

**Finite Element Analysis of Head Injury in the Absence
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Abstract

:Finite element analysis was carried out to study the mechanism of cerebral contusion. Clinical findings indicate that most cerebral contusions in the absence of skull fracture occur at the frontal and temporal lobes. To explain these observations, cavitation and shear strain theories have long been advocated. Plane strain finite element models of a parasagittal section of the human head were developed in the present study. The model was first validated against a set of experimental results from the literature. Frontal and occipital impacts were then simulated, and pressure and shear stress distributions in the brain were compared. While comparable negative pressures always developed in the contrecoup regions, shear stress distributions remained nearly identical regardless of the impact direction, consistent with the clinically observed pattern for contusion. Therefore, shear strain theory appears to account better for the clinical findings in cerebral contusion.