Mild hypothermia improved neurological outcome and reduced mortality after cardiac arrest because of ventricular fibrillation


QUESTION: In patients who are resuscitated after cardiac arrest because of ventricular fibrillation, is mild hypothermia more effective than standard normothermia for improving neurological outcome?

Design
Randomised (allocation concealed)*, blinded (data collectors, clinicians assessing neurological outcome)*, controlled trial with 6 months of follow up.

Setting
9 centres in Austria, Belgium, Finland, Germany, and Italy.

Patients
275 patients seen in the emergency department who were 18–75 years of age (median age 59 y, 76% men) and had spontaneous circulation restored after a witnessed cardiac arrest with ventricular fibrillation or non-perfusing ventricular tachycardia as the initial cardiac rhythm; a presumed cardiac origin of the arrest; an estimated interval of 5–15 minutes from collapse to the first attempt at resuscitation by emergency medical personnel; and an interval of ≤60 minutes from collapse to restoration of spontaneous circulation. Exclusion criteria included a tympanic membrane temperature <30°C on admission and response to verbal commands before randomisation. Follow up was 99% to 100%.

Intervention
All patients received standard intensive care according to a detailed protocol. Standard treatment included sedation (midazolam, initially 0.125 mg/kg/h, and fentanyl, initially 0.002 mg/kg/h), and pancuronium (initially 0.1 mg/kg every 2 h, then as needed for shivering) for 32 hours, with mandatory mechanical ventilation. Patients allocated to mild hypothermia (n=137) were cooled to a target bladder temperature of 32–34°C with an external cooling device. If cooling did not occur within 4 hours after the return of spontaneous circulation, ice packs were applied. The temperature was maintained at 32–34°C for 24 hours from the start of cooling, after which patients were passively rewarmed. Patients allocated to normothermia (n=138) were placed on a conventional hospital bed, and normothermia was maintained.

Main outcome measures
Favourable neurological outcome (Pittsburgh cerebral performance category of 1 [good recovery] or 2 [moderate disability] on a 5 category scale). Secondary outcomes included mortality.

Main results
Analysis was by intention to treat. At 6 months, the hypothermia group had a higher rate of favourable neurological outcome and a lower mortality rate than the normothermia group (table).

Conclusion
In patients who were resuscitated after cardiac arrest because of ventricular fibrillation, mild hypothermia improved neurological outcome and reduced mortality more than standard normothermia.

*Information provided by author.

Mild hypothermia vs standard normothermia after resuscitation for cardiac arrest because of ventricular fibrillation

<table>
<thead>
<tr>
<th>Outcomes at 6 months</th>
<th>Hypothermia</th>
<th>Normothermia</th>
<th>RBI (95% CI)</th>
<th>NNT (CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Favourable neurological outcome</td>
<td>57%</td>
<td>39%</td>
<td>47% (9 to 82)</td>
<td>6 (4 to 29)</td>
</tr>
<tr>
<td>Mortality</td>
<td>34%</td>
<td>55%</td>
<td>38% (5 to 64)</td>
<td>5 (3 to 37)</td>
</tr>
</tbody>
</table>

*Abbreviations defined in glossary; hypothermia event rates, RBI, RRR, NNT, and CI calculated from risk ratios (adjusted for all baseline variables) and control event rates reported in article.

COMMENTARY
Renewed research interest exists on the use of therapeutic hypothermia after resuscitation for out of hospital cardiac arrest as a means of improving patient outcomes. The Hypothermia After Cardiac Arrest Study Group (HACASG) found that patients surviving cardiac arrest who received controlled hypothermia (32–34°C) for 24 hours had better neurological outcomes without an increase in complications during the first 7 days after cardiac arrest. These findings support and extend those of Bernard et al, who studied Australian patients who survived cardiac arrest and were cooled to 33°C for 12 hours.1

Strengths of the HACASG study include the design and the assessment of neurological outcome by clinicians who were unaware of whether patients received hypothermia or normothermia. Because of the specific inclusion criteria and the focus on patients at high risk for brain damage, only 8% of assessed patients were included in the study. Therefore, these results only apply to the small proportion of patients meeting similar criteria. A weakness of the study is that the attending physicians were not blinded to patient allocation, and therefore could have provided more aggressive care to one group or the other.

The results of these 2 trials are relevant to nurses working in emergency departments and intensive care units. Nurses in these settings need to be prepared to safely and effectively care for patients receiving therapeutic hypothermia. Continuous monitoring of core body temperature, blood pressure, heart rhythm, and urine output during induction, steady state hypothermia, and re-warming is crucial. Because sedation and analgesia are needed to ensure patient comfort, and neuromuscular blockade may be needed to prevent shivering and promote induction, patient neurological status should be carefully monitored, especially as the procedure ends.

Although the differences did not reach statistical significance, more patients in the hypothermia group had bleeding, pneumonia, and sepsis during the first 7 days after cardiac arrest. Patients should be observed for signs of bleeding and infection. Assessing the patient’s skin requires vigilance regardless of the external cooling method used.

REFERENCES

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