Knee Airbag Injury Risk Assessment for Children

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INTRODUCTION

Background: Knee bolster airbags are designed to deploy low on the dashboard to protect adult front seat occupants from injurious forces and submarining. However, little is known about how susceptible pediatric front seat occupants may be to lower extremity injuries caused by these airbags. Lower extremity injuries can be extremely debilitating for the pediatric population due to potential growth plate damage and developmental delays due to long recovery periods.

Project Goals:
- Identify realistic scenarios which may be potentially dangerous in the event of a knee airbag deployment.
- Adapt ATD instrumentation to capture useful lower extremity data.
- Compare test results to scaled pediatric injury thresholds.

RESULTS

The largest axial loads in the long bones were seen during trials when the ATD’s feet were positioned on the floor and the airbag impacted the knees. However, many positions typical of a small child in the front seat resulted in the airbag impacting the ATD’s feet. This impact pattern resulted in the force of the airbag being translated through the ankle joint, tibia, then knee joint. Since the Hybrid III 6-year-old does not have biofidelic ankle or knee joints, the credibility of the data above the foot region is compromised. In these cases, the ankle struck the end of its range of motion abruptly, which created an artificial peak in the tibia and femur forces. Additionally, more work needs to be done to define accurate injury thresholds for pediatric lower extremities, as scaled values do not take into account differences in tissue mechanics or body proportions between adults and children.

CONCLUSIONS

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