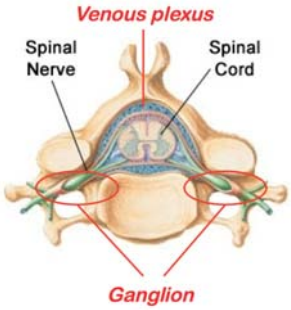

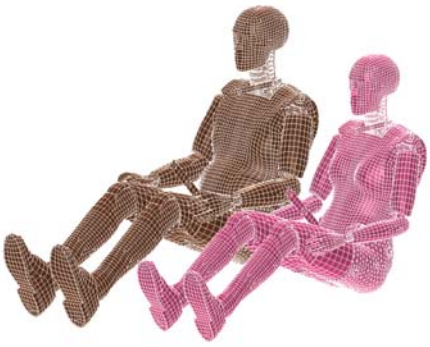

SAFER SUCCESS STORY: Neck injury prevention

"The BioRID dummy with its human-like response to low speed rear collisions has been key to our safety ratings and has promoted vehicle seats with demonstrably fewer real world injuries."

Adrian K. Lund, President, Insurance Institute for Highway Safety

- **As the BioRID II dummy creators, taking the lead in setting the future directions in the area, exemplified by the development of the world-first mid-size female dummy model**
- **State-of–the-art real world data analyses providing important input to regulation, standard development and car design**
- **Research results confirm the in house developed neck injury criterion NIC providing best correlation to neck injury risk**
- **Ongoing work on a new female human body model for neck injury assessment in rear impact to be delivered open source**

Neck injuries (often called whiplash injuries) can occur in all collision types, and is one of the most challenging injury types in safety research and developments, mainly due to difficulties to diagnose. They account for 64% of all disabling car occupant injuries in Swedish. The aim is to identify injury mechanisms and develop assessment methods and guidelines that allow industry to develop effective protection.

Benefit to the project partners and impact on society:

- SAFER research has significantly contributed to occupant dummies and models, starting with the mid-size male dummy, BioRID, in 1998 followed by mathematical models of BioRID and a mid-size female counterpart, EvaRID, in 2011.
- Development and validation of the most recognized neck injury criterion for rear-end impacts, the NIC.
- Key contributor in the development of international rear-end impact assessment methods, exemplified by EuroNCAP.
- Joint research activities resulted in world-first protection systems by Volvo and Saab in 1997, SAFER research has shown these systems to be state-of-the art still.
- Hypothesized and partly corroborated a completely new injury mechanism and injury site (pressure induced cervical dorsal root ganglion injuries), providing important input both to the engineering and medical society .
- Currently developing a new average female size Human Body Model (HBM) with a detailed neck. First focus being neck injury assessment in rear impacts.

Approach:

This effort involved several SAFER partners, starting in the 1980ies, and is still ongoing. During the SAFER period in total eight projects are performed involving varying partner constellations. The projects include accident data analyses, accident reconstructions, experimental biomechanics, dummy development, seat testing and computer modeling. Results are shared internationally, enabling independent evaluations and wide implementation tools and criteria. This approach was proven successful making the BioRID and NIC world standard and used globally for car developments. The same approach is used for the continued work, mainly focusing protection for females and development of human body models, as well as the experimental work on injury mechanisms.

Measurable results:

- In total about 10 PhD examinations, whereof two during 2006-2015
- One Post-Doc period
- Numerous journal and conference papers

SAFER
VEHICLE AND TRAFFIC SAFETY CENTRE AT CHALMERS

Funding: Approx. 2,5 MSEK SAFER internal (cash and inkind), and 18 MSEK external

Partners: Autoliv, Chalmers, University of Gothenburg, Epsilon (ÅF), Folksam, Saab Automobile, Swedish Transport Administration, Volvo Cars, VTI

Funders: VINNOVA, FFI, EU

Period: 2006-ongoing, joint research history back to 1985

Oct 2015