

Lateral impact injuries with side airbag deployments—A descriptive study

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Received 26 September 2005; received in revised form 13 April 2006; accepted 24 May 2006

Abstract

The present study was designed to provide descriptive data on side impact injuries in vehicles equipped with side airbags using the United States National Automotive Sampling System (NASS). The database was queried with the constraint that all vehicles must adhere to the Federal Motor Vehicle Safety Standards FMVSS 214, injured occupants be in the front outboard seats with no rollovers or ejections, and side impacts airbags be deployed in lateral crashes. Out of the 7812 crashes in the 1997–2004 weighted NASS files, AIS ≥ 2 level injuries occurred to 5071 occupants. There were 3828 cases of torso-only airbags, 955 cases of torso–head bag combination, and 288 inflatable tubular structure/curtain systems. Side airbags were not attributed to be the cause of head or chest injury to any occupant at this level of severity. The predominance of torso-only airbags followed by torso–head airbag combination reflected vehicle model years and changing technology. Head and chest injuries were coupled for the vast majority of occupants with injuries to more than one body region. Comparing literature data for side impacts without side airbag deployments, the presence of a side airbag decreased AIS = 2 head, chest, and extremity injuries when examining raw data incidence rates. Although this is the first study to adopt strict inclusion–exclusion criteria for side crashes with side airbag deployments, future studies are needed to assess side airbag efficacy using datasets such as matched-pair occupants in side impacts.

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Keywords: Lateral impact; Side airbags; Head and chest injuries; Descriptive study

1. Introduction

Airbags are used in modern motor vehicles for enhancing occupant safety during impact. Frontal airbags have been in the vehicle fleet for over a decade, and the United States federal requirements are promulgated through Safety Standards FMVSS 208 (NHTSA, 2005). In contrast, side airbags are more recent than frontal airbags and are intended to primarily protect the occupant during lateral crashes. They are installed as thorax or torso-only airbag, torso–head airbag (combination airbags), or separate torso and head airbags (inflatable tubular structure or curtain). Although federal regulations do not exist in the United States for side airbags, such systems are gaining popularity because of public awareness for safety and their potential injury mitigating characteristics (NHTSA, 1999, 2003). While many studies are conducted to investigate injuries

in frontal impacts with frontal airbags, no such systematic evaluations of side impacts with side airbags have been published, to the best knowledge of the authors (Pintar *et al.*, 2000). Only a few studies have begun to appear in the literature with no unified conclusions on side airbag responses. McGwin *et al.* (2003) used the United States National Automotive Sampling System (NASS) database for the years 1997–2000 to determine the association between side airbags and risk of injury in motor vehicle collisions with near-side impact. The authors assumed that all vehicles with side airbags as optional equipment were equipped with the technology and concluded that vehicles with side airbags had a risk of injury similar to occupants of vehicles without side airbags. This assumption is a major limitation of the study, and its validity was not discussed. Using NASS database for the year 2000, another study conducted an analysis of 187 occupants with airbag deployments out of which 62 were in side impacts (Bazarian *et al.*, 2004). Although this study concluded that side airbags may be effective in preventing cranial trauma, less than 1% of occupants were in vehicles equipped with side airbags. These analyses, albeit brief, indicate the need to conduct a more detailed study specific to side airbag deployments. Therefore, the purpose of the present investigation is to focus

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