Cell Salvage (CS) n=9

21

Author: Dafydd Thomas

Definition:

Any adverse events or reactions associated with autologous transfusion methods, including intraoperative and postoperative cell salvage (washed or unwashed), acute normovolaemic haemodilution or preoperative autologous donation (PAD).

Nine cases were reported; on review none were withdrawn, nor transferred to or from other categories. This chapter describes the main findings from 9 completed questionnaires. Although definite data about how many cell salvage procedures are undertaken within the UK is unknown, it is the author's opinion that this low number of cases reflects a degree of underreporting of adverse events.

As has been shown previously, it seems that cell salvage appears to be a very safe procedure when undertaken by trained personnel but an increased awareness of the importance of reporting adverse events to SHOT seems to be needed. As with other adverse events human factors and a lack of training about correct procedural techniques are as likely to lead to adverse events when employing cell salvage as with all other areas of transfusion practice.

Cell salvage cases by speciality

There were 9 cases reported as shown in Table 21.1

Specialty	Number
Obstetrics	3
Vascular surgery	2
Urological surgery	1
Orthopaedic surgery	1
Neurosurgery	1
Cardiac surgery	1
Total	**9**

Table 21.1: Specialty for cell salvage reports

Emergency n=3; elective n=6
Female n=6; male n=3

Types of cell salvage

Intraoperative cell salvage techniques were involved in all 9 cases. There were no postoperative cases reported.

Cell salvage adverse events and reactions

There were six adverse events of which four related to operator error. Two were machine failures.

There were three clinical reactions, two patients suffered major morbidity and later died, although the relationship to cell salvage (imputability) was not clear.

Another case had moderate morbidity but with no lasting consequence and follows the pattern previously reported of transient hypotension when administering warm cell-saved blood via a leucocyte depletion

filter. Interestingly a second obstetric case reported hypotension but no leucodepletion filter was being used. The report did however mention that the anaesthetist used a 20mL syringe and a three way in line tap to force a higher flow rate of salvaged blood into the patient. The question arises about possible release of vasoactive substances due to this technique.

Another reported case related to temporary storage of cell-saved blood in a satellite blood refrigerator as the midwife required written orders for the administration of the salvaged blood. Salvaged blood can remain at room temperature for up to 6 hours from collection and needs to remain with the patient to avoid possible administration errors. This was therefore included as operator error due to incorrect storage and not following the correct protocol; written instructions should have been left for transfusion of the cell-salvaged blood.

A third case was reported where some salvaged blood had to be discarded as the slow running intravenous infusion meant the cell-salvage blood became time expired.

This reporting year there were no reports from the use of postoperative cell salvage and this may reflect a changing trend in its use during orthopaedic procedures. One orthopaedic procedure was reported using intraoperative cell salvage for a revision hip replacement. There were black fragments noticed in the blood bag following reinfusion. This phenomenon has been reported before and is included in the miscellaneous contraindications to the use of cell salvage in titanium alloy prosthesis removal. It is recommended to discontinue cell salvage until all darkened tissue has been removed. Cell salvage can resume after thorough irrigation of the wound with 0.9% sodium chloride via an alternate suction source.

Death n=0

Although 2 patients who suffered major morbidity described below both died, there is not enough evidence to attribute the deaths to the cell salvage.

Major morbidity n=2

There were two patients who suffered major morbidity and both eventually died, although the imputability for cell salvage has been estimated as low.

Case 21.1: Cardiac arrest in a baby during cardiac surgery. Imputability 1

During cardiac surgery, red cells were reinfused using a cell saver. This appeared to be associated with profound hypotension and cardiac arrest. Topical haemostatic agents had been used within the surgical field, but there had been no suggestion that these caused any blockage or failure of the cell-salvage equipment or washing process.

The baby had a complex past medical and surgical history. Cardiac surgery had been initially undertaken two days previously to try and correct co-arctation of the aorta and a hypoplastic aortic arch. The baby also had a complete atrio-ventricular septal defect. The initial operation two days before re-operation reported coagulation problems secondary to heparin and aspirin use and postoperatively hypotension had been a longstanding issue. Following the cardiac procedures the baby remained critically unwell developing renal failure and septicaemia eventually dying just over a month later.

Comment: This sad case of a paediatric death was associated with a number of interventions. Re-do paediatric cardiac surgery following persistent hypotension carries increased risk. There is no doubt that the reporters witnessed a drop in blood pressure on one occasion associated with the reinfusion of cell-salvaged blood, but the report also mentions the use of topical haemostatic agents which have been associated with anaphylactoid responses in some patients. It might be worth stressing the importance of avoiding aspiration of these agents as there has been a case report of anaphylaxis attributed to floseal contamination of washed cell-salvage infusion (Kumar et al. 2015). This phenomenon has been reported previously and usually responds to cessation of cell-saved red cell infusion plus vasopressors. In this case, it seems that cardiac reserve was not sufficient to withstand this hypotensive challenge. A coagulopathy also seemed to be present, but again there were multiple causative factors associated with this. It needs to be remembered in such situations that only cell-salvaged red cells are being reinfused

and there may be additional need for component therapy to replace platelets, fibrinogen and clotting factors for correction of the coagulopathy.

Case 21.2: Hypotension during re-infusion; neurosurgery. Imputability 1

Cell-salvage blood was collected and administered during meningioma resection. Sudden cardiovascular collapse (SBP 40mmHg) occurred and the infusion limb became red. The transfusion was stopped and a dose of vasopressor and crystalloid resulted in a rapid restoration of blood pressure (BP) with a short period of tachyarrhythmia and possible atrial fibrillation followed by sinus rhythm. Transfusion of the same bag of salvaged red cells was cautiously restarted through a different cannula and site and completed without incident. A second bag of cell-saved blood was commenced approximately one hour later with repetition of cardiovascular collapse and a red limb. The infusion was stopped and the salvaged red cells discarded. Transfusion continued with crossmatched blood and products thereafter. The patient was extubated postoperatively but later admitted to the intensive therapy unit (ITU) from recovery but then developed disseminated intravascular coagulation (DIC). Two further operations where required and the patient developed a refractory coagulopathy. The patient unfortunately died and the case is under investigation with clinical teams and transfusion consultant.

Comment: Meningioma resection can sometimes result in significant haemorrhage depending on vascularity of the lesion. It would be interesting to know if a double volume wash was used as this has always been the recommendation in neurosurgery because of potentially high levels of thromboplastin and other bioactive substances in brain tissue. If haemostats were used, the same comment as mentioned above may apply as this may be anaphylaxis? Cell-salvaged blood quality can be maintained by ensuring that aspiration of contaminants is minimised and appropriate wash volumes are used.

N.B. No leucodepletion filters were used in these two cases. There have been some cases reported previously where filters were not used and hypotension was still observed.

General comments

A wealth of supporting information for the correct use of cell salvage is available on the JPAC website and is updated regularly by the UK Cell Salvage Action Group.

Recommendations

- All cell salvage operators must undertake initial and regular update training and be assessed as competent (there should be documented evidence of competence in the form of a training record)
- All bags of cell salvage blood must be fully labelled with the patient identification and unique case number
- All hospitals where intraoperative cell salvage (ICS) and postoperative cell salvage (PCS) are undertaken should report adverse events to SHOT
- Monitoring of patients is as important for the reinfusion of red cells collected by ICS or PCS as it is for allogeneic red cells
- Practitioners need to revisit previous Annual SHOT Reports particularly related to autologous transfusion to ensure historic incidents are not repeated

Action: Cell salvage teams

Reference

Kumar S, Goyal K et al. (2015) **Anaphylactic reaction after autologous blood transfusion: A case report and review of the literature.** Asian J Neurosurg 10 (2), 145-7