ABSTRACT

TITLE OF THE ABSTRACT : Estimation of Aquaporin-4 levels in cerebral cortex and its role in brain edema and neurological function in an automated cortical cryoinjuy model in mice

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AIM / OBJECTIVES:

To study the spatial and temporal profile of aquaporin-4 (AQP-4) at injury and distant sites at 24, 48, 72 hours post injury following cortical cryoinjury mice and to correlate the neurological function at different time intervals

MATERIAL AND METHODS:

Young male adult Swiss albino mice weighing 30 to 35 gms were used. Twelve animals each were sacrificed at time points of 24 hours, 48 hours and 72 hours post injury. Brains from six normal mice were used for determining the water content as well as AQP4 distribution in the normal brain. Cold injury (18) was created by a automated cryoinjury model. Sham injury (18) was created by doing a craniotomy and placement of non pre-cooled copper cylinder on dura. Percentage water content was calculated and functional outcome was measured using NSS and RR score. AQP-4 expression was determined using western blotting. Data were expressed as mean ± standard deviation. The percentage water content and Neurological Severity Score (NSS) and RR score was compared between the two study groups using Mann-Whitney U test. P-values of less than 0.05 were considered statistically significant. All statistical analysis was done using SPSS Version 16.0 (IBM, USA).

RESULTS:

There was increased percentage water content in the injury group as compared to sham group at the end of 24 hours which correlated with poor neurological outcome as measured by the NSS and RR score which were significant at the end of 24 hours. There was increased expression of AQP-4 and its isoforms at the end of 24 hours at the site of injury and distant sites of injury in the injury group. This correlated with increased water content and poor neurological outcome.

CONCLUSIONS:

There is a 1.4 fold increase in AQP-4 expression in the injured brain as compared to sham as well as controls at the first 24 hours following injury that could be correlated with deterioration in functional outcome as well as development of brain oedema. Over the next 48 hours, there was partial functional recovery with reduction in AQP-4 expression. Though there was increase in the percentage water content at the end of 48 and 72 hours there was no statistically significant increase in the water content as that seen at the end of 24 hours. Hence newer strategies to target AQP-4 during the early hours of traumatic brain injury could lead to better treatment of cerebral oedema following a traumatic brain injury. However we need more studies to substantiate our findings.

Key words Aquaporin 4 (AQP-4), Neurological Severity Scale (NSS), Rotarod Score (RR), Brain oedema