Blood Conservation During Anaesthesia for Major Vascular Surgery

Essay

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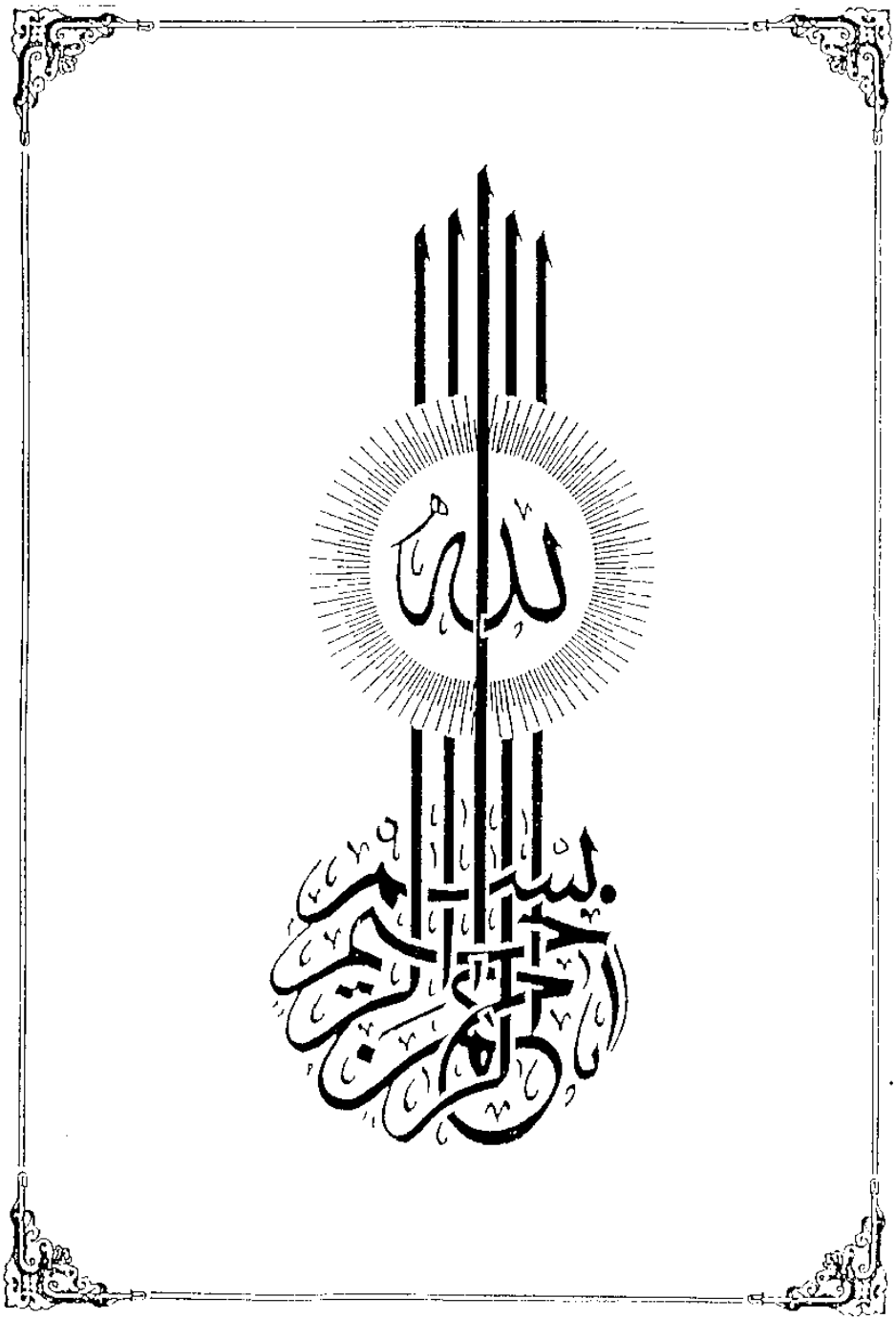

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Ahmed El-Shebiny

To

My

Family

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Introduction

Blood conservation during major surgery, particularly vascular surgery, has gained much importance nowadays as it adds great benefits to the patients by reducing their demands of homologous blood transfusion, preventing exposure to its adverse effects.

Blood conservation also prevents rapid depletion of blood bank stores, particularly for those patients with rare blood groups and for those whose moral scruples prevent them from, willingly, accepting donor blood.

Blood conservation depends on close co-operation between anaesthesiologists, haematologists and surgeons.

Anaesthesiologists can contribute by using techniques that reduce the amount of blood loss as hypotensive technique and managing complications of other techniques as tourniquet, posture sympathomimetic infiltration, and also maintaining normal blood volume and adequate tissue perfusion.

Transfusion of stored homologous blood may be followed by altered haemoglobin affinity for oxygen, acid-base imbalance, citrate toxicity, micro-emboli, elevation of

serum potassium and phosphate, impaired antibacterial defences and transmission of diseases.

As a way to avoid hazards of homologous blood, many patients are turned to autologous blood donation and retransfusion especially with operations that involve considerable blood loss.

Interests in the use of operative blood salvage have increased recently.

As an alternative to human-derived blood components, substitutes and alternate sources are being investigated. Although it will take many years before widespread human use, marked progress has been made over the last few years.

Aim of The Work

The aim of this essay is to study and discuss many factors for the decline in the amount of blood transfused intra- and post-operatively in major surgical procedures. These include; decreasing blood loss by delibrate hypotension, local vasopressors, posture and application of surgical techniques as diathermy, torniquet and recently laser photocoagulation and replacing blood loss by homologous blood (whole or specific components) or autologous blood with pre-operative phlebotomy and haemodilution or blood salvage and reinfusion (either intra- or post-operative), mentioning in brief the ideas of different devices. Recent advances are going on to replace blood by other oxygen-carrying synthetic compounds.

Tolerance to Acute Blood Loss and Acute Haemodilution

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I. Hypovolaemia

Hypovolaemia is a common clinical problem. It is a result of imbalance between the blood volume and the capacity of the circulation causing impaired tissue perfusion, and haemorrhage is the most common cause of hypovolaemic shock.

Loss of fluid reduces venous return, decreasing right atrial filling pressure and thus cardiac output. The resulting hypotension is countered by the baroreceptors, which increase heart rate, induce vaso- and venoconstriction.

Approximately 10% of the total blood volume can be removed with no significant effect on either arterial blood pressure or cardiac output. Usually arterial blood presssure is maintained untill approximately 20% of blood volume is lost but cardiac output is diminished by about 30%, thereafter it decreases progressively. Fig. (1) shows the relationship between blood loss and both cardiac output and arterial blood pressure. Any drug that attenuates vasoconstriction or tachycardia (e.g. anaesthetic agents or β-blockers) results in early hypotension.

Obviously, all degrees of shock can result from haemorrhage from mildest diminishment of cardiac output to almost complete cessation of output *(Guyton, 1991).*

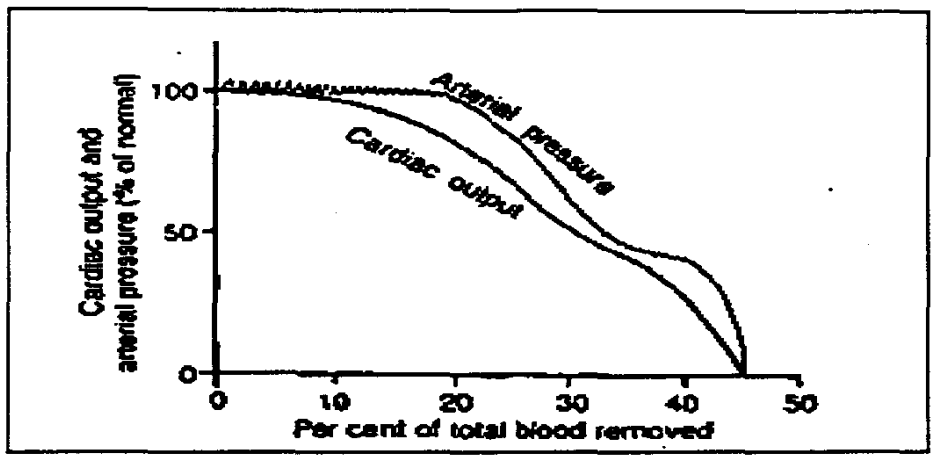

Fig. (1) : Effect of haemorrhage on cardiac output and arterial pressure

Table (1) : Classification of degrees of blood loss

%Blood loss		Blood Pressure	S. & S.
Compensated	10-15%	Normal	Dizziness, palpitation, tachycardia
Mild	15-30%	Slight decrease	+ Thirst, sweating, weakness
Moderate	30-35%	70-80 mmHg	+ Restlessness, pallor. oliguria.
Severe	35-40%	50-70 mmHg	+ severe pallor cyanosis collapse
Profound	40-50%	< 50 mmHg	+ Collapse, air hunger, anuria.