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Original Article

Pathology Section

Giant Platelets in Platelet Donors – A Blessing in Disguise?

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ABSTRACT

Introduction: Inherited thrombocytopenias, including inherited giant platelet disorders (IGPD) are relatively rare, but their prevalence is probably underestimated. Harris platelet syndrome, the most common IGPD reported from Indian subcontinent, mostly from eastern part, is characterised by a low platelet count, high mean platelet volume (MPV) and absence of bleeding.

Aim: A short study was conducted to assess the prevalence of giant platelets in voluntary donors of single donor platelets (SDP) and analyse the effect of transfusion of such SDPs in patients.

Materials and Methods: Voluntary donors of SDPs were screened as per standard guidelines prior to the procedure. A complete blood count (including MPV) along with a peripheral smear was done. A total of 45 donors were screened for plateletpheresis. Following plateletpheresis from these donors, a platelet count from the collection bag was done after one hour. The SDP was transfused as a single unit or divided into two and transfused to the same patient at two different occasions, as per clinical need. Platelet counts on pateints were done after one hour and the platelet recovery was noted.

Results: Out of the 45 donors who were screened, 30 (66.67%) were found to have giant platelets. It was observed that the pre procedure platelet counts in donors having giant platelets were relatively low (1.5 -1.7 lacs) and so also the platelet yield (2.7-3x10^{11}) compared to donors who did not, but the post transfusion platelet recovery was greater.

Conclusion: Since presence of giant platelets has been seen to be common in the Eastern part of India, a peripheral smear examination should always be considered during screening of plateletpheresis donors to avoid rejecting donors with giant platelets whose platelet counts are given falsely low by autoanalysers.

Keywords: Apheresis donors

INTRODUCTION

The role of apheresis in the management of patients suffering from cancer has always been significant in this era of component therapy. Apheresis is a procedure where blood is collected from a donor, separated into components, one (or more) of the components is retained and the remaining constituents are recombined and returned to the individual. This procedure, when applied to extract platelets from a donor, is called plateletpheresis and the platelet unit derived from such procedure is called a single donor platelet (SDP) [1].

This study was conducted in a newly built tertiary care cancer centre in Eastern India where numerous SDP requisitions were generated every day. The usual indications for such requisitions were mainly stem cell transplants and chemotherapy related thrombocytopenia. These patients were usually from overseas countries and had no donors available with them for the plateletpheresis procedure. Therefore, we had to take the responsibility of motivating and recruiting donors for plateletpheresis. Donor recruitment for plateletpheresis to meet the huge demand from the clinicians was not an easy task to achieve. However, constant counseling of patient's relatives and friends and motivation of the hospital staff helped us to achieve the goal [2].

One major observation during screening of platelet donors was that most patients did not meet the eligibility criteria for pre-donation platelet count (more than equal to 1.5 lacs/cumm) and majority of these patients had presence of giant platelets in them. But this was an incidental finding and the donors did not have any symptoms related to low platelet count. These donors, however, constituted a huge donor pool and rejection of these donors because of failure to meet the cut-off for pre donation platelet count led to a loss of an otherwise healthy donor pool.

Inherited thrombocytopenias, including inherited giant platelet disorders (IGPD) are relatively rare, but their prevalence is probably underestimated [3]. Harris platelet syndrome, the most common IGPD reported from Indian subcontinent, mostly from eastern part of India, is characterised by a low platelet count, high mean platelet volume (MPV) and absence of bleeding [4,5].

Since the observation was quite frequent, a short study was conducted to assess the prevalence of giant platelets in voluntary donors of single donor platelets (SDP) and analyse the effect of transfusion of such SDPs in patients.

The main aim and objective of this study were to estimate the prevalence of giant platelets in platelet donors, to study the platelet recovery in patients transfused with SDPs and further to compare the platelet recovery in patients transfused with SDP from donors with giant platelets with that in patients transfused with SDP from donors who do not.

MATERIALS AND METHODS

Voluntary donors of SDPs were screened as per standard guidelines prior to the procedure. A complete blood count (including MPV) along with a peripheral blood smear, to assess the platelet morphology, was done. The study was conducted in Tata Medical Centre, Kolkata, India. A total of 45 donors were screened for plateletpheresis. Following plateletpheresis from these donors, a platelet count from the collection bag was done after 1 hour to estimate the platelet yield. The SDP was transfused as a single unit to the patient, as per clinical need. Platelet counts on patients were done after one hour and the platelet recovery was calculated according to the formula [6].

$$\text{Percent Platelet Recovery (PPR)} = \frac{\text{TBV x PCI}}{\text{Number of platelets transfused}}$$

TBV = Total blood volume (75ml/kg for adults)

PCI = Platelet count increment (Platelet count after transfusion – Platelet count before transfusion)

Number of platelets transfused = Platelet yield (estimated from collection bag).

RESULTS

Out of the 45 donors who were screened, 30 (66.67%) were found to have giant platelets. [Table/Fig-1] shows that the pre procedure platelet counts in donors having giant platelets (peripheral smear showing giant platelets in [Table/Fig-2]; platelet histogram showing evidence of presence of giant platelets in [Table/Fig-3]) were relatively low (1.5 -1.8 lacs/cumm) and so also the platelet yield (2.6-3.2x10^{11}) compared to donors who did not, but the post transfusion platelet recovery was greater (44.4-99.29%); mean being 68.1 (SD = 13.39). In donors who did not have giant platelets, the platelet counts were in the range of 1.5 – 3.6 lacs/cumm, platelet yield was 3.1-3.8x10^{11} and platelet recovery was 25.54-52.5%; mean being 40.79 (SD = 7.36) [Table/Fig-4]. Data is normally distributed as Shapiro-Wilk's test is not significant (p-value >0.05). Applying independent sample t test, it is seen that there is significant difference in platelet recovery (p-value<0.05) in both the groups (donors with giant platelets versus donors with no giant platelets).

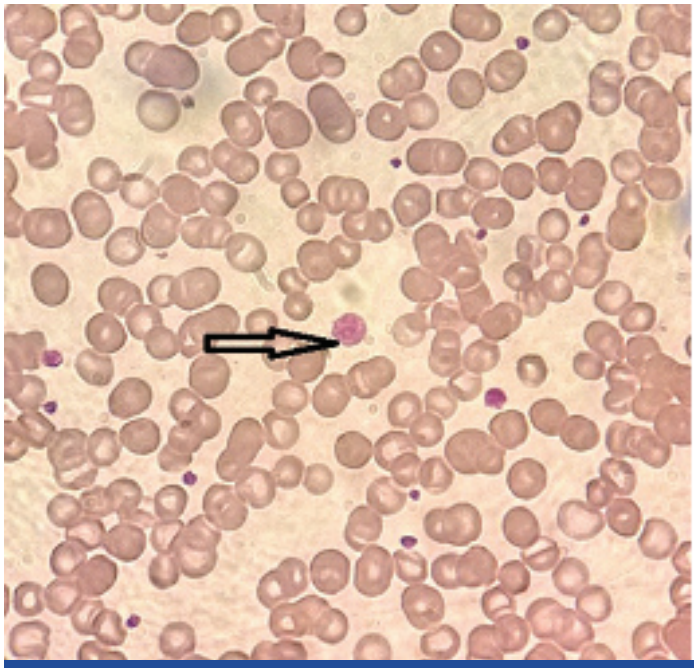
DONOR NUMBER	DONOR PLATELET COUNT (lakhs/ mm^3)	PRODUCT QC COUNT	PRE-TRANSFUSION PLATELET COUNT	POST-TRANSFUSION PLATELET COUNT (AFTER 1HR)	PERCENT PLATELET RECOVERY (PPR)
1	1.50	2.9X10^{11}	3,000	41,000	64.125
2	1.65	2.8X10^{11}	24,000	27,000	44.4
3	1.80	3.1X10^{11}	9,000	30,000	48.75
4	1.59	3.1X10^{11}	13,000	70,000	99.29
5	1.65	3X10^{11}	4,000	42,000	73.88
6	1.50	3.2X10^{11}	11,000	44,000	68.02
7	1.50	3.1x10^{11}	2,000	4,000	70.9
8	1.67	2.7X10^{11}	4,000	45,000	77.44
9	1.50	2.8X10^{11}	15,000	54,000	67.9
10	1.55	2.6X10^{11}	15,000	53,000	91.97
11	1.65	3X10^{11}	13,000	54,000	71.75
12	1.80	3.1X10^{11}	11,000	44,000	67.33
13	1.50	3.1X10^{11}	7,800	48,300	68.58
14	1.76	3X10^{11}	6,000	39,000	59.4
15	1.66	3.2X10^{11}	7,500	42,000	57.41
16	1.78	3.1X10^{11}	5,500	50,000	77.51
17	1.69	3X10^{11}	9,800	60,000	86.59
18	1.50	2.9X10^{11}	3,000	50,000	82.65
19	1.54	3X10^{11}	8,000	38,000	56.25
20	1.75	3.2X10^{11}	14,000	53,000	63.07
21	1.64	3.1X10^{11}	24,000	27,000	44.4
22	1.80	2.9X10^{11}	9,000	30,000	48.75
23	1.78	3X10^{11}	6,000	39,000	57.44
24	1.75	3.2X10^{11}	7,500	42,000	57.41
25	1.67	2.7X10^{11}	4,000	45,000	76.44
26	1.50	2.8X10^{11}	15,000	54,000	66.9
27	1.55	3X10^{11}	15,000	53,000	81.97
28	1.50	3.1X10^{11}	11,000	44,000	67.23
29	1.50	3.1x10^{11}	2,000	4,000	71.92
30	1.73	3X10^{11}	4,000	45,000	75.44

[Table/Fig-1]: Pre procedure platelet counts in donors having giant platelets and the corresponding PPR data

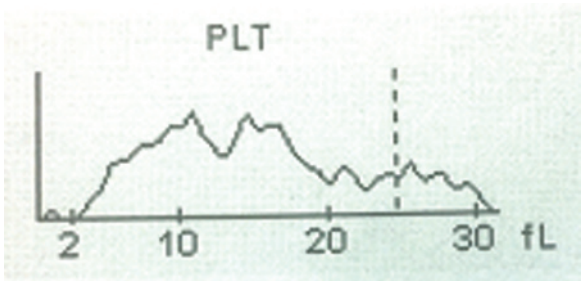
Therefore, it was observed that although the pre-donation platelet count and platelet yield in donors were on the lower range in donors who had giant platelets in them, the platelet recovery was greater compared to that from donors who did not have giant platelets.

DISCUSSION

Of all the inherited thrombocytopenias, Harris platelet syndrome (HPS) is the most common [4]. In 2002, this syndrome was called "Asymptomatic constitutional macro thrombocytopenia" (ACMT) [3]. In 2005, this entity was renamed as Harris platelet syndrome to avoid confusion between ACMT and congenital amegakaryocytic



[Table/Fig-2]: Peripheral blood smear of a blood donor showing giant platelets (Leishman, 1000x)



[Table/Fig-3]: Platelet histogram of a blood donor showing presence of giant platelets

DONOR NUMBER	DONOR PLATELET COUNT (lakhs/ mm^3)	PRODUCT QC COUNT	PRE-TRANSFUSION PLATELET COUNT	POST-TRANSFUSION PLATELET COUNT (AFTER 1HR)	PERCENT PLATELET RECOVERY (PPR)
1	2.37	3.4X10^{11}	10,000	50,000	49.3
2	2.40	3.7X10^{11}	28,000	46,000	25.54
3	1.97	3.6X10^{11}	30,000	60,000	45
4	1.74	3.6X10^{11}	30,000	62,000	46.66
5	1.5	3.8X10^{11}	5,600	27,000	30.69
6	1.87	3.1X10^{11}	23,000	47,000	37.16
7	1.98	3.2X10^{11}	4,000	29,000	38.67
8	2.45	3.2x10^{11}	6,000	30,000	38.81
9	2.67	3.5x10^{11}	8,500	34,000	34.42
10	2.75	3.2x10^{11}	10,000	38,000	45.93
11	3.05	3.1x10^{11}	9000	40,000	49.92
12	3.6	3.4x10^{11}	12,000	47,000	52.5
13	1.65	3.1x10^{11}	18,000	42,000	37.18
14	2.67	3.2x10^{11}	5,000	31,000	40.21
15	2.87	3.2x10^{11}	6,500	34,000	39.96

[Table/Fig-4]: Pre procedure platelet counts in donors without giant platelets and the corresponding PPR data

thrombocytopenia (CAMT) [4,5]. HPS was identified among healthy blood donors in the north-eastern part of the Indian subcontinent, characterized by absent bleeding symptoms, mild to severe thrombocytopenia (platelets rarely <50 X 10^9/L)with giant platelets (Mean platelet volume 10fL) and normal platelet aggregation studies with absent MYH9 mutation [4]. Authors have found a statistically higher MPV, RDW and a lower platelet count and platelet biomass in the blood donors with HPS [3]. The present day diagnosis of HPS is based on ascertaining the ethnicity of the patient, as well as assessing for conditions causing acquired thrombocytopenias, and also excluding the known inherited giant platelet disorders (IGPD) and other congenital thrombocytopenias. It is extremely important to recognize and diagnose Harris platelet syndrome, as almost one third the population of certain parts of Indian subcontinent is affected [5,7].

Earlier studies have shown that larger platelets, as compared with smaller platelets, are more active enzymatically and metabolically and have a higher potential thrombotic ability [8]. It has also been shown that platelet size, when measured as mean platelet volume (MPV), is a marker of platelet function and is positively associated with indicators of platelet activity [8]. However, we currently lack understanding of the predictive accuracy of high MPV in SDP donors for post transfusion platelet recovery in patients. The index study shows that the platelet recovery was greater when patients were transfused with platelet units containing giant platelets. This could be an indicator that giant platelets are functionally more active than normal platelets. However, function of giant platelets need to be assessed by performing platelet function tests to establish this correlation. Future research works based on platelet function with a larger sample size are needed to clarify this issue.

CONCLUSION

It is recommened that a peripheral smear examination should always be done to verify the platelet counts given by auto-analyser, because in case of presence of giant platelets in donors the auto-analyser may give a false low count and relying on machine counts solely may lead to rejection of donors who actually might be having a platelet count >1.5 lacs per cumm. Therefore, in the Eastern part of India, a peripheral smear examination or platelet count in Neubauer's chamber should be made an essential component for screening plateletpheresis donors. As the study noted that platelet recovery in patients was greater with transfusion of platelet units containing giant platelets, it might be suggested that plateletpheresis donors with platelet count lower than the eligibility cut-off of 1.5 lacs per cumm, but with presence of giant platelets may be accepted as SDP donors in the Eastern part of India. This, if possible, would add to the precious apheresis donor pool and contribute to the easier management of patients who are in dire need of platelets.

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