

Supplementary appendix

Supplement to: Stewart JA, Särkelä M, Salmi T, Wennervirta J, *et al.* Noninvasive neuromonitoring of hypothermic circulatory arrest in aortic surgery.

TRANSCRANIAL DOPPLER ULTRASOUND AND BIOMARKERS

Transcranial Doppler ultrasound (TCD) measures changes in intracranial blood flow, which are a surrogate for changes in intracranial pressure. (1) Pulsatility index (PI) was derived from systolic and diastolic flow differences, measured by TCD from the middle cerebral artery, sonographed at a depth of 49 to 55 mm (TCD, Pioneer TC 4040, Nicolet-EME, Überlingen, Germany). (1) Certain biomarkers, such as neuron-specific enolase (NSE) and protein S100-beta (S100 β) have been used to predict neurological outcome after cardiac surgery. (2)

In this study, measurements by TCD were not predictive of outcome, as the ischemic insults during aortic surgery do not typically lead to immediate increase in intracranial pressure. (3) In this study the blood levels of biomarkers (neuron-specific enolase, protein S100 β) were measured at admission, and on the first two postoperative mornings. Both biomarkers (NSE, S100 β) had higher, non-significant means in the poor primary outcome group, with the exception of a higher S100 β for the poor outcome group on the 2nd POD. Both markers are released from other sources as well, (1) even when no neuron damage is evident.

Neuron-specific enolase (ref. <17 μ g/l) values (median, range) were at admission 11.6 (7.4-27.1) for the good outcome group and 13.4 (8.3-22.5) for the poor outcome group, $p = 0.25$. At 1st postoperative day the values were 37.2 (20.9-76.0) for the good outcome group and 38.7 (32.7-66.9) for the poor outcome group, $p = 0.60$. At the 2nd postoperative day the values were 25.2 (14.6-66.0) for the good outcome group and 37.6 (21.9-46.0) for the poor outcome group, $p = 0.18$. Protein S100 β (ref. <0.11 μ g/l) values (median, range) were at admission 0.04 (0.02-0.12) for the good outcome group and 0.05 (0.03-0.13) for the poor outcome group, $p = 0.36$. At 1st postoperative day the values were 0.16 (0.07-0.51) for the good outcome group and 0.21 (0.16-0.36) for the poor outcome group, $p = 0.36$. At the 2nd postoperative day the values were 0.11 (0.07-0.59) for the good outcome

group and 0.18 (0.12-1.35) for the poor outcome group, $p = 0.02$.

ANESTHESIA AND SEDATION

Anesthesia induction was achieved with propofol ($n = 15$), etomidate ($n = 8$) or a combination of these ($n = 7$). The median (range) dose was 130 (40-240) mg for propofol, and 19 (8-20) mg for etomidate. During surgery all patients received a propofol infusion with a median (range) dose of 2.3 (1.2-3.7) mg/kg/h. For analgesia, patients received either a fentanyl-infusion with a median (range) dose of 0.05 (0.01-0.12) $\mu\text{g/kg/min}$, or a sufentanil-infusion ($n = 6$) with a median (range) dose of 0.010 (0.004-0.080) $\mu\text{g/kg/min}$. At the ICU, patients were sedated with a propofol-infusion at a median (range) dose of 2.2 (0.3-3.3) mg/kg/h. For analgesia, patients ($n = 9$) received a fentanyl-infusion with a median (range) dose of 0.02 (0.01-1.50) $\mu\text{g/kg/min}$, or repeated boluses of intravenous oxanest with a median (range) dose of 2.0 (0.2-5.0) mg/h.

STATISTICAL METHODS

Outliers were defined as any observation outside the range of $[Q1-k(Q3-Q1), Q3+k(Q3-Q1)]$, where $k = 1.5$ and $Q1$, $Q3$ are the 25 % and 75 % quartiles, respectively. Missing data were handled as complete-case analyses. Statistical analyses were performed with IBM SPSS Statistics 21 (IBM Corporation, NY 10589), and Matlab R2015b furnished with Signal Processing and Statistics toolboxes (MathWorks Inc., Natick, MA, USA).

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References

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