NICE guidance

Ex-situ machine perfusion for extracorporeal preservation of livers for transplantation

Interventional procedures guidance
Published: 16 January 2019

www.nice.org.uk/guidance/ipg636

Your responsibility

This guidance represents the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, healthcare professionals are expected to take this guidance fully into account, and specifically any special arrangements relating to the introduction of new interventional procedures. The guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or guardian or carer.

All problems (adverse events) related to a medicine or medical device used for treatment or in a procedure should be reported to the Medicines and Healthcare products Regulatory Agency using the Yellow Card Scheme.

Commissioners and/or providers have a responsibility to implement the guidance, in their local context, in light of their duties to have due regard to the need to eliminate unlawful

discrimination, advance equality of opportunity, and foster good relations. Nothing in this guidance should be interpreted in a way that would be inconsistent with compliance with those duties. Providers should ensure that governance structures are in place to review, authorise and monitor the introduction of new devices and procedures.

Commissioners and providers have a responsibility to promote an environmentally sustainable health and care system and should assess and reduce the environmental impact of implementing NICE recommendations wherever possible.

1 Recommendations

1.1 The evidence on ex-situ machine perfusion for extracorporeal preservation of livers for transplantation raises no major safety concerns. However, current evidence on its efficacy is limited in quantity. Therefore, this procedure should only be used with special arrangements for clinical governance, consent, and audit or research.Find out what special arrangements mean on the NICE interventional procedures guidance page.

1.2 Clinicians wishing to do ex-situ machine perfusion for extracorporeal preservation of livers for transplantation should:

- Inform the clinical governance leads in their NHS trusts.
- Ensure that patients given a liver which has had ex-situ machine perfusion understand the uncertainty about the procedure's safety and efficacy, and provide them with clear written information to support shared decision making. In addition, the use of NICE's information for the public on ex-situ machine perfusion for extracorporeal preservation of livers for transplantation is recommended.
- Audit and review clinical outcomes of all patients given a liver which has had ex-situ machine perfusion for extracorporeal preservation of livers for transplantation. NICE has identified relevant audit criteria and has developed NICE's interventional procedure outcomes audit tool (which is for use at local discretion).

1.3 Clinicians and centres doing this procedure must follow the relevant regulatory and legal requirements of the Human Tissue Authority.

1.4 Clinicians should enter details about all patients having this procedure into the NHS Blood and Transplant UK transplant registry.

1.5 Further research should report the exact method of perfusion used (such as hypothermic or normothermic), graft survival and the use of marginal grafts.

2 The condition, current treatments and procedure

The condition

2.1 Liver transplantation is the treatment of choice for patients with end-stage liver disease. It may also be indicated in patients with some types of primary liver cancer. End-stage liver failure can be either acute (for example, from poisoning) or chronic (for example, because of cirrhosis from alcohol-related liver disease, metabolic, autoimmune or infectious conditions). In children, the most common cause of end-stage liver failure is congenital biliary atresia.

Current treatments

2.2 Limited availability of deceased donor livers for transplantation led to the development of techniques that increase the number of recipients who can benefit from 1 available organ. These include split liver grafts (the larger right lobe is usually grafted into an adult and the left lobe into a child) and reduced (segmental) liver grafts.

2.3 Living-donor liver transplantation is also an option for patients who are deteriorating clinically while waiting for a deceased donor transplant.

The procedure

2.4 Ex-situ machine perfusion preserves the donor liver outside the body under normothermic or hypothermic conditions. A perfusion machine is

used to deliver oxygenated perfusate (which may or may not contain blood depending on the technique employed), supplemented with nutrients and metabolic substrates. The intention is to:

- reduce the rate of tissue deterioration that occurs after the liver has been removed from the donor compared with that seen with conventional static cold storage
- extend how long the liver can be stored to allow more flexibility in the timing of the transplant operation.

Normothermic machine perfusion also allows assessment of donor liver viability and function during preservation. The aim is to improve clinical outcomes for the recipient and to enable otherwise marginal organs (such as those donated after circulatory death, steatotic livers and livers from older people) to be transplanted safely, so increasing the number of livers available for transplantation.

2.5 In this procedure, the donor liver is placed in a perfusion machine. The precise configuration of the machine depends on whether normothermic or hypothermic perfusion is being used. Typically, it comprises a reservoir, a pump, an oxygenator, a warming or cooling unit and, for normothermic machine perfusion only, monitoring equipment. Both the hepatic artery and portal vein of the liver may be perfused. For normothermic perfusion, the effluent perfusate is collected and recirculated through the liver. A donor liver can be perfused for several hours, after which it can be implanted into a recipient in the conventional way.

3 Committee considerations

The evidence

3.1 To inform the committee, NICE did a rapid review of the published literature on the efficacy and safety of this procedure. This comprised a comprehensive literature search and detailed review of the evidence from 11 sources, which was discussed by the committee. The evidence

included 1 randomised controlled trial, 7 matched case-control studies, 2 non-randomised control studies, and 1 case series, and is presented in table 2 of the interventional procedures overview. Other relevant literature is in the appendix of the overview.

3.2 The specialist advisers and the committee considered the key efficacy outcomes to be: graft function, patient survival and use of marginal grafts.

3.3 The specialist advisers and the committee considered the key safety outcomes to be: graft damage (including vascular damage), biliary tract complications and infection.

3.4 No patient commentary was sought because the procedure is done ex situ, not directly to the patient.

Committee comments

3.5 The literature described different methods used for this procedure including: variation in the temperature used for machine perfusion (hypo- or normothermic); the point at which machine perfusion was started after donor liver explantation; and the duration of machine perfusion.

3.6 This procedure might allow for better assessment and more frequent use of marginal livers, so increasing the number of livers available for transplantation.

ISBN: 978-1-4731-3116-3

Endorsing organisation

This guidance has been endorsed by Healthcare Improvement Scotland.