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DEVELOPMENT AND OPTIMIZATION OF TRANSPLANT SURGEON-INNOVATED EVMP: VALIDATION IN A PORCINE DCD LIVER TRANSPLANT MODEL

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Background : Ex vivo machine perfusion (EVMP) is increasingly recognized as a promising technique for enhancing the preservation and viability of donor organs, especially in donation after circulatory death (DCD) liver transplantation (LT). This study validates a transplant surgeon-innovated EVMP protocol, assessing its efficacy in preserving liver function and reducing ischemic-reperfusion injury in a porcine DCD LT model.

Methods : Twenty Yorkshire pigs were used to compare static cold storage (SCS) and EVMP. In Model 1, the SCS group (n=5) underwent 5 hours of cold storage, while the EVMP group (n=9) had 1 hour of cold storage followed by 4 hours of EVMP. In Model 2, the SCS group (n=3) underwent 6 hours of cold storage, while the EVMP group (n=3) had 2 hours of cold storage followed by 4 hours of EVMP. Hemodynamic stability during perfusion, laboratory findings, and apoptosis (via TUNEL assay) after reperfusion were evaluated.

Results : The EVMP system successfully performed all 12 cases without technical complications. Hemodynamic parameters were stably maintained during perfusion. In Model 2, ALT levels were significantly lower in the EVMP group compared to SCS (e.g., 134.3 ± 27.0 vs. 48.0 ± 6.2 U/L, P = 0.006 at 3 hours post-reperfusion). TUNEL staining revealed significantly reduced hepatic apoptosis in the EVMP group versus SCS at 2 and 3 hours post-reperfusion in both models.

Conclusions : This study successfully demonstrated the stability of the transplant surgeon-innovated normothermic EVMP protocol, validating its efficacy in improving organ preservation and reducing ischemic-reperfusion injury in a porcine DCD LT model.

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