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Dickinson W. Richards Lecture and Hypothermia Advances in Resuscitation

Abstract 2412: Rapid Induction Of Head Cooling By The Intranasal Route During Cardiopulmonary Resuscitation Improves Survival and Neurological Outcomes

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Introduction: Current guidelines recommend mild hypothermia for all unconscious patients of cardiac arrest after return of spontaneous circulation (ROSC). However, the effects of intra-resuscitation cooling, specifically targeted at the brain, are still unclear.

Hypothesis: Early head cooling during cardiopulmonary resuscitation (CPR) culminating in systemic hypothermia improves 96 hour survival and neurological outcome in a pig model of prolonged cardiac arrest.

Methods: Ventricular fibrillation was electrically induced in 16 domestic pigs and untreated for 10 minutes. After 5 minutes of CPR, defibrillations and additional CPR were attempted until ROSC, or for a maximum of 15 minutes. In hypothermia group, cooling was induced coincident with start of CPR using a transnasal spray of a highly volatile perfluorochemical and continued until core temperature (T_c) measured in the pulmonary artery was reduced to 34°C. The spray was then adjusted to maintain T_c below 34.5°C for 4 hours after ROSC. Retrograde right jugular vein temperature (T_{jv}), which has been previously reported as a indicator of brain temperature, and T_c were continuously recorded. Survival and Neurological Deficit Score (NDS) were recorded daily for 96 hours after ROSC.

Results: Baseline T_c was maintained at 38.0°C in both groups. All animals except one in the control group were successfully resuscitated. After 5 minutes of CPR, T_{jv} was significantly lower in the hypothermia group (34.2±4.5°C vs 38.1±0.3°C, $p<0.05$). The hypothermia group showed significantly improved 96 hour survival (8/8 vs 2/8, $p=0.007$) and improved neurological outcomes (Table 1).

Conclusion: Rapid induction of head cooling by the intranasal route during CPR culminating in systemic hypothermia, significantly improved 96 hour survival and neurological outcomes.

Table 1 Neurological Deficit Score after resuscitation expressed in median (min, max)

	Hypothermia(n=8)	Control(n=8)	P value
24 hr	60 (0, 140)	400 (115, 400)	0.001
48 hr	0 (0, 75)	400 (0, 400)	0.005
72 hr	0 (0, 10)	400 (0, 400)	0.002
96 hr	0 (0, 10)	400 (0, 400)	0.002

NDS= Neurological Deficit Score (0=normal, 400=death or brain death)