

Early Selective Head Cooling During CPR Improves Post-ROSC Hemodynamic Stability And Decreases Recurrence Of Ventricular Fibrillation

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Background. We have previously demonstrated that early selective head cooling improved coronary perfusion pressure (CPP) during CPR and post resuscitation myocardial function and survival. In the present study, in a porcine model of prolonged cardiac arrest, we investigated the effects of selective head cooling initiated during CPR on hemodynamic stability following return of spontaneous circulation (ROSC). We hypothesized that head cooling initiated during CPR would increase post-ROSC arterial and CPP and would reduce post resuscitation recurrent VF.

Methods. In 16 domestic pigs weighing 40±3 kg, VF was electrically induced and untreated for 10 min. Animals were then randomized to receive head cooling initiated coincident with the start of CPR or control. Head cooling was performed by spraying coolant into the nasal cavity. CPR was performed for 5 min prior to defibrillation. Retrograde jugular vein temperature was measured as a surrogate of brain temperature. Immediately following ROSC and prior to the occurrence of recurrent VF, arterial blood pressure, CPP and recurrent VF were measured.

Results. No difference in baseline hemodynamics and temperatures were observed between the two groups. When ROSC was achieved, core temperature was equivalent in the two groups, brain temperature was, however, significantly lower in cooled animals compared to control animals. Immediately post-ROSC arterial and CPP increased in cooled animals and were significantly greater compared to control animals, in which pressures decreased. Significantly less recurrent VF were observed in the cooled animals (Table).

Conclusion. In this model, selective head cooling rapidly reduces brain temperature during CPR. These reductions in brain temperature increase arterial and CPP immediately following ROSC, resulting in greater hemodynamic stability and less recurrence of VF.

Table

	Control (8)	Head Cooled (8)	p value
Brain temperature, °C			
BL	38 ± 0.3	38.01 ± 0.3	NS
PR	38.3 ± 0.2	35.8 ± 2.3	0.016
Core temperature, °C			
BL	37.9 ± 0.1	38 ± 0.3	NS
PR	38.1 ± 0.3	38 ± 0.3	NS
Number of recurrent VF	12 ± 7	6 ± 4	0.05
CPP, mm Hg			
BL	73 ± 11	73 ± 14	NS
PR	30 ± 17	61 ± 25	0.009
Systolic arterial pressure, mmHg			
BL	143 ± 10	142 ± 10	NS
PR	96 ± 27	171 ± 39	< 0.001
Diastolic arterial pressure, mmHg			
BL	77 ± 10	77 ± 14	NS
PR	41 ± 14	71 ± 23	0.007
Mean arterial pressure, mmHg			
BL	119 ± 12	119 ± 11	NS
PR	71 ± 23	130 ± 6	< 0.001

BL = baseline; PR = post resuscitation (immediately after ROSC and prior to occurrence of recurrent VF).