Prehospital monitoring of cerebral circulation during out of hospital cardiac arrest? A feasibility study

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Background: About two-thirds of the in-hospital deaths after out-of-hospital cardiac arrests (OHCA) are a consequence of anoxic brain injuries, which are due to hypoperfusion of the brain during the cardiac arrests. Being able to monitor cerebral perfusion during cardiopulmonary resuscitation (CPR) is desirable to evaluate the effectiveness of the CPR and to guide further decision making and prognostication.

Methods: Two different devices were used to measure regional cerebral oxygen saturation (rSO2): INVOS™ 5100 (Medtronic, Minneapolis, MN, USA) and Root® O3 (Masimo Corporation, Irvine, CA, USA). At the scene of the OHCA, advanced life support (ALS) was immediately initiated by the Emergency Medical Services (EMS) personnel. Sensors for measuring rSO2 were applied at the scene or during transportation to the hospital. rSO2 values were documented manually together with ETCO2 (end tidal carbon dioxide) on a worksheet specially designed for this study. The study worksheet also included a questionnaire for the EMS personnel with one statement on usability regarding potential interference with ALS.

Results: Twenty-seven patients were included in the statistical analyses. In the INVOS™5100 group (n = 13), the mean rSO2 was 54% (95% CI 40.3–67.7) for patients achieving a return of spontaneous circulation (ROSC) and 28% (95% CI 12.3–43.7) for patients not achieving ROSC (p = 0.04). In the Root® O3 group (n = 14), the mean rSO2 was 50% (95% CI 46.5–53.5) and 41% (95% CI 36.3–45.7) (p = 0.02) for ROSC and no ROSC, respectively. ETCO2 values were not statistically different between the groups. The EMS personnel graded the statement of interference with ALS to a median of 2 (IQR 1–6) on a 10-point Numerical Rating Scale.

Conclusion: Our results suggest that both INVOS™5100 and ROOT® O3 can distinguish between ROSC and no ROSC in OHCA, and both could be used in the pre-hospital setting and during transport with minimal interference with ALS.