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# NAVIGATING FREQUENT PLATELETPHERESIS: OPTIMIZING DONOR HEALTH AND HEMATOLOGICAL OUTCOMES

Hematology

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## ABSTRACT

**Background & Objectives:** Ongoing concerns exist regarding the health and safety of individuals who donate platelets frequently. This study was conducted to investigate how repeated plateletpheresis procedures affect the blood cell counts and other key blood parameters of these donors. **Methods:** Between January 2024 and February 2025, a study was conducted at a tertiary care center to track the health of frequent platelet donors. The research followed donors who completed multiple procedures, from their second donation up to a maximum of six. Researchers compared the donors' blood values after each procedure to see if frequent donations had any effect on their blood composition over time. **Results:** The study included 42 donors, who were divided into two groups based on the timing of their follow-up. Five donors were followed up within seven days of their donation, while the other 37 were followed up between 8 and 30 days later. Across both groups, researchers found no significant changes in any of the blood parameters measured. **Interpretation & Conclusions:** Frequent plateletpheresis can be performed safely without causing harm to a donor's blood cells. The evidence suggests that repeated donations do not negatively affect the cellular components of the blood.

## KEYWORDS

Single donor platelet; Frequent plateletpheresis; haematological parameters; plateletpheresis

## INTRODUCTION

Plateletpheresis is a procedure where a person donates a concentrated unit of platelets. It's known that this can cause a temporary drop in the donor's platelet count. To keep donors safe, the U.S. Food and Drug Administration (FDA) has set clear rules: a donor can give platelets up to 24 times a year, with no more than two donations in a single week. There must also be at least 48 hours between each donation.

Even with these safety guidelines, there are still worries that frequent donations might lead to a long-term drop in a donor's platelet count. This issue hasn't been widely studied in our area. So, this research was designed to see what impact multiple platelet donations have on a donor's platelet levels and other key blood metrics over time.

## MATERIAL & METHODS

This study, which took place from January 2024 to February 2025 at a tertiary care center in Western India, investigated the effects of frequent platelet donation on donor health. The researchers enrolled repeat donors of single donor platelets (SDP) who completed at least two donations within the 13-month study period.

Before each donation, all participants underwent a thorough screening process. This involved completing a questionnaire and providing informed consent after the procedure was fully explained. Donors were also screened for transfusion-transmissible infections and had their blood type and hematological parameters assessed. A Sysmex hematology analyzer was used to measure a range of blood counts, including hemoglobin (Hb), red and white blood cells (RBC, WBC), and various platelet and red blood cell metrics.

The plateletpheresis procedures were carried out using a COM.TEC cell separator. The process involved using an anticoagulant, citrate dextrose solution-A (ACD-A), mixed with the donor's blood at a ratio of 1:12 to 1:7. The goal of each procedure was to collect a single unit of SDP, which contains approximately 3 \times 10^{11} platelets in 250-300 ml of plasma.

For the study, only donors who gave blood at least twice a month were included. Those whose second donation was more than 30 days after their first were excluded. The hematological values from a donor's second visit were used as a follow-up to evaluate the impact of the initial donation and to determine eligibility for subsequent procedures.

Donors were categorized into two groups. Group I included donors whose second SDP donation was within one week of the first. Group II comprised donors with a repeat donation interval of 8-30 days. Within these groups, donors were further subdivided based on their platelet counts:

- **Subgroups IA And IIA:** Platelet counts between 150,000 and 200,000/µL.
- **Subgroups IB And IIB:** Platelet counts between 200,000 and 300,000/µL.
- **Subgroups IC And IIC:** Platelet counts exceeding 300,000/µL.

For the statistical analysis, the study used several methods to examine the data. Results were presented using either the mean and standard deviation or the median and range, depending on the type of data.

To calculate the percentage change in a donor's blood parameters, the researchers used a formula: the mean difference divided by the pre-donation values, multiplied by 100.

To compare the data, a paired t-test was used for comparisons within the same group (e.g., a donor's values before and after donation), while an independent t-test was used for comparisons between different groups (e.g., Group I vs. Group II donors). This approach allowed the researchers to determine if any observed differences in blood parameters were statistically significant.

## RESULTS

The study examined 42 repeat single donor platelet (SDP) donors over the course of a year. The cohort was predominantly male (41 men, 1 woman), with a mean age of 39.76 years and an age range of 19 to 59 years. A total of 270 plateletpheresis procedures were conducted during the study period.

To assess the impact of frequent donations, the researchers analyzed the hematological parameters of all 42 donors at the time of their first and second donations. The average time between these two donations was 15.3 days. The results showed no significant changes in any of the measured blood parameters between the baseline and follow-up.

**The Donors Were Divided Into Two Groups Based On The Time Between Their First And Second Donations:**

*** Group I:** Five donors who had a mean interval of 5.4 days between donations.

*** Group II:** Thirty-seven donors with a mean interval of 18.6 days between donations.

An analysis of platelet counts at the time of the second donation revealed that 54.8% of the donors had a higher count than their baseline, while 45.2% had a decrease. However, these changes were minimal and not statistically significant.

Furthermore, a long-term follow-up was conducted on five donors who completed an average of six donations over the year, with a mean interval of 32 days between each procedure. The study found no significant changes in their hematological parameters when comparing their first and sixth donations. These findings suggest that frequent platelet donation, when performed at regular intervals, does not adversely affect donor blood cell components.

**Table I: Hematological Parameters For Pre 1st And 2nd Donation**

| Variables | Mean ± SD | | Mean Difference | Percentage Change | P value |
|---|---|---|---|---|---|
| | Pre−1st plateletpheresis | Pre−2nd plateletpheresis | | | |
| Hb (g/dl) | 14.2±0.7 | 13.9±0.6 | 0.3 | 2 | 0.3 |
| RBC (/ul) | 5.03±1.9 | 5±1.5 | 0.03 | 0.5 | 0.9 |
| HCT (%) | 42.6±1.1 | 41.7±0.9 | 0.9 | 2.1 | 0.06 |
| TLC (/ul) | 7.71±1.5 | 7.65±1.4 | 0.06 | 0.77 | 0.8 |
| Platelet count (/ul) | 327.16±64 | 327.12±191 | 10.04 | 3.1 | 0.08 |
| MPV (fl) | 8.7±0.06 | 8.6±0.05 | 0.1 | 1.1 | 0.7 |
| PDW (fl) | 10.1±0.5 | 10±0.3 | 0.1 | 0.9 | 0.7 |

**Table II: Platelet Count For Various Sub-groups**

| Group | Sub-group | Total No. Donors | Donors with increase in plt | Donors with decrease in plt |
|---|---|---|---|---|
| I | IA (1.5-2L) | 1 | 0 | 1 (100) |
| | IB (2L-3L) | 3 | 1(34) | 2(66) |
| | IC (>3L) | 1 | 0 | 1 (100) |
| II | IIA (1.5-2L) | 10 | 5 (50) | 5 (50) |
| | IIB (2L-3L) | 11 | 7 (63) | 4 (37) |
| | IIC (>3L) | 16 | 10 (62) | 6 (38) |

**Table III: Platelet Count For Repeat Donors Over A Period Of One Year**

| Variables | Mean ± SD (n=5) | | Mean Difference | Percentage Change | P value |
|---|---|---|---|---|---|
| | Pre−1st plateletpheresis | Pre−6th plateletpheresis | | | |
| Hb (g/dl) | 14.5±0.7 | 14.3±0.5 | 0.2 | 1.3 | 0.3 |
| RBC (/ul) | 5.08±1.9 | 5.06±1.5 | 0.02 | 0.3 | 0.9 |
| HCT (%) | 42.6±1.1 | 42.7±0.9 | -0.1 | 0.2 | 0.7 |
| TLC (/ul) | 7.71±1.2 | 7.70±1.5 | 0.01 | 0.12 | 0.8 |
| Platelet count (/ul) | 327.6±55 | 327.5±58 | 0.1 | 0.03 | 0.7 |
| MPV (fl) | 8.5±0.04 | 8.7±0.03 | -0.2 | 2.3 | 0.4 |
| PDW (fl) | 10.5±0.4 | 10.1±0.2 | 0.4 | 3 | 0.1 |

## DISCUSSION

This study observed minimal changes in the hematological parameters of frequent plateletpheresis donors during follow-up. Notably, most eligible donors who completed a second plateletpheresis donation within a month of their initial one demonstrated platelet count recoveries that surpassed their baseline levels.

Previous research by Katz et al. (1) suggested that restrictions on frequent plateletpheresis donors might not affect binding efficiency but could influence the availability of apheresis components. Studies have also reported immediate post-procedure decreases in hemoglobin (HB), hematocrit (HCT), platelet count, and white cell count in plateletpheresis donors, based on samples taken up to 30 minutes after the procedure (3, 4). However, other investigations imply that these immediate reductions may not persist over longer durations. Katz et al. (1) hypothesized that discrepancies between their findings and those of others, such as Lazarus et al. (3), could be attributed to variations in instrumentation and apheresis materials. While several studies have reported a significant immediate decline in post-donation platelet counts (4, 5, 6), our study's follow-up results indicated an increase in platelet levels post-plateletpheresis donation, sometimes remaining elevated for 1–7 days.

Several mechanisms contribute to platelet count recovery. Firstly, thrombopoietin (TPO) levels are known to rise following plateletpheresis donation, thereby stimulating bone marrow activity, increasing progenitor cell numbers, and maintaining platelet survival (7, 8, 9, 10, 11). Secondly, there is a recruitment of sequestered platelets from the spleen, which typically holds approximately one-third of the body's total platelet reserve (12, 13). These newly released platelets tend to be younger, larger, and exhibit a higher mean platelet volume (MPV) (12). Thirdly, the bone marrow is stimulated to release platelets in response to the donation-induced platelet production (14, 15). However, significant MPV changes were not observed in this study. Given that our repeat donation intervals were 8–30 days, the potential presence of younger platelets in circulation due to frequent donations might have contributed to a higher MPV, as these changes typically occur within a week.

According to Das et al. (4), immediate post-plateletpheresis drops in HB, RBC count, and HCT are likely due to hemodilution resulting from the infusion of saline and/or anticoagulants during the procedure. Our study, however, did not collect immediate post-donation samples. Research by Aguilar-Nascimento et al. (16) on the effects of normal saline infusion on hematological parameters found a significant decrease in HB and HCT within the first hour post-infusion. This suggests that some red cell loss during plateletpheresis, combined with hemodilution, may contribute to observed HB reductions.

Contrary to findings from other studies involving frequent plateletpheresis donors (17, 18), this study did not observe any significant drop in HB, RBC, or HCT across donor groups. This difference could be attributed to the fact that most donors in our study underwent only three to four plateletpheresis sessions, whereas earlier research (17, 18) examined a higher number of more frequent donors.

## CONCLUSION

While our study provided valuable insights, it wasn't without limitations. Our sample size was relatively small, and we couldn't analyze immediate post-plateletpheresis samples. Additionally, we had limited data for donors returning within a week, and we didn't assess serum ferritin levels, which some studies (18, 19) have found to be an important factor. Future, more comprehensive studies should delve into these specific areas to further ensure plateletpheresis donor safety.

Despite these limitations, our findings consistently indicate that repeat plateletpheresis does not lead to significant detrimental effects on the hematological cell counts of donors. This suggests that the procedure is well-tolerated with respect to these parameters.

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**Conflicts Of Interest:** None.

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