CRITICAL CARE

COMMENTARY

Optic nerve sheath diameter on initial brain CT, raised intracranial pressure and mortality after severe TBI: an interesting link needing confirmation

Pierre Masquère[1], Fabrice Bonneville[2] and Thomas Geeraerts*[1]

See related research by Legrand *et al.*, http://ccforum.com/content/17/2/R61

Abstract

Optic nerve sheath diameter (ONSD) enlargement on initial computed tomography (CT) scan has been found to be associated with increased mortality after severe traumatic brain injury. This could offer the possibility to detect patients with raised intracranial pressure requiring urgent therapeutic interventions and/or invasive intracranial monitoring to guide the treatment. The method to measure ONSD using CT scan, however, needs further confirmation. Moreover, the link between ONSD enlargement on initial CT scan and raised intracranial pressure also needs to be confirmed by further studies.

In a very interesting study performed on 77 severe traumatic brain injury patients, Legrand and colleagues found that the optic nerve sheath diameter (ONSD) measured on the initial brain computed tomography (CT) scan (performed within the first 3 hours of injury) was a very good predictor of ICU mortality [1]. In the multivariate analysis, ONSD >7.3 mm was independently associated with ICU mortality, and performed better than age >32 years, anisocoria at admission, and basal cistern compression on initial CT scan.

The optic nerve is surrounded by a dural sheath that can inflate in cases of raised pressure in the cerebrospinal fluid. An enlarged ONSD, measured using ocular sonography, has been found in patients with raised intracranial pressure (ICP) [2]. Even if in Legrand and colleagues' study the ICP was measured in only 9% of the patients, we can assume that the strong association between ONSD enlargement of initial CT and mortality was related to raised ICP occurring very early after trauma, as suggested by the fact that ONSD enlargement was also associated with other signs of raised ICP in the first CT scan as basal cistern effacement and midline shift. This is probably the major interest of this study: ONSD measurement on initial CT scan could offer the possibility to detect patients with raised ICP needing urgent therapeutic interventions and/or invasive intracranial monitoring to guide the treatment.

Our enthusiasm must be tempered, however, as the method to measure ONSD using CT scan needs clarification and confirmation. ONSD has been measured 3 mm behind the globe – where the dural sheath is distensible, as has previously been determined using sonography [2-4] and magnetic resonance imaging [5]. In Legrand and colleagues' study, ONSD has been measured on a millimetric slice brain CT scan but only in one plane. As suggested by Unsold and colleagues [6], since the optic nerve has a sinuous course in the horizontal and the vertical plane, a section of the nerve in a single plane can conduce one to overestimate ONSD. Actually, the values of ONSD in Legrand and colleagues' study are larger than values obtained with ultrasound or magnetic resonance imaging or even with CT [7]. Moreover, the precise limits of the sheath and the orbital fat surrounding the sheath can be very difficult to determine. This study probably needs further confirmation of the reliability of the ONSD measurement, after realignment in the optic nerve plane and measurement in several axes.

Abbreviations

CT, computed tomography; ICP, intracranial pressure; ONSD, optic nerve sheath diameter.

*Correspondence: geeraerts.t@chu-toulouse.fr
[1]Department of Anesthesiology and Intensive Care, University Hospital of Toulouse, University Paul Sabatier Toulouse 3, CHU de Rangueil, 31059 Toulouse cedex 9, France
Full list of author information is available at the end of the article

Competing interests
The authors declare that they have no competing interests.

Author details
[1]Department of Anesthesiology and Intensive Care, University Hospital of Toulouse, University Paul Sabatier Toulouse 3, CHU de Rangueil, 31059 Toulouse cedex 9, France. [2]Department of Neuroradiology, University Hospital of Toulouse, University Paul Sabatier Toulouse 3, CHU de Rangueil, 31059 Toulouse cedex 9, France.

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