

Time to Target Temperature with Intravascular Cooling Device for Survivors of Out-of-Hospital Cardiac Arrest

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INTRODUCTION: In 2005 the American Heart Association recommended the use of induced hypothermia for the post resuscitation management of cardiac arrest (CA) victims. Studies to date have used surface cooling techniques with or without cold saline and achieve target temperature in an average of 6 hours.

OBJECTIVES: To describe the time required for post-resuscitation CA patients to reach target temperature with the utilization of an intravascular cooling device.

METHODS: This case series evaluated 63 consecutive patients treated with a standardized hypothermia protocol in a single institution. The protocol relies on an intravascular cooling device (ALSIUS Icy® Catheter) as the sole method for temperature control. Patients who were non-neurologically intact after pre-hospital resuscitation were eligible to receive up to 2 liters of cold saline prior to hospital arrival. The initial temperature, the time cooling was initiated with the intravascular device, and time the patient's temperature fell below 34 degrees were abstracted from patient care records. The primary end-point was the time from placement of intravascular device to the patient's temperature falling below 34 degrees. Stratified analysis compared patients who received cold saline vs. those who did not receive cold-saline pre-treatment.

RESULTS: Six patients were excluded due to incomplete data. Mean time to target temperature was 62 minutes (95% CI 50 minutes to 76 minutes). Median time to target temperature was 53 minutes (IQR 31-78). Those 26 patients who received prehospital intravenous fluids achieved target temperature in 68 minutes (95% CI 47 to 88) while the 31 patients who did not receive such treatment achieved target temperature in 59 minutes (95% CI 43 to 75).

CONCLUSIONS: Hypothermia induced by intravascular cooling achieves target temperature faster than methods used in published studies. Further research is required to determine which cooling technique is most efficacious, the relative benefit of prehospital induction, and to describe complications of intravascular and surface cooling methods.



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BACKGROUND

- In 2002, two RCTs showed induced hypothermia improves neurologic outcomes after ROSC from cardiac arrest
- Subsequent studies have used a variety of cooling methods and protocols
- Limited data on cooling speeds with various methods

OBJECTIVES

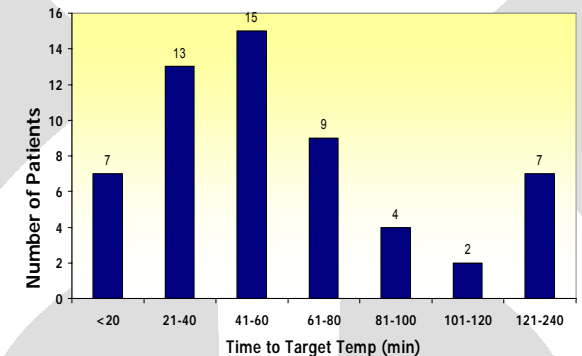
- Describe time required to reach target temperatures using an intravascular cooling device (Aelsius Icy Cooling Catheter)

METHODS

- Retrospective chart review of 63 consecutive patients at a single institution
- October 2006 through October 2007
- Standardized intravascular cooling protocol for comatose pts with ROSC after non-traumatic cardiac arrests in and out-of-hospital
- Recorded initial temp, time of line placement, and time pt's temp <34°C



Number of Patients Cooled by Time to Target Temperature <34°C



Patient Characteristics (N=57)		
Age (years)	Mean	59
	Range	18-93
Male Sex		53%
Out-of-hospital arrests		33
EMS Cold IVF		27
No EMS IVF		6
In-hospital arrests		24

Other Published Times

STUDY	TYPE	RATE (C/hr)	MEDIAN
Hachimimi et al. 2001	Helmet		225 m
Bernard et al. 2002	External	0.9	150 m
HACA 2002	External		8 h
Oddo et al. 2006	External		5 h
Holzer et al. 2006	Endovascular	1.2	
HACA 2007	Endovascular	1.1	
	External	1.3	

Criteria

Inclusion

- ROSC after non-traumatic cardiac arrest
- Intubated
- GCS < 8 and no purposeful pain response
- Initial temp > 34 °C
- Non-gravid
- Age ≥ 16

Exclusion

- Hemorrhage (GI or Intra cranial)
- Uncontrollable ventricular arrhythmias
- Refractory MAP < 75mm Hg
- Suspected sepsis
- Major surgery within 14 days

EMS Protocol

Criteria Met

- ↓
- Successful Intubation
- ↓
- Ice Packs to Axilla, Neck, Groin
- ↓
- Versed .15mg/kg
- ↓
- Vecuronium .1mg/kg
- ↓
- Cold Saline (up to 2 L)
- ↓
- Dopamine for MAP >75

Time to Cooling

Interval of Initial Temp to <34°C (min):

Median	53
IQR	31 - 78

Rate of cooling (°C/hr):

Median	1.68
IQR	1.14 - 2.73

In vs. Out-of-hospital arrests (min)

In (IQR)	60.97 (34-73)
Out (IQR)	65.15 (30-84)

LIMITATIONS

- Therapeutic protocol design
- Small sample size
- Uncertain interval between initial temp and start of intravascular cooling
- Amount of cold saline given not well documented

CONCLUSIONS

- Intravascular cooling device consistently induces mild hypothermia in less than 2 hours



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