Changes of Surface Body Temperatures after Local Cooling in Survivors of Cardiac Arrest during the Maintenance Phase of TTM

Andrej Markota^{a,b}, Kristijan Skok^b, Sandra Burja^b, Jernej Mori^a, Andreja Sinkovič^{a,b}
a) Medical Intensive Care Unit, University Medical Centre Maribor, Maribor, Slovenia
b) Faculty of Medicine, University of Maribor, Maribor, Slovenia

PURPOSE

To determine changes in surface body temperatures after local cooling of different regions in comatose adult survivors of cardiac arrest in the maintenance phase of targeted temperature management (TTM).

MATERIALS AND METHODS

We included six patients sedated to Ramsey Sedation Score 6 and without neuromuscular blocking agents during imaging. We obtained IR images (FLIR SC620, FLIR Systems, Wilsonville, Oregon, USA) of the **head, thorax, abdomen and legs** before and after an ice pack was placed on the skin. Ice pack covered 2% of body surface area (BSA) in the head region, and 9% in other regions. After 5 min, the ice pack was removed and IR images of each region were obtained in 1 min intervals for 5 min.

RESULTS

Average maximal surface temperatures of the head, thorax, abdomen, and legs before local cooling were **significantly lower compared to core body** temperature measured by the Foley catheter ($34.25 \pm 1.57^\circ\text{C}$) at $30.78 \pm 3.01^\circ\text{C}$, $30.67 \pm 2.82^\circ\text{C}$, $30.48 \pm 2.02^\circ\text{C}$ and $28.00 \pm 3.73^\circ\text{C}$, respectively (all p values < 0.005). There was **no correlation between BSA and cooling rate** ($r=0.001$, $p=0.997$), and a **negative correlation between BSA and rewarming rate** ($r=-0.54$, $p=0.006$). There were **no significant differences in rewarming rate** between head ($2.06 \pm 0.34^\circ\text{C}/\text{min}$), thorax ($1.6 \pm 0.37^\circ\text{C}/\text{min}$), and abdomen ($1.68 \pm 0.24^\circ\text{C}/\text{min}$), and a **significantly faster rewarming rate when comparing other body regions with legs** ($0.81 \pm 0.43^\circ\text{C}/\text{min}$, all p values < 0.03).

Number of patients	6		
Male (No)	4		
Age (years)	66.3 ± 10.8		
OHCA (No)	3		
Weight (kg)	80 ± 8.9		
Height (cm)	172.5 ± 9.4		
Temperature measurements	Initial temperature	After 5 min of local surface cooling	After 5 min of passive rewarming
Core (Foley) body temperature ($^\circ\text{C}$)	34.3 ± 1.6	not measured	34.3 ± 1.7
Head&neck surface temperature ($^\circ\text{C}$)	30.8 ± 3	16.1 ± 1.5	27.2 ± 3
Thorax surface temperature ($^\circ\text{C}$)	30.7 ± 2.8	16.7 ± 1.7	24.7 ± 1
Abdomen surface temperature ($^\circ\text{C}$)	30.5 ± 2	16 ± 1.1	24.4 ± 1.3
Legs surface temperature ($^\circ\text{C}$)	28 ± 3.7	14.7 ± 1.7	18.8 ± 2.8

CONCLUSIONS

Surface body temperature measured anywhere **cannot be used to estimate core body temperature**. In spite of coma after cardiac arrest and drug-induced sedation, a **marked difference exists in thermoregulation of different body regions**, with **central regions rewarming faster** compared to periphery after local cooling.

LITERATURE

- Markota A, et al. Identification of regions with maximal body surface-to-environment temperature differences in survivors of out-of-hospital cardiac arrest using an infrared camera. Resuscitation 2016; 106: e80
- Weihs W, et al. The importance of surface area for the cooling efficacy of mild therapeutic hypothermia. Resuscitation 2011; 82: 74-8
- Joly HR, et al. Temperature of the great toe as an indication of the severity of shock. Circulation 1969; 39: 131-8.

CORRESPONDING AUTHOR:
Andrej Markota, andrejmarkota@hotmail.com