UK CELL SALVAGE ACTION GROUP

ICS Infrequently Asked Questions

AREA of APPLICATION

Wherever Intraoperative Cell Salvage (ICS) is used.

STAFF

- All staff trained in the use of ICS
- Staff in pre-operative clinics
- Medical, Nursing and Midwifery staff, Operating Department Practitioners, Biomedical Scientists and Healthcare Support Workers

CAN CELL SALVAGE BE USED FOR A PATIENT WHO HAS RH NULL DISEASE?

Rh Null phenotype (also referred to as Rh Null syndrome or Rh Null disease) is a rare blood group with a reported frequency of approximately 1 in 6 million individuals. Rh Null is characterised by the lack of expression of all Rh antigens (D, C, c, E and e) on the red cells. The clinical significance of its recognition is that such patients suffer from Rh Null syndrome associated with chronic haemolysis of varying severity, with stomatocytosis, spherocytosis, increased osmotic fragility, altered phospholipids asymmetry, altered cell volume, defective cation fluxes, and elevated Na+/K+ ATPase activity. In addition, Rh Null phenotype patients readily build alloantibodies when transfused with RBCs that are not Rh Null. Therefore, allogeneic transfusion from non-Rh Null donors should be avoided and it is very difficult to find compatible blood for transfusion.

There has been no data found on the survivability of Rh Null RBCs during or after cell salvage. As a theoretical discussion, since avoiding non-Rh Null allogeneic transfusion would seem to be a priority, cell salvage might be an option (this should not be considered a recommendation).

The RBC recovery might not be as high as with normal RBCs and it might take more wash volume to get rid of excess free haemoglobin. However, if some of the Rh Null RBC's survived processing, and the final product could be washed to acceptable levels of free haemoglobin, there might be sufficient volume of recovered RBC's to avoid allogeneic transfusion. Having said that, we don't know that any of the Rh Null cells would survive the cell salvage process or how they would survive after transfusion, so we really can't make a recommendation.

In the absence of rare allogeneic blood being available especially in the emergency situation the potential use of cell salvage on a patient with Rh Null syndrome would have to be a decision made by the attending Clinicians and patient (if possible), with the understanding that the process and resulting product has not been studied on Rh Null patients.

References

1. Avent ND, Reid ME. (2000) The Rh blood group system: a review. Blood. 95, 375-87.

CAN CELL SALVAGE BE USED FOR A PATIENT WITH COLD AGGLUTININ ANTIBODIES?

Cold agglutinins are autoantibodies that react with antigens on the red blood cell surface. They may induce complement-mediated haemolysis and agglutination (clumping) of red cells (a cryopathic haemolytic syndrome).

Cold agglutinins derive their name from the fact that they show maximal activity at temperatures lower than normal body temperature. They are present in low titres in healthy individuals, but may be associated with a range of disease states.

'Physiological' cold agglutinins develop as a result of the change in expression of red cell antigens that occurs naturally after birth, and react maximally at about 4°C.

'Pathological' cold agglutinins are maximally reactive at around 28-31°C and tend to occur at very low titres. They are most commonly of the immunoglobulin M (IgM) class but can occur less commonly as IgG and IgA forms.

Cold agglutinin disease (CAD) is relatively rare. Annual incidence in the USA is roughly 1 case per 300,000 population [1]. It accounts for up to a quarter of all haemolytic anaemias which have an annual incidence in the USA of approximately 1 in 80,000 [1]. There appear to have been no UK-based epidemiological studies of CAD.

Cold agglutinins may be detected in the laboratory using a routine screening test. Some laboratories may also report the autoantibody titre and its thermal amplitude.

There are no evidence-based publications or formal guidelines specifically addressing the use of cell salvage in patients with detected cold agglutinins: the notional risks are therefore a matter of conjecture.

In theory, the cold agglutinin autoantibody could interact with red cells as the aspirated blood cools in the cell salvage reservoir. This could result in agglutination or clumping of the red cells and subsequent complement

fixation leading to haemolysis. Additionally, complement sequences initiated in this way may be aborted by the cell membrane and plasma complement regulatory proteins, leaving opsonically active fragments of C3 and C4 on the red blood cells. If these complement fragments remain on the red cell surface after the cell salvage washing process, on reinfusion these cells will either be ingested by macrophages in the liver or spleen, or undergo 'intravascular' haemolysis via the generation of the C5b–9 membrane attack complex.

Activity of the cold agglutinin will very much depend on its titre and the temperature at which it binds. As the factors involved in this process are plasma based, prompt separation of the red cells from the plasma with minimal cooling of the collected blood may circumvent these theoretical concerns.

The decision to use cell salvage in a patient with cold agglutinins should be taken in consultation with a haematologist with reference to the specific nature of the cold agglutinin detected. In cases where the autoantibody is only active below ambient room temperature, cell salvage may be judged an appropriate option (this should not be considered a recommendation). Additional steps to mitigate theoretical risks may include the use of a low volume bowl to avoid blood stasis and thereby ensure prompt red cell separation and plasma clearance. A blood warmer for reinfusion may also be considered.

References

1. Georgy S. (2009) Cold Agglutinin Disease. eMedicine Feb

CAN CELL SALVAGE BE USED FOR A PATIENT UNDERGOING C-SECTION WITH A TWIN PREGNANCY WITH A HYDADITIFORM MOLE AND CO-EXISTENT HEALTHY FETUS?

Hydatidiform mole and co-existent healthy fetus is a very rare condition with only 30 cases documented in detail in the literature [1]. There are no publications or guidelines addressing the use of cell salvage in molar pregnancy.

A hydatidiform mole is an abnormality of fertilization. There are two types of hydatidiform mole, complete and partial. With complete mole the chromosomal genetic material from the ovum (egg) is lost, by a process that is yet not understood. Fertilization then occurs with one or two sperm and an androgenic (from the male only) conceptus (fertilized egg) is formed. With this conceptus the embryo (fetus, baby) does not develop at all but the placenta does grow but it is abnormal and forms lots of cysts and has no blood vessels. These cysts look like a cluster of grapes and that is why it is called a hydatidiform mole (grape like).

Molar tissue can grow into the wall of the uterus and from there may spread to other parts of the body through the bloodstream. If this occurs it is called “trophoblastic neoplasia” or "persistent trophoblastic tumour". As cell salvage has the potential to deliver trophoblastic cells into the circulation, its use in this indication is **not recommended.**

References

1. Piura B, Rabinovich A, Hershkovitz R, Maor E, Mazor M. (2008) Twin pregnancy with a complete hydatidiform mole and surviving co-existent fetus. Arch. Gynecol. Obstet. 278(4) 377-82

WHEN USING CELL SALVAGE EQUIPMENT WITH A BOWL-BASED SYSTEM, CAN PART-FILLED BOWLS BE SAFELY TRANSFUSED?

There are concerns that in bowl-based cell salvage devices, incomplete filling of the bowl and subsequent washing may lead to inadequate clearance of contaminants.

There a few small studies that have addressed this issue. Serrick et al (2005) demonstrated in a Latham bowl device that, in patients undergoing cardiac surgery, a quality red cell product was produced from washing partial bowls [1]. An earlier study examined the effect of partial filling on quality using a Baylor bowl based system and found differences in washing efficiency with variation of parameters [2].

Szpisjak et al (2001) compared washing efficiency between full and partially filled bowls using banked blood [3]. Partially filled washed bowls had lower concentrations of free Hb and C3a, but higher concentrations of white blood cells compared to full bowls. It also must be remembered that although all cell-saving devices use the same theory of centrifugation, the actual quality of the washed RBC product differs widely from one device to another [2]. It is advisable therefore to check with the relevant manufacturer for recommendations relating to their specific device.

When considering using a part filled bowl it would be much better to use the ‘concentrate’ function where previously processed packed red cells are returned to the bowl from the reinfusion bag to fill the bowl. However, if this is not possible, the clinical utility of the part filled bowl should be considered and risk/benefits evaluated on an individual patient basis.
Another alternative to transfusing a partially filled bowl is to use a smaller volume bowl size e.g. a 125ml bowl instead of a 225ml bowl. This option is good when the 'collect only' set up has been used [3].

References

1. Serrick CJ, Scholz M. (2005) Partial bowls using the Haemonetics Cell Saver 5: does it produce a quality product? J Extra Corpor Technol Jun 37(2) 161-4.

2. Serrick CJ, Scholz M, Melo A, Singh O, Noel D. (2003) Quality of red blood cells using autotransfusion devices: a comparative analysis. J Extra Corpor Technol Mar 35(1) 28-34.
3. Szpisjak DF. (2001) Debris Elimination from a Partially-Filled Cell Salvage Bowls. Anaesthesia/Analgesia 92 1137-1138.