PLASMA EXCHANGE
IN THE TREATMENT OF AUTOIMMUNE DERMATOSES

THESIS

Submitted in Partial Fulfilment of the Master Degree in Dermatology and Venereology

By

AMAL ABD EL-MAKSOOD MOHAMED

M.B.B.Ch.

Supervised by

Prof. Dr. MONA EL-OKBI

Prof. of Dermatology and Venereology

Faculty of Medicine,

Ain Shams University

Dr. OSSAMA BADR MOAWAD

Lecturer of Dermatology and Venereology

Faculty of Medicine,

Ain Shams University

Faculty of Medicine,
Ain Shams University
1986

Central Library - Ain Shams University

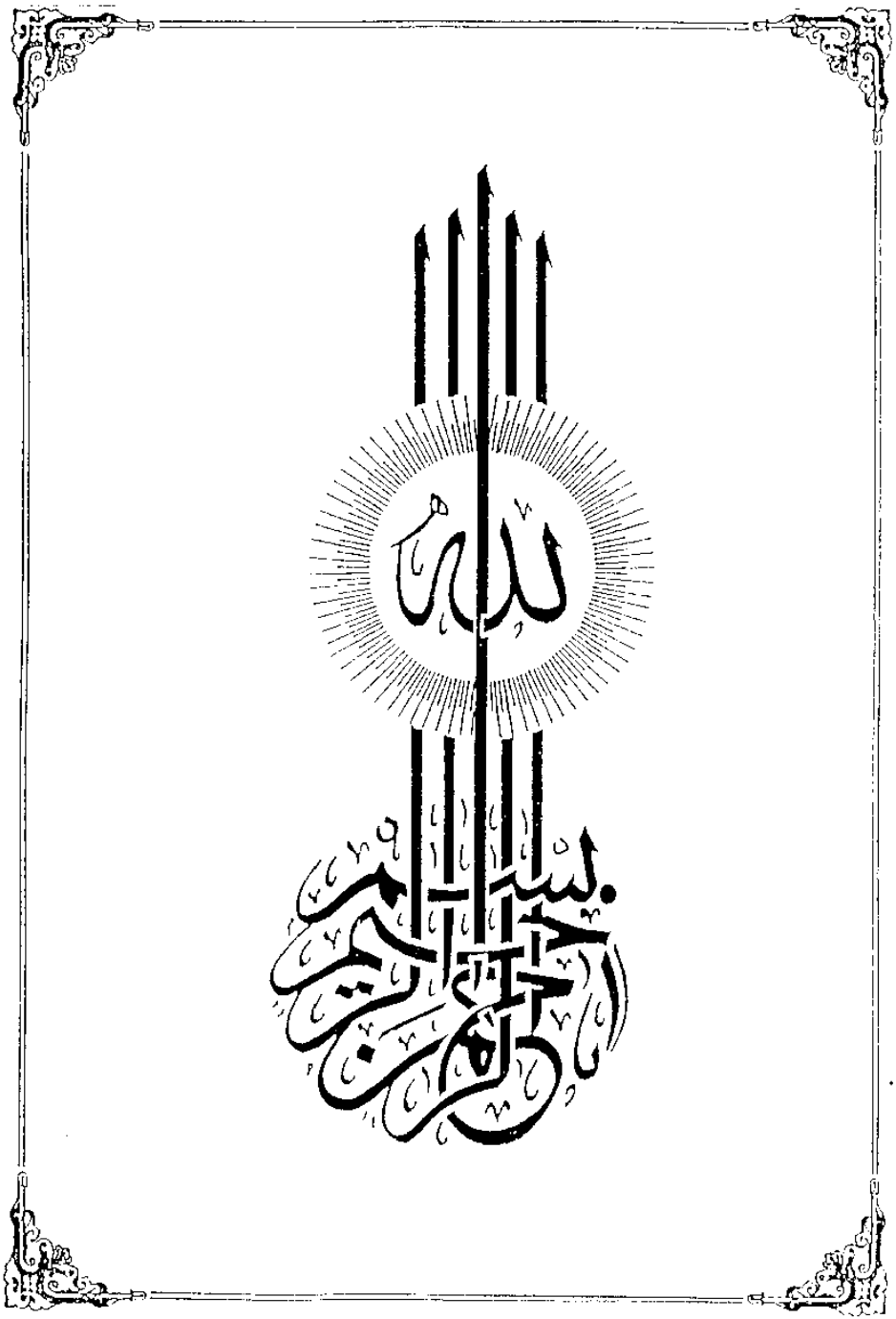
ACKNOWLEDGEMENT

I wish to express my deepest and sincerest thanks to Professor Mona El-Okbi Professor of Dermatology and venereology Ain Shams University for accepting the supervision of this work. This supervision gave me the invaluable opportunity to benefit from her constant help and guidance.

I am also deeply indebted to Dr. Ossama Badr Moawad lecturer of Dermatology and Venereology Ain Shams University for his valuable suggestions and wise guidance that contributed to the success of this work.

Dr. Amal Abd El-Maksood

Central Library - Ain Shams University



Central Library - Ain Shams University

CONTENTS

	Page
- INTRODUCTION	1
- REVIEW OF LITERATURE	
• Historical Review	3
• Technique	5
• Indications	15
• Instruments	65
• Complications	79
- CONCLUSION	88
- SUMMARY	90
- REFERENCES	92
- ARABIC SUMMARY	

Central Library - Ain Shams University

INTRODUCTION

Central Library - Ain Shams University

INTRODUCTION

Plasma exchange means separating whole blood into plasma and cellular components either by centrifugal cell-separators or with membrane filters. Then, the cellular components are returned to the patient with plasma or plasma fractions from healthy donors.

On the other hand, plasmapheresis involves the removal of plasma without plasma substitution the volume of plasma is replaced if necessary by 0.9% saline.

In order to augment the suppressive effect of plasma exhcange or apheresis it can be combined with lymphocytes removal (lymphoplasmapheresis) in certain diseases in which the lymphocytes play a role in its pathogenesis as Rheumatoid arthritis.

Sham apheresis is another type of apheresis which is usually done on the control patients to evaluate the effect of plasmapheresis. It is performed by delivering whole blood to the centrifuge bowl and separating it into plasma and cellular components, then each of these components is reinfused into the patient in total amount. Controlled studies of plasmapheresis are difficult to

Central Library - Ain Shams University

design because sham apheresis has some limitations. Therefore, the exact role of apheresis and the degree of its efficiency as a therapeutic measure still can not be evaluated.

The aim of plasma exchange is to remove a known (or though to be known) pathogenic material from the circulation which may be cytotoxic antibodies as in good pasture's syndrome or immune complexes as in systemic lupus erythematosus or to replenish a specific plasma factor as in thrombotic thrombocytopenic purpura. In other diseases such as scleroderma in which the role of immunological abnormalties in its pathogenesis is not clear, the mechanism of action of plasmapheresis can not be explained.

Plasmapheresis has an advantage of its rapid action,so it is effective especially when applied in an intensive, short-term fashion in acute fulminant diseases. On the other hand, it has some disadvantages as infection and allergic reactions.

Central Library - Ain Shams University

REVIEW OF LITERATURE

Central Library - Ain Shams University

HISTORICAL REVIEW

Plasmapheresis is a greek word that means plasma-removal (Waldenstrom, 1980). It was carried out by Fleig (1909) and Abel et al. (1914), but its clinical use was limited.

Waldenstrom (1980) stated that he and Willert tried plasmapheresis on a patient with macroglobulinemia in 1955 and they showed that macroglobulin content could be diminished. However, at that time plasmapheresis was a complicated and a very time-consuming procedure.

Schwab and Fahey (1960) studied the effect of plasma-pheresis therapy on Waldenstrom's macroglobulinemia and they reported that plasmapheresis is beneficial to patients with Waldenstrom's macroglobulinemia as well as manifestations of hyperviscosity syndrome. At that time, continous - and intermittent - flow centrifuges were introduced.

Recently, flat-and hollow - fiber filtration devices developed and simplified the procedure (Shumak and Rock, 1984 and Council on Scientific Affairs, 1985).

Hamblin (1984) stated that the popularity of plasma-pheresis began to grow at 1976 when it was used in the

Central Library - Ain Shams University

treatment of different immunologically mediated diseases. Some of them are, Myasthenia gravis (Dau et al., 1977 and Newsom -Davis et al., 1979), Guillain-barré syndrome (Brettie et al., 1978 and Levy et al., 1979), rapidly progressive glomerulonephritis (Lockwood et al., 1977), Goodpasture's syndrome (Lockwood et al., 1976), and RH incompatibility (Fraser et al., 1976). In addition, plasma exchange was used in Renal-transplant rejection (Cardella et al., 1977) and progressive multiple sclerosis (Hauser et al., 1983 and Khatri et al., 1984).

This review will be mainly concerned on the role of plasmapheresis in Dermatologic diseases.

Central Library - Ain Shams University

TECHNIQUE

It is possible to perform plasma exchange using hand packs, but this laborious and cell separator have simplified the procedure (Pinching, 1981).

There are two methods of exchange, one is the continous method (e.g IBM. Aminco) and the other is the semicontinous one. In the continous method, the centrifugation chamber is thin, providing a small extracorporeal compartment, thus allowing blood to be separated continously for plasma exchange. In the semicontinous method, a larger centrifugation bowl is used (Pinching, 1981 & Shumak and Rock, 1984).

The technique is dependent upon adequate blood flow from the patients and there are a variety of methods for achieving this, all of which may present with problems (Pinching, 1981). The most frequent problem is the accessppoint and the plasmapheresis therapy may be stopped or not undertaken because of this problem (Clough and Paganini, 1984).

Several types of accesses are possible including placement of a small catheter in the brachial vein or a larger bilateral one in the femoral or subclavian at

Central Library - Ain Shams University

each treatment. An indwelling double-lumen catheter which may remain throughout the course of treatment can be also used (Clough and Paganini, 1984).

If the access is difficult, an alternative to vein dependent method is the creation of an arteriovenous shunt or fistula (Pinching, 1981 & Clough and Paganini, 1984). It may be created surgically or a 5-polytetrafluoroethylene graft may be placed (clough and Paganini, 1984).

Peripheral vein-to-vein exchange can be used in patients with large forearm veins and if only a small number of exchanges is planned, but it may gives a poor flow and it may a source of infection in immunosuppressed patients (Pinching, 1981).

In the subclauian catheter, the risk of infection is smaller. (Pinching, 1981).

The arteriovenous shunt is the method of choice because it provides an excellent flow, however it is a source of infection and this can be avoided by giving the time for maturation of the shunt before immunosuppression occurs and before the start of plasma exchange. It also done if long series of exchange is planned (Pinching, 1981).

Central Library - Ain Shams University

Particular care has to be taken in patients with renal disease because preservation of veins for possible use in long-term hemodialysis is essential (Pinching, 1981).

Three techniques of plasmapheresis are currently available (Clough and Paganini, 1984):

1) Centrifugal separation:

This form of separation is based on the difference in the sedimentation properties of the components of whole blood (Komoriyama et al., 1983 and Clough and Paganini, 1984).

A high-speed central-core centrifuge allows the incoming blood to form layers according to denisty (Clough and Paganini, 1984). The bowl is first filled with blood and then plasma is constantly removed from the central upper part of the bowl, while whole blood flows into the bowl from the patient (Pinching, 1981). Contents of a layer are removed through precisely positioned sampling ports (Clough and Paganini, 1984). This continues until the bowl contains packed cells and a small layer of plasma, the contents of the bowl are then returned to the patient and the cycle is restarted (Pinching, 1981).

Central Library - Ain Shams University

Some anticoagulation appears necessary even if there is abnormal coagulation data. It is prefere to use acid citrate dextrose (ACD) if the platelet count is markdely decreased and to use heparin if the platelet count is normal. The expected side effect of ACD is the citrate toxicity which may be calcium binding resulting in cardiac arrhythmias (McCullough et al., 1973). Mollison, (1967)suggested that the rate of citrate administration appears to be critical. While 0.03 mmoles/kg/m is safe, 0.06 m moles/kg/m is lethal.

Centrifugal separation has some disadvantages including the big size of the centrifuge, the need to remove a large volume of blood from the donors and the removal of cellular components (Komoriyama et al., 1983).

2) Membrane Separation:

This can be done by the use of semipermeable membranes with a variety of separation properties. These membrane have larger pores and are formed of a different material than the dialysis membranes, so they can sieve larger molecules (Clough and Paganini, 1984).

Membrane plasmapheresis can be used not only for diseases resulting from excessively elevated concentrations of protein or protein-bound substances as in

Central Library - Ain Shams University

hyperviscosity and paraproteinemia but also in immunologically based disorders as lupus erythematosus and pemphigus vulgaris (Gurland et al., 1984)

3) On-line plasma processing:

This consists of treatment of the separated plasma followed by recombination of the treated plasma with the cellular elements and reinfusion (Clough and Paganini, 1984).

Gurland et al. (1984) mentioned that several schemes to recycle the plasma in a closed loop circuit have been proposed and are in vrious stages of development and application. One is cryoprecipitation in which plasma is chilled to induce formation of cryoprecipitates, which are then removed by a microporous filter. This process is useful only in these diseases where the offending substances are in fact cryoproteins. Another approach is the immunospecific adsorption, in which an immunologically specific antibody is immobilized on an external matrix and employed to specifically adsorb a pathological antigen from the extracorporeal plasma. Such approaches are applied in the early stage of development.

Sieberth (1980) and Agishi et al. (1980) suggested another route to plasma purification, that was the

Central Library - Ain Shams University