The association between global hemodynamics, cerebral oxygenation and survival in post-cardiac arrest patients

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Purpose: the relationship between global hemodynamics, cerebral saturation and patient survival has been poorly investigated in post-cardiac arrest patients. In analogy with sepsis, current guidelines recommend to target mean arterial pressure (MAP) above 65mmHg and SVO2 above 70%. This is unsupported by mortality or cerebral perfusion data. Therefore the aims of the present study were to explore the relationships between MAP, SVO2, cerebral oxygenation and patient survival in post-cardiac arrest patients.

Methods: Prospective observational study in 82 post-cardiac arrest patients

Results: During the first 24 hours after ICU admission, the mean SVO2 was 67±9% and the mean MAP 76±8mmHg. Thirty-nine patients died and 43 survived (43/82 patients, 52%) until ICU discharge. The mean SVO2 range during the first 24 hours after admission associated with maximal survival was 67-72% (OR 8.23, 95% CI [2.07; 32.68], p=0.001). The mean MAP range associated with maximal survival was 76-86 mmHg (OR 2.63, 95% CI [1.01; 6.88], p=0.04). Achievement of the currently recommended MAP above 65mmHg or SVO2 above 70% was not associated with increased survival. Multivariate regression revealed early bystander CPR and a mean SVO2 in the optimal range (OR 6.30, 95% CI [1.12; 35.5], p=0.04) as independent factors associated with increased survival. Based on more than 1625000 data points, we found a strong linear relation between SVO2 (range 40-90%) and average cerebral saturation (R^2 0.86) and between MAP and average cerebral saturation for MAP's between 40-87 mmHg (R^2 0.70). The predicted optimal SVO2 (72%) and MAP (87mmHg) based on this hemodynamic model matched with the optimal SVO2 (67-72%) and MAP (76-86mmHg) associated with maximal survival.

Conclusion: We found an SVO2 between 67-72 % and a MAP between 76-86 mmHg during the first 24 hours after cardiac arrest to result in optimal cerebral oxygenation while being associated with maximal survival. Prospective intervention studies to reach or maintain these targets are needed to confirm these findings.