CASE REPORT

Emergency infusion of evacuated blood

W ter Woerds¹, J Geuze², BJ Meursing³, S Houtman²

1 Department of Anaesthesiology, Radboud University Nijmegen Medical Centre, The Netherlands
2 Department of Intensive Care Medicine, Canisius Wilhelmina Hospital, Nijmegen, The Netherlands
3 Department of Cardiology, Canisius Wilhelmina Hospital, Nijmegen, The Netherlands

Abstract - A 43-year-old female developed pericardial effusion 6 weeks after a transhiatal oesophageal resection. Following pericardiocentesis, the patient showed a circulatory collapse, secondary to a bleeding in the pericardial space causing cardiac tamponade. Blood was evacuated from the pericardial space via a three-way valve and syringe connected to the pericardial catheter, and immediately infused into the femoral vein via a catheter connected to the aforementioned three-way valve and syringe. Following initiation of this almost continuous pericardial drainage and autotransfusion, adequate circulation was restored. The patient remained haemodynamically stable until definitive, surgical, treatment. There were no adverse events due to this method of cell saving, and the patient made a full recovery.

Keywords - transhiatal esophageal resection; pericardial effusion; cardiac tamponade; pericardiocentesis; autologous blood transfusion

Introduction
A transhiatal esophagus reconstruction is a surgical procedure requiring outstanding post-operative care. Approximately 40% of these patients will have post-operative complications like atrial fibrillation, pneumonia or an anastomotic leak. Less frequent complications include a chylothorax, empyema and rare complications like pericardial effusion.

Besides presenting a rare complication, we report on a blood cell saving technique used during pericardial tamponade and awaiting definitive treatment.

Case report
A 43-year-old woman with an oesophageal malignancy underwent a transhiatal oesophageal resection with reconstruction. The patient had no history of cardiac disease and did not receive chemotherapy or radiation therapy. Surgery was uneventful, with clear margins and no pathological lymph nodes. However, the post-operative course was complicated by a pneumothorax and a persistent chylothorax, treated by thoracic drainage and on the 15th post-operative day a left-sided thoracotomy for drainage of the chylus. On the 40th post-operative day the patient complained of fatigue, was tachycardic, and dyspnoeic and showed signs of pleural effusion, the latter being confirmed by chest X-ray. There was no elevated jugular venous pressure, pulsus paradoxus, pericardial rub, or changes on the electrocardiogram. The blood pressure was 130/70 mmHg, extremities were warm and capillary refill and diuresis were normal. Serum cardiac troponin concentration and the creatine phosphokinase level were normal.

Computer tomography of the chest (CT-chest) showed a significant amount of pericardial effusion (figure 1), not present on an earlier CT scan. An echocardiogram confirmed the diagnosis of pericardial effusion. Because the pericardial effusion was thought to contribute to the patient's dyspnoea, a fluoroscopy guided pericardiocentesis was performed, using the subxiphoid approach. The puncture was successful and a guide wire was introduced into the pericardial cavity. A multi-holed pigtail catheter was advanced, over the wire, into the pericardial space. Immediately after the puncture, one litre of bloodstained pericardial fluid was evacuated, a sample was taken for microbiology and cytological investigation. The haemoglobin concentration was significantly lower than that of venous blood (3.1 mmol).

However, ten minutes after the pericardiocentesis, the patient showed a brief episode of hypotension in response to fluid resuscitation. Soon thereafter, blood pressure decreased again to 60/30 mmHg with sinus tachycardia, during which time she lost consciousness and became respiratory insufficient. The patient was intubated and mechanically ventilated. Pericardial fluid, aspirated through the pericardial drain, looked at this time like pure blood, which was confirmed by the haemoglobin concentration of the effusion fluid (8.9 mmol/l). An echocardiogram was made, still showing significant pericardial fluid and signs of cardiac tamponade. Thus, a perforation of either the myocardium or a coronary vessel was suspected, for which surgical intervention is warranted. In order to stabilize the patient and enable transfer to a nearby tertiary hospital, and knowing that the pericardial space contained pure blood, it was decided to autotransfuse its contents. Hereto the femoral vein was cannulated and a closed system was effectuated between the pericardial drain and the central venous catheter, with a 50 ml syringe on a three-way valve in between. Blood from the pericardial drain was manually aspirated and returned to the patient via the femoral catheter.

Correspondence
S Houtman
E-mail: s.houtman@cwz.nl
Blood pressure normalized without the need for further infusions of erythrocyte concentrates. Heparin (7500 EH) was administered intravenously to prevent activation of the coagulation cascade during this extra-corporal circulation. This meant that the two hours needed for transport and organization of immediate cardiac surgery could be bridged. Approximately 3 litres of blood was autotransfused during this period.

During surgery, the pericardial drain appeared to have perforated the left ventricle. The defect in the myocardium was closed and the patient subsequently remained haemodynamically stable. The patient was extubated the day after surgery. Bacterial and viral cultures of the pericardial fluid remained negative. Cytological investigations were normal and did not reveal malignant cells. Eventually, the patient was discharged in good condition 64 days after the initial oesophagectomy.

Discussion

We have described a patient who developed chronic pericardial effusion after a transhiatal oesophageal resection. A therapeutic pericardiocentesis was complicated by an intrapericardial bleeding, resulting in an acute cardiac tamponade. While evacuating blood from the pericardial space, we infused this blood into a femoral vein, thus saving blood cells while awaiting definitive treatment.

Transhiatal oesophageal resection is associated with a high rate of complications, resulting in a high perioperative morbidity and mortality [1,2]. Pericardial effusion after oesophagectomy is a rare complication, of which only case reports exist [3-5]. Previously, Kats et al. [3] described a patient with cardiac tamponade a few hours after transhiatal oesophagectomy, secondary to laceration of a small cardiac vein. In contrast, in the present case pericardial effusion developed slowly. Also, the pericardial fluid of our patient was sterile and contained no malignant cells or chyle.

A sterile pericarditis following manipulation of the heart during the initial oesophagectomy or the left-sided thoracotomy seems a likely explanation, as has been suggested earlier [3,4]. Pericardial effusion and pericarditis following manipulation of the heart is a relatively frequent observation after cardiac surgery. The provoking insult may be relatively minor, as it has been observed after percutaneous intervention, pacemaker implantation and radiofrequency ablation [6].

While a gradual increase of pericardial fluid may go unnoticed for a long time, acute increases in pericardial fluid will cause cardiac tamponade and thus compromise cardiac output. Pericardiocentesis might relieve symptoms like dyspnoea and fatigue, and improve haemodynamics, even in the absence of clinical signs of tamponade [7]. Pericardiocentesis may also be indicated for diagnosis and/or therapy in cases of chronic pericardial effusion [8]. Although it is a relatively safe procedure, major complications such as chamber lacerations and pneumothorax, have been described in 0.6-3 % of cases [9-11]. In the present case, the pericardial drain probably entered the left ventricular wall incompletely at first, perforating the left ventricle soon after the procedure.

In the case described here, intrapericardial bleeding after fluoroscopy guided pericardiocentesis caused cardiac tamponade. Ongoing evacuation of blood from the pericardial space was necessary. To prevent allogeneic blood transfusion, we decided to autotransfuse blood from the pericardial space.

Venkatachalam et al. [12] retrospectively analysed nine patients who had pericardial effusions requiring pericardial drainage after an ablation procedure for atrium fibrillation. They described the successful use of a cell saver device during emergency pericardiocentesis. However, in the patient presented in this case report, there was an acute situation with no immediately available cell saver. As far as we know, only two studies have mentioned the use of autologous blood transfusion without using any filtering or washing device [13,14]. In both studies, one bolus of 300-500 ml of blood from the pericardial space was returned to the patient. In the present case, a closed system allowed intermittent blood aspiration and infusion totalling 3 litres over a period of two hours.

The efficacy and safety of cell salvage techniques has been investigated previously in order to minimize perioperative allogeneic transfusion. A large meta-analysis concluded that autotransfusion of unwashed blood decreases the use of allogeneic transfusion in orthopaedic surgery and, to a lesser extent, in cardiac surgery. No significant effect was found on perioperative mortality [15]. However, autotransfusion of unwashed blood is associated with a number of complications. Micro embolisms and thrombosis may follow humoral and cellular blood components activated after contact with artificial surfaces [16]. Activation of the plasma coagulation pathway has been described during retransfusion of unwashed drainage blood following orthopaedic surgery [17,18]. In the mentioned studies, reinfusion of blood was performed using a filtering device. Such

Figure 1. CT-chest showing pericardial effusion.
a device reduces thrombosis and prevents erythrocyte damage [19]. Although our patient received 7500 EH heparin to reduce the risk of thrombosis, we should have used a filtering device to minimize the risk of further thrombosis. No extensive literature is available on the heparin dose during this procedure, but 7500 EH seemed reasonable to us.

The incidence of an infection after perioperative autologous blood donation is low, and clinically important sepsis seems unrelated with cell salvage. Although organisms can be cultured from the tip of the suction catheter as well as from the salvaged blood in 21 to 48% of the patients, post-operative blood cultures rarely grow any organisms. Perioperative antibiotic prophylaxis, in this case cefazoline 1000 mg, contributes to this low risk of infection [20]. After surgery, selective decontamination of the digestive tract (SDD) was started.

Malignancy is considered as a contraindication for autotransfusion, because of potential spread of malignant cells. In our patient the resection margins were clean after the oesophagecto-

vtomy and no infiltration of tumorous cells in lymph nodes had been found. Therefore, a pericarditis carcinomatosa was deemed extremely unlikely. Thus, autotransfusion of blood seemed feasible in this patient.

Conclusion
We have described a patient with pericardial effusion after oesophagectomy, probably secondary to a sterile pericarditis. After pericardiocentesis, intrapericardial bleeding caused an acute cardiac tamponade with haemodynamic compromise. Evacuated blood from the pericardial space was autotransfused in the femoral vein in order to bridge the time to surgery without the need for allogeneic blood transfusion. The patient made an uneventful and full recovery after surgery.

Acknowledgements
The authors would like to express their thanks to dr. Evert Lamfers, cardiologist, with his help in preparing the manuscript.

References