Study simulated car crashes involving pregnant women

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Women are often driving to work today much longer into their pregnancies, thus increasing chances of having an automobile accident. Researchers with the Virginia Tech-Wake Forest University School of Biomedical Engineering and Science and Ford Motor Company are investigating the development of improved safety devices to protect the fetus and the mother. Credit: Virginia Tech Photo

Although states are not required to report fetal deaths in accident data, between 300 and 1,000 unborn babies die in car accidents each year. This accident fatality rate is about four times the rate for victims between infancy and four years old, said Stefan Duma, head of the Virginia Tech - Wake Forest University School of Biomedical

Engineering and Science (SBES).

"There is no silver bullet to solving these problems," Duma added.

However, in response to these numbers, Ford Motor Company has worked with SBES for the past three years to gather data in support of future development of a computer-aided model of a pregnant woman for virtual crash test simulations. The effort builds on 15 years of Ford research that helped lead to one of the first adult whole body computerized crash models. These virtual crash models combine advanced computer simulations and medical research to virtually test how crash forces affect the human body.

The model being developed could help Ford safety researchers better understand how crash forces specifically affect pregnant women. The "pregnant" crash test model would add to Ford's use of computerized adult test models in safety research. Computer models show how crash forces might injure skeletal structures, internal organs and even the brain. Starting in 2010, Ford, Lincoln and Mercury models will include owner's guide information and instructions specifically to help pregnant women buckle up properly.

The nearly complete Ford-funded research project with SBES is now expected to provide Ford's safety researchers with important data about pregnant women and their developing babies, such as abdominal shape and tissue properties. The data, collected by SBES, will help in the continuing development of the realistic "pregnant" human body model for virtual crash test simulation.

Duma said that despite the fact that the automobile industry is 15 years away from new technology that will help protect the unborn, "this project is another example of how industry and academia can work together to conduct important safety research."

"Traditional crash dummies are very important, but the computerized human models allow us to see underneath the skin inside the body during a crash," said Stephen Rouhana, senior technical leader, Ford Passive Safety Research and Advanced Engineering. "Not all virtual models are the same. We chose to work with Virginia Tech and Wake Forest because we believe they better understand the biomechanics of pregnant women and could translate that into effective computer crash test models."

The virtual models used in this research project simulate regions of the body such as the head, neck, rib cage, abdomen, thoracic and lumbar spine, pelvis, and the upper and lower extremities, as well as the internal organs of the chest and abdomen. The models contain detailed representations of the bones and soft tissues of the human body.

"We developed new methods and techniques for this project in order to collect detailed internal pregnant geometry from MRI and CT scans, including accurate size and location of the uterus, placenta and fetus," said Dr. Joel Stitzel, program leader and director of the Virginia Tech-Wake Forest University Center for Injury Biomechanics (CIB). CIB performs research investigating human tolerance to impact loading, especially as it relates to automobile safety, military restraints, and sports biomechanics.

Source: Virginia Tech (news : web)