MILD HYPOTHERMIA DURING EX-VIVO MACHINE PERFUSION IMPROVES RECOVERY OF HEARTS DONATED AFTER CIRCULATORY DEATH

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Objectives: To establish the optimal machine perfusion temperature for recovery of hearts in a rodent model of donation after circulatory death (DCD).

Methods: Hearts from male Lewis rats (n = 8/group) were subjected to 25 min of in-situ warm (37°C) ischaemia to simulate DCD. They were then explanted and reperfused with diluted autologous blood for 60 min at 20°C, 25°C, 30°C, 33°C or 37°C, after which they were stored at 0–4°C in Custodiol preservation solution for 240 min. Fresh-excised and cold-stored ischaemic hearts were used as controls. Viability was assessed in a Langendorff circuit, by comparing perfusate levels of troponin-t and creatine kinase, as well as myocardial adenosine triphosphate and reduced-glutathione levels.

Results: During ex-vivo reperfusion, hearts in all groups resumed sinus-rhythm after 5–10 min. The mean heart rate was highest in the 37°C group (162.3 ± 33.01 BPM), and declined in proportion to temperature (38.64 ± 6.35 BPM at 20°C). Troponin-t levels were lowest (P < 0.05), and showed trend of lower creatine kinase in the 20°C group. During Langendorff assessment, the mean heart rate and contractility of all groups were higher than those of cold-stored ischaemic hearts (P < 0.05), and were not significantly different than those of fresh excised controls. A trend towards higher heart rate and contractility was seen in the 25°C and 30°C groups. The perfusate levels of troponin-t and creatine kinase, and myocardial levels of reduced-glutathione and adenosine triphosphate, were not significantly different between groups.

Conclusion: Our results suggest that mild hypothermia (25–30°C) during ex-vivo reperfusion improves recovery of ischaemic hearts in a rodent DCD model.