Prognostication and management of patients who are comatose after cardiac arrest

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The development of cardiopulmonary resuscitation by Peter Safar and others has had the unintended consequence of increasing the number of patients surviving in coma from hypoxic-ischemic encephalopathy. Neurologists often assess the prognosis for functional recovery of these patients, communicate this prognostic information to the patient's family, and help manage the patient through the initial post-arrest period and through subsequent recovery, rehabilitation, or transition to palliative management. Prognostication in the United States has predominantly been based on physical findings elicited at defined time points after resuscitation, typically using data from the work of the Cornell group. In the past 25 years, many have attempted to improve prognostication by adding electrophysiologic or biochemical tests. Of the electrophysiologic studies tested, short-latency somatosensory evoked potentials (SSEPs) emerged as the most robust predictor of poor outcome: loss of the cortical response to median nerve stimulation (the N20 potential) when the earlier potentials (those recorded over the brachial plexus and the dorsal root entry zone near C7) are intact carries an almost certain prognosis of death or poor functional recovery. However, the presence of N20 potentials does not automatically select a group who will do well; several groups have attempted to improve on the predictive accuracy of SSEP testing by looking at longer-latency potentials. The preservation of the N70 SSEP had a sensitivity of 94% and a specificity of 97% for predicting good outcome in patients with preserved N20 potentials. All five patients with preserved N70 responses recovered awareness out of 33 comatose cardiac arrest survivors.

Both of these studies reported on the performance of the N70 potential in single centers, with investigators highly focused on their research protocols. In this issue of Neurology, Zandbergen et al. describe the results of a multicenter trial conducted under circumstances that should more closely reflect the performance of the test in clinical practice. In their study, local neurophysiologists using the equipment already available at their hospitals performed and interpreted the results; there was only moderate interobserver agreement on the interpretation of the evoked potentials. Studies were often not available on weekends, perhaps reflecting a view of neurology as a weekday profession, a problem being fueled by a focus on counting work hours rather than improving performance. The investigators confirmed that bilateral absence of the N20 potential carried a dismal prognosis (no such patient achieved a recovery better than persistent coma). In this setting, the addition of the N70 data to the N20 results was not as useful as in the prior investigations. Thus, this real world study of the N70 potential did not find that it was ready for wide use.

There is accumulating evidence that patients who are comatose after resuscitation should immediately be treated to induce moderate hypothermia (core temperature 32 to 34 °C) for 12 to 24 hours. The number of patients needed to treat to produce one additional neurologically normal survivor is about six, based on these and other studies, without an apparent increase either in mortality or in the number of patients with poor outcomes. Despite these and other reports, and the endorsement of international bodies concerned with resuscitation, hypothermia for coma after cardiac arrest has not achieved widespread use in the United States. Neurologists have an important role in seeing that patients in coma after a cardiac arrest get optimal therapy. In some centers, neurologists have the facil-
ities and expertise to manage these patients primarily. Moreover, we can provide both prognostic and diagnostic information. Initial data suggest that SSEPs still provide prognostic information when hypothermia has been started emergently, although the velocity of conduction is slowed modestly. Although EEG is less useful than SSEPs for prognostication, it is essential for the detection and management of status epilepticus, which may otherwise occur unnoticed when neuromuscular junction blockade is used to suppress thermogenesis during induced hypothermia. Finally, we can initiate or participate in new research on prognostication in the hypothermia era; some of our current notions may need re-examination.

References