

# Therapeutic Hypothermia after SCA

The therapeutic value of hypothermia in the immediate treatment of resuscitated, but comatose, patients suffering out-of-hospital sudden cardiac arrest (SCA) has been recognised.

Kenneth Collins reviews some of the recent clinical trials into the therapeutic procedure and comments upon the valuable role of the Hypothermia After Cardiac Arrest Registry (HACA-R).

The International Liaison Committee on Resuscitation (ILCOR) recommends: "Unconscious adult patients with spontaneous circulation after out-of-hospital cardiac arrest should be cooled to 32°C to 34°C for 12 to 24 hours when the initial rhythm was ventricular fibrillation (VF)."<sup>1</sup>

This recommendation was based upon 2 randomised controlled trials: the HACA study<sup>2</sup> in Europe and the Bernard Study<sup>3</sup> in Australia.

## Bernard *et al.*

Bernard *et al.*<sup>3</sup> commenced cooling in the ambulance using ice packs. Surface cooling was then employed upon arrival at the hospital and hypothermia was maintained for 12 hours, followed by a slow rewarming. "Twenty-one of the 43 patients treated with hypothermia (49%) survived and had a good outcome (i.e. discharged home or to a rehabilitation facility) as compared with 9 of the 34 treated with normothermia (26%,  $p=0.046$ ). After adjustment for base-line differences in age and time from collapse to the return of spontaneous circulation, the odds ratio for a good outcome with hypothermia as compared with normothermia was 5.25 (95% confidence interval, 1.47 to 18.76;  $P=0.011$ ). Hypothermia was associated with a lower cardiac index, higher systemic vascular resistance, and hyperglycemia. There was no difference in the frequency of adverse events."

Bernard *et al.* reported: "The difference between the rates of a good outcome (normal or with minimal or moderate disability) in the hypothermia and the normothermia groups (49% and 26%, respectively) was 23 percentage points (95% confidence interval, 13 to 43 percentage points;  $P=0.046$ ). The unadjusted odds ratio for a good outcome in the hypothermia group as compared with the normothermia group was 2.65 (95% confidence interval, 1.02 to 6.88;  $P=0.046$ ). The odds ratio for a good outcome in the hypothermia group as compared with the normothermia group, after adjustment by logistic regression for age and time from collapse to return of spontaneous circulation, was 5.25 (95% confidence interval, 1.47 to 18.76;  $P=0.011$ )."

## The HACA Group

The HACA study group<sup>2</sup> used forced cold air or cold mattresses to induce hypothermia over an average time of 8 hours from arrest down to a target temperature of 33°C. Patients were maintained at that level for up to an elapsed time of 24 hours. Thereafter, they were rewarmed slowly back to normothermia.

The HACA group reported following their randomised, multi-centre trial: "Seventy-five of the 136 patients in the hypothermia group for whom data were available (55%) had a favourable neurologic outcome

## Allgemeines Krankenhaus (AKH) Icy Series

The use of the CoolGard 3000/Icy catheter heat exchange system has been studied in a single-centre patient series conducted by Dr. Fritz Sterz at the Allgemeines Krankenhaus, Vienna, Austria (AKH) between 4 July 2002 and 29 September 2003. Outcomes in patients who received mild hypothermia via the CoolGard System were compared to those seen in normothermia control patients using a propensity score analysis.

Target temperature was reached within 90 minutes of the initiation of cooling. The average rate of cooling obtained was 1.2°C per hour (fig.1). The system maintained temperatures within  $\pm 0.5^\circ\text{C}$  of target. Warming was controlled over a 12 hour period (fig. 2).

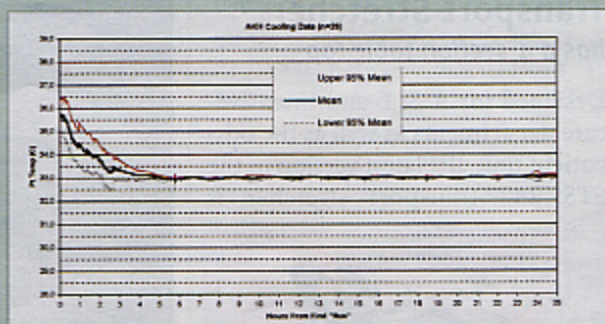


fig. 1: Average Patient Temperature Recorded by CoolGard 3000 system

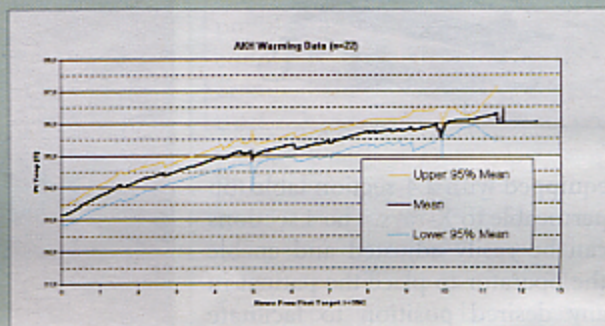


fig. 2: Average Bladder Temperature - Warming Phase

The use of the CoolGard System, when compared to normothermia controls, was associated with a significant improvement in outcome. A safety analysis showed no difference in sepsis rates and a possible trend towards more pneumonia. There were fewer post-arrest episodes of VF in the hypothermic group. There were reversible increases in pancreatic enzymes and creatinine levels noted. The benefits in survival and functional class of survivors clearly outweighed the reported side effects.

## ERC HACA Registry

HACA-R was established by Dr Fritz Sterz, Dr Risto Roine and Dr Kjetil Sunde under the auspices of the European Resuscitation Council. This aim of the Registry is to document the clinical use and outcome of mild resuscitative hypothermia, in patients after cardiac arrest, admitted to the hospital. Registry welcomes data from any European physician working with hypothermia as part of resuscitative care. It works collaboratively to ensure high-quality data from which sound medical practice recommendations can be derived using appropriate scientific methods. The Registry is supported by a grant from Alsium

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The HACA group reported following their randomised, multi-centre trial: "Seventy-five of the 136 patients in the hypothermia group for whom data were available (55%) had a favourable neurologic outcome (cerebral performance category, 1 [good recovery] or 2 [moderate disability]), as compared with 54 of 137 (39%) in the normothermia group (risk ratio, 1.40; 95% confidence interval, 1.08 to 1.81). Mortality at 6 months was 41% in the hypothermia group (56 of 137 patients died), as compared with 55% in the normothermia group (76 of 138 patients; risk ratio, 0.74; 95% confidence interval, 0.58 to 0.95). The complication rate did not differ significantly between the two groups."

The HACA study group showed that the use of mild hypothermia provided a statistically significant improvement in both survival ( $p=0.02$ ) and survival with good neurologic outcome ( $p=0.009$ ) and concluded that in the HACA study, patients were cooled, over 8 hours, down to a target temperature of 33 °C and maintained at that level for up to an elapsed time of 24 hours. Thereafter they were rewarmed slowly back to normothermia.

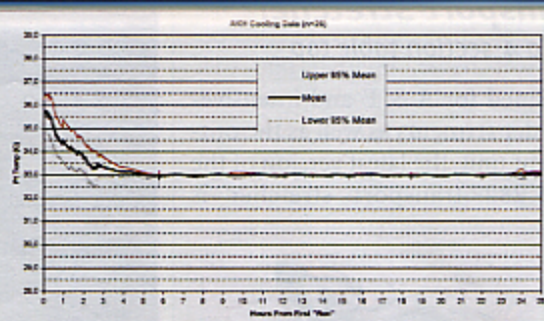


Fig. 1: Average Patient Temperature Recorded by CoolCard 3000 system

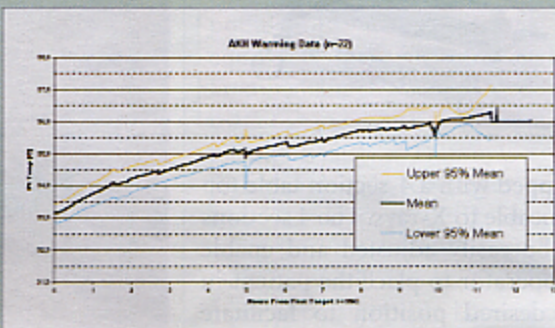


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Physicians interested in participating in the Registry may contact the Chairman via the Registry's web page <http://www.erchacar.org>

### References

- <sup>1</sup> Nolan, J.P., Morley, P.T., Vanden Hoek, T.L., Hickey, R.W. 2003. Therapeutic Hypothermia After Cardiac Arrest. An Advisory Statement by the Advanced Life Support Task Force of the International Liaison Committee on Resuscitation Writing Group. *Circulation* 108:118-121.
- <sup>2</sup> Bernard, S.A., Gray, T.W., Buist, M.D., *et al.* 2002. Treatment of comatose survivors of out-of-hospital cardiac arrest with induced hypothermia. *N Engl J Med* 346:557-563.
- <sup>3</sup> The Hypothermia after Cardiac Arrest Study Group. 2002. Mild therapeutic hypothermia to improve neurologic outcome in cardiac arrest. *N Engl J Med* 346:549-556.

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