Letters to the Editor

Ammonia and cerebral water. Importance of structural analysis of the brain in hepatic encephalopathy

To the Editor:
We read with interest the article by Mardini and colleagues [1], who induced hyperammonaemia experimentally in patients with cirrhosis. They show an increase in apparent diffusion coefficient (ADC) reported on diffusion tensor MR imaging (DTI) of the brain and a decrease in frontal white matter (FWM) myo-inositol (ml) demonstrated on concurrent 1H MR spectroscopy (MRS). These imaging abnormalities were reported in the absence of a change in cognitive status of the patients longitudinally across the study. The authors conclude that this is further evidence of compensated, low grade cerebral oedema in minimal hepatic encephalopathy (MHE), but we would caution against this firm conclusion in MHE patients, because the accumulated published data are uncertain, owing to a lack of direct structural analysis of brain volumes to date.

While measurement of ADC is a valid, but indirect method of assessing shifts in brain water content in cellular compartments, there is debate about the precise contribution to structural changes and to the formation and nature of cerebral oedema itself in MHE. Mardini and her group suggest that the low ml changes and to the formation and nature of cerebral oedema there is debate about the precise contribution to structural assessing shifts in brain water content in cellular compartments, of brain volumes to date.

Volumetric analysis of the brain has advanced mathematically in recent years and small changes lower than 1% brain volume change can be assessed by thorough MRI co-registration. We have used co-registration techniques in patients with a previous episode of overt hepatic encephalopathy and have demonstrated changes in brain volume following a 4–6 week treatment with lactulose [2], but with appropriate software, the technique is sensitive enough to detect even very small brain volume changes over short time frames of 2 h, such as in intense learning tasks [3]. Voxel-based morphometry (VBM) allows sensitive detection of regional brain volume changes, which would have supported the MRS data on induced hyperammonaemia in Mardini’s elegant study [4].

Given the lack of change in psychometric state in these patients following the induced hyperammonaemia, it is questionable as to whether the model used by Mardini’s team accurately represented clinical decompensation in this instance. It could be argued that hyperammonaemia alone is not sufficient to cause changes in cognitive state and that structural changes in addition to changes in water compartmentalization are required. Volumetric analysis would have supported the main conclusions of the paper. Since the acquisition parameters of the 3D 3T MRI data used by Mardini and her co-workers still lend themselves to a post hoc volumetric analysis, we believe that this would assist hepatologists in their ongoing debates regarding the pathophysiological significance of brain water and low grade cerebral oedema in MHE.

Conflict of interest

The authors declared that they do not have anything to disclose regarding funding or conflict of interest with respect to this manuscript.

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References


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Reply to: “Ammonia and cerebral water. Importance of structural analysis of the brain in hepatic encephalopathy”

To the Editor:

We thank McPhail et al. [1] for their comments regarding our paper [2] in which we reported that induced hyperammonaemia in patients with hepatic encephalopathy (HE) leads to a transient increase in brain water apparent diffusion coefficient (ADC) reported from diffusion tensor imaging (DTI), accompanied by a decrease in frontal white matter myo-inositol (ml) measured by proton magnetic resonance spectroscopy (MRS). McPhail et al.