Reviewer's report

Title: Cognition after malignant media infarction and decompressive hemicraniectomy

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Reviewer: Tibo Gerriets

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In reference to cognition, quality of life and self-estimation of symptoms the authors describe the outcome of 20 patients with malignant middle cerebral artery (MCA) infarction who received decompressive hemicraniectomy (DCH). The assessment took place at a mean of 3 years after DCH (with high range of time points for follow-up). It included a thorough neuropsychological examination with a broad variety of tests. The test battery consisted of well-established sensitive and reliable neuropsychological measures which are fit to detect impairment in cognitive domains in a differentiated manner. To include only patients with MCA infarction on the non-dominant hemisphere was a correct decision for homogeneity and comparability. However, regarding functional activity (Barthel index) there was a high range in this group, ranging from nearly gravest need of care to low need. The outcome measures were compared to 20 healthy volunteers with similar age and education.

The strongest disadvantage of the study, as the authors themselves state in their discussion, is that it cannot provide any data in comparison to malignant MCA infarction patients who received conventional treatment. This lack is very unfortunate as it means, in conclusion, that none of the described effects can clearly be attributed to the specific condition. It is possible (as the authors also admit) that conventionally treated patients show even more or heavier deficits due to untreated swelling. In addition it possible that this kind of patients had mild cognitive impairment (MCI) even before infarction or that the impairment develops over the years (in an extreme case, one patient was assessed 8 years after stroke!). Although in this sample no patients have a recorded history of dementia before infarction, it is well-possible that subclinical MCI was present beforehand - as is frequently the case in patients with cerebro-vascular risk factors. - A statistical difference in cognitive performance overall (presented as one of the main findings) is just an expectable result when contrasting patients after severe brain lesions with healthy individuals.

The selection of patients with non-speech dominant hemisphere stroke should be discussed insistently, since many authors do not exclude aphasic patients from DHC and find quite remarkable recovery of speech during the rehabilitation and acceptable QoL thereafter. A comparison of speech dominant and non- speech dominant patients would be desirable with respect to cognitive outcome and QoL. I would furthermore modify the last sentence of the abstract. The term "should be informed" should be avoided and the second key finding (high incidence of
depression) might be emphasized.

There are some points in addition:

- How was post-stroke dementia differentiated from MCI? E.g. z scores somewhat lower than -1 indicate only mild impairment (if any). According to all criteria for dementia, in addition to a measured decline in cognitive domains, substantial and persistent failures in daily living – due to cognitive deficits - need to be reported by patients or relatives. Furthermore, most patients are impaired due to a variety of problems, like physical handicaps, epilepsy, depression, etc. How was a limitation of daily functioning, as caused in particular by cognitive problems, verified?

- As stated above, patients had a high range in Barthel index, thus comparability within this group is clearly reduced.

- Depression - and this is a major issue - was very common in this study group. Cognitive results are severely influenced by depression (“pseudo dementia”), thus cognitive impairment or dementia could be over-estimated. Cognitive outcomes in depressed patients are plainly not reliable. In conclusion, the study does not prove cognitive impairment.

- The choice of a healthy control group is also a disadvantage in this regard. It would have been much more recommendable to contrast against people with depression.

- Was depression correlated to the presence of epilepsy?

- In my opinion, the fact that depression was remarkably high-rated is the most striking result. It should be discussed more thoroughly and appraised in the main conclusions. Depression – as was also shown in the results - has an impact on the patient’s estimation of the decision for DCH retrospectively (or to state that one would opt for this solution again). The results indicate it is not the cognitive outcome that impairs quality of life primarily but depression, although these phenomena might be interrelated. Detailed information about medical/psychotherapeutic treatment of the depressive symptoms should be provided.

- The authors do not state what underlying pathophysiology is assumed to play a role in the outcomes like cognitive impairment or depression.

- How long did the cognitive assessment take? The test battery is quite extraordinarily extensive. (Maybe too long for very handicapped people?)

- In Figures 1-2 it is advisable to present groups graphically more distinguishable (e.g. black vs. white).

**Level of interest:** An article of outstanding merit and interest in its field

**Quality of written English:** Needs some language corrections before being published

**Statistical review:** No, the manuscript does not need to be seen by a statistician.
Declaration of competing interests:

I declare that I have no competing interests