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Editorial

Ultra-early application of prognostic tests for outcome after resuscitation from cardiac arrest

This issue of RESUSCITATION contains a noteworthy article by Scarpino et al.[1] that demonstrates that testing within the first 24 h or cardiac arrest provides robust prognostic information. The study was prompted by the need for better prognostic criteria, with 0% false positives (0%FP) for establishing a poor prognosis (CPC of 4 or 5 categories or 3–5 categories; i.e. death/brain death or vegetative state or severe disability to death, respectively) at 6 months.

Three hundred forty-six patients were studied. The study design was pragmatic and original: 3 tests were analyzed: somatosensory evoked potentials (SSEPs) using absent or marked reduction in the initial cortical response; the ratio of Hounsfield Number ratio of grey matter to white matter (GM/WM) and EEG patterns. These data were collected within the first 24 h of cardiac arrest at multiple centres in Italy and interpreted by local practitioners. Withdrawal of life supportive therapy (WLST) was avoided, preventing self-fulfilling prophesies.

The authors found 0% false positives (FPs)/100% specificity for poor outcomes in the following single parameter groups: SSEPs with bilateral absence of unilateral absence and marked contralateral reduced amplitude in 57.4% of patients; the computed tomographic grey matter to white matter Houndsfield Unit (CT GM/WM) ratio of $<$1.21 in 34.5 % and EEG showing burst-suppression or isoelectric patterns in 48.8%. Various combinations of the three modalities with each showing 0% FP individually, as expected, reduced the sensitivity. However, the non-overlapping cases, where O% FPs was found in one testing modality but not in others increased the sensitivity in finding patients with poor prognosis. For example, 93 patients with normal SSEPs still had poor outcomes; of these 23 had GM/WM ratios $<$1.21, which raised the cumulative sensitivity to from 57.4 to 70.4%. Interestingly, clinical factors commonly used for prognosis, e.g. pupillary reaction, did not prove useful within the 24 h frame.

The findings make sense. When SSEPs are lost, even early, they are almost never regained, and their absence serves as a powerful predictor of poor outcome in cardiac arrest and trauma patients.[2–4] Similarly, edema on CT appears within the first 24 h, has high specificity for poor outcome, and only worsens in the next few days.[5] Kim et al. also found GM/WM ratio at 1 h post-resuscitation was the strongest predictor of poor neurological outcome.[6] Cytotoxic edema, affecting the grey matter, as examined in the Scarpino and Kim papers,[1,6] probably has greater specificity for neuronal damage than more generalized swelling, which likely is a mix of cytotoxic and vasogenic edema.[7] "Malignant" EEG patterns also have high specificity for poor outcome.[3,8] Earlier EEG literature lacked precision of terminology, but recent, precise definitions and criteria[9] have allowed for a more valid evaluation of EEG findings. Burst-suppression and generalized suppression reflect a profound suppression of cerebral cortical activity and would be expected to reflect severe cortical damage. A caveat is that EEG, unlike SSEPs and CT scanning, is very sensitive to anesthetic medications, which are almost always used in resuscitated patients, as they were in the Scarpino study.[1] It may well be that the anesthetic doses used would not cause such severe EEG changes, but there is uncertainty when the sick brain might be more sensitive to their effect. This is the most controversial part of the study. Another aspect that limits the value of the study is that the majority of the patients did not receive targeted temperature management or hypothermia.

The paper has a number of strengths: it was multicentered, used clinicians in those centres ("real world" setting), self-fulfilling prophesies were minimized and a reasonable number of patients were studied. The tests that were used detected early, irreversible changes that were to some extent complimentary. The paper sets the stage for a larger, revised, prospective study to establish improved prognostic criteria, using tests such as these at various time intervals from the arrest, to determine how various times of different tests are best applied.

Conflict of interest

The author declares no conflict of interest.

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G. Bryan Young
Western University, 1800 – 8th Street East, Owen Sound, London, Ontario, N4K6M9, Canada

E-mail address: gbyoung@uwo.ca (G. Young).

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