

## Abdominal Perfusion and Preservation Protocol for NORS Teams in the UK

### Background

Following a meeting of representatives from all of the NORS abdominal centres on 9<sup>th</sup> October 2012, a national protocol for the use of preservation solutions was agreed. This protocol was reviewed on 17 September 2014. The protocol covers the following:

1. Donor type: DBD or DCD;
2. Organ specific: Liver, pancreas and kidney retrieval;
3. In-situ portal flush of the liver;
4. Back table perfusion of liver, pancreas kidney;
5. Packing for static cold storage and transport;
6. Specific issues were also highlighted: use of streptokinase in DCD, pressurised aortic in-situ perfusion, minimum volumes of solution.
7. Where the document refers to University of Wisconsin (UW) solution, this should be read as "UW or equivalent". "Equivalent" means the fluid used must have the same chemical composition as University of Wisconsin fluid for cold storage solution.

### In situ perfusion

1. The aim of in situ perfusion should be to ensure the effluent runs clear.
2. Teams should record the volume of fluid used per donor.

| <b>DBD</b>                        | <b>Aorta (type/volume)</b>  | <b>Portal vein (type/volume)</b>   |
|-----------------------------------|---|------------------------------------|
| <b>Liver, pancreas and kidney</b> | UW solution 50 – 70 ml/kg   | Nil or UW 1 litre                  |
| <b>Liver and kidney</b>           | UW or Soltran solution<br>50 – 70 ml/kg   | UW 1 litre when<br>Soltran is used |
| <b>Kidney</b>                     | UW or Soltran solution<br>50 – 70 mls/kg  | N/A                                |
| <b>DCD III</b>                    |   |                                    |
| <b>Liver, pancreas and kidney</b> | UW solution alone (heparinised)<br>50 – 70 ml/kg<br>or<br>1 litre flush with heparinised low viscosity<br>solution followed by UW solution<br>50 - 70 ml/kg | UW 1 litre                         |
| <b>Liver and Kidney</b>           | UW solution alone (heparinised)<br>50 – 70 ml/kg<br>or<br>1 litre flush with heparinised low viscosity<br>solution followed by UW solution<br>50 – 70 ml/kg | UW 1 litre                         |
| <b>Kidney</b>                     | UW solution alone (heparinised)<br>50 – 70 ml/kg<br>or  | N/A                                |

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|  | 1 litre flush with heparinised low viscosity solution followed by UW solution<br>or<br>Soltran solution alone (heparinised)<br>50 – 70 ml/kg |  |
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Important: the use of Soltran solution only for aortic in-situ perfusion was agreed for liver and kidney DBD retrievals, with the proviso that portal vein perfusion with UW solution is also undertaken (either in-situ or during the back table).

There was discussion around the merits of flushing the aorta and the organs in the context of DCD with 1 litre of low viscosity solution, such as Soltran solution. It was noted that while there is currently no clear evidence for a benefit, teams who prefer this regimen can continue to do so.

### Back table perfusion

Back table perfusion may not be required if in situ examination demonstrates that the organs are well-perfused. However, portal perfusion must take place, either in situ or on the back table.

| DBD      | HA<br>(type/vol)     | Portal<br>(type/vol)  | CBD<br>(type/vol) | Pancreas<br>(type/vol)          | Kidney<br>(type/vol)                            |
|----------|----------------------|-----------------------|-------------------|---------------------------------|---|
| Liver    | UW<br>200-500<br>ml  | UW<br>500-1000<br>ml  | UW<br>250 ml      |                                 |   |
| Pancreas |                      |                       |                   | Nil unless<br>indicated<br>(UW) |   |
| Kidney   |                      |                       |                   |                                 | UW or Soltran 200-<br>300 ml or until clear     |
| DCD III  |                      |                       |                   |                                 |   |
| Liver    | UW<br>200-500<br>mls | UW<br>500-1000<br>mls | UW<br>250 mls     |                                 |   |
| Pancreas |                      |                       |                   | Nil unless<br>indicated<br>(UW) |   |
| Kidney   |                      |                       |                   |                                 | UW or Soltran 200-<br>300 mls or until<br>clear |

## Packing for static cold storage and transport

| Packing    | Liver (type/vol)                | Kidney (type/vol)             | Pancreas (type/vol) |
|------------|---------------------------------|-------------------------------|---------------------|
| <b>DBD</b> | UW until submerged (approx 2 L) | UW or Soltran (approx 250 ml) | UW (approx 500 ml)  |
| <b>DCD</b> | UW until submerged (approx 2 L) | UW or Soltran (approx 250 ml) | UW (approx 500 ml)  |

### Other discussion points and specific issues:

1. The administration of streptokinase in an initial flush is not acceptable in the retrieval of liver or pancreas, as it must be delivered at normal body temperature, and concern was expressed about the delay in cold perfusion. The evidence base for its use in liver and pancreas retrievals is non-existent.
2. The group supported the administration of heparin in the aortic flush.
3. The use of pressurisation of fluids was debated, with the recommendation that a pressure of max 200 mmHg be exerted, which has previously been shown to correspond to an intra-aortic pressure of around 40 mmHg.
4. The addition of additives, such as benzyl penicillin, insulin and dexamethasone, to the preservation solution UW is not recommended any more. The addition of fresh glutathione is optional, although no clinical evidence is available for a benefit.
5. When UW solution is obtained from Bridge to Life (Belzer UW Solution) or from ORS (SPS-1) no filter is needed.
6. Auxiliary blood vessels retrieved for use as conduits should be stored in UW solution in pots where possible to facilitate transport to the transplanting centres. If the vessels are to be stored after the transplant then antibiotics may be added to the pots at the recipient centre according to current centre practice.
7. It was agreed that, in line with European practice, all organs should be stored in **THREE** bags.
8. All organs should be stored as follows:
  - a. Each organ is submerged in sufficient cold preservation solution in the first bag.
  - b. The second bag is filled with at least 250 ml cold saline (without any ice).
  - c. A small amount of fluid (sufficient to ensure there is no air in the bag) shall be placed between the second and third bags.
  - d. Important: each bag is firmly tied after adequate de-airing.
  - e. The bagged organs are then placed in the transport box and covered with non-sterile melting ice.
9. The liver should be placed in a sterile bowl (if the liver is too large to fit in the bowl, the bowl should not be used) and submerged in preservation solution. The bowl with the liver is then packed as described above.

10. For all livers which are to be split, and in all paediatric donors, all perfusion must be with UW solution, and must include in situ portal vein perfusion.
11. It was noted that following the initial in-situ flush first liver and then pancreas should be retrieved followed by immediate additional back table flush and packing. Ideally, another team member could retrieve the kidneys at the same time to reduce 'warm ischaemic' time.
12. In the tables the 'generic' names for the preservation solution are used as according to tender processes brand names may vary.