

Role of AQP4 in brain barriers and functional interfaces during systemic hypertension and ventriculomegaly

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Background

Systemic arterial hypertension produces alterations of the circumventricular structures, ventricular dilation and changes in the protein composition of the CSF, the aim of the present work is to analyze the expression of aquaporin-4 (AQP4) in the CSF-brain interface (CSF-Bi) and blood-brain barrier (BBB) in a rat model of hypertension.

Materials and Methods

Brains and CSF from rats of 26 and 52 weeks of age were used, divided into two groups: a control group Wistar-Kioto (WKY) and a hypertensive group (SHR). The brain sections containing lateral ventricle, striatum, hippocampus and frontal cortex were processed by immunohistochemistry and immunofluorescence with anti-AQP4. AQP4 in the CSF was also analyzed by ELISA.

Results

CSF-Bi AQP4 was located at the feet of the astrocytes and in the ependymal cells of the lateral ventricles. Lateral ventricle presented AQP4 differences, showing a decrease of almost half in the expression of AQP4 in SHR with respect to WKY. BBB AQP4 was also located at the feet of the astrocytes surrounding the cerebral capillaries in hippocampus and frontal cortex. At six months a 1.5 fold increase in the expression of AQP4 was observed in the hypertensive rats compared to the controls, while at 12 months this increase was double in the quantification of AQP4. CSF The mean value of the concentration of AQP4 CSF of the SHR tend to be higher than WKY, but not significant at 6 months. However, at 12 months, an average concentration of AQP4 CSF of the SHR was significant higher than WKY.

Conclusions

Hypertension in these rats produces an AQP4 decrease in the CSF-Bi and an AQP4 increase in the BBB and CSF. We could surmise that, given that BBB and CSF-Bi are areas involved in the passage of water from the blood to the brain and the brain to CSF, that transport would be altered in systemic hypertension and ventriculomegaly and the AQP4 variations could be a compensation mechanism to avoid or slow the brain edema and the ventriculomegaly.