

UNIVERSITI TEKNOLOGI MARA

**PREDICTION OF
SKULL FRACTURES AND
BRAIN INJURY USING
FINITE ELEMENT ANALYSIS**

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MSc

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ABSTRACT

Traumatic Brain Injury (TBI) is a complex injury with a broad spectrum of disabilities and symptoms. Basically, it happens when head is impact with certain value of velocity and the victim must bear with a certain mechanism of injury. This research has investigated the potential for TBI using Finite Element (FE) analysis with rear impact on the head at different velocities. A 3D human skull and brain were presented and run through simulation in explicit dynamic analysis using commercial finite element software. The skull and brain are imported from step format into the simulation software Abaqus 6.13. The wall was designed as concrete box shape. Materials assigned for skull, brain and wall before locating the boundary condition at the back of wall as the skull is being impacted to the wall. During meshing procedure, skull model has a total of 106511 elements and 28386 nodes. Brain has a total of 29513 elements and 7296 nodes. Velocities were assigned in meter per seconds and the biomechanical behaviours were recorded completely. The risk of skull fractures and brain injury were predicted based on the resulting maximum principal stress and total displacement. Final objective of this research is to provide a predictive tool as FE model that can aid in injury diagnosis and design protective devices to minimize the impact effects.

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