MEETING ABSTRACT



Open Access

Prognostication of outcome after cardiac arrest and targeted temperature management

Christoph Leithner

From Targeted Temperature Management (TTM 2014) Berlin, Germany. 6-7 November 2014

The vast majority of cardiac arrest (CA) survivors remain comatose at hospital arrival. Around one-half of these patients suffer from severe hypoxic encephalopathy leading to death or unresponsive wakefulness. Early outcome prognostication may reduce futile intensive care and suffering for next of kin. Several early prognostic markers have shown high positive predictive value for poor outcome in patients treated at normothermia, but results may be altered by targeted temperature management (TTM).

Most prominently, absent motor response to painful stimuli 3 days after CA and a serum concentration of neuron-specific enolase (NSE) above 33 ng/ml do not predict poor outcome reliably in these patients [1,2]. Sedation during TTM is a relevant confounder for motor response and corneal reflexes [3]. Bilaterally absent pupillary light reaction 3 days after CA is a reliable predictor of poor outcome (sensitivity 20%) [1]. Eye diseases and medication are potential confounders.

A threshold for poor outcome prediction by NSE has not been established after TTM. Above a level of 80 to 100 ng/ml 72 hours after CA good outcome has rarely been reported. The NSE levels may vary with different test kits, and NSE producing tumors, acute brain diseases and severe hematological diseases/hemolysis are confounders.

Bilateral absence of cortical median nerve SSEP remains a reliable predictor, but single cases with recovery were reported [4] and inter-rater reliability is not perfect. Preserved spinal SSEP and low cortical noise levels are important prerequisites. The sensitivity of absent SSEP for poor outcome prediction is around 40% [1]. EEG can be a valuable predictive tool when interpreted by experienced neurophysiologists and indicates (subclinical) status epilepticus [5]. The influence of medication on EEG needs to be considered. Recently, a revised EEG classification has been proposed [6].

Department of Neurology, Charité-Universitätsmedizin, Berlin, Germany

A reduced contrast between gray and white matter in brain computed tomography is associated with poor outcome. It can be quantified as gray–white-matter ratio and values below 1.1 predict poor outcome with high specificity [7]. Additional studies are needed to establish this threshold more firmly. MRI emerges as a prognostic parameter because of high spatial resolution and high sensitivity for cytotoxic brain edema with DWI/ADC imaging [8]. However, access is limited and quantification of early changes needs to be established in larger cohorts.

To date, most authors argue for a multiparameter prognostication approach including repeated neurological examination, SSEP, NSE, EEG and imaging (CT or MRI) combined with a waiting period for potential recovery of several days after cardiac arrest.

Financial disclosure

CL has received honorarium and/or travel costs from C. R. BARD.

Declaration

This abstract and supplement was proposed, developed and commissioned by BMC Emergency Medicine and was funded by an educational grant from C. R. BARD, NJ, USA. The published abstract was independently prepared by the author. C. R. BARD had no input into the content.

Published: 24 June 2015

References

- Bouwes A, Binnekade JM, Kuiper MA, Bosch FH, Zandstra DF, Toornvliet AC, et al: Prognosis of coma after therapeutic hypothermia: a prospective cohort study. Ann Neurol 2012, 71:206-12.
- Steffen IG, Hasper D, Ploner CJ, Schefold JC, Dietz E, Martens F, et al: Mild therapeutic hypothermia alters neuron specific enolase as an outcome predictor after resuscitation: 97 prospective hypothermia patients compared to 133 historical non-hypothermia patients. *Crit Care* 2010, 14: R69.
- Samaniego EA, Mlynash M, Caulfield AF, Eyngorn I, Wijman CAC: Sedation confounds outcome prediction in cardiac arrest survivors treated with hypothermia. *Neurocrit Care* 2010, 15:113-9.



© 2015 Leithner; licensee BioMed Central Ltd. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. The Creative Commons Public Domain Dedication waiver (http:// creativecommons.org/publicdomain/zero/1.0/) applies to the data made available in this article, unless otherwise stated.

- Leithner C, Ploner CJ, Hasper D, Storm C: Does hypothermia influence the predictive value of bilateral absent N2O after cardiac arrest? *Neurology* 2010, 74:965-9.
- Rossetti AO, Oddo M, Liaudet L, *et al*: Predictors of awakening from postanoxic status epilepticus after therapeutic hypothermia. *Neurology* 2009, 72:744-9.
- Westhall E, Rosen I, Rossetti AO, van Rootselaar AF, Kjaer TW, Horn J, et al: Electroencephalography (EEG) for neurological prognostication after cardiac arrest and targeted temperature management; rationale and study design. BMC Neurol 2014, 14:159.
- Scheel M, Storm C, Gentsch A, Nee J, Luckenbach F, Ploner CJ, et al: The prognostic value of gray-white-matter ratio in cardiac arrest patients treated with hypothermia. Scand J Trauma Resusc Emerg Med 2013, 21:23.
- Wijman CA, Mlynash M, Caulfield AF, Hsia AW, Eyngorn I, Bammer R, et al: Prognostic value of brain diffusion-weighted imaging after cardiac arrest. Ann Neurol 2009, 65:394-402.

doi:10.1186/1471-227X-15-S1-A10

Cite this article as: Leithner: **Prognostication of outcome after cardiac arrest and targeted temperature management**. *BMC Emergency Medicine* 2015 **15**(Suppl 1):A10.

Submit your next manuscript to BioMed Central and take full advantage of:

- Convenient online submission
- Thorough peer review
- No space constraints or color figure charges
- Immediate publication on acceptance
- Inclusion in PubMed, CAS, Scopus and Google Scholar
- Research which is freely available for redistribution

BioMed Central

Submit your manuscript at www.biomedcentral.com/submit