Reviewer's report

Title: Ophthalmodynamometry for ICP prediction and pilot field test on Mt. Everest

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Reviewer: Thomas Geeraerts

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This study can be divided in two parts.

The first part aims to validate a non-invasive estimate of intracranial pressure (ICP) using ophthalmodynamometry (ODM) in 12 neurocritical patients, with intraventricular pressure as a reference method.

The second part is a description of ODM changes during a climb to the Mt Everest in a cohort of 42 trekkers.

I have several major concerns.

The first part of the paper is convincing. This results are however not original, as very similar results have been already published by the same team on 6 patients, and by a German group on 22 neuro-ICU patients, using a very comparable prototype. The prototype “improvement” (powering it with two rechargeable Lithium, electrical isolation, and addition of a finger activated button-type switch to freeze the display readout despite a foot pedal switch) does not appear to be significant. Conducting a replication study to validate this prototype with such small « improvement » can therefore appear futile.

Inter and intra-observer variability appears to be acceptable, however the prediction of ICP using ODM can be questioned, as a range of 10 mmHg of ICP can be observed for the same ODM value. Authors should plot the linear regression between ICP and ODM with the 95% confidence line. What were the 95% limits of prediction. This point is very important to estimate the accuracy of ODM to predict ICP, and should be discussed.

The second part of the paper is not convincing. Authors claims that “On the southwestern approach to and South Col route on Mt. Everest (Nepal), we performed ODM measurements on 42 volunteers (a 'convenience set'), including multiple altitudes on 9 subjects. ». Looking at the figure 3A, it seems that measures were not performed in the 42 volunteers at different altitude, but rather in a variable dataset (from 2 to 11 volunteers) at different altitudes. This point is a major limit of the study, as mean ODM derived from only 2 observations at a given altitude is not pertinent. An acceptable dataset would be more than 10 ODM measurements at predefined altitudes. Moreover, it is not clear to me if ODM measurements have been only performed during the ascent. Data obtained from measurement during descend, and comparing it to the ascent would have been very interesting.
Generally the paper is too long. The abstract is too long. The discussion is also too long and should focused on the data, results and not being a general and superficial discussion on brain edema on altitude. A more profound discussion on the effect of altitude on retinal blood flow, and how it can affect the results should be done. The small sample size for ODM measurements at different altitudes should be mentioned in the discussion, knowing the difficulty for having these measurements on such extreme conditions.

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Level of interest: An article whose findings are important to those with closely related research interests

Quality of written English: Acceptable

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:

I have no competing interest