Master's Thesis Defense Announcement
Mechanical and Aerospace Engineering Department
University of Texas at Arlington

RELATING LINEAR AND ROTATIONAL ACCELERATIONS WITH INTERNAL PRESSURES DEVELOPPED INSIDE HUMAN HEAD SURROGATE MODELS

By

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10:00 AM, Friday, December 10th

Woolf Hall 413

Abstract

Traumatic Brain Injury (TBI) is a chronic disease process that is difficult to both detect and treat. TBI can result from blast, kinetic, sonic, and electromagnet energy sources. This research focuses on correlating the bulk acceleration of a human like head model to the localized internal pressure developed in the Coup and Contrecoup regions due to variable impact loading. Damage resulting in a TBI occurs on a multiscale level from the macroscale down to the damage of each individual neuron. Obtaining a relationship between bulk acceleration and localized internal pressure will allow for further correlation to the damage done on these smaller length scales. Internal pressure information also allows for investigation into whether cavitation occurs inside the head, a potential damage mechanism for TBI. This research effort utilizes an in house designed and manufactured pendulum test stand for delivery of the controlled impact load. Data acquisition is obtained using a National Instruments Data Acquisition System (DAQ) and a LabVIEW program. Currently, a human-like 3D printed head model is filled with water and varying concentrations of gelatin solution that is used to simulate the fluids contained within the human head. In water tests, impact accelerations of up to 400g can be felt by the head model and this acceleration correlates to roughly a +100 kPa pressure spike in the Coup region and a -50 kPa pressure spike in the Contrecoup region.