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GUEST EDITORIAL

New Strategies in Organ Preservation: Current and Future Role of Machine Perfusion in Organ Transplantation

Organ transplantation is a very successful therapy for a wide range of medical conditions that cause irreversible failure of an essential organ system. Short- and long-term outcomes have improved rapidly in recent decades such that the greatest challenge facing transplant units is one of donor organ supply rather than rejection of transplanted organs. In response to an increasing discrepancy between supply and demand, transplant specialists are increasingly turning to the use of older and 'higher risk' donor organs – those that are more likely to fail. Organs from such donors, however, usually have normal or near-normal function before the process of death, recovery, preservation and transplantation: progressive injury takes place at every point along this process. The injury is predominantly caused by inadequate or absent delivery of oxygen and nutrients, either in the warm, when oxygen deprivation causes rapid depletion of cellular energy stores, or in the cold, when energy depletion occurs more slowly but cell membrane functions cease causing cell swelling. In ideal donor organs from brain dead standard criteria donors (SCD), this damage is acceptable, but in organs from extended criteria donors (ECD) or donors after circulatory death (DCD), the effect of these sequential injuries is such that the organ may be irrecoverably damaged.

Full utilization of a wider range of deceased donor organs is a realistic approach to the donor shortage. For this to address the real demands both now and in the future, it will be necessary to devise methods to optimize the condition of donor organs before recovery, to repair injured donor organs after recovery and to preserve these organs without adding to pre-existing damage enhancing transplantability and utilization.

Conventionally, organ preservation has been carried out by simple flush out with specialist preservation solutions and static storage at ice temperature. This method has been shown to be effective with SCD organs but may be insufficient to maintain viability of older and 'higher risk' organs. In recent years, there has been a resurgence of interest in the use of hypothermic machine perfusion (HMP) – a device to pump preservation fluid through the vasculature of the organ at cold temperature. There is also increasing

interest in the use of 'normothermic' techniques – perfusion at normal body temperature (NMP). Both methods can be applied in situ as hypothermic or normothermic regional perfusion (HRP, NRP) or ex situ (HMP, NMP). Machine perfusion can start immediately after recovery and continue until implantation or may be used only immediately prior to transplantation as a method of End-HMP or End-NMP after static cold storage. How these practices have evolved, whether there is a need to combine some of the methods and what data support these strategies in various organs, is the focus of the expert reviews in this issue of Transplant International.

We would like to thank the authors of the reviews for their creative insights and for summarizing the most recent developments in organ perfusion. The current practices are very well summarized in the reviews and we hope that they will be useful and enhance the knowledge of the transplant community regarding the evidence and potential of novel technologies in machine perfusion and organ conditioning.

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