Mild hypothermia during global cardiac ischemia opens a window of opportunity to develop heart donation after cardiac death

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Although heart donation after cardiac death (DCD) could greatly improve graft availability, concerns regarding warm ischemic damage typically preclude transplantation. Improving tolerance to warm ischemia may thus open a window of opportunity for DCD hearts. We investigated the hypothesis that, compared with normothermia, mild hypothermia (32° C) initiated after ischemic onset improves cardiac functional recovery upon reperfusion. Isolated, working hearts from adult, male Wistar rats underwent global, no-flow ischemia, and reperfusion (n = 28). After ischemic onset, temperature was maintained at either 37° C for 20 or 30 min or reduced to 32° C for 40, 50, or 60 min. Recovery was measured after 60-min reperfusion. Following normothermic ischemia, recovery of rate-pressure product (RPP; per cent of preischemic value) was almost complete after 20-min ischemia (97 ± 9%), whereas no recovery was detectable after 30-min ischemia. After mildly hypothermic ischemia (32° C), RPP also recovered well after 40 min (86 ± 4%). Markers of metabolism and necrosis were similar in 37° C/20 min and 32° C/40 min groups. Simple reduction in cardiac temperature by a few degrees after the onset of global ischemia dramatically prolongs the interval during which the heart remains resistant to functional deterioration. Preservation of hemodynamic function is associated with improved metabolic recovery and reduced necrosis. The application of mild hypothermia may be a simple first step towards development of clinical protocols for DCD heart recovery.