**Asian Biomedicine Vol. 5 No. 3 June 2011; 393-395** **DOI: 10.5372/1905-7415.0503.050**

**Brief communication (Original)**

# Significant reduction in hematological values after plateletpharesis: clinical implication to the donor

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***Background:*** Plateletpheresis procedures are thought to be generally safe without serious complications to the donor, and the products obtained are preferred over platelets derived from whole blood. However, safety issues about the donors have not been fully explored.

***Objective:*** Investigate changes in hematological values after plateletpheresis in healthy volunteer donors.

***Methods:*** A retrospective study was performed in 76 healthy donors at the Transfusion Medicine Unit, Universiti Sains Malaysia between 2004 and 2009. Haemonetics MCS+ and Trima accel (Gambro BCT) separators were used during plateletpheresis. Pre- and post-donation hematological values such as Hb, Hct, platelet, and leukocyte counts were measured using Sysmex XE-2100.

***Results:*** After each procedure, there was a significant reduction in hemoglobin (pre-donation: 14.9g/dl, post-donation: 14.7g/dL), hematocrit (pre-donation: 44.6%, post-donation: 44.1%), platelet count (pre-donation: $264.0x10^9$/L, post-donation: $193.4x10^9$/L), mean platelet volume (pre-donation: 10.0fL, post-donation: 9.7fL), and platelet distribution width (pre-donation: 12.3fL, post-donation: 11.8fL).

***Conclusion:*** There were significant drops in the donors hematological values post plateletpheresis.

***Keywords:*** Donor safety, hematological values, plateletpheresis.

Technical advances in automated cell separators have substantially improved the productivity and quality of the collection of apharesis platelets [1]. The cell separator has been used as a primary tool to collect platelet concentrates. Accordingly, apharesis platelets have been significantly improved in the productivity and quality.

Various studies on automated plateletpheresis have investigated the quality of platelet concentrates and its relation to the biological contribution (platelet count and/or total mass) of the donor [2]. However, safety issues with post-procedure hematological decrements have been not fully explored in donors undergoing plateletpheresis yet.

Hematological values changes are seen post donation in plateletpheresis. This change is an important factor of clinical implication to donors. However, only selected medical centers have donor follow-up and routine quality programs for plateletpheresis.

Previous studies have provided conflicting data of hematological values changes after plateletpheresis. In fact, one study showed increases in hemoglobin concentration (Hb), hematocrit (Hct), and white blood cell (WBC) count after plateletpheresis [3]. On the other hand, other authors described significant falls in these parameters [4].

Although these hematological changes may induce clinical implications to the donor such as thrombocytopenia and anemia, the previous results are still controversial. In this study, we investigated the changes in hematological values after plateletpheresis in Malaysian healthy voluntary apharesis donors.

## Materials and methods

This retrospective study was conducted on 76 healthy donors for six years between 2004 and 2009

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at Transfusion Medicine Unit, Universiti Sains Malaysia. This study was approved by the Ethics Committee, Universiti Sains Malaysia.

All procedures were performed using Hemonetics MCS+ (Straight Scientific, USA) and Trima accel (Gambro BCT) cell separators (BMS Diagnostic, USA). All plateletpheresis procedures were performed using the closed system apharesis kits.

Whole blood was taken into ethylenediamine tetra-acetic acid (EDTA) bottles just before and after the procedures. Pre- and post-donation hematological values were measured in the blood. Parameters such as Hb, Hct, platelet, and leukocyte count were measured by Sysmex XE-2100 (Sysmex Co, Tokyo, Japan)

### *Statistical analysis*

All data were analyzed with SPSS software version 10. The results were analyzed using paired sample t-test. Data were expressed as means ± standard deviation (SD).

## Results

**Table 1** shows hematological values before and after plateletpheresis (n=76). We note significant reduction between pre- and post-donation for hemoglobin (pre-donation: 14.9g/dl, post-donation: 14.7g/dL), hematocrit (pre-donation: 44.6%, post-donation: 44.1%), platelet count (pre-donation: 264.0x$10^9$/L, post-donation: 193.4x$10^9$/L), mean platelet volume (pre-donation: 10.0fL, post-donation: 9.7fL), and platelet distribution width (pre-donation: 12.3fL, post-donation: 11.8fL).

After each procedure, values for hemoglobin (Hb), hematocrit (Hct), platelet (PLT) , mean platelet volume (MPV), and platelet distribution width (PDW) decreased significantly in the donors ($p < 0.001$). Significant increment was also seen for total white blood cells (pre-donation: 7.1x$10^9$/L, post-donation: 7.5x$10^9$/L).

## Discussion

Plateletpheresis is the safe sources for platelet concentrate in preventing red cell alloimmunization. In our study, we performed the consecutive apheresis donations at the discretion and convenience of the donors according to the recommendation by the Council of Europe [5]. The donation rates of our subjects recruited were 1.0 to 7.0 times per year.

The purpose of eligibility criteria for blood donation is to protect whole blood donors from too aggressive blood donation practices as well as to protect recipients from transfusion of blood products below the minimal quality requirements. According to Swiss regulation, the donor's predonation Hb concentration is the only laboratory parameter that has to be considered for selection of blood donors. European and American guidelines allow donating whole blood if the Hb concentration is ≥125 g/L.

Das et al. [6] addressed donor safety issues about reductions in hematological values after plateletpharesis. Such reductions such as thrombocytopenia and anemia could be expected, but clinical outcomes due to these must always be prevented. In their study, 2% of the donors were found to have post-procedure platelet count of <100x$10^9$/L and fortunately without clinical manifestations [7].

**Table 1.** Hematological values before and after plateletpheresis (paired sample t-test, n=76). SD: standard deviation. Hb: hemoglobin, Hct: hematocrit, PLT: platelet, WBC: white blood cell, MPV: mean platelet volume, PDW: platelet distribution width

| Parameters | Pre-donation | | Post-donation | | Difference* | P-value* |
|---|---|---|---|---|---|---|
| | Mean±SD | Minimum - Maximum | Mean±SD | Minimum -Maximum | Mean±SD | |
| **Hb (g/dL)** | 14.9±0.9 | 12.4-17.0 | 14.7±1.0 | 12.5-17.2 | 0.2±0.5 | <0.001 |
| **Hct (%)** | 44.6±2.5 | 38.8-51.8 | 44.1±2.6 | 37.8-53.1 | 0.6±1.3 | <0.001 |
| **PLT (x$10^9$/L)** | 264.0±39.8 | 189-359 | 193.4±28.9 | 141-269 | 70.5±21.9 | <0.001 |
| **WBC (x$10^9$/L)** | 7.1±1.4 | 4.5-12.2 | 7.5±1.6 | 4.4-13.8 | -0.4±0.6 | <0.001 |
| **MPV (fL)** | 10.0±0.8 | 7.7-12.3 | 9.7±0.8 | 7.7-12.3 | 0.3±0.3 | <0.001 |
| **PDW (fL)** | 12.3±1.6 | 8.7-17.2 | 11.8±1.5 | 8.5-17.3 | 0.6±0.5 | <0.001 |

It is well known that the first or earlier generation of apharesis devices caused more losses of red blood cells during plateletpheresis compared to recent versions. These blood losses were attributed to several factors. The first factor is concerned with blood loss in the void volume of the apharesis kit at the end of procedure. The second factor is concerned with mechanical hemolysis that may occur due to squeezing of the blood tubes by device's pumps. The third factor is concerned with anemia that may be caused by hemodilution due to infusion of saline and citrate solutions during the apharesis procedure [8].

Lazarus et al. [9] documented a transient but significant decrease in full blood count values occurring in donors undergoing plateletpheresis. However, clinically significant thrombocytopenia is unusual. Our data showed that after each procedure, values for Hb, Hct, PLT, MPV, and PDW decreased significantly in the donors ($p < 0.001$) although they have very good count pre-donation.

According to Das et al. [6], apharesis donors with low normal pre-procedure platelet counts (150-200 $x10^9$/L) and Hb concentration (12.5-13 g/dL) must be examined for post-donation drops in these hematological parameters. Donors with significant decrements should be reviewed subsequently to exclude or, if necessary, treat iatrogenic anemia, and thrombocytopenia.

In conclusion, hematological values significantly dropped post-plateletpheresis. Close monitoring and follow-up for these donors must be used to prevent unfavorable events caused by iatrogenic anemia or thrombocytopenia.

The authors have no conflict of interest to report.

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