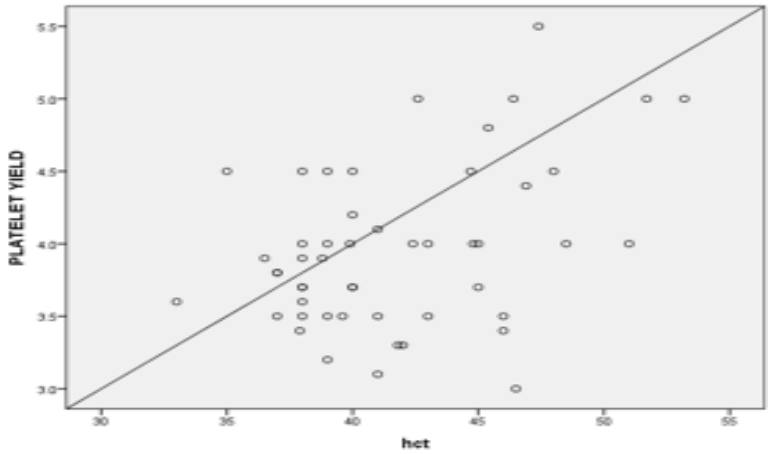

Figure:2 EFFECT OF HEMATOCRIT ON PLATELET YIELD

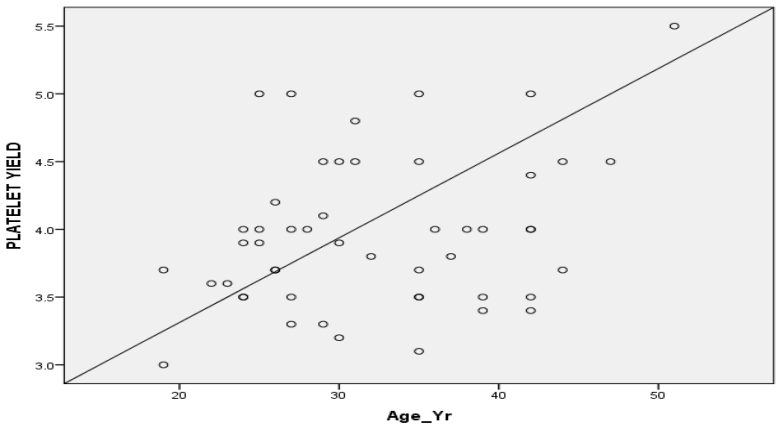

Figure:3 EFFECT OF AGE ON PLATELET YIELD

DISCUSSION & CONCLUSION

Platelet transfusions are needed either prophylactically or therapeutically for bleeding patients as platelets are essential for primary hemostatic plug.(12) Developments in medical sciences, including organ transplantation programs, has significantly increased the demand for platelets.(13) Collection of platelets by apheresis has been a major advance in transfusion medicine and it is advantageous over random donor platelets. Such SDPs allow supply of a therapeutically beneficial component ensuring leucocyte reduction of less than 5 × 106 /unit thereby decreasing febrile non-hemolytic transfusion reactions, limited donor exposure thereby reduced infectious complications and supply of HLA matched platelet concentrates in refractory patients. (14,15)

In our study the Mean platelet count of Donor was 198.6± 27.39 and Platelet yield also show statistical significant correlation with HCT (p=o.oo4, r= 0.402) and age (p= 0.042, r= 0.402). No such correlation seen between platelet yield and Heamoglobin (P= 0.0201 ,r= 0.162) . In Neetu kukar et al(2018) study foud similar results in that study Mean platelet yield was 3.19 ± 0.48×10 11 per unit. Mean age of donor was 30.31± 8.41. Positive correlation was observed between platelet yield and platelet count of donor (p=0.0001, r= 0.318). Which is significant. No such correlation was seen between platelet yield and haemoglobin (r= 0.131, P=0.122) and HCT (p=0.692 ,r= 0.034),Age of Donor (p=0.692, r= 0.034). Under a situation of limited human resources and shrinking donor population, both platelet availability and donor safety should go hand in hand. In our study, donor safety was ensured throughout the procedure. Though a significant decrease in the post-procedure hematological values were evident the donors, no significant clinical manifestations were evident.

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