Postoperative bleeding and autotransfusion

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Introduction: Bleeding in the postoperative period of cardiac surgery is not rare. Mediastinal bleeding is usually collected in a chest drainage system and discarded. However, this blood could potentially be saved with a cell salvage device (CS) during the first six postoperative hours. This practice is generally performed only in case of a surgical re-exploration for massive bleeding and may contribute to decreased allogeneic transfusion. But in case of postoperative coagulopathy requiring medical treatment, re-exploration is usually postponed and consequently, the collected blood is discarded. Chest drainage systems combined with a cell salvage option could therefore optimize the management of blood losses and transfusions in the postoperative period, regardless of any surgical re-exploration. The aim of this study is to assess the effectiveness of such a system during the postoperative period of cardiac surgery, in patients at high risk of bleeding.

Method : During a 6 months period, the CardioPAT® (Haemonetics) device was used postoperatively in all cardiac surgery patients at high risk of postoperative bleeding. The following data were prospectively collected: hemoglobin level, bleeding volume, volume of autologous washed red blood cell transfused by the CardioPAT® (WRBC), volume of allogeneic red blood cell (RBC), fresh frozen plasma (FFP) or platelets (PT) transfused and surgical re-exploration.

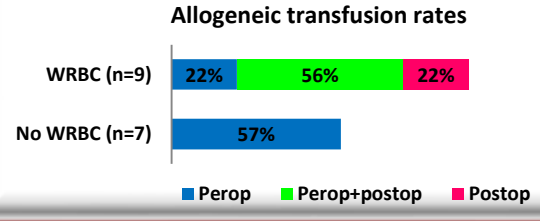
Criteria for high risk of postoperative bleeding

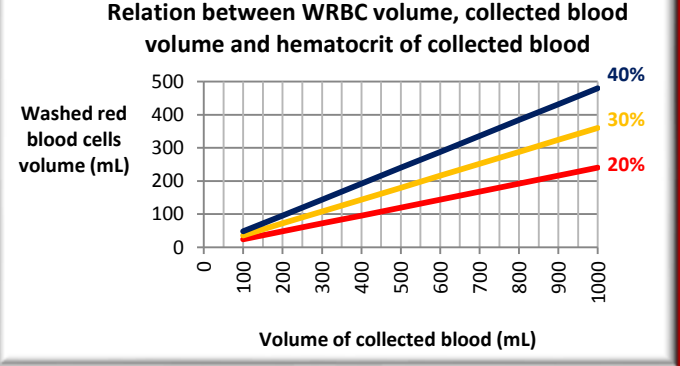
- CPB duration >150min
- >33% of the red blood cell mass treated by CS
- Postop bleeding + coagulopathy (TEG: R>14min and/or MA ≤40mm)
- Postoperative bleeding >200mL/h during 3 hours

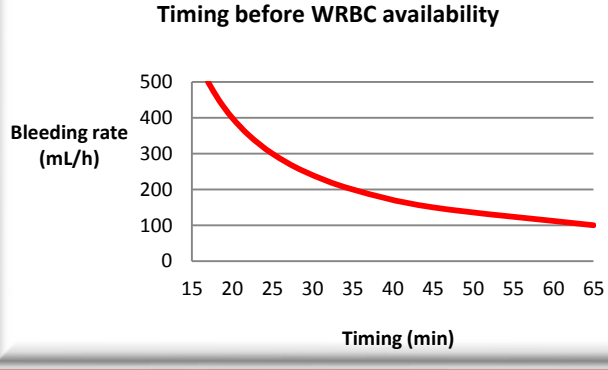
Results : The CardioPAT® was used in 16 of the 361 interventions performed during the target period. Median postoperative bleeding volume was 202 (80-630)mL after 1 hour and 607 (247-1735) mL after 6 hours. The bleedings have allowed the use of the cell salvage option in 9 (56%) cases, with a median WRBC transfused volume of 280 (150-300)mL. Two patients required surgical re-exploration. All patients transfused by WRBC had previously received an allogeneic transfusion (RBC, FFP and/or PT). The hemoglobin level of blood collected with the CardioPAT® device impacted on the delay and the blood volume required for WRBC availability; the lower the hemoglobin level was, the larger the volume of blood required to obtain a concentrate of WRBC was. Consequently, patients with a very low hemoglobin level were transfused with RBC anyway.

Transf. rates (n = 16)

Peroperative FFP (U)	n(%) - M(IQR)	10 (62) – 4 (4-4)
Postoperative FFP (U)	n(%) - M(IQR)	7 (44) – 6 (5-8)
Peroperative PT (Pool)	n(%) - M(IQR)	9 (56) – 1 (1-1)
Postoperative PT (Pool)	n(%) - M(IQR)	5 (31) – 1 (1-2)
Peroperative RBC (U)	n(%) - M(IQR)	10 (62) – 4 (2-4)
Postoperative RBC (U)	n(%) - M(IQR)	7 (44) – 4 (4-6)
Hemoglobin h+0 (g/dL)	M(IQR)	9 (7.4-10.6)
Hemoglobin h+6 (g/dL)	M(IQR)	10.5 (8.4-11.9)







CardioPAT® features

Reservoir capacity : 2000 mL
Blood volume treated by cycle : 100 mL
Cycle duration : 5 min
Volume of WRBC after complete cycle : ≥ 15 mL
Postoperative aspiration : - 10 cmH_2O to - 40 cmH_2O
WRBC hematocrit : 62-77%
RBC recovery : 76-92%

Conclusion : The use of the CardioPAT® device postoperatively can reduce allogeneic blood transfusion after cardiac surgery in patients at high risk of bleeding. It gives time to treat coagulopathy, leading to a decrease of surgical re-exploration. However, a device with a larger reservoir and a flexible processing speed would be more adapted in case of major haemorrhage. Systematic utilisation of this device at the time of FFP and/or PT transfusion is a safe but expensive strategy. It seems more adapted to use this device in a permissive bleeding strategy, waiting for the spontaneous coagulation recovery of the patient in the first postoperative hours.