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WHIPLASH PROTECTION SYSTEM

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Abstract: - *In the fastest growing world, many types of accidents will be happening. During recent year the main focus in whiplash research has been on rear- end impacts. Rear end impacts have the largest risk of whiplash injury and therefore much efforts are being spent on decreasing this injury risk. For avoiding rear end impact injury which is also called the whiplash injury then Volvo introduced the Whiplash Protection System. If you are involved in a rear-end car accident, statistics tell us that you have a one in four chance of sustaining a whiplash injury. Whiplash is caused when the head is very quickly jerked backward and forward at the moment of collision, resulting in damage to the muscles and ligaments in the neck. The data were drawn from a retrospective study of vehicle crash injuries in which the overall soft tissue neck injury rate was 16%. WHIPS are an integrated safety system for avoiding neck injuries and are one of the most effective in the market.*

Keyword: Whiplash, rear end collision, retrospective, ligaments, Jerked.

1. INTRODUCTION

1.1. WHIPLASH INJURY

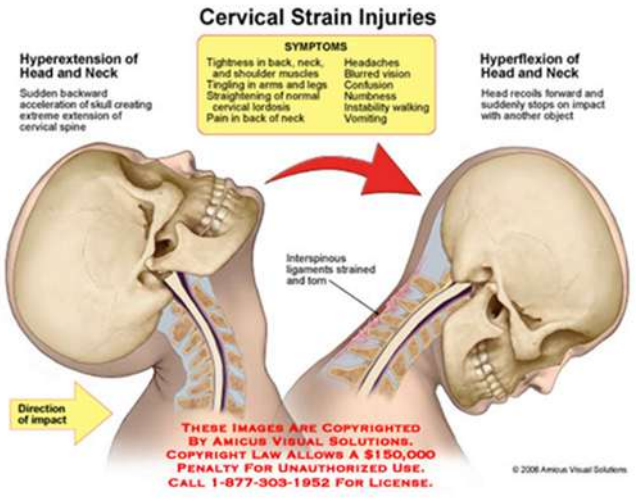

Fig.1. Whiplash injury [7]

WHIPS mean Whiplash Protection System; whiplash is that the commonest injury in car crashes. In order to understand how a whiplash injury occurs, you need to understand the structure of our body. The main support structure of our body is spinal cord, which consists of interlocking bones called vertebrae. Each vertebra is separated by a tough sack of jelly, called a disc. In minor cases the quick jerk to the neck will only result is some muscle damage, which can heal. In more severe cases, the whiplash motion can strain and sometimes even rupture the squishy discs that separate the vertebrae. When the disc gets damaged, the injured person may experience extreme pain, numbness and other unpleasant sensations in the neck.

Advantages of WHIPS over normal seats: -

- It reduces the chances of whiplash disease
- Anti-whiplash designed seat reduces the driver fatigue.
- It increases the intensity by concentrating the energy available over a large surface on to a smaller surface (Absorber).
- The system can be integrated in the seat at a relatively late stage in assembly.
- The same backrest frame can be used as in standard seats.
- In anti-whiplash designed seat pelvis has maximum contact with backrest.

1.2 WHIPLASH PROTECTION SEAT:

The main ways to lower the whiplash injury risk are to minimize the relative motion between head and torso, to control energy transfer between the seat and the body and to absorb energy in the seat back. The WHIPS system within the seat consists of two new recliners, along with a modified backrest and head Restraint. The WHIPS recliner is meant to offer a controlled rearward motion of the backrest during a rear impact. For this purpose, the assembly recliner was modified by adding the WHIPS mechanism. During a rear impact of sufficient severity, the WHIPS mechanism is activated then controls the motion of the backrest in reference to the seat base. This motion could also be divided in two phases, as shown schematically in figure.2

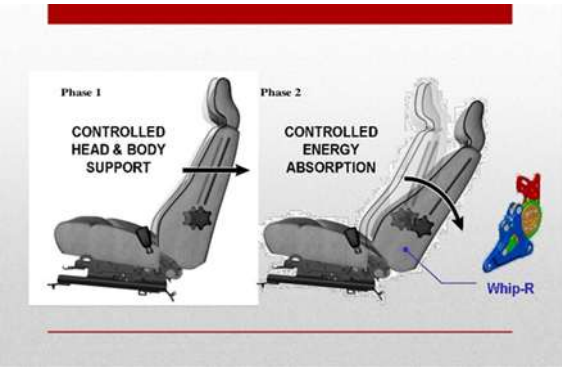

Fig.2. The WHIPS seat motion [7]

The two phases are literally, in most cases, overlapping to some extent. The degree of overlap depends upon several parameters like occupant weight and posture, and also impact severity. A more detailed description of the 2 phases follows below.

In a rear impact, the seat is accelerated forward with the car due to the inertia of the occupant, the rear of the occupant is then pressed into the seat. When the forces from the occupant acting upon the seat backrest exceed a particular level, the WHIPS system are going to be activated. Hence no external sensor system is required to activate the WHIPS system. The aim of the primary phase is,

1) To let the occupant, sink into the seat, thereby reducing the space between the top and therefore the headrest.

2) To make an initial rearward motion of the backrest which doesn't move the top restraint far away from the top.

3) To stay occupant acceleration levels low, by letting the backrest move rearwards during a controlled way. This is often accomplished by the primary phase being a rearward motion of the seat backrest, the character of this motion being essentially translational, i.e. without rotation. However, depending upon the pre-impact posture of the occupant, the motion characteristics of the backrest are to some extent adaptable and suits the occupant's position relative to the backrest.

1.3 REACTIVE HEAD RESTRAINTS – RHR

The RHR system was introduced in 1997 as the world's first active, anti-whiplash head restraint and is standard equipment in all car models. It also provides multiple adjustment points to allow the head restraint to be ideally positioned for most front-seat occupants. Real-life crash statistics show that necks injuries are one of the most common results of rear-end collisions, even at relatively low speeds. The triggering factor in these whiplash injuries is the violent movement of the head in relation to the body during an impact from behind, often leaving victims with long-term pain in the event of a rear-end collision.

Fig.3 RHR [4]

The RHR system is designed to limit the head movement of the occupant during the impact, helping to reduce the risk of whiplash injuries. The system is entirely mechanical and is based on the lever principle. An upper padded support is connected to a pressure plate in the backrest of the seat. In some rear collisions, the occupant's body will be forced by the crash pulse into the backrest, which moves the pressure plate towards the rear. Subsequently, the head restraint is moved up and forward to "catch" the occupant's head before the whiplash movement can start. The precise activation of the system is determined by the force with which the occupant's back is forced against the backrest, the magnitude of the collision forces and by the occupant's weight.

A benefit of the mechanical RHR system is that in most crashes it 6 needs no repairs to restore it to operational condition after it has been activated. The head restraint automatically reverts to its initial position and is immediately ready to operate again. As whiplash injuries usually occur in low-speed collisions in which the vehicle may sustain only limited damage, the Active head restraint does not increase the cost of the repairs needed after the crash. RHR for even faster activation in rear impacts at lower speeds. The head restraint is activated as soon as the lower back is pressed into the seatback by the occupant's inertia during a rear impact.

2. CONCLUSION

The aim of this to develop an anti-whiplash car seat. The design was based on the idea that the extent of whiplash injury can be reduced by controlling the differential motion of the head. The initial idea was to developed a car seat with an active head restraint to control the motion of head and neck. The reason for this is that during a rear impact, the torso loads the seatback and causes it to rotate rearward and hence forces the fixed head restraint away from the head. This allows the head to translate and rotate further than expected.

A modular design was used to enable the new seatback design to be removed and allow the seat to be configured as a standard seat. An active head restraint mechanism was incorporated into the design, which allowed rearward torso translation into the seatback to activate a mechanism to

position the head restraint further forward and upward. This mechanism could be locked to revert the head restraint design to a standard configuration.

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