The role of the dorsal root ganglion injury in whiplash: A review of the biomechanical perspective

Mats Y Svensson, Crash Safety Division, Chalmers University of Technology, Sweden

Introduction:
In 1986 Professor Bertil Aldman (1986) presented his hypothesis regarding transient pressure changes in the cervical spinal canal as a result of whiplash trauma. The pressure could create mechanical loading and damage in the cervical nerve root region. Aldman anticipated that damage to that location could cause several of the most well established whiplash symptoms.

Materials and Methods:
Experimental whiplash tests were carried out on pigs. Central Nervous System (CNS) pressure was monitored during the experiments. The cervical spinal ganglia and other CNS structures were examined in microscope.

Results:
Aldman's pressure hypothesis was verified and signs of cervical spinal ganglion nerve cell body membrane dysfunction were reported by Ortengren et al. (1996).

Discussion:
The ganglion cells were considered to be of particular interest since they are associated with afferent nerve signals that are related to several typical whiplash associated symptoms (e.g. neck pain, cervicogenic headache, vertigo, vision disturbance) and they are at the same time a key link in the system that triggers central nervous system pain sensitisation.

Based on the pressure transient findings during experimental whiplash trauma, a neck injury criterion NIC was developed (Bostrom, 1996).

The NIC has been evaluated using the BioRID II dummy and input from accident data including recorded crash pulses (Eriksson, 2004 and Linder et al., 2004) and it appears to correlate to injury risk.

Conclusions:
Aldman's pressure transient hypothesis was verified and the observed cervical ganglion dysfunction is interesting in relation to typical short and long term whiplash symptoms. The resulting NIC gave a promising correlation to injury risk in limited reconstructions of field accident data.

References:


