Evaluation of plateletpheresis procedure in blood component separation unit of Bone Marrow Transplant Center

Waleed Abdelazez M.B.CH.B. M.Sc.
Omer Amel Amen Ali MBChB, MSc

Abstract

Background: Platelet concentrate can be harvested by apheresis using blood cell separator. In this study; plateletpheresis was evaluated , regarding the safety and clinical effect of the procedure , and quality of the product

Methods: The study carried out in blood separation unit of Bone Marrow Transplant Center (BMTC) in Children Welfare Teaching Hospital using blood cell separator. The donors selected according to the criteria for whole blood donor selection with limited clinical examination. Hb estimation, WBC counting and platelets counting were carried out on the donors , pre and post donation , and platelets counted in the product.

Results: The results reflect the safety of the procedure; there were no significant clinical changes between pre and post donation regarding pulse rate, blood pressure and temperature, beside that there were no significant changes in Hb concentration and WBC count between pre and post donation , while the drop in platelet count of the donors after donation was of no clinical effect. Only 30% of donors show numbness around mouth . Regarding the quality of the product, 20% of platelet units contain more than $3x10^{11}$ platelets, while the other units contain less than that slightly.

Conclusion: The procedure of platelet pheresis in blood separation unit of BMTC was safe and effective in harvesting platelet from platelet donors in short time.

Key Words: Plateletpheresis , platelet concentrate , blood components separation unit .

Introduction

Plateletpheresis is the collection of donor platelet by apheresis [1]

Apheresis is a term that is derived from a greek word that means to separate or to take away . Thus the process of separation or taking away the white cells from the blood becomes leukapheresis , if platelets are removed the procedure is called plateletpheresis [2] Plateletpheresis is achieved by a machine called (Blood Cells Separator), in which' separation of platelets is achieved by centrifugation of blood in a separation chamber, and the platelet forced in to a separate collecting bags [3,4] .

The donors may donate more frequently than whole blood donors but must meet all other whole blood donor criteria ; the interval between donations should be at least two days and donors should not undergo plateletpheresis more than twice in a week or more than 24 times in a year [5] .

Plateletpheresis is used to obtain platelets from random volunteer donors, from patients family members or from donors with matched HLA phenotypes [5] .

The advantages of apheresis is that relatively large amount of plasma or platelets can be collected from donor [1]. Platelets from an apheresis donor selected on the basis of compatible platelet cross matched or matched HLA antigens may be the only way to achieve a satisfactory post transfusion platelet increment [5] ; the products usually leuco-reduced and have less risk of infectious diseases [6].

Aim of study

Evaluation of plateletpheresis procedure in blood component separation unit in Bone Marrow Transplant Center.

Donors & methods

This study was conducted from 1\ 10\2003 to 30\11\2003 in Bone Marrow Transplant Center in Pediatric Welfare Teaching Hospital , Baghdad-Iraq .

Twenty donors were investigated for HIV , HCV antibodies and HBsAg in the National Blood Transfusion Center using ELISA method .

The accepted donor should be negative for all these tests .

Especial form was used for recording the information of the donors – figure-1. The donors subjected to evaluation for donation similar to that for donors of whole blood and the information obtained recorded in the form .

Complete blood count including platelet count was carried out - pre and post donation-by cell counter (MS9- meletschloesing laboratories- France)

The process of plateletpheresis carried out by cell separators -Haemonetics (France) .

During the procedure , any complications were recorded in the form and at the end , the donor checked for pulse ,temperature, blood pressure, and discharged after 15 minutes if he/she feels well .

Sample from the product (platelet concentrate)were taken for platelet counting by automated (cell counter-MS9- meletschloesing

laboratory- France) and manual method. In statistical analysis, t-test was used at ***p*** value of ≤ 0.05.

Results:

I-The results of clinical evaluation for the donors were as follow :

1- age: the mean age +/- SD of the donors was 30.3 +/- 6.64 years with a range of 18-40 years.

2- sex: most of the donors are males-18(90%) while females are 2(10 %) only.

3- weight ; the mean weight +/- SD of the donors was 83.2 +/- 15.3 kg with range of 57 to 115 kg.

4-Hight: the mean tall +/- SD was 168.6 +/- 6.4 cm with a range of 155 to 185 cm.

5- Pulse rate: the mean of pulse rate +/- SD , pre donation, was 78.6 +/- 5.02 / min, with a range of 72-90 / min, while the mean of pulse rate +/- SD post donation, was 79.2 +/- 8.01/ min, with a range of 60-100 / min. There was no significant difference between the means of pre and post donation at $P \leq 0.05$.

6-temperature: the mean of body temperature +/- SD - pre donation and post donation was 36.7+/- 0.6 and 36.7+/- 0.5C respectively, with a range of 36 C to 37.5 C . There was no difference in the mean and range of pre and post donation .

7- blood pressure : the result are summarized in table 1 .

Although there was decrease in the figures of post donation , but statistically there was no significant difference between pre and post donation blood pressure at $P \leq 0.05$.

8- blood group : donors of group A are 9(45%), O =8(40%) , B=2(10%) and AB =1(5%) .

II-The results of investigations carried out pre and post donation are summarized in table II

There is no significant difference in the Hb and WBC count between pre and post donation while there is significant decrease in the platelet count of post donation .The average of decrease was 22.2 % of the platelet count predonation ; the mean +/- SD of decrease of platelet count was 48×10^9/l +/- 29.0 .

Table I : Blood pressure measurements in mmHg of pre and post donation .

	predonation		postdonation	
	Systolic	Diastolic	Systolic	Diastolic
Mean(mmHg)	117.6	76.3	109.7	70.5
SD (+/-)	12.5	10.1	11.1	11.2
Range(mmHg)	90-140	50-80	100-120	50-80

Table II :Results of investigations carried out on donors , pre and post donation

Hb(g/dl)		WBC X 10^9/L		PltX 10^9/L	
Pre	post	pre	post	pre	post
Mean	14.8	14.2	6.6	6.4	207.1	161.1
SD(+/-)	1.58	1.8	1.4	1.26	35.6	38.7
Range	10.9-17	10.2-17	4.4-8.9	4.6-9.0	156-266	103-208

Note: pre: pre-donation . post: post-donation .

III - The results of the procedure and the products were as follow:

The time of the procedure for each donor range from 42- 105 min with mean +/- SD of 59.6 +/- 19.2 min, during that time ,certain amount of blood donor were processed ; the volume of blood processed rang from 1619 ml to 2889 ml with mean +/- SD of 2276.4 +/- 547.9 ml .

The amount of platelets in the product range from 1.1×10^{11}/bag to 4.6×10^{11}/ bag with mean +/- SD of 2.43×10^{11}+/- 0.78 /bag as estimated by the cell separator. Manual platelet counting was carried out on 15(75%)bags, and the mean +/- SD of platelets count was 2.11×10^{11} +/- 0.514/bag .

The volume of the product range from 131ml to 346ml with mean +/- SD of 185.9+/-47.3 ml .

IV-The results of complication were as follow:

the most common complication recorded was

tingling around the mouth which occur in 6 (30%) donors, followed by feeling of cold in 2(10 %) donors, then sweating and dizziness in 1(5%) donor .

Discussion:-

As a general , the results of the study demonstrated that there was no clinical side effect of plateletpheresis on the donors, if the criteria for donor selection was considered, as there were no significant changes in pulse rate, temperature and blood pressure before and after the procedure .

Most of the donors in this study were young males with normal weight and height, and these results are expected as the regulations for donor selection were applied to platelets donors.

The distribution of ABO blood groups between the donors was similar to that of general Caucasian population, (A44%, B4%, AB4% ,O44%) [2].

The investigations of pre and post plateletpheresis showed, that there is no effect of the procedure on the hemoglobin concentration and WBC count , as there is no significant changes between the means of pre and post donation; exception to this is the platelet count which decreased by a mean of $53x10^9$ /L from pre donation level , this results is similar to that obtained by katz and genco [7] .

Although ,the platelet count decreased post donation but the count still above the lower limit of reference value ($150x10^9$/l) [8],except for two cases where the platelet count decrease below $150x10^9$/l ($103x10^9$/l and $117x10^9$/l) , but this level has no clinical effect because the bleeding time prolong only when the platelet count decreased below $70x10^9$/l .

Although a good amount of platelet obtained by plateletpheresis which is superior to single random donor ,but in this study the mean of platelet content in the unit still below the minimal required amount by American Association of Blood Banks (AABB),which require a yield of $3x10^{11}$/bag as the minimum amount of platelets [9] , but 20 %(4 of 20 units) of products contain more than $3x10^{11}$/bag .

The main cause for this draw back is that a larger amount of platelet harvesting need more time but usually the donor delayed in arriving to blood separator unit .

Few complications associated with procedure, but the main complication is parasthesia around the mouth, and this is due to citrate infusion which cause hypocalcemia [6] ; such symptom usually disappear before completion the procedure , and in this study no treatment was used ; this low frequency of complication was similar to that obtained by Mclead and price [10] .

In conclusion:

plateletpheresis is safe procedure and effective for harvesting good amount of platelet in a short time .

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