

PMHS Chin Injury Threshold Testing

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ABSTRACT

In frontal sled testing, it is common for the Hybrid III anthropomorphic test device (ATD) to experience an elevated head acceleration even though the head of the dummy may not have contacted any external structures. These high accelerations in many cases are derived from the chin of the ATD contacting its anterior chest, or sternum. Previous research conducted at the Injury Biomechanics Research Laboratory (IBRL) at Ohio State compared the chin response of the Hybrid III 5th female ATD head, which is the same design as the Hybrid III 10 year old child head, to the adult PMHS head at energy levels typically recorded in FMVSS 213 sled testing. The energy levels used in this previous testing were found to be below the injury threshold of the human mandible. Therefore, a new test series was recently completed to document injuries and the injury threshold of the mandible and to compare these new findings to previous chin impact testing. The IBRL impacted the chin of four post-mortem human subjects (PMHS) at increasingly higher energies until injury occurred either to the mandible, temporomandibular joint, or facial bones of the specimen. Injury was documented by a change in the baseline stiffness response of the chin at a very low impact energy (11 J) which was run following each high energy impact. Three of the four chins failed at an impact energy of 95 J, while the fourth failed at 147 J. The average maximum force reached before failure for the four specimens was 4,652 N. This maximum force is slightly below the value of 5250 N required to fracture the mandible as reported by Hopper et al. (1994). Injuries to the four PMHS included mandibular dislocations, fractures of the body of the mandible, and LeFort II complex fractures. These types of injuries have all been documented to occur to occupants in frontal automobile accidents.