



Use of Accessible Blood Filter for Postoperative Cell Salvage in Cardiac Surgery

Rosita Bihariesingh^{1*}, Pieter Voigt² and Rakesh Bansie³

¹Department of Anesthesiology & Intensive Care, Academic Hospital, Suriname

²Department of Cardiothoracic Surgery, Academic Hospital, Suriname

³Department of Internal Medicine, Academic Hospital, Suriname

Abstract

The availability of centrifugal cell savers support intraoperative cell salvage and thereby reduces the need for allogeneic red blood cell transfusion. Use of these devices however is limited to the operating room, forcing a switch to allogeneic product in the post-operative setting. Here we present a case of massive postoperative bleeding due to severe coagulopathy following CABG. Due to the lack of availability of donor blood products a novel blood filter (HemoClear BV, Zwolle, the Netherlands) was used for postoperative salvage. Because of its accessible use, we believe this salvage device has great clinical value in the poor-resource setting.

Introduction

Bleeding during cardiac surgery is a major complication that often leads to anemia and blood transfusion requirement [1]. In spite of the publication of patient blood management guidelines by various professional societies, implementation of blood conservation strategies remains challenging [2,3]. As in the current COVID-19 pandemic allogeneic blood shortages keep growing at an alarming rate, autologous blood transfusion are a very necessary relief of pressure on the donor blood supply system. The availability of centrifugal cell savers widely support intraoperative cell salvage and thereby reduces the need for allogeneic red blood cell transfusion [3,4]. Use of these cell salvage device is limited to the operating room, forcing a switch to allogeneic product in the post-operative setting. Moreover, mere salvage of red blood cells and loss of platelets and coagulations factors has been shown to contribute to coagulopathies [5,6]. Here we present a case of massive postoperative bleeding due to severe coagulopathy following CABG. Due to the lack of availability of donor blood products and centrifugal cell saver outside of the operating room a novel blood filter (HemoClear BV, Zwolle, the Netherlands) was used to salvage postoperatively shed blood cells [7].

Case Presentation

A male patient, aged 53 years, underwent an emergent surgical revascularization of the myocardium, for a previously verified triple vessel Coronary Artery Disease (CAD) with the LMCA at 90%, RCX 90%, RCA 90% stenose. The patient had a disease history of diabetes mellitus type 2, arterial hypertension, myocardial infarction, hyperlipidemia and a positive family history of cardiovascular diseases. Prior to the operation the patient's hemoglobin level was 7.4 mmol/L, thrombocytes $321 \times 10^9/L$. The operation was completed without any complications, upon leaving the operation room the patient had a hemoglobin level of 5.7 mmol/L and thrombocytes $285 \times 10^9/L$. The early postoperative recovery was stable for approximately two hours. After which the patient gradually started to bleed more, in the third hour a blood loss of 120 mL was measured. Despite normal coagulation parameters and hemodynamically stability, two FFPs were administered as well as tranexamic acid, desmopressin, and factor concentrates. Red blood cells and thrombocytes were not available at that moment because of large shortages cause by the COVID pandemic. During the following three hours the blood loss became progressively more and the patient became hemodynamically instable. At this point in time the hemoglobin level had fallen to 4.8 mmol/L and thrombocytes to $248 \times 10^9/L$. The patient was returned to the operating room to relieve the tamponade. The chest film and the ECG were unchanged. Extensive inspection showed no obvious cause for bleeding. Meanwhile, two RBC units had become available and were administered in addition to two FFPs, two units of TC and 550 ml of salvaged blood cells from the cell saver. After which a hemoglobin and thrombocytes were measured at 4.7 mmol/L and $153 \times 10^9/L$, respectively.

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*Correspondence:

Rosita Bihariesingh, Department of Cardiothoracic Surgery, Academic Hospital, Paramaribo, 1-3 Flustraat, Paramaribo, Suriname, Tel: +442222 (ext 601);
E-mail: r-bihariesingh@hotmail.com

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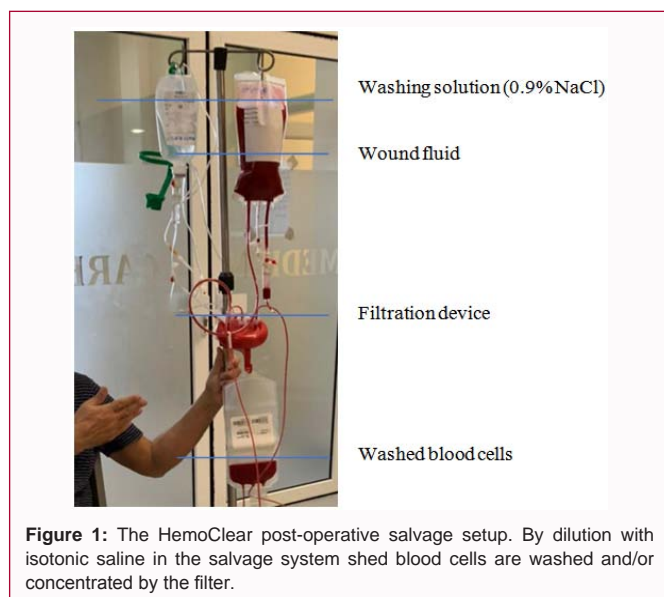


Figure 1: The HemoClear post-operative salvage setup. By dilution with isotonic saline in the salvage system shed blood cells are washed and/or concentrated by the filter.

Perioperative TOE showed no special features. On departure from operating room the patient received high doses of vasopressor and inotropic agents. On the first day after surgery, after re-exploration the bleeding started again and within four hours there was a blood loss of 950 mL. The hemoglobin level was now 3.1 mmol/L and thrombocytes decreased to $106 \times 10^9/L$. With the use of HemoClear filter (HemoClear BV, Zwolle, The Netherlands) we were able to wash the blood from the tubes and re-infuse 600 ml of the patient's own washed blood cells, with another two units of FFP. Following the autologous transfusion hemoglobin level was increased to 3.9 mmol/L, while the platelet count remained stable at $104 \times 10^9/L$. Over the following two to three hours dopamine and norepinephrine doses were decreased, the blood loss lessened, and the patient successfully extubated on the first day post-operation. On the second day post-surgery the patient was transferred to the ward with a hemoglobin level of 4.1 mmol/L and thrombocyte count of $103 \times 10^9/L$. On day three post-surgery the patient received a unit of RBCs and started mobilizing with physiotherapist. The patient's hemoglobin rose to 4.6 mmol/L on post-operation day four, the thrombocyte count was $170 \times 10^9/L$ at this time. On post-operation day nine the platelet count had further increase to $278 \times 10^9/L$, while the hemoglobin level

remained at 4.5 mmol/L.

Comment

The novel HemoClear device enables accessible cell salvage and is easy to operate and affordable (Figure 1). Because the device is driven by gravity it can be used in poor-resource settings without stable power supply. Particularly in emergent cases of nadir the device could be a game changer in patient blood management.

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