

**ESTIMATION OF THE PRODUCT YIELD
AND COLLECTION EFFICIENCY OF
PERIPHERAL BLOOD STEM CELL HARVESTING
USING PERIPHERAL BLOOD CD34⁺ CELLS
QUANTIFICATION**

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ABSTRACT

Peripheral blood stem cells (PBSC) have been used for transplantation since the early 1990s. CD34⁺ has been used as a marker of hematopoietic stem cells to determine the optimal timing for PBSC harvesting. However, a wide ranges of CD34⁺ cells cut-off values from 8/ul to 66/ul have been used to initiate PBSC harvesting in autologous patients. We performed here a study to determine the peripheral blood CD34⁺ cells cut-off value for the prediction of stem cell yield of $\geq 2 \times 10^6$ CD34⁺ cells/kg body weight patients, to study the correlation between peripheral blood CD34⁺ cells and stem cell yield, to study the correlation between the day 1 post-apheresis and day 2 pre-apheresis CD34⁺ count and to study the collection efficiency of the apheresis protocol used.

Forty eight patients with a total of 94 PBSC harvesting procedures were analyzed. All apheresis were performed using a COBE Spectra[™] Apheresis System. Pre and post apheresis peripheral blood CD34⁺ cells as well as the harvested CD34⁺ cell count were analysed using FACSCalibur flow cytometer. The CD34⁺ harvesting cut-off value was determined using the Receiver Operating Characteristic (ROC) curve analysis and the correlation study was done using Pearson's Correlation Analysis.

The cut-off value of ≥ 27 cells/ul has been shown to predict a stem cell yield of $\geq 2 \times 10^6$ CD34⁺ cells/ kg body weight with a single apheresis with 95% sensitivity and 82.4% specificity. Pre-apheresis peripheral blood CD34⁺ cell count correlated well with the stem cell yields ($r = 0.963$ and $p < 0.001$). The day 1 post-apheresis peripheral blood CD34⁺ cell count correlates well with day 2 pre-apheresis count ($r = 0.895$), and a value of ≥ 25 cells/ul and may be able to predict the day 2 stem cell yield of $\geq 2 \times 10^6$ CD34⁺ cells/ kg body weight. The median overall collection efficiency of the stem cell harvesting protocol was 63.7%.

In conclusion, this study has shown that PB CD34+ count of ≥ 27 cells/ul will predict the stem cell yields of $\geq 2 \times 10^6$ CD34+ cells/ kg body weight, and the apheresis protocol used for peripheral blood stem cell harvesting has gave satisfactory collection efficiency.

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TABLE OF CONTENTS

Contents	Page
Title	i
Original Literary Work Declaration	ii
Abstract	iii
Acknowledgement	iv
Table of Contents	vii
List of Figures	viii
List of Tables	x
List of Symbols and Abbreviations	xii
1.0 INTRODUCTION	1
1.1 OBJECTIVE	3
2.0 LITERATURE REVIEW	
2.1 STEM CELL	4
2.1.1 Introduction	4
2.1.2 Types of Stem Cell	5
2.2 HAEMATOPOIETIC STEM CELL TRANSPLANTATION	9
2.2.1 Introduction	9
2.2.2 Types of Haematopoietic Stem Cell Transplantation	9
i) Autologous HSCT	9
ii) Allogeneic HSCT	10
2.2.3 Sources of HSC	11
2.3 PERIPHERAL BLOOD STEM CELL	14
TRANSPLANTATION	
2.3.1 Introduction	14

2.3.2	Peripheral Blood Stem Cell Mobilization	14
2.3.3	Peripheral Blood Stem Cell Harvesting	16
2.3.3.1	Introduction	16
2.3.3.2	Principle of PBSC Harvesting	17
2.4	CD34 ⁺ CELLS	
2.4.1	Introduction	20
2.4.2	CD34 ⁺ Cells and Engraftment	20
2.4.3	Quantification of CD34 by Flow Cytometry	21
2.4.3.1	Introduction	22
2.4.3.2	Principle of Flow Cytometry	22
3.0	METHODOLOGY	23
3.1	PATIENTS	
3.2	METHODS	25
3.2.1	PBSC Mobilisation	25
3.2.2	PBSC Harvesting	26
3.2.3	Sampling	27
3.2.4	CD34 ⁺ Cells Enumeration	28
3.2.5	Acquisition of CD34 ⁺ Cells by Flow Cytometer	29
3.3	Statistical Analysis	32
3.3.1	Data Analysis	32
4.0	RESULTS	
4.1	PATIENT DEMOGRAPHY	34
4.2	PRE-APHERESIS BLOOD CELL COUNT AND COLLECTION CHARACTERISTIC	36
4.3	CORRELATION STUDY	37
4.3.1	Pre-apheresis Peripheral Blood CD34 ⁺ Cells and Product Yield	37

4.3.2	Post-apheresis Peripheral Blood CD34 ⁺ Cells and Second Day Pre-apheresis Peripheral Blood CD34 ⁺ Cells	40
4.3.3	Post-apheresis Peripheral Blood CD34 ⁺ Cells and Second Day Stem Cell Yield	41
4.4	RECEIVER OPERATING CHARACTERISTIC ANALYSIS	43
4.4	COLLECTION EFFICIENCY	48
5.0	DISCUSSION	49
6.0	CONCLUSION	55
	BIBLIOGRAPHY	56
	APPENDICES	62

LIST OF FIGURES

FIGURE		PAGE
1	Characteristics of Embryonic Stem Cells (adopted from Terese, 2006)	6
2	Hematopoietic and Stromal Cell Differentiation (adopted from Terese, 2001)	8
3	Bone Marrow Harvest	11
4	Diagram of Disposable Set of the COBE Spectra Apheresis System	17
5	The Diagram show the layers of Cells Distributed in the Centrifuge of Cobe Spectra Apheresis System	18
6	The Cells Separation by Specific Gravity	18
7	Flow Cytometer; Becton Dickinson FACSCalibur	22
8	Components of Flow Cytometer	23
9	PBSC Harvesting Procedure	26
10	The Diagram Showing the Steps in CD34 ⁺ Cells Staining	28
11(a-f)	Example of Dot Plot Obtained After Acquisition by Flow Cytometer	29-32
12 (a)	Correlation Analysis of Overall Pre-apheresis Peripheral Blood CD34 ⁺ Cells and Stem Cell Yield For Day 1, 2 and 3 PBSC Harvesting	37
12 (b)	Correlation Analysis of Pre-apheresis Peripheral Blood CD34 ⁺ Cells and Stem Cell Yield For Day 1 PBSC Harvesting	38
12 (c)	Correlation Analysis of Pre-apheresis Peripheral Blood CD34 ⁺ Cells and Stem Cell Yield For Day 2 Harvesting	38
12 (d)	Correlation Analysis of Pre-apheresis Peripheral Blood CD34 ⁺ Cells and Stem Cell Yield For Day 3 Harvesting	39
13	Correlation Analysis of Post-apheresis Peripheral Blood CD34 ⁺ Cells Day 1 and Day 2 Pre-apheresis Peripheral Blood CD34 ⁺ Cells	40
14	Correlation Analysis of Post-apheresis Peripheral Blood CD34 ⁺ Cells Day 1 and Day 2 Stem Cell Yield	41

15(a)	ROC Curve of Overall Pre-Apheresis Peripheral Blood CD34 ⁺ Cells and Stem Cell Yield for Day 1, 2 and 3 PBSC Harvesting	43
15(b)	ROC Curve of Pre-apheresis Peripheral Blood CD34 ⁺ Cells and Stem Cell Yield for Day 1 Harvesting	45
15(c)	ROC Curve of Pre-apheresis Peripheral Blood CD34 ⁺ Cells and Stem Cell Yield for Day 2 Harvesting	46
15(d)	ROC Curve of Pre-apheresis Peripheral Blood CD34 ⁺ Cells and Stem Cell Yield for Day 3 Harvesting	47
16	The Flow Cytometer Calibration Step	68
17	Example of Calibration Result	68
18	Example of Result After Acquisition	70
19 (a)	Correlation Analysis of Overall pre-apheresis peripheral blood CD34 ⁺ cells and stem cell yield for day 1, 2 and 3 PBSC harvesting	77
19(b)	Correlation Analysis of Pre-apheresis peripheral blood CD34 ⁺ cells and stem cell yield for day 1 PBSC harvesting	78
19(c)	Correlation Analysis of Pre-apheresis peripheral blood CD34 ⁺ cells and stem cell yield for day 2 harvesting	79
19(d)	Correlation Analysis of Pre-apheresis peripheral blood CD34 ⁺ cells and stem cell yield for day 3 harvesting	80
20	Correlation Analysis of Post-apheresis Peripheral Blood CD34 ⁺ Cells Day 1 and Day 2 Pre-apheresis Peripheral Blood CD34 ⁺ Cells	81
21	Correlation Result Post-apheresis Peripheral Blood CD34 ⁺ Cells Day 1 and Day 2 Stem Cell Yield	82
22(a)	ROC Curve of Overall Pre-Apheresis Peripheral Blood CD34 ⁺ Cells and Stem Cell Yield for Day 1, 2 and 3 PBSC Harvesting	83
22(b)	ROC Curve of Pre-apheresis Peripheral Blood CD34 ⁺ Cells and Stem Cell Yield for Day 1 Harvesting	87
22(c)	ROC Curve of Pre-apheresis Peripheral Blood CD34 ⁺ Cells and Stem Cell Yield for Day 2 Harvesting	90
22(d)	ROC Curve of Pre-apheresis Peripheral Blood CD34 ⁺ Cells and Stem Cell Yield for Day 3 Harvesting	92

LIST OF TABLE

TABLE		PAGE
1	Characteristics of Patients	34
2	Apheresis Yield of CD34 ⁺ Cell	35
3	Pre-Apheresis Blood Cell Count and Collection Characteristic	36
4(a)	Criterion Values and Coordinates of the ROC Curve for Day 1, 2 and 3 PBSC Harvesting	42
4(b)	Criterion Values and Coordinates of the ROC Curve for Day 1 PBSC Harvesting	45
4(c)	Criterion Values and Coordinates of the ROC Curve for Day 2 PBSC Harvesting	46
4(d)	Criterion Values and Coordinates of the ROC Curve for Day 3 PBSC Harvesting	47
5	Collection Efficiency and Contributing Variables	48
6	Raw data of patient	72-75
7	Collection Efficiency	76
8(a)	Correlation Result of Overall pre-apheresis peripheral blood CD34 ⁺ cells and stem cell yield for day 1, 2 and 3 PBSC harvesting	77
8(b)	Correlation Result of Pre-apheresis peripheral blood CD34 ⁺ cells and stem cell yield for day 1 PBSC harvesting	78
8(c)	Correlation Result Pre-apheresis peripheral blood CD34 ⁺ cells and stem cell yield for day 2 harvesting	79
8(d)	Correlation Result of Pre-apheresis peripheral blood CD34 ⁺ cells and stem cell yield for day 3 harvesting	80
9	Correlation Result of Post-apheresis Peripheral Blood CD34 ⁺ Cells Day 1 and Day 2 Pre-apheresis Peripheral Blood CD34 ⁺ Cells	81
10	Correlation Result Post-apheresis Peripheral Blood CD34 ⁺ Cells Day 1 and Day 2 Stem Cell Yield	82
11(a)	Criterion Values and Coordinates of the ROC Curve for Day 1, 2 and 3 PBSC Harvesting	84-87
11(b)	Criterion Values and Coordinates of the ROC Curve for Day 1 PBSC Harvesting	88-89

11(c)	Criterion Values and Coordinates of the ROC Curve for Day 2 PBSC Harvesting	91-92
11(d)	Criterion Values and Coordinates of the ROC Curve for Day 3 PBSC Harvesting	93

LIST OF SYMBOL AND ABBREVIATION

%	Percentage
µl	Microlitre
7-AAD	7-Amino Actinomycin Dye
ACD-A	Acid Citrate Dextose Solution A
AML	Acute Myeloid Leukemia
BD	Becton Dickinson
CD	Cluster of Differentiation
CD 34	Surface Marker of Stem Cell
CE	Collection Efficiency
CLL	Chronic Lymphocytic Leukaemia
DLBCL	Difuse Large B-Cell Lymphoma
DNA	Deoxyribonucleic Acid
EDTA	Ethylene Diamine Tetra Acetic Acid
FITC	Fluorescein-5-Isothiocyanate
FSC	Forward Scatter
G-CSF	Granulocyte Colony Stimulating Factor
GM-CSF	Granulocyte Macrophage Colony Stimulating Factor
GVHD	Graft Versus Host Disease
HLA	Human Leukocyte Antigen
HSC	Hematopoietic Stem Cell
HSCT	Haematopoietic Stem Cell Transplantation
ICM	Inner Cell Mass
IL	Interleukin
ILMS	Integrated Laboratory Management System
ISHAGE	International Society Of Hematotherapy & Graft Engineering
kg	Kilogram

L	Litre
ml	Mililitre
MM	Multiple Myeloma
MNC	Mononuclear Cell
NaCl	Sodium Chloride
NHL	Non-Hodgkin's Lymphoma
NK- cell	Natural Killer Cells
PBSC	Peripheral Blood Stem Cell
PBSCT	Peripheral Blood Stem Cell Transplantation
PE	Phycoerythrin
PerCP	Peridinin-Chlorophyll Protein Complex
r value	Correlation Coefficient
SCF	Stem Cell Factor
SPSS	Statistical Package For Social Science
SSC	Side Scatter
TQproc	Total Quantity of Cells Processed
UCB	Umbilical Cord Blood
UKM	Universiti Kebangsaan Malaysia
WBC	White Blood Cell