Letter by Bennis et al Regarding Article, "Cerebral Near-Infrared Spectroscopy: A Potential Approach for Thrombectomy Monitoring"

Citation for published version (APA):

Bennis, F. C., Aries, M. J. H., & Delhaas, T. (2018). Letter by Bennis et al Regarding Article, "Cerebral Near-Infrared Spectroscopy: A Potential Approach for Thrombectomy Monitoring". *Stroke*, *49*(3), E135-E135. https://doi.org/10.1161/STROKEAHA.117.020293

Document status and date:
Published: 01/03/2018

DOI:
10.1161/STROKEAHA.117.020293

Document Version:
Publisher's PDF, also known as Version of record

Letter to the Editor

Stroke *welcomes Letters to the Editor and will publish them, if suitable, as space permits. Letters must reference a* Stroke *published-ahead-of-print article or an article printed within the past 4 weeks. The maximum length is 750 words including no more than 5 references and 3 authors. Please submit letters typed double-spaced. Letters may be shortened or edited.*

Letter by Bennis et al Regarding Article, "Cerebral Near-Infrared Spectroscopy: A Potential Approach for Thrombectomy Monitoring"

To the Editor:

With interest, we read the brief report by Ritzenthaler et al[1] concerning cerebral near-infrared spectroscopy during thrombectomy in 17 patients with acute anterior circulation ischemic stroke.

The study states that before thrombectomy, frontal regional oxygen brain saturation (rSo_2) significantly correlates with magnetic resonance imaging perfusion parameters. Based on Figure II in the online-only Data Supplement in the study by Ritzenthaler et al, we respectfully disagree with this conclusion. The mentioned figure shows that the correlations between rSo_2 and Time-To-Maximum (TMax) or mean transit time are weak and mainly driven by a large outlier. If this outlier is excluded, correlations are likely to be nonsignificant. In addition, rSo_2 shows large variation with equal ranges for both the affected and the unaffected hemisphere. Because this large variation in rSo_2 is also seen in healthy subjects,[2] it may explain the lack of correlation between reported stroke severity parameters and initial or post-thrombectomy rSo_2.

The median interhemispheric difference in rSo_2 between the affected and the unaffected hemisphere was 8.4% (interquartile range, −11.5 to −4.0). However, an interhemispheric difference of >10% is already present in 5% of preanesthetic patients.[3] Nevertheless, the authors showed that the individual interhemispheric difference diminishes significantly with successful large-vessel recanalization. This finding suggests that near-infrared spectroscopy with 2 simple frontal optodes potentially can be used to detect the important phenomenon of recanalization.

In our opinion, the reported results underline once more that rSo_2 values should not be interpreted as (noninvasive) measures of cortical perfusion or of adequacy of the microcirculation. Changes in local oxyHb and deoxyHb concentrations are likely the result of a complex multifactorial homeostatic process. Furthermore, definite interpretation of the physiological implications of absolute values of rSo_2 is difficult-to-nearly impossible because of lack of knowledge on the exact composition of the small part of tissue measured. However, changes in frontal near-infrared spectroscopy indeed have physiological value because changes in interhemispheric difference seem to correlate with revascularization status, whereas changes in rSo_2 values may reflect increased or stable perfusion without recovering penumbra. This indicates that the suggested method has potential for real-time assessment and guidance for large-vessel revascularization but cannot function as recovery parameter. Because thrombectomy may have a positive effect on clinical outcome even when performed 6 to 24 hours after the onset of ischemic stroke,[4] it is important to assess the individual result of revascularization on brain function. The cerebral fractional oxygen extraction index[5] may provide a more sophisticated measure in which (1) initial high cerebral fractional oxygen extraction index values indicate adequate local perfusion on the short-term and (2) secondary normalizing cerebral fractional oxygen extraction index values point to reduction of the so called overshoot effect by cerebral tissue survival and its associated tissue metabolism. It would, therefore, be interesting to know whether Ritzenthaler et al noticed normalizing cerebral fractional oxygen extraction index values on the long term.

Disclosures

None.

Frank C. Bennis, MSc
Department of Biomedical Engineering
MHeNS School for Mental Health and Neuroscience
Maastricht University
the Netherlands

Marcel J.H. Aries, MD, PhD
Department of Intensive Care
MHeNS School for Mental Health and Neuroscience
Maastricht University Medical Center
the Netherlands

Tammo Delhaas, MD, PhD
Department of Biomedical Engineering
CARIM School for Cardiovascular Diseases
Maastricht University
the Netherlands

References

1. Ritzenthaler T, Cho TH, Mechtouff L, Ong E, Turjman F, Robinson P, et al. Cerebral near-infrared spectroscopy: a potential approach for thrombectomy monitoring. *Stroke*. 2017;48:3390–3392. doi: 10.1161/STROKEAHA.117.019176.
2. Misra M, Stark J, Dujovny M, Widman R, Ausman JI. Transcranial cerebral oximetry in random normal subjects. *Neurol Res*. 1998;20:137–141.
3. Edmonds HL Jr, Ganzel BL, Austin EH III. Cerebral oximetry for cardiac and vascular surgery. *Semin Cardiothorac Vasc Anesth*. 2004;8:147–166.
4. Nogueira RG, Jadhav AP, Haussen DC, Bonafe A, Budzik RF, Bhuva P, et al; DAWN Trial Investigators. Thrombectomy 6 to 24 hours after stroke with a mismatch between deficit and infarct. *N Engl J Med*. 2018;378:11–21. doi: 10.1056/NEJMoa1706442.
5. Naulaers G, Meyns B, Miserez M, Leunens V, Van Huffel S, Casaer P, et al. Use of tissue oxygenation index and fractional tissue oxygen extraction as non-invasive parameters for cerebral oxygenation. A validation study in piglets. *Neonatology*. 2007;92:120–126. doi: 10.1159/000101063.

(*Stroke*. 2018;49:e135. DOI: 10.1161/STROKEAHA.117.020293.)

Stroke is available at http://stroke.ahajournals.org DOI: 10.1161/STROKEAHA.117.020293