CONTRAINDICATIONS TO ICS

AREA of APPLICATION

The risk benefit ratio of ICS should be assessed for each individual patient by the surgeon and anaesthetist involved in the patient's care.

The use of ICS should always be discussed with the patient and their agreement for ICS to be used, documented in the clinical notes. Where contraindications exist, the risks and benefits of using ICS in the presence of these contraindications should also be discussed with the patient.

Pharmacological Agents

Substances	Effects	Recommended Action
Clotting Agents:		
Microfibrillar products examples: Avitene®, Helitene®, Oxycel®, Gelfoam® Powder, Instat® MCH	May cause platelet aggregation and clot formation. Reported to pass through a microaggregate filter into the bloodstream, causing emboli.	Avoid aspiration when product is being used. Resumption is an option after copious irrigation with 0.9% sodium chloride solution to an alternate suction source.
Sponge/Fabric materials examples: Surgicel™, NuKnit®, Gelfoam® Sponge, Helistat®, Instat™, Hemopad®, Super Stat®, HemoFoam®	Activates clotting sequence by acting as a contact agent. May clot off system.	Avoid aspiration in area where product is being used. Resumption is an option after copious irrigation with 0.9% sodium chloride solution to an alternate suction source.

Substances	Effects	Recommended Action
Irrigating Solutions:		
Topical liquid examples: Thrombin–JMI™, Thrombostat®, Thrombogen®	Creates a fibrin clot by direct action on fibrinogen. May clot off system.	Avoid aspiration in area where product is being used. Resumption is an option after copious irrigation with 0.9% sodium chloride solution to an alternate suction source.
Alcohol	Causes red cell lysis.	Avoid aspiration in area where product is being used. Resumption is an option after copious irrigation with 0.9% sodium chloride solution to an alternate suction source.
Antibiotics *Examples:* Bacitracin, Neomycin, Polymyxin	Can result in renal and neural toxicity if blood is not washed.	Increase amount of wash volume by 500ml.
Betadine	Causes red cell lysis.	Avoid aspiration in area where product is being used. Resumption is an option after copious irrigation with 0.9% sodium chloride solution to an alternate suction source.
Chloropactin (Bleach)	Causes red cell lysis.	Avoid aspiration in area where product is being used. Resumption is an option after copious irrigation with 0.9% sodium chloride solution to an alternate suction source.
Hydrogen Peroxide	Causes red cell lysis.	Avoid aspiration in area where product is being used. Resumption is an option after copious irrigation with 0.9% sodium chloride solution to an alternate suction source.

Substances	Effects	Recommended Action
Irrigating Solutions cont:		
Hypertonic Solution *Examples:* 3% NaCl, 7.5% NaCl, Dextrose solutions	Causes red cell crenation.	Avoid aspiration in area where product is being used. Resumption is an option after copious irrigation with 0.9% sodium chloride solution to an alternate suction source.
Hypotonic Solution *Examples:* Sterile water, Glycine	Causes red cell lysis.	Avoid aspiration in area where product is being used. Resumption is an option after copious irrigation with 0.9% sodium chloride solution to an alternate suction source.
Ringers Lactate (Hartmann's Solution) (in presence of citrate anticoagulant)* *Not an issue if heparin is the anticoagulant used.	Calcium present may bind with citrate, negating the anticoagulant effect.	Use 0.9% sodium chloride for irrigation instead of Hartmann's Solution.

Contaminants		
Substances	**Effects**	**Recommended Action**
Non-biological Contaminants:		
Methylmethacrylate *Hardened Form*	May cause clogging of the system.	Avoid aspiration in area where product is being used. Flush suction line occasionally with anticoagulant or normal saline to keep clear.
Methylmethacrylate *Liquid or Powder Form*	May cause circulatory collapse.	Avoid aspiration in area where product is being used. Resumption is an option after copious irrigation with 0.9% sodium chloride solution to an alternate suction source.

Substances	Effects	Recommended Action
Biological Contaminants:		
Amniotic Fluid	Contains proteolytic enzymes that may activate clotting.	Amniotic fluid should ideally not be aspirated into the collection reservoir, but should be removed by separate suction prior to starting cell salvage. This recommendation will reduce the initial contamination, although *in vitro* evidence demonstrates that the cell salvage process can effectively remove plasma phase elements of amniotic fluid whatever the initial load. In life- threatening haemorrhage, therefore, a clinical decision to salvage red cells from the start of the procedure should be carefully considered. A number of hospitals in the UK have adopted the one suction approach irrespective of estimated blood loss. See Factsheet 8 for further information.
Bone Chips/Bone Grafting Materials	May cause clogging of the system.	Flush suction line occasionally with anticoagulant solution or normal saline to keep clear.
Bowel Contents	Potential for bacteraemia.	Do not aspirate into system. Resumption is an option after copious irrigation with 0.9% sodium chloride solution to an alternate suction source.
Fat	May not wash out completely.	Increase the wash volume. Reservoir and reinfusion bag should not be agitated (so that any fat can form a layer on top of the blood). A lipid filter may be used for reinfusion. If a visible layer of fat is present in the reservoir or reinfusion bag, processing/reinfusion of the salvaged blood should be halted to retain this layer in the reservoir/reinfusion bag.

Substances	Effects	Recommended Action
Biological Contaminants cont:		
Gastric and Pancreatic Fluid	Proteolytic enzyme may cause red cell lysis.	Do not aspirate into system. Resumption is an option after copious irrigation with 0.9% sodium chloride solution to an alternate suction source.
Infection at Site of Aspiration	Potential for bacteraemia.	Avoid aspiration in the presence of purulent material.
Skin Lesions (Infectious)	Incising a lesion may introduce organisms.	Blood recovery may be used if incision is not through a lesion.
Urine	Potential for bacteraemia if urinary tract infection is present.	Avoid aspiration into system in the presence of a urinary tract infection.
Mucous Membrane Procedures Examples: Oral, nasal, vaginal	Potential for bacteraemia, due to normal resident bacteria.	Medical risks and benefits should be discussed between the surgeon and the clinician responsible for cell salvage.

Malignancy		
Primary at Operative site	Evidence indicates the procedure is safe and does not increase the incidence of metastatic disease. The decision to use cell salvage in malignancies must be left to the discretion of the surgeon.	Medical risks and benefits should be discussed between the surgeon and the lead clinician for cell salvage. Avoid blood recovery at tumour site. Consider the use of a leucoreduction filter.
Metastatic at Operative Site	Potential for further spread of disease.	Disease already systemic. Use at discretion of surgeon.
Phaeochromocytoma	Potential for marked hypertension due to high concentrations of catecholamines.	Avoid aspirating at the tumour site. Resumption is an option after copious irrigation with 0.9% sodium chloride solution to an alternate suction source.

Substances	Effects	Recommended Action
Malignancy cont:		
Ascites	Tumour cells may be present.	Avoid aspirating into the system if the surgical procedure is for ovarian malignancy.

Haematologic Disorders		
Sickle Cell Trait	Wash procedure produces potential sickling of salvaged cells.	Alert staff of potential for red cell sickling.
Confirmed Sickle Cell Anaemia	Wash procedure produces potential sickling of salvaged cells.	Medical risks and benefits should be discussed between the surgeon and the lead clinician for cell salvage.
Cold Agglutinin Antibody	Agglutination of red cells may occur at temperatures lower than 37°C (98.6°F). Cold agglutinins are in plasma and will be washed off.	If cold agglutinins show significant activity at room temperature recommend transfusion of blood through a blood warmer.

Miscellaneous		
Titanium Alloy Prosthesis	Effect of darkened tissue or clots (blue/green/black) surrounding prosthesis unknown to systemic circulation.	Discontinue cell salvage until the prosthesis and all darkened tissue have been removed. Resume after the wound has been irrigated with 0.9% sodium chloride solution to an alternate suction source.
Liposuction	Fat concentration in salvaged blood may be too high to remove by washing.	Avoid blood recovery.

The information contained in this ICS Technical Factsheet has been sourced from members of the UK Cell Salvage Action Group (UKCSAG) and is generally agreed to be good practice. The UKCSAG does not accept any legal responsibility for errors or omission