

ISSUE INFORMATION: MACHINE PERFUSION IN ORGAN TRANSPLANTATION



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In the last years, the field of organ transplantation has been revolutionized by the emergence and rapid adoption of machine perfusion technologies, such as normothermic regional perfusion, normothermic machine perfusion and hypothermic oxygenated machine perfusion¹. In the first issue of "The European Journal of Transplantation", the newborn Journal of the "Italian Society for Organ and Tissue Transplantation", we aimed to summarize all the recent trials and the potential future applications of machine perfusion technology in organ transplantation. Heart, lung, liver, kidney, pancreas, uterus, limbs, all organs are involved in this revolution and each of them provides its own contribution to the development of the knowledges and the improvement of the competencies.

The issue has been divided in two numbers: the first one will provide a full picture of the machine perfusion scenario in the daily clinical practice, with an intense glimpse to the most promising researches and innovative solutions. The second will report the contribution of some of the most active national Centers in the field, and a special focus on the potential future applications of machine perfusion technology in small-bowel, uterus and limb transplantation. Here to follow the title and the topic of the second number: "**Hypothermic perfusion of the kidney: from research to clinical practice**" (Matteo Ravaioli et al.); "**Some like it hot. Utility and mechanisms of *ex-situ* normothermic machine perfusion of the liver**" (Damiano Patrono et al.); "**Normothermic regional perfusion in cardiac death donation. Organ viability or organ preservation?**" (Riccardo De Carlis et al.); "**The use of machine perfusion in surgical oncology and split liver transplantation**" (Enrico Gringeri et al.); "**Criticalities and usefulness of a small bowel perfusion program: transplant and beyond**" (Manuel Rodriguez-Davalos et al.); "**Uncontrolled donation after circulatory death: a by-product of the controlled? A narrative review**" (Adriano Peris et al.); "***Ex-situ* perfusion of the limbs**" (Bahar Bassiri Gharb et al.); "**The concept of machine perfusion in uterus transplantation**" (Cristiano Quintini et al.).

The use of the so-called "extended criteria" donors is largely adopted to improve the availability of donor allografts and reduce waiting list mortality. Most extended criteria grafts share the common denominator of being more vulnerable to ischemia-reperfusion injury in comparison to standard grafts, hence carrying an increased risk of post-transplant dysfunction. Machines perfusion were introduced in clinical practice to minimize the duration of static cold storage, protect organs from the detrimental effects of ischemia-reperfusion injury, facilitate repair/regeneration of extended criteria donor grafts, expand donor pool, and improve graft survival after transplant².

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Even if static cold storage remains the standard, machines perfusion have the potential to become the new standard for organ procurement and preservation only if the risen costs, logistic complexity and extra time and personnel requirements are objectively justified by increased available grafts or decreased post-transplant complications. The availability of these technologies deems a further act of responsibility and many efforts by our Scientific Society to design well-powered studies and promote multicenter collaborations, as their future relies on the capacity of the transplant community to show "hard" clinical advantages, integrate the competences of all stakeholders to simplify and optimize machine perfusion technology and ultimately, provide a positive cost-effectiveness analysis ^{3,4}. The potentiality of machines perfusion cannot be restricted to clinical practice, as they might be a terrific boost for scientific research, promoting a deep integration among basic science, health care researchers and industry ^{2,4}. The transition of these technologies into clinical practice does not mark the end of a development process but, rather, the start of the clinical evolution of these

devices and their applications. Fulfilling the true potential of these technologies can only be realized by appreciating their existing limitations and identifying new boundaries to push ¹.

References

- ¹ Nasralla D. Incremental improvements in machine perfusion. *Transplantation* 2022;106:1105-1106. <https://doi.org/10.1097/TP.0000000000003946>
- ² Ghinolfi D, Jassem W, Martins PN. Ischemia-free liver transplantation. Is this the right answer to overpass organ shortage and post-liver transplant complications? *Lancet Reg Health West Pac* 2021;16:100263. <https://doi.org/10.1016/j.lanwpc.2021.100263>
- ³ Martins PN, Clavien PA, Jalan R, et al. A call for randomization in clinical trials of liver machine perfusion preservation. *Hepatology* 2021;73:2586-2591. <https://doi.org/10.1002/hep.31686>
- ⁴ Martins PN, Ghinolfi D. Long-term preservation of liver grafts brings "off-the-shelf" organs closer. *Nature Biotechnology* 2022. [Epub Ahead of Print]