Multimodality blood conservation strategy in cardiac surgery with cardiopulmonary bypass : the CHU of Liège experience

M Erpicum[1], F Blaffart[1], J-O Defraigne[1], R Larbuisson[1]

[1] University Hospital of Liège, Belgium

Introduction: The aim of this study is to analyse the transfusion rates of cardiac surgery patients in a single centre following an in-house strategy of blood conservation.

Methods: The data of all adult patients undergoing normothermic cardiac surgery with cardiopulmonary bypass (CPB) over a 1 year period were retrospectively collected (n=491). Management protocols were described and the transfusion rates of allogeneic blood components were recorded: red blood cells (RBC), fresh frozen plasma (FFP) and platelets (PT), as well as the number of units transfused. The timing of transfusion was categorized: during CPB (peroperative period), within the first 48 postoperative hours after wean out CPB (early postoperative period) and during the hospitalisation from surgery until discharge (hospitalization). The hematocrit values were recorded during CPB, 10 minutes after wean out CPB, after the first 48 postoperative hours and at discharge from hospital.

MANAGEMENT

PREOP

Biology: Hemoglobin, Platelets, Quick, Fibrinogen, Proteins
EPO and iron supplementation for Jehovah witnesses patients
Discontinuation of antiplatelet drugs if possible
Prediction of the Hct on CPB:

$$(Preop\ Hct * Blood\ volume) / (Blood\ volume + Priming\ volume + 1,6)$$

Prediction of RBC needs in priming CPB to obtain an Hct of 20%:

$$\{[(Blood\ volume + Priming\ volume + 1,6) * 0,2] - (Preop\ Hct * Blood\ volume)\} \times 2$$

PEROP

Priming of CPB: colloid 1200-1400 mL
Minimum Hct on CPB ≥20% → Ultrafiltration or transfusion of RBC
Mean arterial pressure 40-80 mmHg
Flow rate 2.4 – 3 L/'/m^2
Crystalloid cardioplegia
Systematic cell salvage
Meticulous dissection & hemostasis
Rapid coagulation tests (ACT) and thromboelastography to guide therapy in case of coagulopathy
Continuous monitoring of hemoglobin level, SVO_2, pH, K+ and blood gases. Point of care test for lactates
Systematic use of antifibrinolytic (Tranexamic acid)

POSTOP

Transfusion of FFP and/or PT in case of active bleeding or factor deficiency
Early re-exploration if bleeding ≥200 mL/h/3h and cell salvage treatment of shed mediastinal blood in the 6 hours
Point of care test for pH, blood gases, lactates, hemoglobin, ionogram.
Continuous monitoring of SVO_2

TRANSFUSION INDICATIONS

RBC
Hb <7g/dL
Hb >7g/dL with:
PAs<90; Age>70; HR>100/'; CI<2.2L/'/m^2; Hemorrhage

FFP
Hemorrhage + Antivitamin K treatment
Hemorrhage + Coagulation factor deficit

PTS
Platelets ≤15000/mm^3
Platelets >15000/mm^3 with:
Haemorrhage ; Hyperthermia ; Invasive procedure

Age (Years)	M(IQR)	69 (59-77)
Sex (Female)	n(%)	164 (33)
Redo operation	n(%)	27 (5)
Jehovah witness patient	n(%)	2(0)
Parsonnet score (Logistic)	M(IQR)	7.8 (3.7-16.6)
EuroSCORE (Logistic)	M(IQR)	4.2 (2.1-8.5)
Valvular surgery ; *Isolated*	n(%)	254 (52) ; *176(36)*
Coronary surgery ; *Isolated*	n(%)	285 (58) ; *219(45)*
Heart transplantation	n(%)	5 (1)
CPB duration (min)	M(IQR)	87 (70-105)
Aortic clamp (min)	M(IQR)	54 (41-67)

Results: Two hundred and forty-eight patients (50%) received an allogeneic blood component transfusion during hospitalisation. One hundred and twenty-one patients (25%) received RBC during the operative period; the median number of units transfused was 2(1-2).The preoperative hematocrit value was 36(33-40)% in median and the lowest hematocrit value during CPB was 21(19-24)%. A cell salvage device was used in each case: the median volume of washed red blood cells transfused was 678(512-891) mL. The median hematocrit value after CPB was 23(21-25) %. One hundred and sixty-five patients (34%) were transfused in the early postoperative period: 27% received RBC, 18% received FFP and 18% received PT. The median number of units transfused was 2(1-3) for RBC, 4(2-6) for FFP and 1(1-2) for PT. The median hematocrit value after 48 hours was 32(29-34) % and 32(30-35) % at discharge.

Conclusion: The transfusion rates observed in this series are relatively high compared with the literature. Improvements will be made in our practice and protocols management in order to decrease the need of transfusion. This detailed audit of the transfusion practices in our cardiac surgery centre would be helpful to value the effectiveness of further improvements.