Knee Airbag Injury Risk Assessment for Children

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ABSTRACT

Recent advances in child safety have begun to shift the focus of pediatric injury research from vital body regions such as the head, neck, and thorax to various other body regions. Knee bolster airbags, which deploy low on the dashboard, may pose a threat to children's lower extremities. Pediatric lower extremity injuries can cause severe impairment and permanent disability. To date, little research has been done in this area due in part to insufficient instrumentation in pediatric Anthropomorphic Test Devices (ATDs). The objective of this ongoing study is to examine the potential hazards of the deployment of knee bolster airbags on children's lower extremities and the associated risk of injury. During preliminary test trials, a six-year-old Hybrid III ATD was placed in several seating positions commonly reported in child front-seat passengers. The ATD was instrumented with femur load cells, foot pressure sensors, and several accelerometer/angular rate sensor blocks. Examination of the quantitative data highlighted a few problem areas; axial tibia loads and measured ankle rotation rates both indicated the potential for injury. However, more data and better collection methods were needed to draw accurate conclusions, especially in the body regions of interest. A second set of trials were conducted after implementing a cluster of strain gauges on the tibiae of the ATD, which allowed for reliable estimation of axial force and moment in the tibiae. The results from these trials are currently under investigation. Future trials will include a re-designed ankle joint to allow for more accurate transmissions of impact forces through the joint. By comparing the data to published pediatric injury thresholds, the risk of injury to the pediatric lower extremity can be evaluated.