



Title	The Clinical and Cost Effectiveness of Pulsatile Machine Perfusion Versus Cold Storage of Kidneys for Transplantation Retrieved From Heart-beating and Non-heart-beating Donors
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Aim

To evaluate the clinical effectiveness and cost effectiveness of machine perfusion (MP) vs. cold storage (CS) in preserving kidneys to be transplanted. It addresses MP for kidneys from heart-beating donors (HBDs) and non-heart-beating donors (NHBDs), and the impact on graft function immediately post-transplantation and in the longer term. It also examines whether or not the use of MP can allow valid testing of kidney viability prior to transplantation.

Conclusions and results

Meta-analysis suggested that the use of MP, as compared with CS, is associated with a relative risk of delayed graft function (DGF) of 0.804 (95% confidence limits 0.672 to 0.961). No evidence suggests that this effect is different in kidneys taken from HBDs vs. NHBDs. Meta-analysis of 1-year graft survival data showed no significant effect, but the studies, even when aggregated, were severely underpowered with respect to the likely impact on graft survival. The size of effects demonstrated were in line with those predicted by an indirect model of graft survival based on the association of DGF with graft loss. Economic assessment indicated that in the UK it is unlikely that all costs will be recovered from reducing the incidence of DGF. The probability that MP is cheaper and more effective than CS in the long term was estimated at around 80% for NHBD recipients and 50% to 60% for HBD recipients. Flow characteristics of the perfusate of kidneys undergoing MP may be an indicator of kidney viability, but data were inadequate to calculate the sensitivity and specificity of a test based on this. The concentration of α -glutathione-S-transferase (a marker of cell damage) in the perfusate may be the basis of a valid test. A threshold of 2800 mg/100 g gave a sensitivity of 93% and specificity of 33% (and hence a likelihood ratio of 1.41).

Recommendations

Baseline analysis indicated that in the long term, MP would be expected to be cheaper and more effective than

CS for both HBD and NHBD recipients. A definitive study of the clinical benefit of MP to establish its effect on DGF and longer-term graft survival would be valuable, along with an economic evaluation of the benefits. While direct evidence relating to improvements in graft survival would be preferable, the small predicted improvement indicates that a very large sample size would be required.

Methods

A literature search was undertaken to identify relevant studies, and a meta-analysis was performed on the studies that had appropriate comparator groups and reported sufficient data. A structured review examined tests of viability of kidneys on MP. Economic modeling was used to determine the cost effectiveness and cost utility of MP.

Further research/reviews required

In addition to seeking direct evidence of the impact on DGF, research quantifying the impact of DGF on graft survival in this technology is required. Research is also needed to establish whether a valid test (or combination of tests) of kidney viability can be developed.