

Organ retrieval and transplantation surgery:

Living-donor Nephrectomy: The endoscopic (laparoscopic) approach is the preferred technique for living-donor nephrectomy in established kidney transplant programmes. Open surgery, preferably by a mini-incision approach, can still be considered a valid option, despite increased pain in the post-operative period.

Recommendations	Strength rating
Offer pure or hand-assisted laparoscopic/retroperitoneoscopic surgery as the preferential technique for living-donor nephrectomy.	Strong
Perform open living-donor nephrectomy in centres where endoscopic techniques are not implemented.	Strong
Perform laparo-endoscopic single site surgery, robotic and natural orifice transluminal endoscopic surgery-assisted living-donor nephrectomy in highly-specialised centres only.	Strong

Organ Preservation: In kidneys donated after cardiac death (DCD) evidence suggests that **warm ischaemia** contributes to worse graft outcome. **Donor haemodynamic parameters** may be predictors of delayed graft function (DGF) and graft failure. **Cold ischaemia time (CIT)** should be as short as possible.

Kidneys from expanded criteria donors (ECD) after brain death (DBD) and DCD donors are more sensitive to ischaemia than standard criteria donors.

Kidneys from DBD donors should ideally be transplanted within a 18 to 21 hour time period.

Kidney storage solutions and cold storage: The aims of modern kidney storage solutions include: **control of cell-swelling during hypothermic ischaemia; maintenance of intra- and extra-cellular electrolyte gradient during ischaemia; buffering of acidosis; provision of energy reserve; and minimisation of oxidative reperfusion injury.**

Recommendations	Strength rating
Minimise ischaemia times.	Strong
Use hypothermic machine-perfusion (where available) in deceased donor kidneys to reduce delayed graft function.	Strong
Hypothermic machine-perfusion may be used in standard criteria deceased donor kidneys.	Strong
Use low pressure values in hypothermic machine perfusion preservation.	Strong
Hypothermic machine-perfusion must be continuous and controlled by pressure and not flow.	Strong
Do not discard grafts based only on increased vascular resistance and high perfusate injury marker concentrations during hypothermic machine perfusion preservation.	Weak

Recommendations	Strength rating
Use either University of Wisconsin or histidine tryptophane ketoglutarate preservation solutions for cold storage.	Strong
Use Celsior or Marshall's solution for cold storage if University of Wisconsin or histidine tryptophane ketoglutarate solutions are not available.	Strong

Donor Kidney Biopsies:

Procurement biopsies are used for the detection of tissue injury to aid the decision of whether or not a deceased donor kidney is suitable for transplantation.

There is no consistent association between histological lesions observed in donor kidney biopsies and post-transplant outcomes and there is no agreement on prognostically relevant lesions and how they should be scored. The size of the biopsy is of critical importance for its diagnostic value. An adequate biopsy reaches beyond the immediate subcapsular area (≥ 5 mm) and contains ≥ 25 glomeruli and ≥ 1 artery.

Recommendations	Strength rating
Do not base decisions on the acceptance of a donor organ on histological findings alone, since this might lead to an unnecessary high rate of discarded grafts. Interpret histology in context with clinical parameters of donor and recipient including perfusion parameters where available.	Strong
Use paraffin histology for histomorphology as it is superior to frozen sections; however, its diagnostic value has to be balanced against a potential delay of transplantation.	Strong
Procurement biopsies should be read by a renal pathologist or a general pathologist with specific training in kidney pathology.	Strong

Implantation biopsies: are used to provide baseline information on donor kidney injury for comparison with subsequent post-transplant kidney biopsies and can be essential for clear distinction between pre-existing damage and acquired lesions.

In contrast to procurement biopsies implantation biopsies are usually taken before implantation in order to cover potential effects of CIT.

Living and deceased donor implantation surgery:

1. Anaesthetic and peri-operative aspects: Good communication between nephrologists, anaesthetists and surgeons is required for optimal anaesthetic and peri-operative care of the renal transplant patient

Recommendation	Strength rating
Use dialysis or conservative measures to manage fluid and electrolyte imbalance prior to transplant surgery taking into consideration the likelihood of immediate graft function.	Weak

2. Immediate pre-op haemodialysis:

3. Operating on patients taking anti-platelet and anti-coagulation agents: continuing anti-platelet therapy with aspirin, ticlopidine or clopidogrel does not confer a significantly greater risk of peri/post-operative complications.

Recommendations	Strength rating
Consider continuing anti-platelet therapy in patients on the transplant waiting list.	Weak
Discuss patients who take anti-platelet and anti-coagulation agents prior to transplant surgery with relevant cardiologist/haematologist/nephrologist.	Weak

4. What measures should be taken to prevent venous thrombosis including deep vein thrombosis during and after renal transplant?

Recommendation	Strength rating
Do not routinely give post-operative prophylactic unfractionated or low-molecular-weight heparin to low-risk living donor transplant recipients.	Weak

5. Is there a role for peri-operative antibiotics in renal transplantation?: Prophylactic peri-operative antibiotics are generally used in renal transplant surgery but the optimal antibiotic regimen is not known and increasing antibiotic resistance may hamper their effectiveness in this setting.

Recommendation	Strength rating
Use single-dose, rather than multi-dose, peri-operative prophylactic antibiotics in routine renal transplant recipients.	Strong

6. Is there a role for specific fluid regimes during renal transplantation and central venous pressure measurement in kidney transplant recipients?: Careful peri- and post-operative fluid balance is essential for optimal renal graft function. Central venous pressure (CVP) measurement helps anaesthetists guide fluid management.

Recommendations	Strength rating
Optimise pre-, peri- and post-operative hydration to improve renal graft function.	Strong
Use balanced crystalloid solutions for intra-operative intravenous fluid therapy.	Weak
Use target directed intra-operative hydration to decrease delayed graft function rates and optimise early graft function.	Strong

7. Is there a role for dopaminergic drugs, furosemide or mannitol in renal transplantation? There is insufficient evidence to recommend the routine use of low-dose dopamine, diuretics or mannitol during renal transplant recipient surgery.

Recommendation	Strength rating
Do not routinely use low-dose dopaminergic agents in the early post-operative period.	Weak