

INFLUENCE OF THE DYNAMIC OF THE ACCIDENT IN THE DEVELOPMENT OF WHIPLASH INJURIES

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Introduction

The whiplash injury occurs due to a tension-extension load applied to the spine, which lead to a formation of an S-shape curvature of the cervical spine (CS) during the rear-end impact [Grauer,1997]. The symptoms of a whiplash injury can vary “from a simple neck pain to combinations of several musculoskeletal and neurological manifestations” [Suissa,2003]. On the other hand, for the diagnosis of whiplash there are no specific neuropsychological studies or electrophysiological tests that can be performed [Yadla,2008], which explain the subjectivity of this type of injuries.

Therefore, the aim of this study was to investigate the influence of the dynamic of the accident where the victim was involved in the probability of development of whiplash associated injuries.

Methods

It was collected a set of 102 files from the Portuguese National Institute of Legal Medicine (Lisbon). These files belong to victims that suffered damages on the CS as consequence of road accidents. From this collected set, it was analyzed the dynamic of three rear-end impacts through the software Pc-Crash. The simulations were performed according to the vehicle rest positions, vehicle damages and characteristics. After the simulations, the values of acceleration and velocities the NIC_{max} (maximum value of the *Neck Injury Criterion*) and mean acceleration (a_m) were computed for each victim. These were the criteria used to establish a correlation between the dynamic of the accident and the injuries sustained by the victims.

Results

The results obtained for the three computational simulations are specified on Table 1. In this table is represented the pre-impact velocity of the vehicle of the victim (v_v) (km/h), the impact velocity of the vehicle that caused the accident (v_c) (km/h), as well as the EES (km/h), NIC_{max} (m^2/s^2) and a_m (g) of the vehicle of the victim.

Two frames of the simulation of PR48 are presented in Figure 1, where it can be observed the victim before the impact, followed by the moment where the head has its first contact with the head restraint.

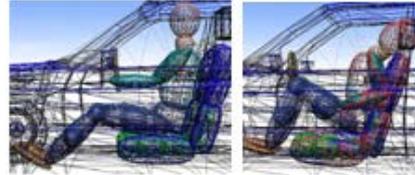


Figure 1: Frames of the multibody during the simulation of PR48.

	v_v	v_c	EES	NIC_{max}	a_m
PR5	4	40	15.99	52.28	7.88
PR48	9	65	24.4	86.97	8.70
PR97	0	43	20.77	89.95	10.1

Table 1: Values obtained for the computational simulations of PR5, PR48 and PR97.

Conclusions

It was shown that the tendency of having higher values of NIC_{max} and a_m is not directly related to the velocity of the vehicles or the EES, depending on the complex interaction of the several factors present on the dynamic of the accident. It was also possible to observe that the victim could describe symptoms that are not coincident with the dynamic of the accident.

For a more accurate prognosis of the victims from road accidents with whiplash injuries, the doctors should ask for the analysis of the dynamic of the road accident to use that information as auxiliary to the prognosis.

References

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