

“Head-Neck Finite Element Model - Validation in the Frequency Domain and Simulation of a Rear Impact”

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Abstract:

None severe neck injuries under moderate rear impact conditions continue to be an acute problem in road safety. Bolström et al. (1996) as well as Ono et al. (1997) and Yoganandan et al. (1998) demonstrated that neck retraction (S-Shape) is an important neck injury mechanisms which can conduce to lesion even in the physiological range of motion. This study proposes a detailed FEM of a human volunteer's neck and proceeds to an original model validation against experimental data recorded with this human volunteer. Model geometry is obtained by scanning the volunteer's Head-Neck. Material properties are from the literature. New validation parameters are based on an experimental test proceeded in the frequency domain in order to extract the volunteer's Head-Neck system's modal characteristics. The validation of the head neck FEM is performed by superposing the numerical and experimental frequency response function. Finally, a rear impact was reproduced in order to estimate the risk of whiplash injury.

Keywords:

- Biomechanical Simulation
- Frequency Domain
- Rear Impact
- Safety