Intensive Care Med (2019) 45:1842–1843
https://doi.org/10.1007/s00134-019-05769-w

CORRESPONDENCE

Optic nerve sheath diameter: the next steps

Chiara Robba[1*], Gregorio Santori[2], Marek Czosnyka[3], Francesco Corradi[4] and Giuseppe Citerio[5]

Dear Editor,

The interest in non-invasive determination of raised intracranial pressure (ICP), and in particular, the ultrasonographic measurement of the optic nerve sheath diameter (ONSD) is growing. Despite this technique presents some limitations, as highlighted in our meta-analysis [1], it has shown to be quite accurate when compared with other non-invasive techniques for intracranial pressure estimation (ICP) [2], and it can help in the bedside estimation of raised intracranial pressure [3].

We read with great interest the letter by Hansen HC and Helmke K [4]. They suggested to follow the trend of the ONSD in the same patient over time instead of having a fixed threshold value. This is crucial due to the described variability of ONSD and different cut-offs in pathological conditions. However, for having it useful at the bedside, a definition of percentage changes or of a threshold is needed. Suspected high ICP requires prompt intervention and all the strategies, having side effects, have to be started when an intracranial volume imbalance is present.

Moreover, after an important increase of ICP, the ONSD is not able to shrink immediately as the expanded ONSD requires displacement of cerebrospinal fluid (CSF) from the intracranial compartment and this does not happen in all the conditions and without a delay.

This makes evaluation of trends problematic. We strongly believe that future research should focus on defining the threshold and on the behavior of ONSD with increasing ICP, especially in some pathologies such as subarachnoid hemorrhage and traumatic brain injury.

The concerns about the standardization of ONSD measurement, in our point of view, are clearly defined. This has been also summarized in a review on brain echography in ICU recently published on this journal [3].

Moreover, the unexperienced clinician that starts with the use of ONSD in the clinical setting needs to be sure of an accurate visualization of the anatomical structures and of the possibility of error or artifacts. Using TCCD, which combines color-coded Doppler vessel representation with bi-dimensional pulsed-wave Doppler ultrasound imaging, will help the examiner to avoid error in interpreting vascular images as the ONSD [5]. As for all the monitoring devices, understanding limitations and defining realistic clinical application are crucial for a correct use of ONSD evaluation.

"Less invasive" movement, and the ONSD evaluation is part of it, looks cool and more patient friendly, but until we are able to be accurate with the ICP estimation, it will remain a research tool to be further tested.

*Correspondence: kiarobba@gmail.com
[1] Anaesthesia and Intensive Care, San Martino Policlinico Hospital, IRCCS for Oncology and Neuroscience, Genoa, Italy
Full author information is available at the end of the article

Author details
[1] Anaesthesia and Intensive Care, San Martino Policlinico Hospital, IRCCS for Oncology and Neuroscience, Genoa, Italy. [2] Department of Surgical Sciences and Integrated Diagnostics (DISC), University of Genoa, Genoa, Italy. [3] Brain Physics Laboratory, Division of Neurosurgery, Department of Clinical Neurosciences, Cambridge Biomedical Campus, Addenbrooke's Hospital, University of Cambridge, Cambridge, UK. [4] Anaesthesia and Intensive Care Unit, E.O. Ospedali Galliera, Genoa, Italy. [5] School of Medicine and Surgery, University of Milan-Bicocca, Milan, Italy.

Publisher's Note

Accepted: 25 August 2019
Published online: 12 November 2019

References

1. Robba C, Santori G, Czosnyka M et al (2018) Optic nerve sheath diameter measured sonographically as non-invasive estimator of intracranial pressure: a systematic review and meta-analysis. Intensive Care Med. https://doi.org/10.1007/s00134-018-5305-7
2. Robba C, Cardim D, Tajsic T et al (2017) Ultrasound non-invasive measurement of intracranial pressure in neurointensive care: a

prospective observational study. PLoS Med. https://doi.org/10.1371/journal.pmed.1002356
3. Robba C, Goffi A, Geeraerts T et al (2019) Brain ultrasonography: methodology, basic and advanced principles and clinical applications. A narrative review. Intensive Care Med. https://doi.org/10.1007/s00134-019-05610-4
4. Hansen HC, Helmke K (2019) Optic nerve sheath responses to pressure variations. Intensive Care Med. https://doi.org/10.1007/s00134-019-05746-3
5. Geeraerts T, Launey Y, Martin L et al (2007) Ultrasonography of the optic nerve sheath may be useful for detecting raised intracranial pressure after severe brain injury. Intensive Care Med. https://doi.org/10.1007/s00134-007-0797-6