

PATHOLOGICAL ASSESSMENT OF A PIGLET MODEL OF TRAUMATIC BRAIN INJURY UTILIZING NON-INVASIVE MAGNETIC RESONANCE IMAGING

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ABSTRACT

Traumatic brain injury (TBI) is a major cause of death and disability in the United States. Stem cell therapies offer a promising treatment for TBI by producing regenerative and anti-inflammatory growth factors while also functioning as a cell replacement therapy. Animal models not truly representative of the human condition have impeded development of a translatable TBI treatment, suggesting a more human-like animal model, such as a piglet, is necessary for developing a successful cell therapy. Magnetic resonance imaging (MRI) is pertinent in the analysis and treatment of TBI, and combining multiple MR parameters provides a comprehensive understanding of TBI pathophysiology. We hypothesize that controlled cortical impact (CCI) TBI in piglets will result in substantial deficits at the lesion site that can be measured and quantified non-invasively through MRI. TBI was induced in six male piglets. After 24 hours post-TBI, T2 FLAIR was implemented to visualize the lesion. Midline shift, lesion size, brain swelling and edema will be measured from the T2 weighted coronal images. Analyzing the multiple MR parameters will illustrate the differences in the injury 1-day post TBI and 12-weeks post-TBI. A reduced midline shift, lesion size, brain swelling and edema is expected 12-weeks post-TBI as damaged tissue is removed and the brain undergoes global regeneration and remodeling. Development and characterization of key cytoarchitectural changes in the CCI TBI piglet model utilizing MRI in this study will enable more robust and predictive assessment of novel therapeutics and treatments that will likely lead to more success in human clinical trials.