P17 Simulations of Blast Induced Head Acceleration in Confined Blast

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Abstract:

The medical community is increasingly concerned with the high incidence of blast-induced Traumatic Brain Injury in soldiers returning from the conflicts in the Middle East. As a result, significant efforts have been devoted towards achieving a better understanding of the injury mechanisms associated with IED (Improvised Explosive Device) blast. A number of previous studies have been conducted to link head injury indicators (e.g. head acceleration, HIC) to engineering blast parameters (e.g. pressure, impulse). Simple relationships between expected injury outcome and basic blast parameters, such as mass of explosive charge and standoff distance, would be the most convenient for individuals potentially exposed to blast threats to make decisions about their standard operating procedures. While such relationships already exist, they have only been validated for the free-field condition. In the current study, numerical simulations are carried out using a Hybrid III mannequin numerical model subjected to the blast from a representative explosive, in two types of configuration: free-field, and near a rigid wall. The presence of a rigid wall near the mannequin generates increases in blast pressure and blast impulse, but also a region of stagnation flow due to the rigid wall boundary condition. Differences in injury predictions were observed for mannequins subjected to similar values of maximum blast impulse, but generated in one case in a free-field configuration, while in other cases with a lesser explosive charge, but in a wall-reflection configuration. The results from this numerical study emphasize the need to consider blast confinement in the development of blast injury predicting charts and blast injury criteria.

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