Effect of hypothermia on the peripheral and cerebral microcirculation in a Rat Model of Cardiac Arrest

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Background

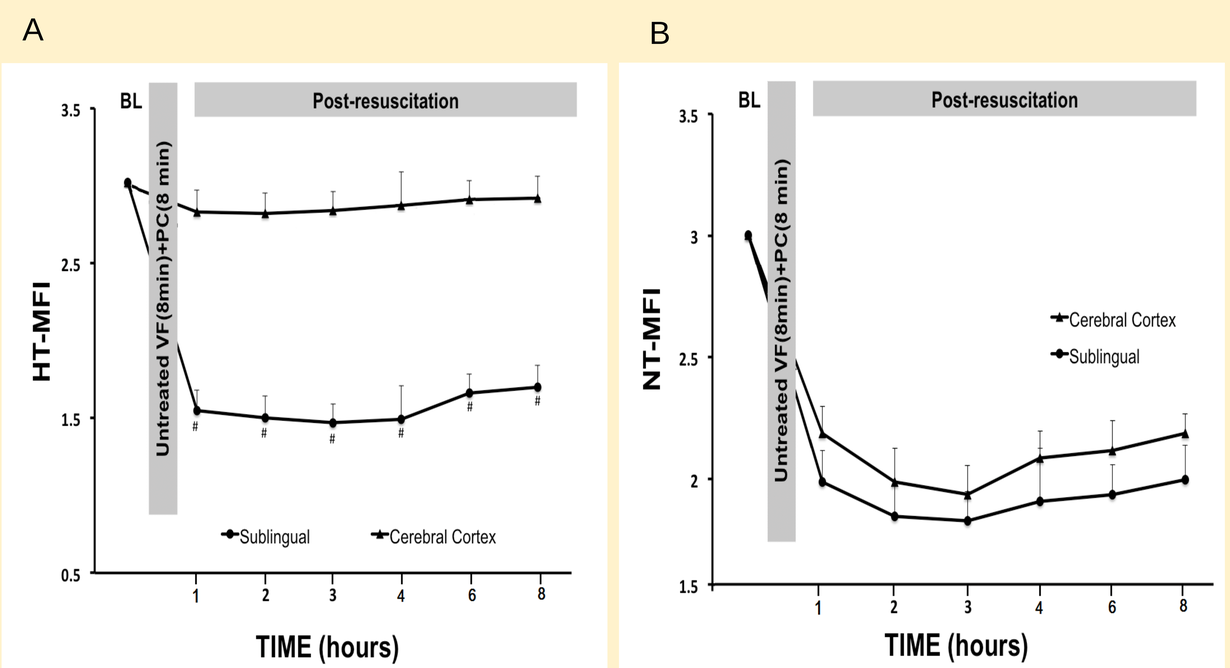
Therapeutic hypothermia improves outcomes after cardiac arrest (CA) and is a standard therapy for comatose patients after successful initial resuscitation[1]. Post-resuscitation functional vital organ recovery is largely dependent on microcirculatory function. The effects of hypothermia on the peripheral and cerebral microcirculation following CA are not fully understood. We hypothesized hypothermia reduces the peripheral microcirculatory flow. However, the microcirculatory flow of the cerebral cortex is preserved during hypothermia in a rat model of CPR.

Methods

Twenty-one male Sprague-Dawley rats were randomized into three groups: hypothermic (HT, n=8), normothermic (NT, n=8) or sham-operated group (SO, n=5). Ventricular fibrillation was induced electrically and untreated for 8 minutes, followed by 8 minutes of precordial compressions and mechanical ventilations. The core temperature was reduced to 33±0.2° C at 5 minutes following successful resuscitation and maintained for 8 hours in the HT group. Normothermic animals were maintained at 37±0.2° C for 8 hours. Sublingual and cerebral cortex micro-circulation was measured by a side stream dark-field imaging device at baseline, 1, 2, 3, 4, 6 and 8 hours post-resuscitation.

Results

Figure 1. Comparison of MFI during post resuscitation



HT, hypothermia group, NT, normothermia group, MFI, microcirculatory flow index. #p<.05 vs. Cerebral Cortex.

All animals were resuscitated successfully. The sublingual MFI (microcirculatory flow index) was decreased compared to the cerebral cortex MFI in the HT group following resuscitation (P< 0.05) (A). However, sublingual and cerebral microcirculation were impaired equally in the NT group after resuscitation(B). A similar reduction in both sublingual and cerebral cortex microcirculatory flow was observed following resuscitation under conditions of normothermia.

Conclusions

Hypothermia preserved the cerebral cortex microcirculation, but not the peripheral microcirculation, after cardiopulmonary resuscitation.

References

1.Group, H. A. C. A. S. (2003). New England Journal of Medicine, 346(8), 549-56.

Disclosure

None