Influence of positions of the incidence and severity of maxillofacial injuries in vehicular crashes

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Summary

The objective of this study was to determine the influence of positions on the incidence and severity of maxillofacial injuries in vehicular crashes. Two hundred and fifty cases of RTA were seen and studied from October 1999 to May, 2000. They comprised 72.8% males and 27.2% females with a male to female ratio of 2.7:1. The age range was 1 to 80 years with a mean age of 40 years.

The most common vehicle involved in RTA was the mini bus, 34.3% followed by motorcycle, 26.5%. Middle seat passengers, drivers and motorcycle passengers and riders sustained more and severe injuries during crashes. The mandible was more frequently fractured at the symphysis (24.6%) than at any other site while the maxilla was frequently fractured at the zygomatic bone and arch (10.8%). More injuries occurred in the age range of 20 – 30 years and these accounted for 31.8% of the cases. Only 6 occupants of motor vehicles wore seat belts before accident while no motorcycle rider or passenger wore any helmet.

In conclusion, drivers, middle seat occupants of a vehicle, motorcycle passenger and riders sustained more and severe injuries than back seat occupants.

Keywords: ***Position, Incidence, Severity, Maxillofacial injuries, Vehicular, Crashes.***

Résumé

L'objet de cet étude est de décider l'influence des sièges sur l'incidence et la gravité des blessures maxillo-faciales en matière d'accident de voiture. Deux cent cinquante cas de RTA ont été recensés et étudiés à partir d'octobre 1999 au mai 2000. Ils sont 72,8% mâles et 27,2% femmes dans une proportion de 2,7,1. Tranche d'âge était l à 80 ans avec l'âge moyen de 40 ans.

La voiture la plus impliquée en matière de RTA était minibus 34,3%, suivi de motocyclette, 26,5%. Les voyageurs assis au milieu chauffeurs et voyageurs de la motocyclette et les cyclistes reçoivent des blessures les plus graves pendant les accidents. La mandibule était le plus souvent fracturée sur la symphyse (24,6%) plus que dans d'autres sièges tandis que le maxillaire était fréquemment fracturé sur l'os zygomatique et la cambrure (10,8%). Plus des blessures arrivent dans la tranche d'âge de 20 – 30 ans et recensés pour 31,8% des cas. Six voyageurs seulement des voitures ont utilisé la ceinture de sécurité recensés pour 31,8% des cas avant l'incidence d'un accident tandis qu'aucun des cyclistes ou voyageurs portaient casque protecteur.

En conclusion, chauffeurs, passagers assis au milieu d'une voiture, passagers de motocyclette, et les cysclistes reçoivent plus de blessures graves plus que les passagers assis à l'arrière du minibus.

Introduction

Trauma has continued to receive much attention in the European and African literature because of the magnitude of the problems it creates. More than a million persons are killed annually worldwide as a result of road traffic accident with some fifteen million more injured. The huge financial cost to the various governments and communities amount to more than those for the treatment of any other major disease[1].

In many reports of fatally injured victims of traffic accidents, maxillofacial injuries are often given less prominence possibly due to the fact that the concurrent head and brain injuries often present are held responsible for the final outcome[2]. Nonetheless, injuries to soft tissues and bony skeleton of the face constitute a high percentage of all traumatic admissions that pass through many emergency rooms[3]. This is because injuries to the face can be life threatening, sometimes causing airway obstruction or provoking severe haemorrhage[4]. Furthermore, society places value on facial appearance to the extent that minor injuries that alter this appearance can cause severe psychological morbidity[5].

Severity of traumatic injuries have been previously esti-

Table 1 Aetiology of road traffic accident in relation to different types of vehicles

Types of vehicle	Lost control	Burst tyre	Failed brakes	Head-on collision with vehicle	Rammed by vehicle	Rammed by motorbike	Collision with log of wood	Head-on collision with motorbike	Unspecified	Total no of vehicles	%
Minibus	11	24	3	11	8	–	3	–	2	62	34.3
Coaches	5	1	1	1	1	–	–	–	–	9	5.0
Lorry	5	1	–	3	–	–	–	–	–	9	5.0
Saloon car & Station wagon	12	13	2	4	12	1	–	–	2	46	25.4
Pickup van	–	1	–	–	–	–	–	–	–	1	0.5
Motor cycle	9	–	1	6	23	3	–	5	1	48	26.5
Tricycle	–	–	–	–	–	–	–	–	–	–	–
Bicycle	–	–	–	–	–	–	–	–	–	1	0.5
Unspecified	–	–	–	–	–	–	–	–	–	5	2.8
Total	42(23.2%)	40(3.1%)	7(3.9%)	25(13.8%)	45(24.9%)	4(2.2%)	3(1.6%)	5(2.8%)	5(2.8%)	181	100

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mated using various indices and scoring systems[6-9], but there is a dearth of information on how the positions of passengers in a vehicle contribute to the incidence and severity of the facial injuries sustained in our environment. This formed the basis of a prospective study we carried out in our hospital.

Materials and method

All consecutive oral and maxillofacial injury cases that were seen at the Accident and Emergency Centre (A&EC) of the University of Benin Teaching Hospital (UBTH), Benin City, Nigeria between October 1999 and May 2000 were studied. Only patients who sustained injuries to the facial region as a result of traffic accidents were graded and studied.

A data form was designed to collect among others, demographic parameters, causes of accidents, aetiology of injury, type of injury, , classification of injury and vehicles. The use of seat belt or helmet by patients and patients' positions were also noted. The following criteria were used to assess the severity of facial injuries.

Grade I – Minor – Bruises and or superficial lacerations, avulsed teeth or fracture of nasal bone.

Grade II – Moderate – Lacerations greater than 5cm, dislocation of TMJ, deep laceration of the tongue, LeFort I fracture.

Grade III – Severe – Deep lacerations exposing underlying bone, avulsion of soft tissues, fracture of mandible, zygoma, LeFort II and III fractures.

Selected patients especially those in grade II and III were admitted as inpatients.

Results

Of the 895 trauma cases seen within the period, 380 sustained injuries resulting from trauma to the facial region. This constituted 42.5% of the sample. They comprised 282 (74.3%) males and 98(25.7%) females with a male to female ratio of 2.9:1. Of these, 250 resulted from RTA which constitute 65.8% of the total number of trauma to the facial region. The other causes of facial trauma were assault 37(9.7%), fall 29(7.6%), gunshot 18 (4.8%) and others 46 (12.1%). There were 182 (72.8%) males and 68 (27.2%) females with a male to female ratio of 2.7:1. The age range was from 1 to 80 years with a mean age of 40 years.

Table 1 shows the types of vehicles involved in RTA and the distribution of the various causes of RTA in relation to the different types of vehicles. The most common type of vehicle used for transport was the mini bus 62(34.3%) and this was the most frequently involved in traffic accidents. The common cause of traffic accidents was attributed to ramming at the rear by another vehicle 45(24.9%) and motor cyclists were frequently involved whereas where automobile crashes were caused by burst tyres, 40(22.1%), the front left tyre was frequently involved 14(35.0%), followed by the rear right tyre 10(25.0%), rear left tyre 8(20.0%) and front right tyre 8(20.0%).

Table 2 shows the positions of patients in relation to their injuries. Motorcycle passengers sustained more injuries per patient (3.0) than the other vehicle users. Two hundred and thirty two passengers sustained 65 fractures with an average of 0.3 fractures per passenger. Of the 65 fractures, 42 (64.6%) involved the mandible, 21(32.3%) the middle third and 2(3.1%), the skull. Table 3 shows the various distributions of fractures. Table 4 shows the number and classification of fractures. The middle seat passengers had slightly more severe soft tissues injuries 19(24.7%) than the drivers of a vehicle 18(23.4%) and

Table 2 Positions of patients in relation to injury sustained in road traffic accidents

Positions	Patients	Bruises	Laceration	Fractures	No. of fractures per patient	Total no of Injuries	No of injuries per patient
	n %	n %	n%				
Driver	43(17.2)	37(17.8)	27(15.6)	23(35.4)	0.5	87	2.0
Beside drivers (Front seat)	33(13.2)	24(11.5)	38(22.0)	11(16.9)	0.3	73	2.2
Behind front seat	11(4.4)	14(6.7)	4(2.3)	–	–	18	1.6
Middle seat	51(20.4)	30(14.4)	29(16.8)	4(6.2)	0.1	63	1.2
Back seat	7(2.8)	2(1.0)	2(1.2)	–	–	4	0.6
Motorcycle Riders	22(8.8)	28(13.5)	22(12.7)	9(13.8)	0.4	59	2.7
Motorcycle Passengers	21(8.4)	34(16.4)	26(15.0)	3(4.6)	0.2	63	3.0
Pedestrian	41(16.4)	25(12.0)	20(11.6)	11(6.9)	0.3	56	1.4
Unspecified position	21(8.4)	14(6.7)	5(2.9)	4(6.2)	0.1	23	1.1

Table 3 Distribution of fractures

Site	No of fracture N %
Mandible	
Parasymphyseal/Symphyseal	16(24.6%)
Dentoalveolar process	11(16.9%)
Body	9(13.9%)
Angle	7(10.8%)
Midface	
Zygomatic bone/arch	7(10.8%)
Unilateral Lefort I	2(3.1%)
Bilateral Lefort I	1(1.5%)
Lefort II	2(3.1%)
Lefort III	1(1.5%)
Nasal complex	5(7.7%)
Orbital blow out	2(3.1%)
Upper face	
Parietal bone	1(1.5%)
Frontal bone	1(1.5%)
Total	65(100)

Table 4 Number and classification of injuries sustained

Positions	Lacerations	Minor (Grade I)	Moderate (Grade II)	Severe (Grade III)	Fractures	Minor (Grade I)	Moderate (Grade II)	Severe (Grade III)
	n %	n %	n%	n %	n %	n%	n %	n %
Driver	27(15.6)	3 (5.3)	6 (15.0)	18 (23.4)	23 (35.4)	3 (21.4)	5 (25.0)	15 (28.0)
Beside driver (Front seat)	38 (22.0)	20 (35.7)	10 (25.0)	8 (10.3)	11 (16.9)	5 (35.8)	4 (20.0)	2 (6.5)
Behind driver	4 (2.3)	3 (5.3)	1 (2.5)	–	–	–	–	–
Middle seat	29 (16.8)	2 (3.6)	8 (20.0)	19 (24.7)	4 (6.2)	1 (7.1)	–	3 (9.7)
Back seat	2 (1.2)	2 (3.6)	–	–	–	–	–	–
Motorcycle rider	22 (12.7)	2 (3.6)	6 (15.0)	14 (18.2)	9 (13.8)	1 (7.1)	3 (15.0)	5 (16.1)
Motorcycle passengers	26 (16.0)	5 (8.9)	3 (7.5)	18 (23.4)	3 (4.6)	–	–	3 (9.7)
Pedestrians	20 (11.6)	16 (28.6)	4 (10.0)	–	11 (6.9)	4 (28.6)	6 (30.0)	1 (3.2)
Unspecified position	5 (2.9)	3 (5.4)	2 (5.0)	–	4 (6.2)	–	2 (10.0)	2 (6.4)
Totals	**173(100)**	**56(100)**	**40(100)**	**77(100)**	**65(100)**	**14(100)**	**20(100)**	**31(100)**

Table 5 Age distribution of road traffic accident patients

Age group (years)	Number of patients	%
0 – 9	15	(6%)
10 – 19	26	(10.4%)
20 – 29	80	(32%)
30 – 39	74	(29.6%)
40 – 49	39	(15.6%)
50 – 59	11	(4.4%)
60 – 69	2	(0.8%)
70 – 79	2	(0.8%)
80 – 89	1	(0.4%)
Total	**250**	**(100%)**

the motor cycle passengers 18(23.4%). Similarly, the driver of a vehicle had more severe bone injuries 15(48.4%) than the middle seat passengers 3(9.7%) and the motor cycle passengers 3(9.7%).

The age distribution of patients involved in RTA are shown in Table 5. The highest injury occurred in the age range of 20 – 30 years and this accounted for 80(32.0%) of the cases. Only 6(14.0%) of the 43 drivers wore seat belt before accident while no cyclist or passenger wore protective helmet. Minor injuries were sustained as a result of splinter glasses from broken windscreens by the drivers who wore seat belts.

Discussion

Several studies have documented the changing trends in the aetiology of facial fractures from RTA in developing countries[11-14] to assault in developed countries [15-16]. This has been attributed to some legislative laws which make it compulsory for vehicle occupants to restrain themselves in the vehicle and motorcycle riders to wear protective helmets. The effectiveness of these devices became obvious when some studies used the various injury scoring systems to demonstrate that restrained occupants have fewer moderate or severe facial injuries compared to unrestrained occupants[7,15]. We did not use any of the injury scoring systems to classify injuries sustained, because most systems in current use have disadvantages[17] and most fail to allow for proper comparison on both practical and intellectual grounds[18]. Because of the considerable unease surrounding these scoring systems[19,18] therefore, we relied on the accuracy of description of an injury or intervention as recorded in the information data to categorise injury in the facial region.

The most common cause of automobile crashes in this study was burst tyre with the left front tyre being frequently involved which may be attributed to the non-maintenance of roads and the purchase and use of fairly used tyres by some vehicle owners in Nigeria. On the other hand, motorcycle riders crashed frequently as a result of being rammed at the rear by another vehicle. This is in contrast with a recent study that recorded collision with automobiles as the highest cause of motorcycle accidents[20]. These accidents may be due to the fact that low income earners and retirees who are not licensed to ride have resorted to the use of these vehicles for commercial purpose. The other contributory factors are possibly the non-compliance with the highway code, impatience and over speeding. The minibus occupants, motorcycle riders and passengers sustained more injuries than other vehicle occupants because these are the vehicles most frequently used for transport in the urban and semi urban areas of Nigeria. Bicycles are not used as means of transport in the urban areas and these may account for the low incidence of injuries from their riders. This study also shows that drivers, middle seat passengers and motorcycle passengers were more likely to sustain severe facial lacerations while the driver sustained more severe facial bone fractures than the middle seat and motorcycle passengers and riders. These findings agree with Parkinson et al findings, which compared a high incidence and severity of injuries sustained by these group of passengers before the introduction of seat belt legislation and a low incidence and severity of injuries after legislation[16]. This study further revealed that it is safer to sit at the back seat of a vehicle because less injuries were sustained by the occupants of these seats in any of the vehicles identified in this study. On the other hand, pedestrian who was hit by a vehicle sustained more body injuries than either the motorcycle passenger or rider. This finding raises the issue of the construction of sidewalks for pedestrians in our environment as obtains in Western countries.

More injuries were sustained in the age group of 20 – 30 years which confirms previous studies[21,12,22]. Several reasons have been given for the high occurrences of facial injuries in this age group ranging from young and active upwardly mobile group, involvement in drugs and dangerous driving[14] to tendency to make numerous journeys in search of employment[17].

The mandible was the most frequently fractured bone which agrees with several reports[12,23,22] but while in these re-

ports, the body of the mandible was frequently fractured, this study recorded the symphyseal and parasymphyseal sites as the most frequently fractured. This is interesting because the force to fracture the symphysis is about 249.5 – 408.2kg while that of the body is about 136.1 – 340.2kg and there were no concomitant fracture of the condyles which require a force of 192.8kg[7].

More facial injuries were seen in men than in women in a ratio of 2.7:1 which is in contrast with previous reports from Nigeria. But while some of these reports were retrospective studies and recorded high ratios of 16.9:1[12], 5.5:1[23], 4.1:1[24] for fractures of various aetiology, the ratio of 2.7:1 is recorded for both soft tissues and bony injuries sustained in RTA only. The reasons for these findings have been attributed to negligible number of women who own motor cars, motorcycles and bicycles compared to men in the Northern part of Nigeria, therefore less involvement in the socioeconomic lives of the people[12]. In the Southern part of Nigeria where this study took place, these reasons are negligible because of the high involvement of women in socioeconomic activities.

These injuries and deaths resulting from the accidents are preventable by the use of safety devices and proper evaluation of their efficacy. Unfortunately, this has not been so in Nigeria. Committee reports in some Western countries have identified the faults at three levels-government, public and professionals-for all studiously ignore accidents[24]. Quite often, accidents are stratified, for example road accidents are studied separately from aircraft accidents and attempts at applying lessons learnt from one to the other have not been realistic[25].

In conclusion, middle seat occupants of minibuses, the driver, motorcycle passengers and riders were more at risk of sustaining more and severe injuries in vehicular crashes. The motorcycle passengers sustained more injuries per passenger than any other vehicle user. Back seat passengers sustained fewer and lesser severity of injuries than any other vehicle occupant. Thus, it may be safer to sit at the back seats of vehicles when commuting.

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