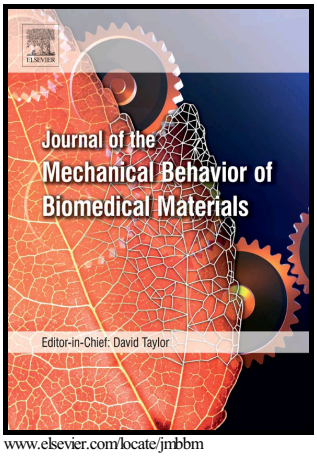

www.elsevier.com/locate/jmbbm

Compressive Properties and Constitutive Modeling of Different Regions of 8-week-old Pediatric Porcine Brain under Large Strain and Wide Strain Rates

Zhigang Li, Haifeng Yang, Guangliang Wang, Xiaoqiang Han, Shaopeng Zhang

PII: S1751-6161(18)30701-X
DOI: https://doi.org/10.1016/j.jmbbm.2018.09.010
Reference: JMBBM2975

To appear in: *Journal of the Mechanical Behavior of Biomedical Materials*

Received date: 6 May 2018
Revised date: 15 August 2018
Accepted date: 7 September 2018

Cite this article as: Zhigang Li, Haifeng Yang, Guangliang Wang, Xiaoqiang Han and Shaopeng Zhang, Compressive Properties and Constitutive Modeling of Different Regions of 8-week-old Pediatric Porcine Brain under Large Strain and Wide Strain Rates, *Journal of the Mechanical Behavior of Biomedical Materials,* https://doi.org/10.1016/j.jmbbm.2018.09.010

Compressive Properties and Constitutive Modeling of Different Regions of 8-week-old Pediatric Porcine Brain under Large Strain and Wide Strain Rates

Zhigang Li*, Haifeng Yang, Guangliang Wang, Xiaoqiang Han, Shaopeng Zhang

School of Mechanical, Electronic and Control Engineering, Beijing Jiaotong University, Beijing 100044, China

Email: zgli@bjtu.edu.cn
lizhigang504@163.com

Correspondence to:Zhigang Li, PhD, School of Mechanical, Electronic and Control Engineering, Beijing Jiaotong University, Beijing 100044, PR China, Tel.: +86-13436980207

Abstract

Porcine head is often used as a human surrogate in traumatic head injury research. Extensive research on mechanical properties of adult human / porcine brain tissues has been performed previously; however, very limited data is available for children, which is particular important for modelling the pediatric traumatic brain injury (TBI). In this study, uniaxial compression tests at strain rates of 0.01/s, 1/s and 50/s up to 50% strain were performed for the corona radiata, corpus callosum, thalamus, cortex, cerebellum and brainstem of 8-week-old piglets. No significant difference in tissue strength was found among the cerebrum regions of cortex, thalamus, corona radiata and corpus callosum. The average stress of cerebellum was approximate 21% and 15% higher than that of cerebrum at a strain of 0.25 and 0.5, respectively, but it did not reach statistical significant level than most of the cerebrum regions. Brainstem was the stiffest among these 6 regions, and it was significant stiffer than most regions of cerebrum, with average stress of about 28% and 40% higher at a strain of 0.25 and 0.5, respectively. The strengths of all these three regions showed significant strain-rate dependent characteristics, with the strain rate increasing from 0.01/s to 50/s, the average stress of cerebrum, cerebellum and brainstem increased to approximate 4.6, 6.3 and 6.3 times, respectively at a strain of 0.25; and increased to approximate