HEMAPHERESIS AND CELLULAR THERAPY

Essay

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LIST OF ABBREVIATIONS

Abbreviation		
2RBC	:	Double red blood cells
AABB	:	American Association of Blood Banks
ACD	:	Acid Citrate Dextrose
ACE	:	Angiotensin-converting enzyme
AChR	:	Acetylcholine receptor molecule
AD	:	Air Detector
AFFP	:	Apheresis Fresh Frozen Plasma
AIDS	:	Acquired immuno-deficiency syndrome
ALL	:	Acute lymphocytic leukemia
AML	:	Acute myelogenous leukemia
ANCAs	:	Antineutrophil cytoplasmic antibodies
ASFA	:	American Society for Apheresis
BM	:	Bone marrow
BP	:	Blood pumb
C	:	Centrifugal
CCE	:	Counterflow centrifugal elutriation
CF	:	Continuous flow
CFC	:	Continuous flow centrifugation
CFU-GM	:	Colony forming units granulocyte macrophages
CFUs	:	Colony Forming Units
CIC	:	Circulating immature cells
CIDP	:	Chronic inflammatory demyelinating polyneuropathy
CLL	:	Chronic lymphocytic leukemia
CML	:	Chronic myelogenous leukemia
CMV	:	Cytomegalovirus
D	:	Donor

LIST OF ABBREVIATIONS (Cont'd)

DF	:	Discontinuous Flow
DMSO	:	Dimethylsulfoxide
dsDNA	:	Double-stranded DNA
ECBV	:	Extracorporeal blood volume
FACS	:	Fluorescence-Activated Cell Sorting
FACT	:	Foundation for the Accreditation of Cellular Therapy
FDA	:	Food and Drug Administration
FFP	:	Fresh frozen plasma
g	:	Gram
G-CSF	:	Granulocyte-Colony Stimulating Factor
G-CSF	:	Granulocyte Colony-Stimulating Factor
GluR3	:	Glutamate receptor
GM-CSF	:	Granulocyte macrophage colony stimulating factor
GVHD	:	Graft versus host disease
GVL	:	Graft-versus-leukemia
Hb A	:	Hemoglobin A
Hb S	:	Hemoglobin S
Hct	:	Hematocrit
HDN	:	Hemolytic disease of the newborn
HES	:	Hydroxyethyl starch
HLA	:	Human leukocyte antigen
HPA	:	Human platelet antigen
HPCs	:	Hematopoietic progenitor cells
HPCT	:	Hematopoietic cell transplantation

LIST OF ABBREVIATIONS (Cont'd)

HSCs	:	Hematopoietic stem cells
HSCT	:	Hematopoietic stem cell transplantation
IFC	:	Intermittent flow centrifugation
Ig	:	Immunoglobulin
IgA	:	Immunoglobulin A
IgD	:	Immunoglobulin D
IgG	:	Immunoglobulin G
IgM	:	Immunoglobulin M
in	:	Inch
ISCT	:	International Society for Cellular Therapy
Kg	:	Kilogram
L	:	Liter
lb	:	Pounds
LDL	:	Low density lipoprotein
LVL	:	Large volume leukapheresis
MCBC	:	Multicomponent blood collection
Min.	:	Minute
mL	:	Milliliter
MNC	:	Mononuclear cells
MoAbs	:	Monocolonal antibodies
NR	:	Disorder not ranked
P	:	Pressure monitor
P	:	Patient
P.P	:	Plasma protein
PANDAS	:	Pediatric autoimmune neuropsychiatric disorder associated with streptococcus

LIST OF ABBREVIATIONS (Cont'd)

PBPC	:	Peripheral blood progenitor cell
PCR	:	Polymerase chain reaction
PC-WBC	:	Photochemically modified white blood cells
PLAP	:	Platelets by apheresis
PLT	:	Platelet
PV	:	Polycythemia vera
QC	:	Quality Control
RA	:	Rheumatoid arthritis
RBCP	:	1 unit RBCs and one large volume plasma unit
RBCs	:	Red blood cells
Rh-Ig	:	Rhesus immunoglobulin
SLE	:	Systemic lupus erythematosus
SM	:	Spinning Membrane
SP	:	Source Plasma
TBV	:	Total blood volume
TLC	:	Total leukocytic count
TPE	:	Therapeutic Plasma Exchange
U/L	:	Unit per Liter
UCB	:	Umbilical cord blood
vs.	:	versus
vWF	:	von Willebrand factor
WBCs	:	White blood cells
WBD-FFP	:	Whole blood fresh-frozen plasma
μL	:	Microliter

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Aim of this essay

The aim of this essay is to review the literature of hemapheresis, laying special emphasis on its new techniques and its applications whether in donation, cellular therapy or other recent therapeutic modalities.

Introduction

Hemapheresis is the selective removal of one or more component of the blood ***(Pineda and Vamvakas, 2002).*** In this procedure, the separation is done by centrifugation or filtration of the blood, then the disease-provoking element of the patient is discarded or the selected component of the donor is collected, while the remainder of the blood components are reinfused into the patient or the donor ***(Lazarus and Klein, 2001).***

Hemapheresis can be named according to the component of blood that is separated from the donor or the patient. Accordingly, it includes plasmapheresis, leukapheresis and plateletpheresis. Hemapheresis also includes total plasma exchange with removal of the plasma and replacement with fresh frozen plasma ***(McLeod, 2001).***

Recently, with the introduction of new treatment modalities such as advanced cancer therapy and the increasing number of marrow and organ transplants, the need for

hemapheresis procedure is rapidly growing, as it allows for a greater yield of the desired component ***(Tran et al., 2004).***

Nowadays, hemapheresis has an important role in clinical medicine by permitting the therapeutic removal of pathological cells or plasma and providing a therapeutic transfusion of donor cells or plasma ***(Rock, 2002).*** This application may be the primary or the secondary or adjunctive therapy. Both the primary and secondary therapies are considered to be effective and beneficial ***(Smith et al., 2003).***

Furthermore, and with the growing need for circulating hematopoietic progenitor cells in cellular therapy, the efficient use of hemapheresis separators techniques have been developed for selecting progenitor cells from peripheral blood and reducing collection of undesired cells ***(Moog, 2004).***

BASIC BACKGROUND OF HEMAPHERESIS

A- Definition and Historical Background

Hemapheresis (also termed apheresis) is derived from a Greek verb means "to take away or withdraw" ***(Rodwing, 1999 and Lazarus and Klein, 2001)***.

It refers to any procedure performed on a donor or patient in which blood is withdrawn from the person and separated ex vivo into some or all of its components. Some of these components are retained for donation or therapeutic purpose and the others are returned to the person ***(Gilcher, 2002)***.

Hemapheresis practice has an important role in clinical medicine either by permitting the therapeutic removal of pathological cells or plasma (therapeutic hemapheresis), or providing a therapeutic transfusion through administration of donor's cells or plasma collected by hemapheresis (donation hemapheresis). Also, the recent advances in hemapheresis technology help in peripheral blood progenitor cells (PBPCs) collection which is used in cellular therapy ***(Klein and David, 2005).***