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Keywords:

liver transplantation; organ preservation; organ reconditioning; bile production; graft viability

Abbreviations:

NMP, normothermic machine perfusion; HBOC, hemoglobin-based oxygen carrier; RBC, red blood cells; ATP, adenosine triphosphate; ALT, alanine aminotransferase.

Financial Support:

The Authors did not receive any grant or financial support for this work.

Conflict of interest:

The Authors declare they have no conflict of interest.

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To the Editor,

We read with interest the paper by Matton et al. [1] about normothermic machine perfusion (NMP) without the need for human blood products using a novel hemoglobin-based oxygen carrier (HBOC). As provision of cross-matched blood products represents a logistical and economic obstacle to wider implementation of NMP, introduction of a valuable alternative is welcome. HBOC would allow better oxygen delivery [2] and obviate to some risks associated with red blood cells (RBC) use, including hemolysis, immunization and pathogens transmission. In this paper, use of an HBOC-based perfusate was feasible and it was associated with increased tissue ATP content and bile production, and faster lactate clearance. We would like to add some insight into Authors results interpretation. LiverAssist® device allows for a pressure-controlled perfusion through both portal vein and hepatic artery. In a pressure-controlled circuit, flow is determined by organ vascular resistances and perfusate viscosity. Due to reduced viscosity, total flow was about 2.5 times higher when HBOC-based perfusate was used. Thus, oxygen delivery (which is a function of oxygen content and flow) could be more efficient using HBOC due to decreased perfusate viscosity rather than HBOC oxygen affinity. This could explain why lactate clearance was faster and why ATP tissue content and bile production, which is an energy-dependent process[3], were increased. Therefore, a major advantage of HBOC-based perfusate would be decreased viscosity, allowing for higher perfusion flows without the need for higher perfusion pressures, which are associated with a risk of endothelial injury.

On a separate note, we are concerned by the steep increase of ALT level throughout perfusion. Although ALT 6-hour level was approximately halved in HBOC groups, this was about 2,500 IU/L, which is discordant with otherwise good results presented, and with preserved histology. In many protocols of normothermic regional perfusion for donors after cardiocirculatory death [4], such an ALT level would lead to organ discard. We appreciate that

these were discarded extended-criteria grafts not meant for transplantation, and that ALT metabolism could be altered during NMP. However, as one major advantage of NMP is a more objective assessment of graft viability before transplantation, this finding should be an alert to exclude perfusion-related damage.

In the rapidly evolving field of NMP, our main challenge is the deeper understanding of organs physiology in an “extra-corporeal life” setting, with the aim to refine perfusion techniques and organ viability assessment.

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