The First Six Hours: Tracking Neural Damage Through Cerebrospinal Fluid

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Neonatal brachial plexus injury (BPI) can lead to significant and lasting motor and sensory impairments, particularly because the brachial plexus is directly connected to the spinal cord. Injury at this interface can extend to the spinal cord, yet early detection of spinal cord involvement remains a major challenge. Delays in identifying this injury can postpone critical interventions during a narrow therapeutic window. This study explores whether cerebrospinal fluid (CSF) biomarkers can provide early evidence of spinal cord injury following BPI. Spinal cord and CSF samples from a clinically relevant piglet model were used. Samples were provided from two groups (Sham and Injury) 6-hours post-operation. Concentrations of glial fibrillary acidic protein (GFAP), a marker of neural structural damage, and interleukin-6 (IL-6), an inflammatory cytokine, were quantified using enzyme-linked immunosorbent assay (ELISA). It was hypothesized that injury samples would exhibit elevated levels of both biomarkers compared to controls. Results demonstrated increased concentrations of GFAP and IL-6 in injury samples relative to controls. Additionally, biomarker levels rose with increasing injury severity, indicating a relationship between the extent of damage and the magnitude of both structural disruption and inflammatory response. These findings support the potential of CSF biomarkers as early indicators of spinal cord injury following neonatal BPI. Early detection through biomarker analysis may enable more timely diagnosis and intervention, ultimately improving clinical outcomes.

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