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Title **The Effectiveness and Cost Effectiveness of Methods of Storing Donated Kidneys from Deceased Donors: A Systematic Review and Economic Evaluation**

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Aim

To review the evidence for the effectiveness and cost effectiveness of storing kidneys from deceased donors prior to transplantation, using cold static storage solutions or pulsatile hypothermic machine perfusion.

Conclusions and results

The conclusions drawn in comparing machine perfusion with cold storage depend on which trial data are used in the model. Due to the lack of good research evidence for the superiority of ViaSpan vs Soltran, the cheaper (Soltran) may be preferable. In the absence of a cost-utility analysis, the results of our meta-analysis of the RCTs comparing ViaSpan with Celsior indicate that these cold storage solutions are equivalent. Further RCTs may be useful in studying comparators of interest to allow for appropriate analysis of subgroups and to determine whether either of the machines produces better outcomes. Additional research needs to: establish the strength and reliability of the presumed causal association between delayed graft function (DGF) and graft, and patient survival; investigate the utility of renal replacement therapy; determine what the additional cost, survival, and QALY impacts are of decreased or increased nonviable kidneys when discarded pre transplantation; and identify a reliable measure for predicting kidney viability from machine perfusion. Eleven studies were included: 3 full journal published RCTs, 2 ongoing RCTs, 1 cohort study, 3 full journal published retrospective record reviews, and 2 retrospective record reviews published as posters or abstracts only. For LifePort vs ViaSpan, no significant differences were found for DGF, primary nonfunction, acute rejection, duration of DGF, creatinine clearance or toxicity, patient survival, or graft survival at 6 months, but graft survival was better at 12 months post transplant with machine perfusion (LifePort=98%, ViaSpan=94%, p <0.03). For LifePort versus RM3, all outcomes favored RM3, although the results may be unreliable. For ViaSpan vs Soltran, there were no significant differences in graft survival for cold ischemic times up to 36 hours. For ViaSpan vs Celsior, no significant differences were found on any outcome measure. Regarding cost effectiveness, data from the MPT suggested that machine preservation was cheaper and generated more quality-adjusted life-years (QALYs), while the PPART study data suggested that cold storage was preferable on both counts. The less reliable deterministic outputs of the cohort study suggested that LifePort would be cheaper and would generate more QALYs than Soltran. Sensitivity analyses found that changes to the differential kidney storage costs between comparators have a low impact on overall net benefits; where differences in effectiveness exist, dialysis costs are important in determining overall net benefit; DGF levels become important only when differences in graft survival are apparent between patients experiencing immediate graft function (IGF) vs DGF; relative impact of differential changes to graft survival for patients experiencing IGF vs DGF depends on the relative proportion of patients experiencing each of these two outcomes.

Recommendations

See Executive Summary link at www.hta.ac.uk/project/1699.asp.

Methods

See Executive Summary link at www.hta.ac.uk/project/1699.asp.

Further research/reviews required

There is a need for: 1) sufficiently large RCTs of comparators of interest to allow for appropriate analysis of subgroups; and 2) more research to establish the strength and reliability of the presumed causal association between DGF and graft and patient survival.

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