

Heart rate during targeted temperature management: A novel early marker of outcome in comatose out-of-hospital cardiac arrest patients treated with both 33°C and 36°C.

Purpose Bradycardia is common during targeted temperature management (TTM) at 33°C, and we recently proposed heart rate as an early marker of outcome following out-of-hospital cardiac arrest (OHCA) (ACCA choice 2014). As the International Liaison Committee on Resuscitation now leaves option for TTM targeting 36°C, markers of outcome and clinical knowledge of the physiological response to TTM in broader ranges are needed. We investigated the predictive capabilities of heart rate in patients randomized to TTM targeting 36°C or 33°C.

Methods We studied 877 comatose OHCA patients, with heart rate data, from the recent TTM-trial. Endpoints were 180-day mortality and unfavorable neurological function (Cerebral Performance Category 3-5). Patients were stratified by target temperature and quartiles of minimum and average heart rate during maintenance of TTM. Multivariable models were applied to adjust for potential confounders including age, initial rhythm, time to return of spontaneous circulation (ROSC) and admission lactate level.

Results Baseline characteristics were similar between quartiles of minimum heart rate in both TTM-groups, however patients with higher heart rates had longer time to ROSC and higher admission lactate level. Minimum and average heart rate were significantly higher in patients treated with TTM at 36°C compared to 33°C (69 vs. 59 bpm, $p < 0.0001$ and 74 vs. 64, $p < 0.0001$, respectively).

Mortality increased with increasing minimum heart rate in the 36°C ($p < 0.001$) and 33°C-group ($p < 0.0001$) (Figure–left). Patients within the lowest quartile of registered heart rate from both groups had lower mortality (36°C: $HR_{adjusted} = 0.63$ (0.40-0.98), $p = 0.04$; 33°C: $HR_{adjusted} = 0.44$ (0.29-0.67), $p < 0.001$) and lower odds of unfavorable neurological outcome (36°C: $OR_{adjusted} = 0.41$ (0.21-0.83), $p = 0.01$; 33°C: $OR_{adjusted} = 0.29$ (0.14-0.58), $p < 0.001$) compared to the highest heart rates. Average heart rate showed similar, albeit less strong, associations with outcome in both TTM groups (Figure–right).

Conclusion Lower heart rates during TTM are independently associated with lower mortality and favorable neurological outcome in a large cohort of comatose OHCA patients treated with 33°C as well as 36°C. Minimum heart rate during TTM is seemingly a stronger predictor of outcome than the average heart rate.

Figure

180-day survival in comatose OHCA patients treated with TTM at 33°C (upper panel) and 36°C (lower panel), stratified by quartiles of minimum heart rate (left panel) and quartiles of average heart rate (right panel).

