Anesthesia and Analgesia Protocol During Therapeutic Hypothermia After Cardiac Arrest: It Is Time to Build Evidence

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A very common clinical scenario: a middle-aged patient suddenly collapses at home/at work/in the community, pulseless. The emergency medical service is called, the patient resuscitated, and rushed to the emergency department. The emergency room physician asks for the admission of a comatose patient after out-of-hospital cardiac arrest (OHCA).

The likelihood of survival at this point is determined by factors that cannot be influenced by the intensive care unit (ICU) physician: initial rhythm, whether the collapse was witnessed, and, the most important factor, the geographic region where the patient collapsed. There is a 10-fold difference in mortality in the latter factor, from 26% in Seattle1 (all rhythms, pretherapeutic hypothermia period) to 2.3% in France2 (all rhythms, standard advanced cardiac life support arm).

Since 2002, there is evidence that adding therapeutic hypothermia (TH) to standard care in selected patient populations experiencing OHCA improves survival3 and neurologic outcome.3,4 Shortly after these publications, the International Liaison Committee on Resuscitation recommended the use of TH in patients experiencing OHCA with ventricular fibrillation and supported its application in all patients with other presenting rhythms, mainly because TH is a brain-directed treatment and not a cardiac treatment.5

These recommendations left the physician community with many practical problems, such as when to start TH (ambulance/emergency room/ICU), how to induce TH, how long to continue treatment (12 hours, 24 hours, or longer), and how to sedate and paralyze patients during TH. Considerable effort has been expended in addressing these questions, but regarding the last point, sedation, answers are still missing. This reflects the situation seen in real life: the ICU in the next town uses different medication, the ICU in the next county never paralyzes patients, and so there are as many concepts as there are ICUs. The great variability reflects the lack of knowledge and evidence for the best treatment. Everyone is trying to provide the best possible care, but the individual approaches vary. The solution to this situation is building evidence, and the first step is defining the problem.

In this issue of Anesthesia & Analgesia, Dr. Chamorro et al.6 review how sedation, analgesia, and muscle relaxation are handled during hypothermia treatment after cardiac arrest. The authors performed a systematic literature search and review of articles to characterize the problem. In a second step, they presented a sedation protocol that they developed based on their analysis. This protocol aims at clarity and minimizing the use of sedative drugs, especially those with longer half-lives. Remifentanil infusion is given at a (moderate) dose of 6 μg/kg/h. To prevent shivering, cisatracurium infusion rather than deep sedation is suggested. Because the muscle relaxation precludes clinical sedation assessment, the bispectral index (BIS) is proposed as a sedation monitor, with a BIS target value of 40 to 60, and propofol is added only to achieve the target.

At first glance, most physicians would be scared by this protocol. The 2 major issues are the use of muscle relaxation without sedation and the use of the BIS monitor to guide sedation and detect seizures. Muscle relaxation efficiently suppresses shivering and helps to induce and maintain hypothermia. Shivering can also be prevented with threshold-lowering drugs, but all of them contribute to sedation. The negative effects of prolonged sedation are well described and are substantial, contrary to the effect of short-term use of muscle relaxants on ICU-acquired paresis. Whether there is an increase in posttraumatic stress disorder in comatose OHCA patients receiving paralysis and analgesic drugs without sedation remains to be demonstrated.

BIS was developed to monitor depth of anesthesia in the operating room, but intensivists have never been convinced of its value as a tool for monitoring depth of sedation, mainly because of the lack of predictability.7 The 2-channel electroencephalogram (EEG), which is the basis of the nonpublic BIS algorithm, cannot exclude the presence of seizure activity. Based on available evidence, the use of this “black-box” device can only be discouraged. However, the...
authors have shown that most ICUs use muscle paralysis without any EEG or sedation-monitoring tool, so arguing against its use without presenting better solutions is not helpful in this discussion.

The authors’ protocol may not be the very best sedation protocol, but it is a practical suggestion. It is based on well thought-out considerations regarding the different drugs, proposed ordering of a stat EEG (probably only available in a few hospitals receiving OHCA patients), and strategies to reduce the amount of sedative drugs. In a third step, this protocol should be validated and tested against other schemes and principles, such as less-expensive opioids instead of remifentanil, benzodiazepines instead of propofol in hemodynamically unstable patients, and continuous EEG monitoring for seizure detection and treatment, if available. The first and second steps have been taken; now it’s time for the third step: building evidence.

REFERENCES