swiss transplant

CM
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STANDARD OPERATING PROCEDURE (SOP) FOR MULTI-ORGAN RETRIEVAL

Donation after Circulatory Death (DCD)

Swisstransplant Working Group for Procurement and Transport (STAPT)

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1. Preparation

Before organ procurement starts, the retrieval surgeon must check the following.

1.1 Checklist

- Brain death protocol
- DCD Protocol
- Organ donation consent
- Blood group compatibility
- Serology
- Chest X-ray, CT scan (if available)
- Medical history (SOAS)
- Hemodynamic status and vasoactive drugs requirement
- Blood gas analysis (with FiO_2 100 % and 5 mbar PEEP)
- Organ specific blood exam results

1.2 Procurement times

Procurement surgeons are trained in their own centre to be allowed to go outside for retrieval. The senior surgeon of the centre is in charge to teach the procurement surgeons during the procurement. The retrieval team must have a correct behaviour in the OR.

The procurement of visceral organs is performed within approximatively 30 minutes:

- 20 min for liver/pancreas
- 10 min for kidneys

The procurement of lungs takes 30 minutes.

1.3 Definition and acronyms

SOAS	Swiss organ Allocation System
IVC	Inferior Vena Cava
CIA	Common Iliac Artery
SMA	Superior Mesenteric Artery
SVC	Superior Vena Cava
LCCA	Left Common Carotid Artery
LAA	Left Atrial Appendage
IGL-1	Institute Georges Lopez Preservation liquid

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2. Super rapid technique abdoinal team

2.1 Incision

Midline medial laparotomy, from xiphoid to symphysis (visceral team). Other incisions accepted if justified (obesity, adhesions…). No diathermy for all layers.

2.2 Cannulation and retrieval preparation

Cannulation is done 5 minutes within start of procedure (start of cold flush).

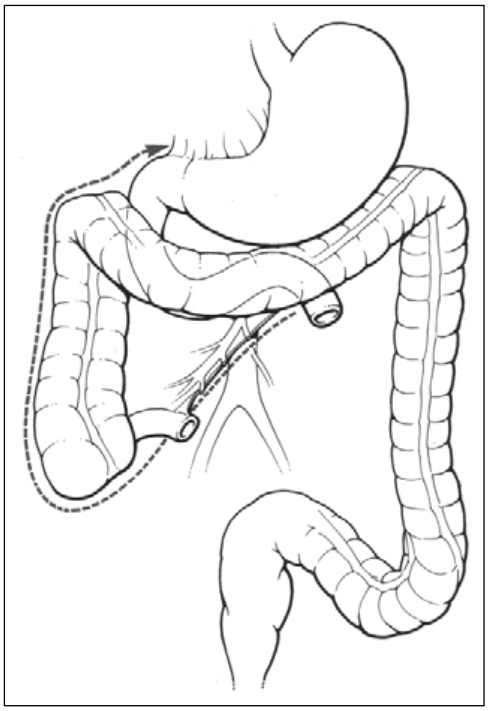

Figure 1

1. Incise peritoneal fold of distal ileum and caecum (scissors)
2. Complete manual exposure of the retroperitoneum following mobilization of right hemicolon (Figure 1)
3. Identify the right common iliac artery
4. Open the right common iliac artery (CAVE Ureter).
5. Insert "simple cannula" and clamp at proximal aortic level
6. Start flush with pressure (150mmHg): 2 l Saline + 20000 U Heparin (20 °C), afterwards switch to cold IGL-1 (4 °C, 4–6 l).
7. Fill abdomen with ice.

2.3 Eploration

During abdominal flush, check all abdominal and thoracic organs for diseases or abnormalities.

➔ Contraindications: malignant abdominal tumour.

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3. Retrieval technique lung team

3.1 Lung retrieval

Lung retrieval team waits while the abdominal surgeons cannulate. As soon as they have cannulated and started the flush, the lung team takes over and starts with sternotomy.

1. Sternotomy
2. Open the pericardium.
3. Insert pulmonary artery cannula.
4. Connect the cannulas to the perfusion solutions and de-air. The pulmonary preservation solution should be placed 30 cm above the heart level .
5. Continue ventilation with 100 % FiO2 and 5 mbar PEEP. The donor is already intubated after 10 minutes of no touch period.
6. Open the left atrium appendage with a scissor to decompress the heart and drain the pulmonary preservation solution.
7. Incise the inferior vena cava above the diaphragm close to the atrium (Figure 2). It is important to leave a long vena cava inferior for liver transplantation.

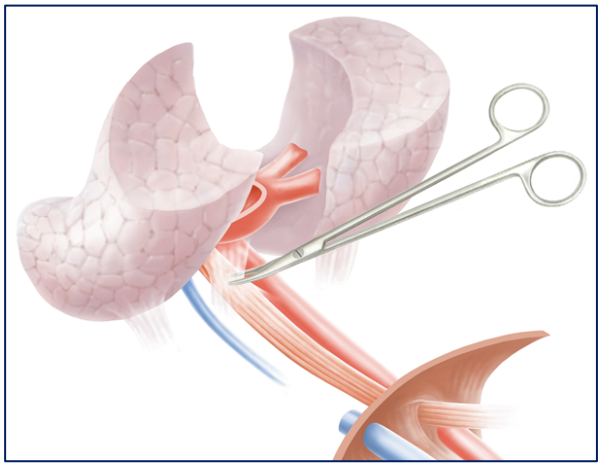

Figure 2

8. Open the both mediastinal pleura.
9. Surface cooling is done by applying cold saline, not ice cubes!
10. Check the appearance of the lungs.
11. Is there any atelectasis or consolidation?
12. Are the lungs heavy (oedema)?
13. Emphysematous lung?
14. Thorough palpation of the both lungs for any lesion (tumour, nodule etc.)
15. Are there any adhesions?
16. Are the fissures complete or incomplete (for lobar transplantation or size reduced lung transplantation)?
17. Test the lungs for compliance (disconnection from ventilator).
18. When the lung is acceptable, inform the anaesthetist to intubate the recipient.
19. Retrieve now the lungs.
20. First, divide both inferior pulmonary ligaments.
21. Then, continue the dissection along the anterior part of the oesophagus with luxation of the lungs with the left hand upwards until carina (Figure 2).

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22. Dissect the remaining part of the left mediastinal pleura by luxation of the left lung into the right hemi thorax.
23. Transect the descending aorta below the left subclavian artery. Reposition the left lung into the left hemi thorax.
24. Luxate the right lung into the left hemi thorax.
25. Open the remaining part of the mediastinal pleura to the level of thoracic inlet.
26. Place the right lung again into the right hemi thorax.
27. Divide all the vessels above the trachea and gently mobilize the trachea from the oesophagus.
28. Staple the trachea above the carina at the end of inspiratory phase of ventilation following opening all the atelectasis with the help of anaesthesiologist (manual gentle inflation).
29. Before dividing the trachea above the staple line, apply another clamp and divide the trachea between the clamp and the staple line.
30. Remove the lung block from the thoracic cavity and disinfect tracheal cut line by betadine solution.

4. Abdominal organs retrieval

4.1 En bloc liver and pancreas removal (following removal oft he thoracic organs)

➔ A paragraph with the option of separated removal of liver and pancreas is in preparation

1. Check for aberrant hepatic vessels, open gallbladder and rinse gallbladder.
2. Incise the diaphragm on the left side up to the oesophagus, on the right side until the adrenal gland with much care not to cause lesions to the right liver capsule due to traction.
3. Divide the right gastroepiploic and right gastric artery.
4. Staple the proximal duodenum directly distally to the pylorus, using a 60 mm GIA blue stapler magazine (CAVE NASOGASTIC TUBE!).
5. Transect gastric artery and vein.
6. Transect inferior mesenteric vein at the distal border of the pancreas.
7. Dissect and transect the superior mesenteric artery vein at the 3rd part of the duodenum next to the inferior part of the head of the pancreas.
8. Staple the 3rd part of the duodenum distal to the angle of Treitz using a reload for the GIA.
9. Transect the ligamentum splenocolium whilst lifting up the tail of the pancreas using the spleen as a handgrip.
10. Release the dorsal side of the pancreas.
11. Dissect the aortic part of the superior mesenteric artery under visualization of the left and right renal arteries.
12. Free the infrahepatic IVC showing the origins of the right and left renal veins and transect the IVC just above the renal veins.
13. Divide the right paravertebral muscle layer and transect the right adrenal gland.
14. Divide the left paravertebral muscle layers and transect the left adrenal gland up to the sling/clamp of the proximal aorta.
15. Divide the prevertebral connective tissue and cut the SMA with the proximal aorta including the coeliac trunk.
16. Release the complete bloc.

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4.2 Back table separation of liver and pancreas (before packaging)

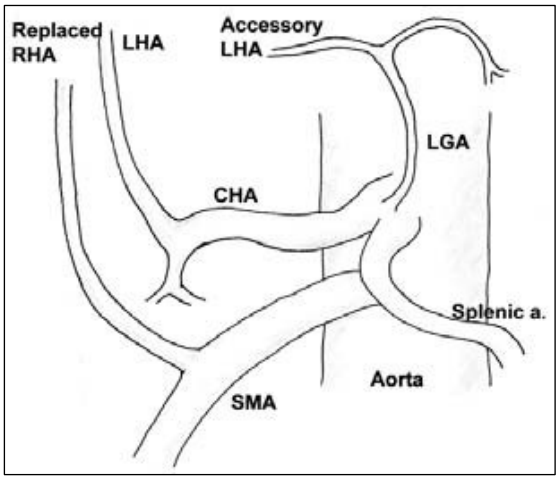

Figure 3

1. Divide the hepatoduodenal ligament and the common hepatic artery.
2. Mark suture (towards the pancreas) and transect the gastroduodenal artery at the upper border of the head of the pancreas with consecutive transection leaving a stump at the common hepatic artery.
3. Transect the portal vein above the confluence of the splenic and superior mesenteric vein.
4. An aberrant/accessory right hepatic artery might become apparent dorsal to the portal vein (if present, ligation of right hepatic artery at its origin, preserving the SMA for the pancreas) (Figure 3)
5. Ligate the distal ductus choledochus and transect.
6. Prepare and divide the aorta with a patch for the coeliac trunk and SMA ends the split procedure.
7. Before packaging, open gallbladder, rinse gallbladder and common bile duct extensively with preservation solution.
8. Extensively rinse DCD liver with cold IGL-1 through the portal vein until complete removal of blood.

4.3 En bloc retrieval of kidney

1. Following incision of the retroperitoneum, lift up the sigmoid.
2. Transect the left mesocolon.
3. Dissect and transect the ureters close to the bladder and clip/shot marking of their distal ends.
4. Incise the left perirenal fat and freeing of the left kidney.
5. Lift up both ureters together with the IVC and distal aorta.
6. Dissect the retroperitoneal tissue will provide the en bloc kidneys.
7. At back table isolate and transect the left renal vein with a patch of the IVC leaving most of the IVC with the right renal vein.
8. Turn over the kidney bloc to open the posterior aorta in between the lumbar arteries.
9. Transect the anterior wall of the aorta under clear view of renal arterial orifices and potential additional arteries, **preserving patches for all (also for potential use on Life Port).**
10. Back table perfuse the kidney to check for clear flush.

Remove most perirenal fat before packaging, no preparation of the renal hilus.

Procure the iliac arteries and veins as a tool kit for both liver and pancreas. Dissect and transect the 2nd degree branches of the internal iliac artery. In case of severe arteriosclerosis, perform procurement of the brachiocephalic arteries additionally.

Leave the entire mesenteric root attached to the pancreas providing the ileocolic artery for direct revascularization of the splenic artery.

Meticulous and watertight closure of the thoraco- laparotomy. Close neatly the skin and dress decently wound.

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5. Organ packaging

- 1st bag: organ in cold preservation solution (min 500ml), no ice
- 2nd bag: sterile cold saline solution
- 3rd bag: **nihil**

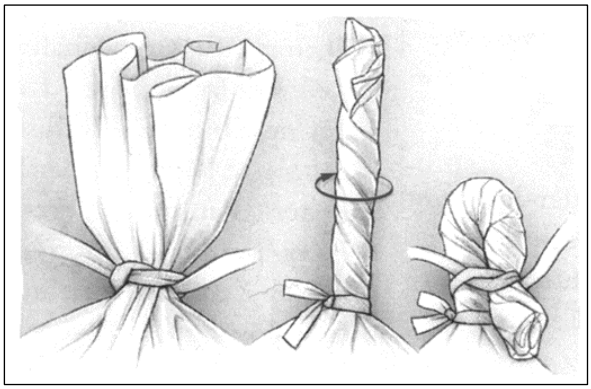

Figure 4

- ➔ Each bag is firmly tied, no air in bags (Figure 4)
- ➔ Immediately identify the organ with a tag on the third organ bag
- ➔ Put the triple organ bags in the Vitalpack or on ice in a transportation box to maintain a temperature of 4 °C
- ➔ Put retrieved vessels in an extra bag (or container) with preservation solution
- ➔ Put spleen or lymph nodes in a container with saline solution

6. References

- Heiko Wunderlich, Jens Brockmann, Rigo Voigt, Falk Rauchfuss, Andreas Pascher, Stefan Brose, Christian Binner, Hartmuth Bittner, Ernst Klar: German Procurement Guidelines, Transplant International, 2011, European Society for Organ donation and Transplantation 24 (2011) 733-757
- NHSBT, National Operating Procedure: Packaging, Labelling and Transport of Organs in Deceased and Living Donation and Transplantation, NOP003v2, December 2016