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Maxillofacial fractures associated with motor vehicle accidents: A review of the current literature

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ABSTRACT

Objective: The aim of this article was to review and discuss papers that were published during the past 30 years regarding the distribution and characteristics of motor vehicle accidents-related facial injuries throughout the world.
Methods: We systematically reviewed all papers that were published in English between January 1980 and December 2013 using MEDLINE and the MeSH term "facial fractures" together with the term "motor vehicle".
Results: The percentage of motor vehicle accidents as an etiological factor in epidemiological studies about maxillofacial injuries ranged between 11% and 85%. On the whole, a progressively decreasing trend was observed, particularly in North America, Brazil, and Europe.
Discussion: Motor vehicle accidents are still one of the most important etiological factors for maxillofacial injuries. A great difference in the incidence of this kind of fractures between developed countries and developing countries can be observed.

Contents

1. Introduction

Maxillofacial fractures can have various causes, such as traffic accidents, falls, assaults, sports injuries, and others, in isolation or in combination with other injuries [1–39]. The epidemiology of these fractures varies depending on the geographic area, socioeconomic status, and the period of investigation [1–10]. In many countries, traffic accidents are the most common cause of maxillofacial fractures [1–10].

Motor vehicle accidents (MVAs) are still among the most frequent causes of facial fractures all over the world, although assault

☆ Asian AOMS: Asian Association of Oral and Maxillofacial Surgeons; ASOMP: Asian Society of Oral and Maxillofacial Pathology; JSOP: Japanese Society of Oral Pathology; JSOMS: Japanese Society of Oral and Maxillofacial Surgeons; JSOM: Japanese Society of Oral Medicine; JAMI: Japanese Academy of Maxillofacial Implants.

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is becoming the most frequent cause in many developed countries [2,40–42].

Investigations of MVA-related maxillofacial injuries are crucial to clarify the mechanisms and socioeconomic costs of MVA injuries, in particular because patients with oral and maxillofacial injuries often acquire disabilities and require long-term treatment [1,2,6].

In the last 30 years, the implementation of laws that require seat belts and/or airbags in cars and helmets to be worn by motorcyclists has had an impact on the incidence of facial trauma in developed countries [1,2,6,7].

Furthermore, socioeconomic reasons such as poor roads and speed limits are a crucial factor that influences the incidence of MVA [6,7].

Preventing maxillofacial injuries is a valuable pursuit for improving the quality of life of the involved subjects and decreasing the socioeconomic costs of motor vehicle collision injuries [6–8].

Thorough knowledge and understanding of the etiology and epidemiology of MVA-related facial injuries are fundamental for the development of health services, and the adoption of new methods for preventing injuries.

The aim of this paper, therefore, was to review and discuss papers that were published during the past 30 years regarding the distribution and characteristics of MVA-related facial injuries throughout the world.

2. Methods

We systematically reviewed all papers that were published in English between January 1980 and December 2013 using MEDLINE and the MeSH term "facial fractures" together with the term "motor vehicle". Fourteen papers in other languages were excluded. Papers that presented complete data about the etiology of motor vehicle accidents with appropriate information about car, motorcycle and pedestrian accidents were identified and included. Data were collected on etiology and characteristics of fractures and summarized in tables.

This article was exempt from IRB approval as it is a review of the literature. We followed Helsinki Declaration guidelines.

3. Results

A total of 27 studies met the inclusion criteria and were included in this review (Tables 1 and 2).

The percentage of MVA as an etiological factor in epidemiological studies about maxillofacial injuries ranged between 11% [30] and 85% [24]. On the whole, a progressively decreasing trend was observed, particularly in North America, Brazil, and Europe. Data regarding male:female ratio were extremely different too, with results between 2.2:1 and 20.9:1.

The percentages of the categories of MVAs (car, motorcycle and pedestrian) showed a progressive trend all over the world: the incidence of maxillofacial injuries due to car accidents is decreasing, whereas a continuous increase in motorcycle-related facial injuries has been observed in Asia (Japan, India) and Europe (The Netherlands, Greece). A further observed result was the progressive decrease of incidence of facial injuries suffered by pedestrians in the last 30 years (Fig. 1). Facial fractures mainly involved the lower third or the middle third in all the considered studies (Table 2 and Fig. 2).

4. Discussion

Motor vehicle accidents are still one of the most important etiological factors for maxillofacial injuries. Nowadays, their incidence widely varies, as various factors are involved in the prevention of such accidents. In particular, not only road conditions, speed limits, and safety equipment, but also the characteristics of used vehicles, socioeconomic conditions and regulations about alcohol drinking before driving are fundamental for the prevalence of such injuries.

In the recent literature, a great difference in the incidence of MVA-related facial fractures between developed countries (20% in Japan, 35.2% in the Netherlands, 11% in Ireland) and developing countries (72–85% in India, 46.7% in China) can be easily observed. Of course, those data cannot be really compared because of the aforementioned differences in regulations and their implementations.

The etiology of MVA gives us important information, in particular regarding the progressive decrease of pedestrians suffering from MVA-related injuries. This may be the first result of the establishment and enforcement of more severe laws and regulations with regard to alcohol drinking and speed limits.

Unfortunately, there are too many variables to draw any conclusion about car and motorcycle accidents.

However, for car accidents, detailed examinations for neck lesions are suggested for the patients involved in MVAs. The decrease of the severity or incidence of head, chest, and abdominal

Table 1
Etiology of MVA-related maxillofacial fractures: review of epidemiologic studies.

Country	Number of patients	Percentage of MVA	M:F ratio in MVA victims	Etiology of MVA			Author	Year
				Car	Motorcycle	Pedestrian struck by MV		
Nigeria	1447	72.7%	20.9:1	**67.2%**	31.3%	6.5%	Adekeye [15]	1980
Jordan	131	61.1%	–	**50%**	20%	30%	Karyouti [16]	1987
India	262	50%	–	**41.2%**	39.7%	19.1%	Sawhney and Ahuja [17]	1988
Nigeria	442	69.9%	3.6:1	**68.2%**	20.8%	11.4%	Ugboko et al. [18]	1998
The Netherlands	1324	36.6%	–	**60.2%**	33.4%	6.4%	van Beek and Merkx [19]	1999
Japan	1502	38.8%	–	33.6%	**59.4%**	7%	Iida et al. [20]	2001
Nigeria	206	35%	–	**60%**	25.7%	14.3%	Olasoji et al. [21]	2002
Iran	237	54%	–	**57%**	43%	0%	Motamedi [22]	2003
Brazil	1024	29.9%	–	**46.7%**	40.5%	12.8%	Brasileiro and Passeri [23]	2006
India	2748	85%	4.5:1	**73.3%**	26.7%	0%	Subhashraj et al. [24]	2007
Japan	674	20%	–	23.7%	**65.9%**	10.4%	Sasaki et al. [25]	2009
India	111	74.7%	–	**74.6%**	25.4%	0%	Kamath et al. [26]	2012
India	503	80.3%	6.6:1	17%	**76%**	3%	Kar and Mahavoi [27]	2012
The Netherlands	579	35.2%	2.2:1	40%	**53.3%**	6.7%	van den Bergh et al. [28]	2012
Greece	727	50.8%	5.8:1	36.6%	**56.1%**	7.3%	Kostakis et al. [29]	2012
Ireland	82	11%	2.6:1	**94%**	3%	3%	Walker et al. [30]	2012
India	740	72%	–	5.3%	**92.1%**	2.6%	Bali et al. [31]	2013
China	1131	46.7%	–	**66.1%**	33.9%	0%	Zhou et al. [32]	2013

RTA: road traffic accidents.
Bold character indicate the most frequent category for each author.