

OCS Training Manual

DCD Hearts

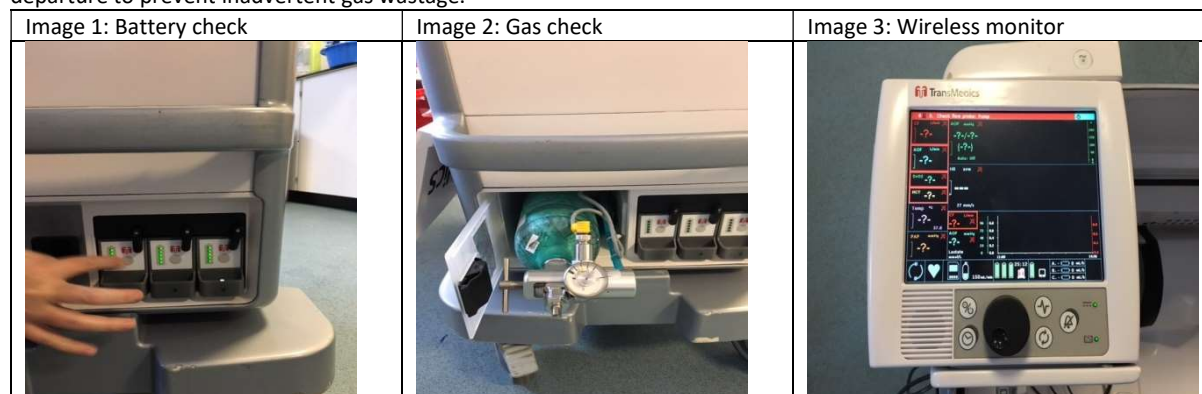


1. PREPARATION AND EQUIPMENT

The OCS machine and all equipment needed for a DCD heart retrieval is kept in the Retrieval Basement Room. As part of the daily basement checks, the allocated retrieval team member must ensure that all retrieval equipment is checked and ready for use as per the checklist. The basement checklist can be found online at

(S:)/shared/CAs/NORS/Checklists/basement check 2021. The specific OCS heart run bag checklist can be found online at (S:)/shared/CAs/NORS/Checklists/OCS heart run bag checklist. If there are any issues with the equipment, please escalate to a senior member of the NORS retrieval team and the transplant co-ordinator in a timely manner. Spare equipment can be found in theatres, or from the Perfusion Team whose office is located within the theatre area.

Prior to leaving Royal Papworth check battery levels (image 1), gas volume (image 2) and turn on wireless monitor (image 3). The cylinder must to be changed at this point if less than 12 hours remaining. Ensure gas cylinder is turned off prior to departure to prevent inadvertent gas wastage.



For a DCD heart retrieval there will be 2 team vehicles arrive on site in order to be able to pack and transport all the necessarily equipment and supplies. There is an OCS Run Equipment Check List kept in the Basement office to tick off equipment as it is packed into the vehicles (appendix 1).

1.1 EQUIPMENT NEEDED FOR A DCD HEART RETRIEVAL

- OCS Rig
- Heart Perfusion Set (OCS Module)
- Red Run Bag (See Appendix 3 for contents)
- Cell saver
- OCS Defibrillator
- Lifepak defibrillator
- TP Black Box (See Perfusion Manual for contents)
- OCS Black Box (See Appendix 4 for contents)
- Blue Roadside Bag (See Appendix 5 for contents)
- EPOC x 2 plus cartridges
- OCS Drug Box
- Standard Retrieval Drug Box
- Ringers Solution (500ml and 1L bags)
- Cardioplegia
- Ice Boxes (1 or 2 boxes depending if Lungs are also to be retrieved)
- Pneumoplegia if lungs accepted (See Perfusion Manual for Lung Protocol)

Once the above has been checked, packed into the vehicles and all staff are present, the team are ready to leave for the donor hospital.

1.2: Communication

On retrievals where the Royal Papworth Hospital surgeon is in attendance, they will liaise with the SNOD to notify them of our departure. In instances of a hybrid Harefield/ Royal Papworth Team, it is the responsibility of the Transplant Practitioner to liaise with the Transplant Co-ordinator from Papworth and SNOD to communicate departure, imminent arrival and any delays if necessary.

2 THEATRE SETUP

On arrival at the Donor Hospital transfer all of the equipment to theatres, with the exception of the blue Roadside Bag which can remain in the team vehicle. Please bring both Zoll & Lifepak defibrillators to theatre.

2.1 THEATRE PREPARATION

Once access has been gained to the operating room, find and set up an area for the OCS near a plug socket as the OCS must be plugged in at all times whilst in the operating room. Put brakes on, remove OCS lid, position OCS Defibrillator next to OCS Machine, and lubricate pump flow connector and AOF connector; gas to be turned on at this point.

Communication within the team, particularly the SNOD is very important as all preparation of equipment, drugs and paperwork must be set up and organised before the donor arrives in the anaesthetic room.

Delegation of tasks and responsibilities can be discussed at this time to ensure everyone is aware of their role throughout the retrieval process.

Ensure the preparation of blood samples, blood cultures and standard NHSBT retrieval paperwork is the same as documented in DCD Lung retrieval protocol (Refer to Section 6 & 7 of the Donor Procurement Perfusion Manual for protocol). DCD Heart Passport paperwork to be completed real time for both DRP retrievals and NRP retrievals.

2.2 DRUG PREPERATION

It is the role of the OCP (Organ Care Practitioner) to ensure all the required medications are prepared and drawn up according to the DCD Heart Protocol (Protocol is located in TP Black Box)

Drugs to Prepare:

- Vancomycin 1g
- Meropenem 1g
- Give scrub nurse Heparin 25,000iu for the RA
- Give scrub nurse Heparin 25,000iu for the PA
- Give scrub nurse Heparin 20,000iu for the blood collection bag
- Fluconazole 200mg*
- Methylprednisolone 1g *

Cardioplegia is prepared by the Transplant Practitioner as follows:

- Prepare cardioplegia - Add the following medication to 500ml bag of Ringers:
 - 2,500iu of Epoetin Alfa
 - 50mgs GTN
 - 3mls Sodium bicarbonate 8.4% (840mgs in 10ml amp)
 - 10mls cardioplegia concentrate

(Solution to be put back into the ice box but easily accessible for use when donor arrives in theatre)

- Prepare cardioplegia for back at Papworth – Repeat the above drug preparation x 2 to create a total of 1000ml cardioplegia solution (2 x 500ml bags). *(Solution to be put back into the ice box for use when heart is back at Papworth)*

| Solutions for OCS (Heart Solution Set) | Additive |
|--|--|
| Transmedics Priming solution | 20mls Sodium Bicarbonate 250mg Methylprednisolone |
| Transmedics Maintenance solution | 50 Units Actrapid |
| Adrenaline infusion (5% Glucose 500ml) | 0.25mg Adrenaline 30 Units Actrapid |

*NRP

Only

If using NRP, assistance will be required to set up as with a normal DBD retrieval.

2.3 SUCTION SET UP

There are 2 methods of blood collection used by the retrieval teams. Please identify which method of blood collection will be used prior to opening blood collection equipment. One method uses gravity to drain the donors blood, the other uses suction.

For both methods the cell saver reservoir must be primed with heparinised saline to reduce the risk of clot formation during blood collection. To do so, first place a clamp on the tubing which leaves the cell saver reservoir. Prepare a 500ml bag of NaCl 0.9% with 15,000iu of Heparin added. Run through and wet the suction pot; when you have 100mls in the bottom of the suction pot turn off. Please see image 4 below.

Image 4: Cell saver canister with heparinised saline.



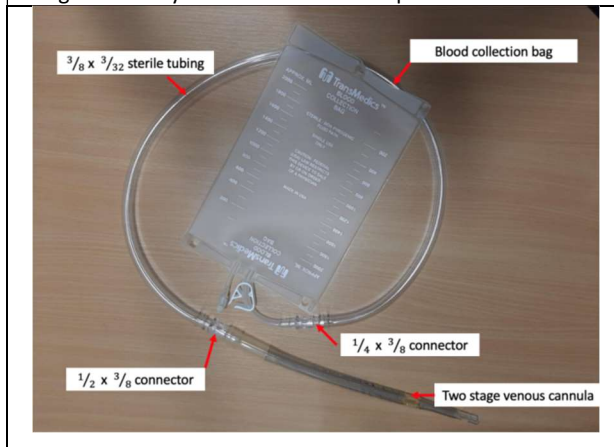
2.3.1: Blood collection using blood drainage bag (gravity method).

For this method, the following additional equipment must be opened for the scrub nurse once the patient meets criteria:

- 3/8 x 3/32 sterile tubing
- Blood collection bag
- 1/2 x 3/8 connector
- 1/4 x 3/8 connector

The scrub nurse will assemble the equipment as illustrated in image 5.

Image 5: Gravity blood collection set up



2.3.2: Blood collection using suction via cell saver

3. WITHDRAWAL OF TREATMENT

When all teams are prepared and ready the SNOD will transfer the donor to the anaesthetic room for withdrawal of treatment. Asystole will be confirmed by the SNOD and at this point set up of the OCS can commence.

If lungs are to be retrieved, set up DCD lung protocol. Do not give Scrub Nurse the Flolan. Instead add the Flolan 50mg to the 1L bag of Perfadex Solution.

4. ASSISTING SCRUB NURSE

It is the responsibility of the scrub nurse to set up the instrument trolley; however it is the OCP's responsibility to ensure

that all necessary OCS equipment for the scrub nurse is ready and available prior to withdrawal of life support. The OCP may delegate responsibility of opening this equipment to a staff member who is appropriately trained in opening equipment in a sterile manner. This should be agreed prior to the withdrawal of life support.

Once the donor has reached asystole the following should be opened -





- Two stage venous cannula - 91246C (Found in red OCS bag)
- Left Heart Vent Catheter – 12002 (Found in red OCS bag)
- Blood Collection Bag
- Aortic Connectors x 4
- Y Connector ¼ ¼ ¼ (Found in red OCS bag, if lungs are being retrieved))
- Connector ½ 3/8 (Found in red OCS bag)
- Foley Catheter x 2 (if lungs are being retrieved)
- Cable ties
- Cable tool tie
- Additional elements for blood collection

5. PREPARE SOLUTIONS

The prepared drugs for the Heart Solution Set as per section 2.2 need to be added to the priming and maintenance solution bags remembering that the maintenance solution bag must have both chambers of the bag mixed together by breaching the peelable seal.

6. INSTALLATION OF OCS MODULE

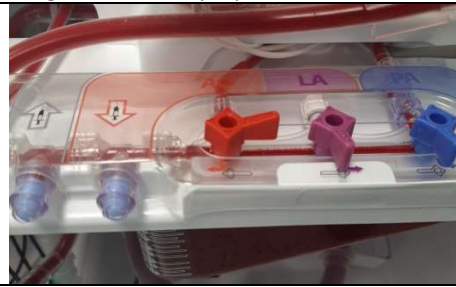
Open packaging along perforated edge, remove piece of pink foam from the bottom of the module. Install module at 30 degree angle until module clicks securely into place. Connect AOF probe, Pump probe and Gas (Compressed gas 85% O2, 1% carbon dioxide, balance nitrogen) (See images 6-9).

| | |
|---|--|
| <div>Image 6: Module in-situ</div>  | <div>Image 7: AOF connector in-situ</div>  |
| <div>Image 8: Pump flow connector in-situ</div>  | <div>Image 9: Gas tubing connected</div>  |

Turn monitor on and silence alarms (press and hold alarm button until alarm stops) Start pump at 1L and hang maintenance fluid bag and adrenaline bag in OCS console.
 Prime the OCS circuit using the priming solution prepared earlier. Connect prime line to priming solution bag using the yellow to yellow connectors and allow to run.

Turn the red, AO, 3 way tap to the right (03:00 position) as outlined in image 10.

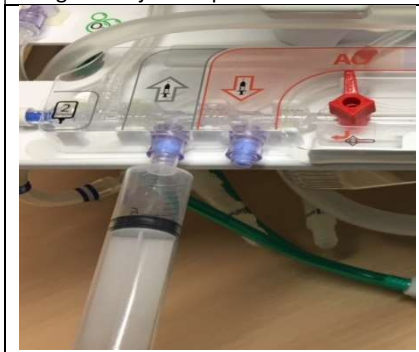
Image 10: AO, 3 way tap



7. ANTIBIOTICS

Add antibiotics to console using administration port, this can be done later if necessary.

Image 11: Injection port


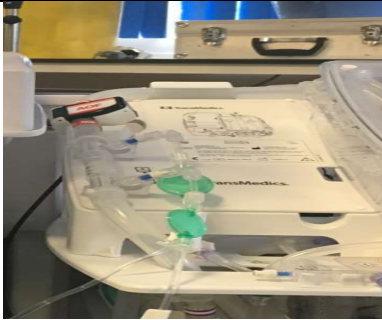
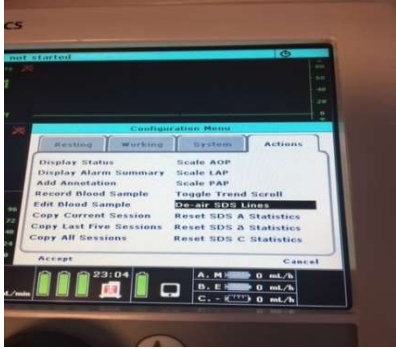



8. SDS CARTRIDGES

Open packaging to locate SDS cassettes and install as detailed below

1. Insert cartridge into SDS module
 - a. Remove shipping guards, green head cap and white body clip.
keep the white plastic covers for the channels they are non-disposable
 - b. Insert 'foot' of cartridge first, and then pinch wings to locate over brass head until the unit clips into place (Image 12).
2. Spike the bag with line clamped
3. Connect administration set to module (Image 13)
 - a. Maintenance (Channel A) to port 1
 - b. Adrenaline (Channel B) to port 4
4. De-air the giving set using controls on the wireless monitor (Image 14)
 - a. Press selector wheel
 - b. Dial until de-air SDS lines
 - c. Channel selection
 - d. Select relevant channel (Maintenance Channel A)
 - e. Select de-air and then press 5-6 times to de-air.
 - f. Select close
 - g. Repeat procedure for second channel (Adrenaline Channel B)
5. To set up infusions
 - a. Press selector wheel
 - b. Select resting
 - c. Select the relevant channel A/B
 - d. Select mode
 - e. Select manual
 - f. Select rate and set mls/hr - Maintenance 30ml/hr and Adrenaline 10mls/hr
 - g. Change the temperature to 34 degrees (image 15)


- h. Press accept
- i. A second press on accept starts the pump running

| | |
|--|---|
| Image 12: SDS cassettes in- situ | Image 13: Administration sets attached |
|  |  |
| Image 14: Select De-air SDS lines | Image 15: Select temp set point |
|  |  |

9. DRAPE WORK AREA

Remove wireless monitor prior to opening drapes.

Pull tabs 1-4 to open up drapes (image 16). Once opened this is your sterile field. Sterile gloves must then be worn to open heart chamber. Y connector from inside the heart chamber can be removed at this point (image 17).

| | |
|---|--|
| Image 16: Open sterile drapes | Image 17: Remove 'y' connector (sterile) |
|  |  |

10. BLOOD COLLECTION

One member of the team will be required to assist with the blood collection from the donor. The donor will need to be in a

steep head down position for exsanguination; aiming for 1L – 1.5L of blood in the collection bag. The blood is then emptied into the suction pot prepared earlier. Once all blood is in the suction container this is transferred to the OCS heart chamber and administered via the leucocyte filter once OCS set up is complete. (SDS de-airing can be completed at this stage if unable to complete previously)

11. INSTRUMENTATION

- Instrumentation of heart onto the OCS will now be completed by Surgeons.
- Whilst this takes place the pump flow will need to be decreased.
- Start clock as soon as the heart is placed on the OCS.
- Maintain AOP 60 – 70 mmHg
- Maintain pump flow 1L – Titrate according to AOP.

12. PACING (If required)

Pacing box should be set at 80bpm. Connect pacing leads to the pacing box including the pins which can be found in the top pocket of the red OCS bag and attached to the HPM defib connection on the OCS module.

13. DEFIBRILLATOR (If required)

Attach defib to the HPM connector on the OCS module. Turn selector switch on the defib to Defib mode, then select the required energy setting using the down arrow (Start with 10 joules). Press charge. Once the defib is charged ensure everyone is clear from the heart and deliver the shock using the shock button. Repeat as necessary, the energy setting may need to be increased by should never exceed 50 joules. If there is an issue with discharging or conduction of a shock from the defibrillator, please use the Lifepak defibrillator with internal defibrillator paddles. These paddles are held by the scrub nurse. A spare set are also located within the OCS roadside bag.

14. BLOOD GAS MONITORING

Both arterial and venous monitoring is required.

These gases are taken and then documented on the DCD Heart Passport (Paperwork will be found in the TP black box)

Blood gases are taken every 15 minutes for the first 90 minutes and every 30 minutes thereafter.

OCP will monitor results and act upon these accordingly. Document any medication administered to the OCS on the monitoring paperwork.

15. GETTING READY TO LEAVE

Ensure the OCS is not left unattended and pressures observed and monitored at all times.

Pack all equipment away.

When loading all the equipment back in the vehicles make sure the ice box with the prepared 1L bag of cardioplegia, OCS black box, OCS drug box and 2 EPOC's and cartridges travel back to implanting centre with the heart. Ensure that the roadside bag and defibrillator are also in the vehicle, within easy reach, for use while travelling if required.

Blood gases will continue throughout the journey as specified above.

16. ARRIVAL AT IMPLANTING CENTRE

Transfer OCS and all equipment to theatres.

The OCP and Surgeon will stay with the OCS until the heart is transplanted.

Blood gas measurements will continue to be taken throughout either using EPOC or theatre bench top analyser.

The OCS operator will be required to assist with taking the heart off the OCS.

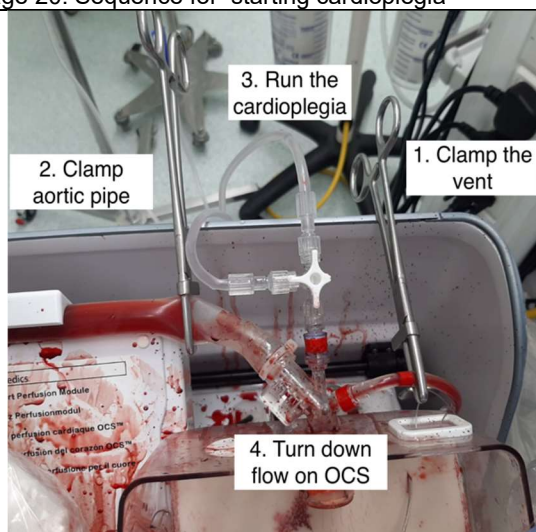
When surgical team are ready for the Heart to come off the OCS you will need to -

- Attach a 3 way tap to the de-air port
- Use a 10ml syringe to de-air the plegia port by withdrawing a few mls until there are no visible air bubbles.
- Trickle the cardioplegia to prime any remaining space. Once air has been dispelled attach giving set, ensuring it is still clamped/occluded (Image 18)
- On instruction from surgeon, clamp the vent tube, then the aortic pipe, then run the cardioplegia (Image 20)
- Turn down the pump flow on the OCS
- Document timings

Image 18: Cardioplegia attached



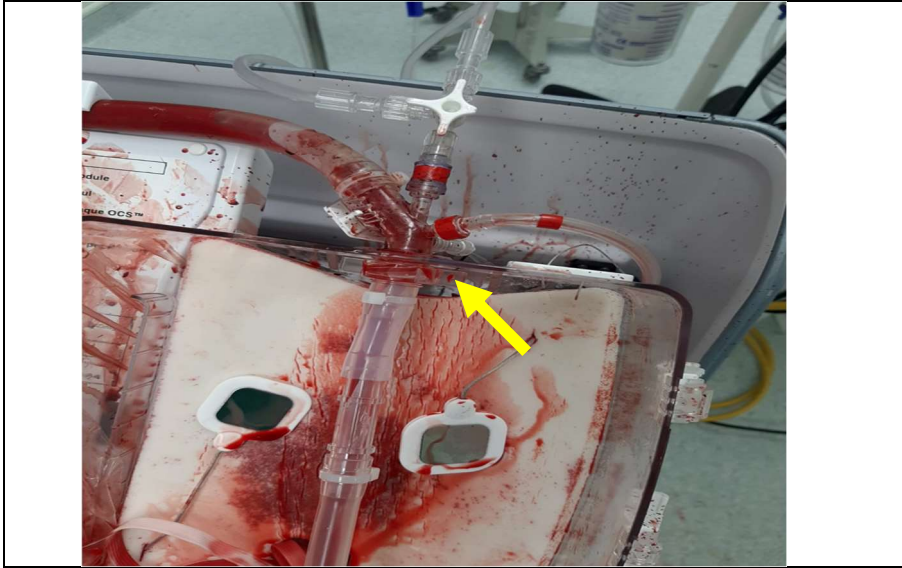
Image 20: Sequence for starting cardioplegia



17. DISMANTLING THE OCS MODULE

- Once heart is removed from OCS machine, remove the remaining aortic connector and attach the cardioplegia drain line (Image 21). Remove the clamps from both the vent and aortic pipe, then slowly increase the pump flow. Increase the flow until almost all fluid is removed from the module. Clamp the cardioplegia drain line, disconnect from the module and discard. Remove the module and dispose of it in the specific yellow bag kept in the DCD black box.
- Clean the rest of the OCS with an actichlor solution and prepare to leave theatre.

Image 21: Connect the cardioplegia drain line



18. ON RETURN TO PAPWORTH

- Ensure that all equipment is returned to the basement in a clean state. Restock any equipment used, ensuring that the equipment is ready to be used on another run before leaving the premises.
- It is the responsibility of the OCP to complete the remainder of the DCD heart passport. Please complete within a timely manner and send to the email address outlined on the front of the DCD passport.

Appendix 1

OCS RUN EQUIPMENT CHECK LIST

| | |
|---|--|
| OCS Console | |
| OCS Module | |
| OCS Red Kit Bag | |
| Cell Saver | |
| Zoll Defibrillator | |
| Lifepak defibrillator | |
| EPOC Machine x 2 | |
| EPOC Cartidges (Check expiry dates) | |
| Heart Perfusion Fluid | |
| Cable Tie Tool, Small Diameter | |
| TP Black Box | |
| TP Black DCD Heart Box | |
| DCD Heart Drug Box | |
| Small Black Drug Box | |
| Emergency Roadside Bag | |
| Ringers and Cardioplegia (1L bag and 500ml bag) | |
| Perfadex (If lungs accepted) | |
| Ice Boxes | |

If NRP the following is also needed -

| | |
|---------------------|--|
| DCP Big Black Box | |
| TOE Probe | |
| DCP Small Black Box | |
| Defibrillator | |
| Air/O2 Blender | |

Appendix 2 – OCS blood collection using cell saver

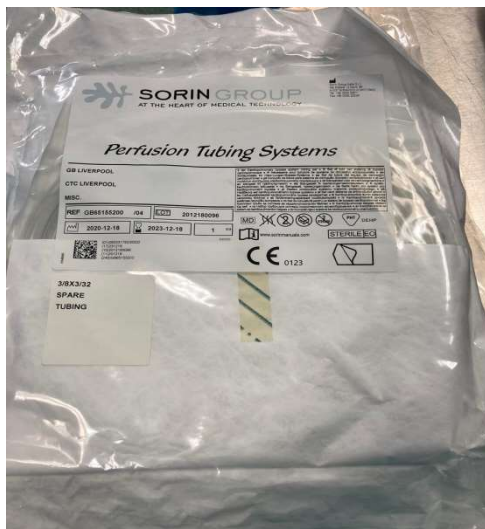
OCS Blood collection using cell saver

Cell saver set up -

- Place cell saver reservoir into holder and attach suction
- Add 20,000 iu Heparin into a 500ml bag of Saline 0.9%, run through giving set and attach to top of reservoir through the luer lock connector in order to wet the reservoir. Once the reservoir is wet remove the saline and giving set ensuring a bung is placed over the port on the reservoir

Pass the following consumables to the sterile scrub nurse from the red OCS run bag

- one 1/2 x 3/8 connector
- 3/8 x 3/32 sterile tubing - Request scrub nurse cut off approximately 25cms from one end keeping the blue cap on



OPP to connect 3/8 x 3/8 connector to the 25cm portion of tubing; ensure to cover with the blue cap once connected



Connect the 25cm tubing length to the top of the reservoir and apply tubing clamp. Once the right atrium is cannulated release clamp from the tubing



Attach leukocyte filter directly onto the bottom of the reservoir (As per your previous practice)
Run the heparinised saline through the reservoir to ensure it is sufficiently 'wet'
Add extra 30.000 IU of heparin to the reservoir

The Surgical Team will prepare the blood collection line attaching the $\frac{1}{2}$ x $\frac{3}{8}$ connector to the tubing once the 25cm section has been cut off

Blood Collection

Once the surgical team have placed the two-stage cannula into the right atrium they will connect it to the $\frac{3}{8}$ x $\frac{3}{32}$ tubing and give the other end of the tube to the OPP

Remove the blue cap from the tubing attached to the top of the reservoir and connect to the tubing passed out by the surgeon. Once connected unclamp the tube and ensure the suction is at maximum (250mmHg)

Inform the surgeons of the amount of blood filling the reservoir. Once enough blood is collected into the

reservoir remove the suction tubing from the top of the reservoir and put blood via the leukocyte filter into the OCS machine.