LEADING ARTICLE

MASSIVE BLOOD TRANSFUSION

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Massive transfusion is conventionally defined as the replacement of the patient's total blood volume by stored homologous bank blood within a 24 hour period. In an average size individual, this is approximately 4 to 5 litres or equivalent to 8 to 10 units of whole blood. Massive transfusions will become more common as more complicated surgeries are performed and the number and extent of traumatic injuries increase. Massive haemorrhage, the initial event, results in hypovolaemic shock and imparied tissue perfusion and this may be followed by abnormalities in blood coagulation and plasma colloid oncotic pressure and electrolyte and metabolic imbalances.

The high mortality among the recipients of massive transfusion are primarily due to the underlying disease rather than to the transfusion itself[1]. Prolonged shock, extensive tissue damage and obstetric complications can all predispose to disseminated intravascular coagulation (DIC). Pre-existing hepatic and renal impairment exacerbate the complications of massive transfusion by affecting the haemostatic system. plasma protein levels and metabolism of some of the constituents of transfused blood.

In the management of massive transfusion, it is important to restore the depleted blood volume promptly to minimise the effects of prolonged hypovolaemia. Initially crystalloids and synthetic colloids could be used and these should be substituted with fresh whole blood when the latter is available so as to ensure adequate tissue oxygenation and maintenance of adequate levels of plasma coagulation factors and proteins. The blood transfusion service should be informed of the expected requirement of massive transfusion as early as possible and specimens should immediately be dispatched to ascertain the ABO and RhD group. The type of blood issued depends on the urgency of the situation. Unmatched group O blood should be used sparingly only in emergency situations and among Caucasians and Indians, these should also ideally be RhD negative. Unmatched but ABO and RhD compatible blood are issued to those whose blood group and antibody screen had been done previously and to those whose circulating blood has been replaced by exogenous blood following massive transfusion[2].

However if the patient's condition is stable, the clinician should transfuse blood which had rapid compatibility test performed using a fresh specimen. As blood stored up to 14 days contains adequate levels of 2, 3-DPG, reduced oxygen carrying capacity does not pose any problems unless there is severe anaemia or significant cardiac decompensation.

Disturbances in the haemostatic system are multifactorial and these can be due to depletion of labile clotting factors and platelet dysfunction in stored blood, co-existing DIC and dilutional effects on platelets and clotting factors when crystalloids are used[3]. Adequate replacement of blood loss to ensure good perfusion and the administration of fresh frozen plasma (containing Factors V and VIII) are sufficient in most instances. Platelet transfusions should be considered if there is profound thrombocytopenia or bleeding continues despite normal or near normal coagulation profiles. Dilutional thrombocytopenia is invariably associated with massive transfusion but levels below 50 x 10^9/l usually indicate that DIC is present at the same time[4]. This should be promptly diagnosed and treated effectively as DIC results in a high mortality. Laboratory tests suggestive of DIC are hypofibrinogenaemia and markedly abnormal coagulation profiles. Cryoprecipitate is useful to provide Factor VIII and fibrinogen in patients with DIC.

The metabolic disturbances following massive transfusion are reviewed from an anaesthetic viewpoint in a paper in this journal. The common abnormalities are hyperkalaemia, hypocalcaemia and acidosis. These are seldom of clinical importance unless there is pre-existing hepatic or renal impairment[5]. It is more important to identify the abnormalities with appropriate baseline biochemical investigations and institute treatment promptly and effectively.

Recipients of massive transfusion have a greater risk of developing transfusion-related infections, particularly hepatitis C. Some countries, including the United States, require routine measurements of alanine aminotransferase (ALT), the surrogate test of hepatitis C[6]. The limitations of ALT testing are elevated levels due to obesity and alcohol consumption and some donations may transmit the disease despite having normal markers. Specific screening test for antibody to hepatitis C virus is available and currently under evaluation.

Similarly, the screening test for anti-HIV by the ELISA technique may be negative in donors recently infected by the HIV as there is a "window period" of a few months before seroconversion.

The incidence of infections by other blood-borne viruses like cytomegalovirus and Human T-cell leukaemic virus (HTLV-I) is very low even among recipients of massive transfusion.

The number of infections that are potentially transmissible by blood transfusion can be kept low as long as high-risk individuals voluntarily exclude themselves from donating; blood that is donated is carefully screened and physicians are more aware of the risks and more discerning in prescribing transfusion of blood or its components.

The usage of blood and blood products in Singapore continue to increase as more complicated medical and surgical procedures requiring heavy support with blood transfusions are performed. This demand, aggravated by increase in the number of massive transfusion should be matched by a corresponding increase in blood collection. In Singapore, this is hampered by an ageing population, greater demands at work and shorter leisure hours and proportionately fewer female donors.

Doctors can also contribute to reducing the demand by judicious use of blood and its components and refinement in their

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surgical techniques. The number of traumatic injuries may be reduced by greater safety consciousness in industries and transportation systems.

REFERENCES

1. Hewitt PE, Machin SJ. Massive Blood Transfusion. Br Med J 1990; 300: 107-9.
2. AABB Technical Manual. 9th edition. American Association of Blood Bank. 1985: 282-5.
3. Collins JA. Massive Blood Transfusion. Clin Haematol 1976; 5: 201-22.
4. Bloom AL, Thomas DP. Haemostasis and Thrombosis. Edinburgh: Churchill Livingstone, 1981: 432-3.
5. Mollison PL. Blood Transfusion in Clinical Medicine. 9th edition. Oxford: Blackwell Scientific, 1983: 54-7.
6. Barbara JAJ, Contreras M. Infectious Complications of Blood Transfusion: Viruses. Br Med J 1990; 300: 450-3.