

**DONOR RETRIEVAL PROCESS FOR HEART AND LUNGS**

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## DONOR RETRIEVAL PROCESS FOR HEART AND LUNGS

### 1 INTRODUCTION

Following the recommendations of the Commission for Health Improvement (CHI) Investigation into Heart and Lung Transplantation at St George's Healthcare NHS Trust, the former UK Transplant Cardiothoracic Advisory Group (UKT CTAG) was given the remit to:

“Develop clear national standards for adequately funded retrieval processes for donor hearts and lungs. The standards should specify the staff mix required for the retrieval process in relation to transplant co-ordination and the team retrieving the donor organs.”

This protocol has been produced to reflect and amalgamate existing policies provided by the six cardiothoracic transplant centres and two paediatric transplant centres in the UK.

### 2 REVIEW

This document will be reviewed every two years, or more frequently as need occurs.

### 3 MULTI-ORGAN RETRIEVAL

The multi-organ retrieval should take place in the donor hospital as early as possible after the offer has been received.

#### 3.1 Members of the Donor Retrieval Team

The usual members of the Heart and Lung Transplantation Donor Retrieval Team are as follows

- q Cardiac surgeon who is suitably trained and experienced in performing cardiothoracic donor retrieval operations
- q Trainee donor surgeon
- q Anaesthetist<sup>1</sup>
- q Donor perfusionist/technician
- q Nurse
- q Staff in training
- q Other staff. <sup>2</sup>

<sup>1</sup> Additional personnel are supplied by the donor hospital, which normally consists of an anaesthetist and circulating nurse or ODA. Some donor teams may choose to take along their own anaesthetist as part of their retrieval team.

<sup>2</sup> Other transplant teams are usually also present at the retrieval for example, the liver team who may also retrieve the kidneys, small bowel and pancreas.

The emphasis is on collaboration with the multi-disciplinary team and professionalism must be maintained at all times, as this is paramount for the smooth running of the retrieval process.

The Donor transplant co-ordinator will be present throughout the whole retrieval process to ensure that the family's wishes are adhered to, the smooth running of the retrieval process and the accurate completion of relevant documentation.

### **3.2 Equipment**

The retrieval teams should bring their own equipment to avoid cost implications for the donor hospital, including the following

- q Sterile instruments
- q Organ storage bags and ice
- q Cool box containing all necessary perfusion fluids, blood bottles and specimen pots (for spleen and lymph nodes)
- q Antibiotics, steroids and other relevant drugs
- q Invasive monitoring equipment (e.g. Swan Ganz catheter)
- q Bronchoscopy
- q Donor information forms.

### **3.3 Transport**

The recipient transplant co-ordinator will arrange transport. Road or air travel arrangements will be dependent upon the location of the donor hospital. Any further transport to or from the destination will also have been arranged. For travel outside the UK, including within the EU, a current passport will be necessary.

### **3.4 The surgical team attending the retrieval has the following responsibilities**

- q Communication is essential with all persons involved in the retrieval process and with the transplants centres
- q The notes should be checked for confirmation of brain stem death, consent, blood group and assessment of risk factors with the general suitability of the donor
- q Patient's identification must be checked with ID band
- q CXR and ECG should be reviewed.

In the operating theatre the surgeon should introduce him/herself and team to the local donor transplant co-ordinator, theatre staff and other transplant teams and explain to them which organs are to be removed and the procedure to be used.

The surgeon should communicate with the anaesthetist about the following:

- q Stability and haemodynamic data
- q Blood gases/Fio<sub>2</sub>
- q Lung compliance
- q Amount of tracheal suction
- q Blood results
- q Inotropic support and any extra requirements
- q Blood loss and colloid replacement.

The anaesthetist will administer to the donor prophylactic antibiotics and one gram of methyl prednisolone as soon as possible and collect blood for sampling.

#### **4 ASSESSMENT OF ORGANS**

If lungs are to be removed a bronchoscopy may be performed by the surgeon prior to a sternotomy to allow an assessment of the state of the lungs (oedema, trauma, secretions, etc). A sputum sample is obtained, and bronchial lavage is performed at this stage for visual inspection and for culture.

Either the cardiac surgeon or liver surgeon performs a sternotomy. Minimal dissection is performed to allow inspection of the heart and lungs.

The pericardium is opened and elevated, the heart is inspected and palpated for

- q Size
- q Contractility
- q Anomaly
- q Coronary arteries for damage or evidence of coronary artery disease
- q Pressures (if not already done via Swan Ganz).

#### **5 HEART-LUNGS/LUNGS RETRIEVAL**

Sternotomy performed and pericardium opened widely. The heart is examined as above. Both pleura are opened. The lungs should be examined for:

- q Appearance and size
- q Palpation
- q Consolidations, atelectasis and trauma
- q Extensive swelling, air trapping, large lacerations and large bullae
- q Sampling for pulmonary venous gases.

## **6 COMMUNICATION**

Once the above information is available, the retrieving surgeon should contact the consultant cardiothoracic surgeon at the recipient transplant centre and discuss the findings. A decision will then be made regarding the suitability of the organs. Pertinent information should include the past medical history, pharmacology, haemodynamic data, pulmonary gas exchange, macroscopic appearance of the heart and where available, bronchoscopic appearance of the lungs. This comprehensive review is presented to the consultant surgeon at the recipient centre so that a decision can be made.

The recipient transplant co-ordinator will be contacted to confirm time and the suitability of the organs so that necessary arrangements at the recipient hospital can proceed. At this time, the surgeon should be able to advise an approximate time for cross-clamp application and the time that the organs will be ready to leave the donor hospital. Specific recipient requirements must be discussed.

Before returning to the operating table, donor information should be completed on the specific forms, one for each recipient centre, and also the NHSBT Donor Information Form.

## **7 THE SURGICAL TECHNIQUE**

Splanchnic dissection usually takes from 45 minutes to 3 hours, during which time it is not uncommon to have frequent and large haemodynamic fluctuations due to compression of the inferior vena cava (IVC) and manipulation of the adrenal glands. Considerable blood and heat loss may occur. Advice should be sought from the liver surgeon regarding the predicted length of time for the splanchnic dissection.

Maximal co-ordination and co-operation is required at this time, with the goal of minimising warm ischaemic time and effecting the rapid but safe removal of all organs.

The cardiac surgeon returns to the operating table following the abdominal dissection but before any abdominal cannulation. Once dissection is complete heparin 3mg (300 units)/kg should be administered. Ensure that the prophylactic antibiotics and blood sampling has been obtained.

## **8 HEART DISSECTION**

- q Set up cardioplegia (e.g. St Thomas's) infusion
- q Dissect around the superior vena cava (SVA) and inferior vena cava (IVC)
- q Minimal dissection around the distal ascending aorta leaving just enough space for cross clamping
- q Ask the anaesthetist to remove all central lines (Swan Ganz)

- q Cross-clamp the aorta as high as possible – ensure that the abdominal team are aware so that splanchnic perfusion can commence. This represents the start of the ischaemic period
- q Commence cardioplegia solution (15ml/kg) through a cannula in the ascending aorta until asystole occurs and infusion is complete
- q Ask the anaesthetist to stop ventilation
- q Divide the IVC close to the diaphragm while the cardioplegia is running
- q At this stage the liver team usually start the liver perfusion causing flooding into the pericardial cavity, which should be dealt with by the presence of strong suction. In children, the liver effluent should be removed by suction from the abdominal cavity
- q During perfusion observe that there is adequate pressure being exerted (e.g. 150mmhg for an adult heart) to the cardioplegia bag
- q If pressure is still low be aware of aortic valve incompetence, check for left ventricle (LV) distension and check the aortic valve after dividing the aorta
- q If the aortic valve is normal give extra cardioplegia to the aortic root after applying a clamp distally
- q To avoid LV distension it is mandatory to divide one of the pulmonary veins or left atrial appendage
- q The electrical activity of the heart should be observed. In the presence of continuing electrical activity you may need to worry about the adequacy and delivery of the cardioplegia solution. In some cases additional amounts may be necessary
- q With a history of hypertension, there may be the presence of left ventricular hypertension (LVH), therefore cardioplegic solution may be necessary to obtain adequate perfusion and preservation of the heart
- q After giving the cardioplegia remove the cardiac cannula from the ascending aorta
- q Divide the ascending aorta as high as possible
- q Divide the pulmonary artery at the bifurcation level
- q Divide the SVC at the level of the azygos vein
- q The left pulmonary veins are divided from the left atrium
- q The left atrium is released from the posterior mediastinum by cutting the pericardial
- q Specific details may vary for paediatric heart removal

## **9 HEART-LUNG/LUNGS**

Some centres may wish to use a cardiopulmonary by-pass machine to cool the donor as part of the organ retrieval process. When assessment of heart/lungs and abdominal dissection is complete the cardiac surgeon performs the following:

- q Pulmonary perfusate (e.g. perfadex) may be prepared at this stage
- q Encircle aorta, SVC, and trachea (as high as possible)
- q Administer heparin of between 20000 to 30000 units (liaise with liver team about timing & dose)
- q Cannulate aorta for cardioplegia. Cannulate pulmonary artery (4 or 5F cannula)
- q Arrange with liver team timing of cross-clamp

- q Inflate lungs to avoid atelectasis (if lungs are considered)
- q Clamp or ligate SVC
- q Cross clamp aorta (continue ventilation if lungs are donated)
- q Divide IVC
- q Vent heart through left atrial appendage
- q Heart only: divide left pulmonary veins
- q Heart & Lungs: incise left upper pulmonary vein leaving good atrial cuff for lung
- q Infuse 2 litres of crystalloid cardioplegia. If applicable perfuse lungs
- q When infusion is completed, take cannulae out and start dissection.

## **10 HEART-LUNG BLOC DISSECTION**

- q Complete division of IVC
- q Divide SVC
- q Excise posterior layer of pericardium transversely
- q Start dissecting left lung beginning by dividing left inferior pulmonary ligament, going upwards close to the oesophagus. Transect descending aorta below the origin of left subclavian. Then divide all neck vessels away from trachea
- q Dissect right lung starting from inferior pulmonary ligament, going upwards to the level of azygos vein, which can be ligated or divided. Then divide all right neck vessels away from trachea
- q Divide aorta as high as possible
- q Staple trachea as high as possible (discontinue ventilation) and divide trachea above staple line
- q The heart-lung bloc can then be lifted out of the thorax
- q The heart-lung bloc is dissected on a table. During this dissection, the bloc should be kept moist by irrigation with slush/cold saline.

## **11 HEART AND LUNGS DISSECTION**

- q Complete incision of left pulmonary veins going towards right pulmonary veins leaving good atrial cuff for both heart and lung
- q Finish procedure as described above
- q Lungs may be split by using stapler, leaving lungs inflated. The right main bronchus will remain with the right lung.

## **12 ICE BOX**

Organs should be placed in a 3 bag technique. After the organ retrieval, all the organs should be placed in the ice box with blood specimens and a piece of spleen and a sample of lymph nodes (placed in labelled specimen pots containing 0.9% saline) for each recipient centre.

**13 LEAVING THE DONOR HOSPITAL**

As the heart and lungs are the organs most susceptible to ischaemic injury it is customary for the heart/lung team to leave prior to the closure of the donor wounds. It is very important to collect and package all the equipment in a quiet and efficient way with all members of the team contributing and helping to clear any residual mess.

The cardiac surgeon should express final thanks to members of the donor hospital and the other donor transplant teams who will continue with the final stages of the donor procedures.

Before departure, the cardiac surgeon should ensure that all necessary paperwork is completed as required by the donor transplant co-ordinator and write a short concise note in the donor's medical notes.

As soon as possible after starting the return journey, the recipient transplant co-ordinator should be informed of the estimated time of arrival at recipient hospital.

## REFERENCES

Commission for Health Improvement (2001) Investigation into heart and lung transplantation at St George's Healthcare NHS Trust

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