ABSTRACT
Rear impact accidents can cause serious injuries to the neck because of that the vehicle seat cannot provide needed support when occupant move backward and may result in whiplash injury. It causes the neck contusion due to the movement of cervical vertebrae. Seat is a main part of vehicle to contact with occupant in rear impact and chiefly concern with the severity of neck injuries. Therefore, improvement in seat design can effectively reduce the neck injuries of occupant. To enhance the occupant safety, this paper designs a seat to prevent neck injuries in a rear impact. The sled test is used to assess the effectiveness and safety of improvement in seat design. The sled test is implemented by computer simulation for taking into consideration required cost and time. First of all, the numerical model of sled test is developed by using MADYMO software. In order to confirm the accuracy of numerical model, results of dummy injury are compared with experimental tests from the literature. For designing an effective vehicle seat to protect occupant, this study discusses the relevance between the seat parameters and occupant's neck based on the validated numerical model. The seat parameters include the stiffness of automobile seat recliner, seat friction and angle of head restraint. Finally, improvement in seat design is implemented based on the factors influencing neck injuries of occupant. Owing to the back of the seat and head restraint move backward together, a larger velocity and acceleration variance of the head and neck is induced during the collision process. Therefore, this study proposes a concluding of seat design which is a concept of separate head restraint from seat back. In addition, the neck injuries of dummy are calculated using with sled test simulation to confirm the safety of seat design. The sled test numerical model which is developed and validated in this study can be assisted to evaluate the effectiveness of other passive safety devices. The discussion of influencing factors of seat and design of separate type seat also can be referred by research institution and industry to enhance the occupant safety in rear impact accidents.

Keywords: Rear Impact, Neck Injury, Separate Type Seat
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