



An in-depth technical and medical investigation of facial injuries caused by car accidents



Bernard Youkhana^a, Frank Tavassol^a, Heiko Johannsen^b, Simon Spalthoff^a, Nils-Claudius Gellrich^a, Rebecca Stier^{a,*}

^a Department for Cranio Maxillofacial Surgery, Medical School Hannover, Hannover, Germany

^b Accident Research Institute, Medical School Hannover, Hannover, Germany

ARTICLE INFO

Article history:

Accepted 24 June 2019

Keywords:

Car accident
Facial injury
Seatbelt
Airbag
Protective factors
Risk factors
Traffic accident
Security measures
Speed

ABSTRACT

Background: Many studies have investigated the issue of facial injuries caused by car accidents, but only a few have addressed the technical and clinical aspects of such accidents and injuries in depth. The aim of this study was to identify risk factors and protective elements for facial injuries in car accidents.

Methods: We analysed the technical and clinical data of patients with facial injuries caused by car accidents over a 16-year period (2000–2016) and investigated the following factors: sitting position, sex, age, accident time, use of a seatbelt, deployment of the front airbag, direction of impact, speed at the time of collision, and occurrence and location of facial injuries.

Results: Of the 1291 patients involved in car accidents who were included in our study, 291 (22.5%) had suffered facial injuries. We found a significant association between occurrence of facial injuries and sex, speed at the time of collision, impact from the back, seatbelt usage, and deployment of the front airbag. In accidents occurring at speeds over 40 km/h, automobile security measures had no significant influence on the occurrence of facial injuries in drivers and front-seat passengers. In accidents occurring at speeds between 0 and 20 km/h, seatbelt usage (without airbag deployment) solely showed a significant protective influence against the occurrence of facial injuries (odd ratio [OR], 0.130; confidence interval [CI], 0.038–0.451). In contrast, patients who were in accidents at speeds between 21 and 40 km/h suffered significantly fewer facial injuries when wearing a seatbelt with the front airbag being deployed (OR, 0.245; CI, 0.091–0.665) or undeployed (OR, 0.216; CI, 0.084–0.561).

Conclusion: Male sex and a high speed at the time of collision are significant risk factors for the occurrence of facial injuries. The security measurements evaluated in this study only exerted a protective influence at low speeds (below 40 km/h). This indicates a possible weakness of these security systems with regard to preventing facial injuries. Engineers could benefit from these findings and improve the efficiency of existing security measures and eventually help decrease the incidence of facial injuries.

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1 Introduction

In 2017, the German police recorded as many as 2.6 million traffic accidents, in which 390,872 persons were injured [1]; car accidents represented the largest fraction of these accidents, and car passengers were the largest group of accident victims [1]. Treatment of facial injuries caused by car accidents is a daily routine in craniomaxillofacial surgery units. Car accidents are responsible for 13–52% of all facial injuries worldwide [2–8].

The introduction of safety measures for cars, such as seatbelts and airbags, has decreased the mortality rate in traffic accidents [9]. While many studies have shown the effectiveness of seatbelts in decreasing the frequency of facial injuries [10,11], the influence of airbags on the frequency and pattern of injuries, including facial injuries, remains controversial [12–14]. Some studies have reported an increased risk of injury to the extremities and face as well as hearing damage from airbag deployment [15–18]. Furthermore, studies have registered cases of damage to the cervical spine and even mortality due to airbag deployment during low-magnitude collisions [17,19].

Because of its exposed position and, consequently, high receptivity for trauma, the face is a frequent site for injuries [20,21]. Diagnosis and treatment of facial injuries is often challenging and requires multidisciplinary teamwork [22].

* Corresponding author at: Department of Cranio Maxillofacial Surgery, Hannover Medical School, Carl-Neuberg-Street 1, 30625, Hannover, Germany.
E-mail address: stier.rebecca@mh-hannover.de (R. Stier).

Because facial injuries are often not life threatening, their treatment is sometimes delayed when patients have concomitant injuries that needed emergency surgery. This delay could lead to poor outcomes upon later treatment for the facial injury [23]. Owing to its functional and aesthetic importance, the face has a significant influence on the quality of life of patients [24]. This has been demonstrated by a direct connection between the severity of facial injury and the duration of the inability of employees to work [25], which additionally increases the economic impact of these injuries.

Many studies have investigated facial injuries in traffic accidents without differentiating among the modes of transportation at the time of injury [26–28], although there are noticeable differences in individual injuries sustained when traveling by a car, motorcycle, or bicycle or on foot [2,29–31]. Therefore, it is necessary to individually examine each mode of transportation to effectively identify risk factors for facial injuries.

The fact that the car is the mode of transportation with the highest number of accidents and the face is one of the more frequently injured parts of the body poses an interesting topic for investigation. Few studies have specifically examined facial injuries in car accidents, including soft-tissue injuries, while also considering the influence of security measures [32–34]. Furthermore, to achieve detailed and comparable results, it is necessary to include factors such as differential velocity and sitting position of the passengers in the analysis. Understanding the causes and patterns of facial injuries could be important for their effective prevention and diagnosis; it can also help develop more efficient treatment approaches. Comparable data about the epidemiology and aetiologies of such injuries are necessary to work out patterns for identifying the risk of occurrence of facial injuries, which could help optimize their treatment and decrease their number and severity through more effective security measures [35,36].

Currently, there is no study that has examined such factors on German roads. Considering the importance of preventing facial injuries as well as the lack of consistent data in the literature about the influence of security measures on facial injury patterns, we recognize the need for more studies to examine this issue. The goal of this study was to analyse the data of patients who presented at the Hannover Medical School with facial injuries due to car accidents between 2000 and 2016. We investigated the risk factors and protective elements for facial injuries in car accidents and evaluated the effectiveness of security measures and their effects on facial injury patterns.

Ethics approval was not required.

2 Materials and methods

The data used for this analysis were provided by the German In-Depth Accident Study (GIDAS), a common project of the Research Association of Automobile Technology (Forschungsvereinigung für Automobiltechnik e.V.; FAT, Germany) and the federal office of road engineering (Federal Highway Research Institute, BaSt, Germany). In greater Hannover and Dresden, approximately 2000 accidents are registered each year by a team of medical and technical specialists that visits the accident site to collect technical and medical information. This team records details regarding the vehicle type, equipment, and damage due to the accident as well as the injuries of the persons involved and the accident conditions. Furthermore, clinical diagnosis received from the hospital is also recorded and added to the database. This allows a detailed reconstruction of the accident, which makes the GIDAS data representative of the actual situation in the surveyed area [37].

From 2000–2016, the team of specialists had registered 32,713 accidents. We analysed these incidents for the following factors: sitting position, sex, age, accident time, use of a seatbelt,

deployment of the front airbag, direction of impact, and differential accident velocity (Table 1). We also investigated the occurrence and location of facial injuries, including the following bones and soft-tissue regions: face (bone or soft tissue), frontal bone, nasal bone, maxilla, mandible, teeth, zygomatic bone, eyes, ears, forehead, eyelids, nose, cheeks, lips, chin, and gums. Facial injuries at unknown locations were listed as “others”. We excluded the following data: all other participants in the accident except the car passengers; incompletely reconstructed accidents; cases where the occurrence of a facial injury was not known; and injured persons who were not delivered to the Hannover Medical School. We finally evaluated the data of 1291 patients in this retrospective comparative study. The included patient groups were compared to the remaining car-accident victims in our dataset.

The data were evaluated by using SPSS Statistics (IBM SPSS Statistics, version 24.0; SPSS Inc., Chicago, USA). After descriptive analysis (Table 1), we found that a univariate binary logistic regression model would be an appropriate instrument for analysing our data. For this model, we excluded cases where the data on age, sex, seatbelt usage, deployment of the front airbag, and differential accident velocity were not known. This left us with 1193 eligible cases, to which we applied the regression model for analysing the variables considered as potential risk or protective factors (*i.e.* seat position, sex, age, accident time, use of a seatbelt, deployment of the front airbag for drivers and front-seat passengers, direction of impact, and differential velocity) for the occurrence of facial injuries (Table 2).

Using a similar model, we investigated the association of different combinations of seatbelt usage and deployment of the front airbag (*i.e.* seatbelt used and airbag deployed; seatbelt used and airbag not deployed; seatbelt not used and airbag deployed; and seatbelt not used and airbag not deployed) with the occurrence of facial injuries in drivers and front-seat passengers. In this model, we also considered differential velocity and analysed the data in three different groups (0–20, 21–40, and >40 km/h; Table 3). The level of significance was set at $p \geq 0.05$.

3 Results

Of the 1291 patients whose data we analysed, 291 (22.5%) had sustained facial injuries (Table 1). The most frequent site of trauma was the forehead (18.9%), followed by the nasal bone (10.7%), nose (8.9%), and cheeks (7.7%; Fig. 1). The following data were missing: age in 4 cases (0.3%); seatbelt usage in 53 (4.1%); sex in 23 (1.8%); location of facial injury in 31 (2.4%); direction of impact in 1 (0.1%); differential accident velocity in 16 (1.2%); and existence or deployment of the front airbag in 10 (0.8%).

Table 1 presents an overview of the accident victims and risk or protective factors analysed in this study. There were more female than male accident victims; the overall male-to-female ratio was 1:1.1, while that among patients who sustained facial injuries was 1.2:1. There was a significant association between sex and occurrence of facial injuries, with the risk being higher among men (Table 2). The mean age of the accident victims was 36.3 years (standard deviation [SD], 19.1; range, 0–97 years), while that of patients who suffered facial injuries was 35.2 years (SD, 18.5; mostly 18–64 years; Table 1). There was no statistically significant association between the age of the victims and incidence of facial injuries (Table 2).

Most accidents had occurred in the afternoon (1–5 pm; Table 1). However, there was no statistically significant relationship between the time of the accident and occurrence of facial injuries (Table 2). The mean car speed during accidents in which the victims sustained facial injuries was 34.9 km/h (SD, 20.0; range, 1–107 km/h; Table 1). There was a significant relationship between

Table 1
Demographic and injury data.

	Total (N = 1291)	No facial injury (n = 1000)	Facial injury (n = 291)
Age			
Children, preschool age	68 (5.3)	58 (5.8)	10 (3.4)
Children, 6–12 years	61 (4.7)	50 (5.0)	11 (3.8)
Adolescents, 13–17 years	32 (2.5)	21 (2.1)	11 (3.8)
18–64 years	1008 (78.1)	779 (77.9)	229 (78.7)
>65 years	118 (9.1)	89 (8.9)	29 (10.0)
Sex			
Male	618 (47.9)	459 (45.9)	159 (54.6)
Female	650 (50.3)	521 (52.1)	129 (44.3)
Seat position			
Driver ^a	812 (62.9)	620 (62.0)	192 (66.0)
Co-driver	274 (21.2)	220 (22.0)	54 (18.6)
Backseat left	90 (7.0)	68 (6.8)	22 (7.5)
Backseat right	103 (8.0)	82 (8.2)	21 (7.2)
Backseat middle	12 (0.9)	10 (1.0)	2 (0.7)
Accident time			
Night (0–5 am)	37 (2.9)	25 (2.5)	12 (4.1)
Morning (6–9 am)	248 (19.2)	186 (18.6)	62 (21.3)
Forenoon (10–12 am)	224 (17.4)	172 (17.2)	52 (17.9)
Afternoon (1–5 pm)	473 (36.6)	376 (37.6)	97 (33.3)
Evening (6–11 pm)	309 (23.9)	241 (24.1)	68 (23.4)
Seatbelt usage			
Yes	1162 (90.0)	921 (92.1)	241 (82.8)
No	76 (5.9)	40 (4.0)	36 (12.4)
Front airbag			
Deployed	306(23.7)	211(21.1)	95(32.6)
Not deployed	975(75.5)	783(78.3)	192(66.0)
Direction of impact			
Downfall, overturned	34 (2.6)	29 (2.9)	5 (1.7)
Front	623 (48.3)	452 (45.2)	171 (58.8)
Right	146 (11.3)	107 (10.7)	39 (13.4)
Back	275 (21.3)	255 (25.5)	20 (6.9)
Left ^a	212 (16.4)	157 (15.7)	55 (18.9)
Differential velocity			
0–20 km/h	488 (37.8)	417 (41.7)	71 (24.4)
21–40 km/h	520 (40.3)	403 (40.3)	117 (40.2)
>40 km/h	267 (20.7)	168 (16.8)	99 (34.0)
Mean Age (years)	36.0 (SD, 19.1)	36.3 (SD, 19.3)	35.2 (SD, 18.5)
Mean speed (km/h)	28.1 (SD, 18.0)	26.07 (SD, 17.0)	34.9 (SD, 20.0)

Values are expressed as number (%).

^a Reference category (for multi-nominal variables); SD, standard deviation.

the differential accident speed and occurrence of facial injury, with the number of injuries being greater at higher speeds (Table 2).

The evaluated accidents had mostly occurred because of frontal impact (Table 1). There was a statistically significant association

between impact from the back and the frequency of facial injuries, with a significant protective influence being observed in cases of impact from this direction (Table 2). Drivers were the largest group of car passengers in our study, and they had also suffered the

Table 2

Association of potential risk or protective factors with occurrence of facial injury: results of univariate binary logistic regression analysis.

Risk factors	Sign.	OR	95% confidence interval for OR	
			Lower value	Upper value
Sex (male/female)	0.014	1.409	1.072	1.853
Age	0.321	0.996	0.989	1.004
Accident time	0.418	0.988	0.961	1.017
Differential velocity	<0.001	1.027	1.020	1.035
Direction of impact ^a				
Downfall, overturned	0.130	0.429	0.143	1.283
Front	0.504	1.135	0.783	1.644
Right	0.763	1.080	0.655	1.780
Back	0.000	0.223	0.124	0.401
Seat position ^b				
Co-driver	0.679	1.385	0.296	6.467
Backseat right	0.938	1.064	0.223	5.085
Backseat middle	0.826	1.200	0.235	6.115
Backseat left	0.760	1.286	0.257	6.437
Seatbelt usage (yes/no)	<0.001	0.284	0.174	0.462
Front airbag (deployed/not deployed)	<0.001	1.799	1.319	2.455

^a Reference category: left.

^b Reference category: driver; independent variables: age, sex, accident time, differential velocity, direction of impact, seat position, seatbelt usage, and front airbag deployment; dependent variable: occurrence of facial injury; OR, odds ratio; Sign., significance.

Table 3
Association of seatbelt usage and airbag deployment with occurrence of facial injury at specific differential velocities: results of univariate binary logistic regression analysis.

Risk factor	Sign.	OR	95% confidence interval for OR	
			Lower value	Upper value
0–20 Km/h				
Seatbelt usage and airbag deployment ^a				
Seatbelt used and airbag deployed	0.194	0.411	0.107	1.573
Seatbelt used and airbag not deployed	0.001	0.130	0.038	0.451
Seatbelt not used and airbag deployed	0.629	0.600	0.076	4.760
21–40 Km/h				
Seatbelt usage and airbag deployment ^a				
Seatbelt used and airbag deployed	0.006	0.245	0.091	0.665
Seatbelt used and airbag not deployed	0.002	0.216	0.084	0.561
Seatbelt not used and airbag deployed	0.686	0.720	0.146	3.544
>40 Km/h				
Seatbelt usage and airbag deployment ^a				
Seatbelt used and airbag deployed	0.441	0.582	0.147	2.304
Seatbelt used and airbag not deployed	0.240	0.439	0.111	1.732
Seatbelt not used and airbag deployed	0.579	0.533	0.058	4.912

^a Reference category: seatbelt not used and airbag not deployed; independent variables: seatbelt usage and airbag deployment; dependent variable: occurrence of facial injury; OR, odds ratio; Sign., significance.

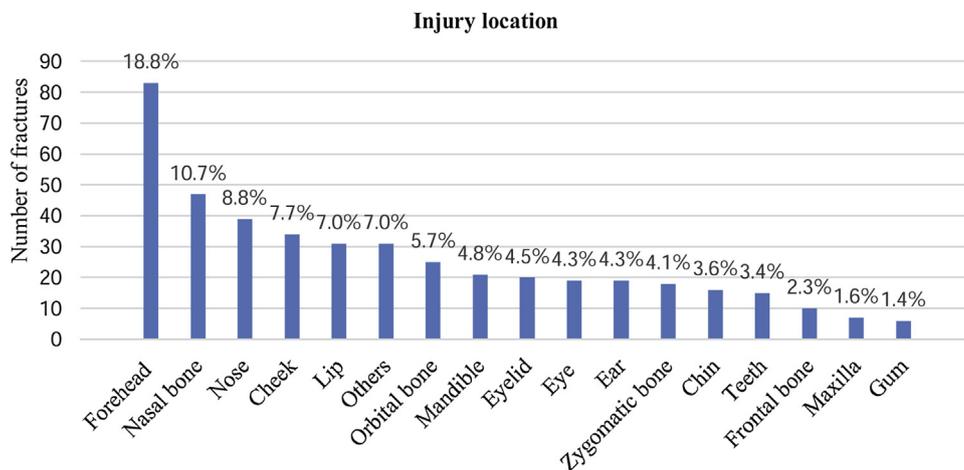


Fig. 1. Rates of injury at specific locations.

highest number of facial injuries. However, seat position seemed to have no significant influence on the incidence of facial injuries (Tables 1 and 2).

In our study population, 90% of all accident victims and 82.8% of those with facial injuries had used seatbelts. Seatbelt usage was correlated with sex and age. While 93.7% of the female patients had used seatbelts, only 86.2% of the male patients had done so (Table 1). The usage of seatbelts was higher among the older age groups. Adolescents (81.3%) showed a particularly low rate of seatbelt usage, whereas patients above 65 years of age were most likely to wear seatbelts (92.6%; Fig. 2). There was a significant correlation between the use of seatbelts and occurrence of facial injuries, with seatbelt usage being a highly protective influence against the latter (OR, 0.284; CI, 0.174–0.462; Table 2).

In the present group of accident victims, we observed an increase in the number of individuals being eventually protected by the deployment of a front airbag through the years (Fig. 3). While only 34.4% of drivers and front-seat passengers had eventually been protected by the deployment of the front airbag in 2000, this proportion had increased to 75% in 2016. There was a significant association between the deployment of the front airbag and occurrence of facial injuries in drivers and front-seat passengers, with a higher risk of such injuries being observed when the airbag was deployed (OR, 1.799; CI, 1.319–2.455).

When examining the different combinations of seatbelt usage and front-airbag deployment for drivers and front-seat passengers at various speeds, we only found a significant association in the occurrence of facial injuries at speeds between 0 and 20 km/h and 21 and 40 km/h (Table 3). In accidents that occurred at speeds between 0 and 20 km/h, seatbelt usage without airbag deployment was a significant protective influence against the occurrence of facial injuries (OR, 0.130; CI, 0.038–0.451). At higher speeds, between 21 and 40 km/h, we noticed that seatbelt usage with (OR, 0.245; CI, 0.091–0.665) or without (OR, 0.216; CI, 0.084–0.561) airbag deployment caused a significant decrease in the risk for facial injuries.

4 Discussion

In this study, we analysed the data of 1291 patients, of whom 291 (22.5%) had suffered facial injuries. While the number of soft-tissue injuries was 267, that of fractures was lower, at 143. The proportion of patients who suffered facial injuries due to car accidents in our study is lower than that reported in previous comparable studies (31.34–51%) [12,20,38], which might be because of the high proportion of passengers who had used seatbelts in our study (90%). Our results revealed no protective influence of the evaluated security equipment against the

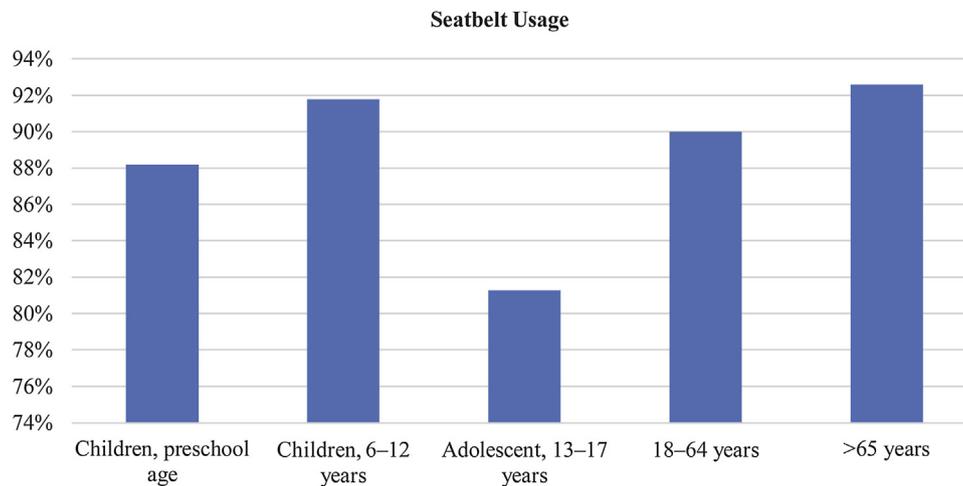


Fig. 2. Rates of seatbelt usage in different age groups.

occurrence of facial injuries in accidents occurring at speeds over 40 km/h. However, we observed a highly protective influence of seatbelt usage at differential velocities of 0–40 km/h and only a significantly protective influence of the combined use of airbags and seatbelts at differential velocities of 21–40 km/h.

We also noted an increased risk for facial injuries at higher speeds and among male patients. The proportion of male patients who sustained facial injuries was 54.6%, which is comparable to that reported in other studies in similarly developed countries [39,40]. The reason for the significantly higher risk of facial injury among men could be the differences between men and women in physical characteristics or specific behaviour patterns. We found that women were more likely to use seatbelts than men (93.7% vs 86.2%), which has also been reported in other studies [14]. These findings, together with our results showing a highly protective influence of seatbelt usage, could explain the relationship between the male sex and the higher risk of facial injury in car accidents. At the same time, we found the lowest rate of seatbelt usage among adolescents (13–17 years), although there was no significant correlation between age and occurrence of facial injuries. The low acceptance of seatbelts among adolescents can be explained by the rebellious behaviour that is often observed in this age bracket.

While studies in less-developed countries have reported a high incidence of facial injuries among rear-seat occupants [4], those investigating facial injuries in developed countries have noted a higher incidence among drivers and front-seat occupants [39]. Our results show no statistically relevant relationship between seat position and occurrence of facial injuries. This discrepancy in the results reported in previous literature might be attributable to the use of commercial vehicles in the population, where passengers use the back seat more frequently [4].

With regard to the direction of impact, while front collisions were the most frequent in our dataset, only collisions from the back showed a significant protective influence against the occurrence of facial injuries. Because facial injuries are mostly caused by impact with the steering wheel, windshield, instrument panel, pillar, or the backside of the front seats [10,38,39], impact from the back and the resulting force vector that pushes occupants into their seats instead of moving them towards the front can serve as an explanation for this protective influence.

Of all the accident victims included in our study, 90% wore seatbelts, which is a higher rate of seatbelt usage than those reported in similar studies in developed countries (30–68%) [14,32,42,43]. The proportion of patients who sustained facial injuries when wearing a seatbelt was 79.3%, which was lower than

the overall incidence of facial injuries in our study but much higher than the rates reported in the literature (0–52%) [8,20,32,41–44]. Even though some studies doubt the declining influence of seatbelt usage on the incidence of facial injuries [23], the majority of investigations have confirmed its usefulness in decreasing the frequency of such injuries [10,11,13,[14,20,29,41,43]. We observed a highly protective influence of seatbelt usage on the overall occurrence of facial injuries (OR, 0.284; CI, 0.174–0.462).

The overall presence of front airbags in our dataset was 59.5%. As shown in Fig. 3, this percentage rose through the years from 34.4% in 2000 to 75% in 2016. Since airbags have been shown to decrease driver fatality [45], this trend probably exists because of the increasing awareness regarding security and the demand for safer cars. Airbag deployment was recorded in 23.7% of all registered cases in the present study; this value is higher than those reported in other studies (3–21%) [12,42,43,46]. It is also striking that the percentage of cases with airbag deployment increased towards the later period of this investigation. Considering the overall influence of airbag deployment on the occurrence of facial injuries in our dataset, we registered a higher risk of facial injuries among passengers with deployed airbags (OR, 1.799; CI, 1.319–2.455; Table 2).

However, we recognize that investigating the influence of front airbags on occurrence of facial injuries is complicated and requires a sophisticated compilation of data. Its influence must be studied in combination with seatbelt usage to get detailed results. The combination of seatbelt usage and airbag deployment has been recognized by many studies as having the highest protective influence against the occurrence and/or severity of facial injuries, relative to cases with seatbelt usage but no airbag deployment or airbag deployment without seatbelt usage or cases involving fully unrestrained passengers [33,38,42,43]. However, the results are more controversial in the case of airbag deployment without seatbelt usage. While some studies have shown that airbag deployment decreases the incidence of facial injuries even without simultaneous seatbelt usage [33,38,42,43], others have reported no protective influence of airbag deployment without seatbelt usage relative to cases involving unrestrained passengers [12,13,47].

However, none of these studies has considered the differential speeds of the evaluated accidents or categorized them by the level of severity. We consider this fact to be a big limitation to the accuracy and reliability of these previous results, especially in case of airbag deployment. The results of regression analysis of our data showed a significantly higher risk of facial injuries in cases where

airbags were deployed for drivers and front-seat passengers, regardless of the severity of the accident or seatbelt usage (Table 2). After considering these two elements as additional influencing factors, we recognize the inaccuracy of these results (Table 3). Since airbag deployment is a sign of the severity of an accident, we can say that the results shown in Table 2 only confirm the significant relationship between differential speed—and with it, the severity of the accident—and the occurrence of facial injuries.

Considering these additional factors, we recognize that none of the combinations of airbag deployment and seatbelt usage has an influence on the occurrence of facial injuries in accidents occurring at differential velocities over 40 km/h (Table 3). This could be because of the very high forces that passengers are subjected to at these speeds, which exceed the capability of these systems to protect the face from getting injured. At velocities of 0–20 km/h, we observed the protective influence of only seatbelt usage without airbag deployment (OR, 0.130; CI, 0.038–0.451), which shows that airbags exert no additional protective influence against facial injuries in low-speed accidents. At these speeds, the energy is presumably low enough for the seatbelt to hold the passenger in place and prevent facial injuries without any significant additional protection from the airbag.

We observed a significant protective influence of seatbelt usage with (OR, 0.245; CI, 0.091–0.665) or without (OR, 0.216; CI, 0.084–0.561) airbag deployment against facial injuries in accidents occurring at differential velocities of 21–40 km/h. We, therefore, conclude that airbags only exert a protective influence against facial injuries in accidents occurring at moderate differential velocities (21–40 km/h) and in combination with seatbelt usage. However, it must be noted that, in the same conditions, seatbelt usage alone had a slightly greater protective influence than the combination of seatbelt usage and airbag deployment. In their prospective study, Loo et al. found no difference in the number of lacerations sustained by belted patients with and without deployed airbags; but, they noted that patients in the group with deployed airbags had suffered mostly superficial cuts and concussion due to the airbag itself [48]. These superficial injuries caused by airbag deployment could also be a conceivable explanation for our results, since our dataset does not contain information about the severity of the injury. In previous studies, the effect of airbag deployment alone did not achieve statistical significance [12,13,47]. Among all existing studies on this issue, only Cox et al. have reported the highest protective influence of seatbelt usage alone against the occurrence of facial soft-tissue injuries and fractures, which corresponds with our findings. However, while Cox et al. considered all accidents occurring at differential velocities over 15 km/h, our result only applies for those occurring at differential velocities of 0–40 km/h [13].

The nature of the evaluated injuries might be the strongest limitation of our study. The small number of fractures in our study made it impossible to perform an accurate and separate statistical analysis of such cases. We, therefore, had to examine all injuries without differentiating between fractures and soft-tissue injuries, which limits the information on the severity and location of the injuries.

5 Conclusion

In conclusion, our results show that the risk of sustaining facial injuries in car accidents is increased among men and in accidents occurring at higher speeds. The security measures examined in our study only had a protective influence against facial injuries at differential velocities below 40 km/h. While seatbelt usage alone consistently offered protection at the aforementioned speeds,

airbag deployment exerted a protective influence only in combination with seatbelt usage and at differential velocities between 20 and 40 km/h. This indicates a possible weakness of these security systems, which could be important for helping maxillofacial surgeons improve the diagnosis and treatment procedures for facial injuries resulting from car accidents. Furthermore, engineers could profit from these findings and improve the efficiency of existing security measures and eventually help decrease the incidence of facial injuries.

Declaration of Competing Interest

None.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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