

Development of 3D Neck Muscle to Analyze the Effect of Active Muscle Contraction in Whiplash Injury

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Abstract : Whiplash Injuries are mostly experienced in car accidents. Symptoms of whiplash are commonly reported in studies, neck pain and headaches are two most common symptoms observed. The whiplash Injury mechanism is poorly understood. In present study, hybrid neck muscle model were developed with a combination of solid tetrahedral elements and 1D beam elements. Solid tetrahedral elements represents passive part of the muscle whereas, 1D beam elements represents active part. To simulate the active behavior of the muscle, Hill-type muscle model was applied to beam elements. To simulate non-linear passive properties of muscle, solid elements were modeled with rubber/foam material model. Some important muscles were then inserted into THUMS (Total Human Model for Safety) THUMS was given a boundary conditions similar to experimental tests. The model was exposed to 4g and 7g rear impacts as these load impacts are close to low speed impacts causing whiplash. The effect of muscle activation level on occupant kinematics during whiplash was analyzed.

Keywords : finite element model, muscle activation, THUMS, whiplash injury mechanism

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