Reviewer's report

Title: Hydrocephalus is a rare outcome in community-acquired bacterial meningitis in adults: a retrospective analysis

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Reviewer: Matthias Klein

Reviewer's report:

In this study, the authors retrospectively analyzed 167 episodes of community acquired bacterial meningitis from 1998 to 2010 from Northern Denmark. Patients were identified through a laboratory register and only cases with direct or indirect identification of bacteria were included. The diagnosis of hydrocephalus relied on radiologists' interpretation of cranial imaging that was done in 122 of the 167 patients. In summary, 5 patients were identified to suffer from hydrocephalus. Two of the patients suffered from E. coli meningitis and 3 of S. pneumonia meningitis. The authors report hydrocephalus to be associated with a high case fatality rate.

Hydrocephalus is a well-known complication of acute bacterial meningitis. Data on the incidence of hydrocephalus in bacterial meningitis differ, reaching from 5% in a Dutch study on community acquired meningitis (Kasamoentalib et al., Neurology 2010) to 16.1% in a monocenter study on pneumococcal meningitis (Kastenbauer et al., Brain 2003). One risk factor for the development of hydrocephalus is pneumococcal meningitis as shown among the studies. The topic of hydrocephalus in bacterial meningitis is important (as it presents a severe (acute) complication of bacterial meningitis and often requires special treatment), making this an interesting study. There are a few points that should be addressed.

Major Revisions:

(i) In the methods section, the authors write that “Outcome was graded according to the Glasgow Outcome Scale (GOS) based on hospital records from the primary and any subsequent admissions or out-patient follow-ups at hospitals within the region”. It remains unclear at what time point GOS was assessed. Furthermore, it remains uncertain what the reasons for a low GOS were. E.g., is it possible that a patient who might have died during a subsequent admission months after meningitis may have received a GOS of 1 (although he died completely unrelated to meningitis e.g. by heard attack)?

(ii) Patient characteristics are described but the information given is limited to causative pathogens and GOS in all patients. At least, basic demographic data should be provided in a table. Among basic information, length of hospital stay and GOS at discharge (see also remark #1) are of interest.

(iii) Concerning patients with hydrocephalus, information on the clinical course and complications should be extended. It is unclear why intensive care and
resuscitation were waved in patients 2 and 5. Also, it is unclear why EVD was removed in patient 3 and not replaced by a new EVD despite hydrocephalus and increased ICP. Data on the clinical findings at the time of hydrocephalus is not reported for any of the patients. Was there a clinical correlate? Were patients comatose? Also, it remains unclear, how hydrocephalus was relevant for clinical outcome. What other complications occurred and how did other complications influence outcome in the reported patients (e.g. ischemic stroke was noted in patients 1 and 3, and patient 4 showed intracranial hemorrhages). What was the reason for the reduced GOS in the surviving patients 1, 2, and 4?

(iv) What was the reason for death in patients who did not suffer from hydrocephalus? Was hydrocephalus ruled out or is there a chance that the development of hydrocephalus was missed because a CT was done only on admission and a follow up scan was not performed in some of these patients?

Minor Revisions:

(v) The patients that were assessed were diagnosed and treated in “North Denmark Region”. Information on the region (number of inhabitants) and the hospital(s) involved (One hospital only? Multiple hospitals?) needs to be provided.

(vi) By inclusion criteria #2, patients with positive blood culture and e.g. little CSF pleocytosis (>10 cells/µl) or high CSF protein only were identified as bacterial meningitis. However, this formulation is critical since it might have allowed false positive inclusion of patients with sepsis and accompanying CFS pleocytosis or high CSF protein due to other reasons.

(vii) The rate of hydrocephalus was quite small in this study. How can the discrepancy to other studies be explained? E.g., may it be possible that very severely ill patients with hydrocephalus on admission could not receive a lumbar puncture initially and, thus, might have received empiric antibiotic therapy for some time before CSF was drawn? As the chance to identify a causative pathogen gets smaller rapidly as time progresses after the start of antibiotics, such (usually very ill) patients might not have shown up in the database that was used to identify patients. This should be discussed.

(viii) Without information on the course of the disease and the reasons that led to poor outcome, the conclusion “The high case fatality and the low Glasgow outcome score among survivors emphasize the need for identifying new methods for timely diagnosis and treatment of this complication” cannot be derived from this study. Furthermore, given the small number of patients with hydrocephalus, conclusions that can be derived from the study remain limited in general.

Level of interest: An article of importance in its field

Quality of written English: Acceptable

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