

# Survival and neurological outcomes after trans-nasal cooling initiated during CPR and maintained for either one or four hour following resuscitation

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**Introduction:** We have previously reported that early trans-nasal cooling initiated during CPR and continued for 4 hours after resuscitation improved outcomes of CPR. In the present study, we investigated the effects of trans-nasal cooling initiated during CPR and continued for either 1 hour or 4 hours on resuscitation and 96 hours neurologic outcomes in a porcine model of cardiac arrest.

**Hypothesis:** Trans-nasal cooling maintained for 1 hour following resuscitation will yield same outcome compared to trans-nasal cooling maintained for 4 hours.

**Methods:** VF was electrically induced and untreated for 10 minutes in 10 domestic male pigs weighing 40±5 kg. CPR was performed for 5 minutes prior to defibrillation and continued for a maximum of 15 minutes in case of failure to achieve return of spontaneous circulation. Trans-nasal cooling was initiated with the aid of the RinoChill device (BeneChill Inc) at the beginning of CPR and animals were randomized to either 1 hour or 4 hours cooling following resuscitation. Aortic and right atrial pressures were continuously measured and coronary perfusion pressures (CPP) were calculated. Nasal, core, and jugular vein blood temperatures were recorded during CPR and following resuscitation. After resuscitation, neurologic outcomes were recorded 24, 48, 72 and 96 hours after post-resuscitation.

**Results:** No differences in baseline hemodynamic data and CPP during CPR were detected. Nasal, core and jugular blood temperatures were no different in the 2 groups during CPR and one hour post resuscitation. Four hours after resuscitation, temperatures were significantly lower in animals in which trans-nasal cooling was continued (Table). All animals were resuscitated and survived for 96 hours. After 24 hours neurological outcomes were slightly better but not statistically different in animals treated with 4 hours cooling (p=0.07). However, after 48 hours, there were no differences in neurological outcome between the two groups.

**Conclusion:** In this model, trans-nasal cooling maintained for one hour following resuscitation yielded the same resuscitation rate, 96 hours survival and neurological outcomes compared to nasopharyngeal cooling continued for 4 hours following resuscitation.

Table.

	<b>One hour cooling (n=5)</b>	<b>Four hours cooling (n=5)</b>	<b>p-value</b>
<b>Nasal Temperature, °C</b>			
Baseline	37.9±0.3	38.0±0.1	0.441
1 hour post resuscitation	7.6±4.9	5.7±2.1	0.453
4 hours post resuscitation	38.2±0.9	5.1±3.6	0.000
<b>Jugular Temperature, °C</b>			
Baseline	38.1±0.2	38.1±0.1	0.521
1 hour post resuscitation	33.9±3.0	33.6±2.3	0.853
4 hours post resuscitation	38.3±0.8	34.0±1.5	0.001
<b>Core Temperature, °C</b>			
Baseline	38.0±0.0	38.0±0.1	0.508
1 hour post resuscitation	37.0±0.3	36.8±0.7	0.624
4 hours post resuscitation	38.1±0.8	35.7±1.0	0.002
<b>Neurological Deficit Score</b>			
24 hours	80±45	20±45	0.067
48 hours	10±22	10±22	1.000
96 hours	0±0	0±0	-