Potential protective role of reactive astrocytes in the periventricular parenchyma in congenital hydrocephalus

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Background

Cerebrospinal fluid accumulation in hydrocephalus produces an elevation of intraventricular pres-sure with pathological consequences on the periventricular brain parenchyma including ischemia, oedema, oxidative stress, and accumulation of metabolic waste products. Here we studied in the hyh mouse, an animal model of congenital hydrocephalus, the role of reactive astrocytes in this clinical degenerative condition.

Materials and methods

Wild type and hydrocephalic hyh mice at 30 days of postnatal age were used. Three metabolites related to the oxidative and neurotoxic conditions were analysed in ex vivo samples (glutathione, glutamine and taurine) using High Resolution Magic Angle Spinning (HR-MAS). Glutathione synthe-tase and peroxidase, glutamine synthetase, kidney-type glutaminase (KGA), and taurine/taurine transporter were immunolocated in brain sections.

Results

Levels of the metabolites were remarkably higher in hydrocephalic conditions. Glutathione peroxi-dase and synthetase were both detected in the periventricular reactive astrocytes and neurons. Taurine was mostly found free in the periventricular parenchyma and in the reactive astrocytes, and the taurine transporter was mainly present in the neurons located in such regions. Glutamine synthetase was found in reactive astrocytes. Glutaminase was also detected in the reactive astro-cytes and in periventricular neurons. These results suggest a possible protective response of reac-tive astrocytes against oxidative stress and neurotoxic conditions.

Conclusions

Astrocyte reaction seems to trigger an anti-oxidative and anti-neurotoxic response in order to ameliorate pathological damage in periventricular areas of the hydrocephalic mice.

No conflict of interest to declare.