3 - Clinical Anatomy

OC-051 - (23819) - A STUDY ON THE INFLUENCE OF CRANIO-CERVICAL JUNCTION COMPLIANCE CHANGES ON CEREBROSPINAL FLUID DYNAMICS

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The cranio-cervical junction (CCJ) represents a critical transitional zone between the cranium and the cervical spine. Tissue compliance changes within this region have been shown to disrupt cerebrospinal fluid (CSF) flow.

A collagen fibrous hyperplasia model was established by injecting bleomycin (BLM) into posterior atlanto-occipital interspace (PAOiS) in mice. Histological staining and semi-quantitative analysis were used to analyses the collagen fiber's amount in PAOiS. Quantitative real time polymerase chain reaction (qRT-PCR) was used to evaluate the expression of fibrosis markers collagen Ia1 (colla1) and α-smooth muscle actin (α-SMA). Tissue compliance in the PAOiS was assessed by uniaxial tensile testing, and CSF pressure in lateral ventricle was monitored using fiber-optic pressure sensor.

Masson-stained sections and semiquantitative analyses demonstrated a significant increase in collagen fiber deposition in the PAOiS following BLM treatment. The proliferative fibers were more regularly organized and densely packed, accompanied by marked thickening of the posterior atlanto-occipital membrane. qRT-PCR revealed significantly elevated expression levels of colIa1 and α-SMA in the BLM-treated group. Uniaxial tensile testing showed a significant increase in the elastic modulus of tissue in the PAOiS after hyperplastic changes, indicating heightened stiffness and reduced compliance of the tissue. Additionally, measurement of CSF pressure indicated that the CSF pressure in lateral ventricle was elevated in mice following the decreased tissue compliance in the PAOiS.

These findings suggest that reduced tissue compliance resulting from hyperplasia may disrupt normal CSF dynamics. This study provides a foundation for clinical investigations into neurological disorders linked to abnormal CSF dynamics in the CCJ.

Palavras-chave : Cranio-cervical junction, Compliance, Cerebrospinal fluid dynamics