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Case Study

PROSPECTIVE STUDY OF MAXILLOFACIAL SKELETAL INJURIES IN THE UNIVERSITY OF CALABAR TEACHING HOSPITAL CALABAR, NIGERIA.

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The pattern of presentation of maxillofacial skeletal injuries varies depending on many factors operating alone or in combination. For instance, the cause and circumstance of injury, mechanism of injury, pre-injury state of comprehension, type of vehicle (car or motorcycle), socioeconomic characteristics of the community often changes with time and complexity of an area.

The objective of this study is to determine the pattern of presentation of maxillofacial skeletal injuries in the Calabar area of Nigeria and to find out how this compares with other studies carried out within and outside the country. It is a prospective study undertaken as part of a wider study by the University of Calabar Teaching Hospital trauma study group.

A total of two thousand two hundred and twenty nine consecutive accidents and emergency cases presented in the casualty unit of the University of Calabar Teaching hospital within a twelve-month period (1st February,2005-31stJanuary, 2006). Trauma accounted for 649 cases, out of which, 98 were maxillofacial skeletal injuries.

The records of their ages, gender, cause of injury, time of presentation, bone/s fractured, treatment methods, outcome and complications were noted and documented in their case notes.

Seventy-eight males and twenty females, a ratio of 4:1 was recorded with a peak age incidence between twenty-one and forty years (64; 65.3%).

Motorcycle accidents constituted the main cause (83; 84.69%) of injury. More of the injured were riders (50;60.24%) and these resulted from head - collision with other motorcycles. The mandible was the most fractured singular bone with 58 (59.2%) out of ninety-eight patients injured, while isolated zygomatic bone fracture was not recorded. All the eleven zygomatic fractures recorded occurred in combination with fractures of other facial bones and these were left sided. No patient used full-faced helmets.

More females tend to present earlier for treatment than their male counterpart. Treatment was mostly conservative with the use of simple procedures. The results were satisfactory with only eight patients (8.16%) presenting with complications that were managed successfully. No death following maxillofacial injuries alone was recorded.

The use of full-faced helmets that will be protective of maxillofacial skeletal structures and a change to low capacity engine motorcycles for the commercial use of conveying commuters are recommended.

KEY WORDS: Skeletal injuries, motorcycles,helmets.

INTRODUCTION

Injuries to the facial structures have remained very common in the 80(Adekeye 1980, Abiose 1986, Ajagbe and Daramola,1980) and in the 90s (Akinwande 1990, Arotiba 1996). In recent times it has not only maintained its frequency but has been on the increase. As urbanization, industrialization and general socioeconomic changes occur in the different parts of the world, so also the scope of possible etiological factors of trauma to the body widens (Arotiba 1996, Ubgoko *et al*., 1998) . The rate of increase in the incidence of facial traumas seems to be proportional to this increasing range of possible causative factors. The face is particularly vulnerable to

trauma possibly because it is the most exposed part of the body, the preferred target of any assaulting fist, and about the most unprotected region compared to other parts of the body that are covered with cushioning pad of muscles and fat. Over a large area of the head, the skull bones are subcutaneously placed.

In a variety of studies in the recent past, motorcycle accidents had competed well with other causes of facial injuries (Wasiu *et al.,* 2005). Current findings indicate that in developed countries particularly the United Kingdom and the United States the incidence of motorcycle related facial traumas are reducing at the expense of assault, industrial, sports and vehicular traumas(Ogden, 1991).

The purpose of this prospective study was to determine the pattern of presentation of maxillofacial skeletal injuries, the causative factors, management procedures and outcome and to highlight such factors that will lead to prevention and the improvement of results.

Materials and methods

A questionnaire based prospective study of patients that presented in the Oral/maxillofacial unit of the University of Calabar Teaching Hospital; Calabar was carried out over a twelve-month period (1st February, 2005-31st January, 2006).

Data concerning the patients' age, sex and site of injury, use or non-use of protective helmets, patients' exact position at the time of accident, the type of treatment method employed as well as other variables in the questionnaire were registered. The etiological factors recorded in these 12 months include road traffic accidents (both vehicular and motorcycle) and assault as other common factors did not manifest within the study period. The exact position of the patient at the time of accident and the type of treatment methods used were also noted,

Post operatively, patients were reviewed on the 1st, 3rd, 7th, 21st and 42nd day for those patients whose fixations were to last for that period. For condylar fractures, the intermaxillary wires were removed between the 9th and 14th day.

Complications, for the purpose of this study was defined as those clinically verifiable situations that arises during the course of management, persists beyond six weeks after fixation have been removed and required another surgical intervention. The results obtained were analyzed with the use of Epi-info Microsoft computer software.

RESULTS

Table 1: Age distribution

Age	No	M	F	%
<10	8	6	2	8.16
11-20	4	0	4	4.08
21-30	45	43	2	45.92
31-40	19	16	3	19.39
41-50	20	11	9	20.41
51-60	0	0	0	0
61-70	2	2	0	2.04
Total	**98**	**78**	**20**	**100**

Out of the 98 patients recorded, 78 were males while 20 were females, with a male: female ratio of 4:1.
Sixty-four (65.31%) patients were of ages between 21 and 40.

Table 2: Distribution of etiology according to gender and position

Mechanism of injury	**No**	**M**	**F**	**as rider/driver**	**as passenger**	**Pedestrian**	**%**
Motorcycle	83	69	14	50(60.24%)	28(33.73%)	5(6.02%)	84.69
Vehicle	13	7	6	4(30.7%)	8(61.54%)	1(7.7%)	13.27
Gunshot	2	2	-				2.04
Total	**98**	**78**	**20**				**100%**

Motorcycle related accidents caused more of the facial injuries than a combination of vehicular and assault wounds did. 41 (49.4%) were head- on collisions between two motorcycles while 25% occurred following impact between the motorcycles with vehicles.

Out of the 13 patients that had vehicular accidents, eight were front seat (including the drivers) and four back seat passengers of the vehicles

Table 3: Occupational distribution of facial trauma

Occupation	No	Percentage
Students	40	40.08
Motorcyclist	15	15.3
Business people	13	13.27
Farmers	11	11.22
Pupils	8	8.16
Politicians	5	5.1
Unemployed	4	4.08
Clergy	1	1.02
Policeman	1	1.02
Total	**98**	**100**

Table 4: Monthly distribution of facial trauma

Month	No.	Percentage
February	6	6.12
March	7	7.14
April	8	8.16
May	8	8.16
June	4	4.08
July	4	4.08
August	6	6.12
September	8	8.16
October	7	7.14
November	10	10.20
December	12	12.24
January (2006)	18	18.37
Total	**98**	**100**

Eighteen patients (18.37%) had maxillofacial skeletal injuries following trauma in January 2006 and this made up the highest figure recorded in the 12-month study. Other months, December and November 2005, 12 and10 patients were registered with facial skeletal injuries respectively. The least number of patients recorded were in the months of June and July 2005 with four cases each.

Table 5: Time interval between injury and presentation

Hours	m (%)	f (%)	total
1-12	12(63.5%)	7(36.85%)	19
13-24	9(69.23%)	4(20.77%)	13
25-48	25(86.20%)	4(13.8%)	29
49-72	9(90%)	1(10%)	10
<72	22(84.61%)	4(15.39%)	26
Total	**78**	**20**	**98**

Majority (15;75%) of females presented within 48hours while 22 out of twenty-six patients that presented after 72 hours were males.

Number of fractures sustained

Fifty-one patients sustained injuries at two sites and forty-one of these were males while the other ten were females. Seven patients (six males and one female) had fractures on at least three sites of the facial skeleton in an accident.

Sixty (62.22%) of the total number of patients had bilateral fractures while 38 were unilateral in location with 22 occurring on the right and 16 being left-side.

Table 6: Anatomical distribution of fractures

Bone/s	No.	Percentage
Mandible only	58	59.2
Maxilla only	18	18.4
Zygoma only	0	0
Mandible/Maxilla	10	10.2
Mandible/Zygoma	2	2.0
Maxilla/Zygoma	8	8.2
Mandible/Maxilla/Zygoma	2	2.0
Total	**98**	**100**

Fifty-eight (59.18%) patients had exclusively mandibular fractures. This was followed by isolated maxillary fractures with eighteen patients represented. No patient had fractures of the zygomatic bone alone while two patients had fractures of all three bones.

In the mandible, fractures of the body alone occurred more frequently with thirty-six patients represented. Isolated ramus and angle fractures occurred least frequently with two patients each presenting. No patient had fractures of the coronoid process occurring either alone or in any combination.

Out of the 18 patients who had isolated maxillary fractures, Le Fort I type occurred more frequently with eleven (61%) patients recorded. Four patients had Le Fort II while three patients had Le Fort III fractures.

Out of the twelve fractures involving the zygomatic complex, the body proper was fractured in nine, while three patients had arch fractures.

Table 7 : Treatment methods

Type	No. Of patients	Percentage
Eyelet wires only	74	75.5
Arch bars only	4	4.1
Gilles technique only	5	5.1
Walsham forceps elevation	2	2.0
Gilles& Walshams elevation	2	2.0
Gilles& eyelet wiring	2	2.0
Arch bars & eyelet wiring	4	4.1
Open reduction & transosseous wiring	5	5.1
TOTAL	**98**	**100**

Ninety-three patients (94.89%) were treated using various forms of closed reduction technique including the use of eyelet wires alone (74) Upper and lower arch bars used alone(4), Gilles technique with Bristow's malar elevation (5); Upper or lower arch bars in combination with either upper or lower eyelet wires (4). Six others had elevation of fractured middle third bones repositioned with Walshams' forceps while open reduction with placement of transosseous wires was done in five patients.

COMPLICATIONS

Only eight patients (8.16%) developed various forms of complications. Five had limited mouth opening (5.1%), two developed chronic Osteomyelitis (2.04%) while one patient had parotid duct salivary fistula (1.02%), which was adequately managed.

DISCUSSION

There has been a consistence in the records of higher male facial injuries than females in studies carried out both in Nigeria and abroad. What has remained varied in these records is the ratio, which defines by how much more males sustained these injuries than the females. Some authors have recorded ratios as high as16.9: 1 (Adekeye ,1980) while others have as low as 2.19:1 (Olasorji *et al.,* 2002i) from about the same geographical area of Nigeria. Though these two studies took place 21 year apart, it shows that as time passes by the incidences of facial fractures varies in age, gender and etiological factors. Within the same etiological factor, the mechanism of injuries also varies with time and sociological changes. In this study, a male/female ratio of 4:1 was recorded due to the overwhelming predominance of motorcycle-related injuries. Injuries resulting from motorcycle accidents accounted for 84.69% while

vehicular trauma and assault led to13.27% and 2.04% of the total number of cases. In a review of literature, some authors (Wasiu *et al*., 2005) found out that though motor vehicles were responsible for most road traffic accidents, motorcycle-related injuries have been on a significant increase in the last 40 years and attributed it to the increasing number of motorcycles plying our roads lately. The striking feature of this study is that 50 out of the 83 who had facial fractures due to motorcycle accidents were riders while 28 were passengers. This result was similar to those obtained in another study(Oginni *et al*., 2006) of 104 motorcycle related maxillofacial injuries in Ile-Ife and Sokoto in which 50.5%of the victims were riders and none was a female. Furthermore, the mechanism of injury sustained by 41 (49.39%) out of these 83 patients was by head-on collisions with other motorcycles, while 25% were due to motorcycle collision with stationary vehicles. In the times past, motorcycle riding was not a popular means of transportation rather mini-cabs, Lorries and trains (for trans-city movements of goods and persons) was common while bicycle riding was mostly used for short distance intra-city movements.

Since in Calabar, only the males ride motorcycles mostly for commercial purposes, this account for the high percentage (50/69; 72.5%) of males seen in this study. This they do at very high speeds along narrow and sharply winding roads. Majority of the roads are without street lights or road signs. Most times these motorcycles are poorly maintained, often with poor lighting systems. In addition to this, the winding roads through which these motorcyclist ply makes distant vision of on-coming automobiles difficult to appreciate, hence the likelihood of a head - on collision. These results in various degrees of fatal injuries, which range from multiple facial bone fractures, associated injuries, sometimes instant death. This degree of severity is reflected in the number bilateral fractures (60/98) as against 38/98, which was unilateral. This can also be seen in the number of multiple fractures sustained, with 68 patients having two or more fractures. This underscores the urgent need to legislate on the compulsory use of protective helmet by motorcycle users. However, records of the use of helmets inconsistent as not all patients seen in the casualty were asked of the prior use of helmets. Moreover, some of the patients present in such clinical condition that their response is considered unreliable. The use of helmets by motorcyclists in this area is very uncommon. This may be due to the absence of a law that makes it compulsory to wear helmets.

The mandible was more involved in the fractures of the facial skeleton. It is the most prominent bone in the face and that it hangs in a hinge form loosely to the skull, a head –on impact to the face is more likely to lead to a fracture of the mandible. This is in agreement with the findings of other authors (Wasiu *et al*., 2005).

In the studies carried out in an environment where assault was a more common cause of fracture, the zygomatic bone was frequently fractured particularly on the left side, suggesting a right sided direction of the fracturing force (Ogden , 1991). In the present, study no isolated zygomatic bone fracture was recorded. This may suggest that fractures of the zygomatic bone are not very common in situations where motorcycle accidents caused more of the fractures. The two assault- related fractures were due to politically motivated gunshot wounds, which resulted in fractures of the mandible rather than those of the zygoma.

Also in a situation where automobile road users keep to the right side of the road, a head collision on motorcycles is expected to result in more of left sided fractures. This was however not the case here where more of right sided fractures were recorded suggesting that a possible sudden lane crossing may have occurred moments before impact leading to right sided fractures. Though as expected, all zygomatic fractures were sustained on the left side.

Majority of the patients were students. Because of unemployment and the need to keep themselves busy during vacations, students engage in commercial motorcycle riding supposedly to make additional pocket money. A good number of them are inexperienced and unlicensed; in addition they indulge in the consumption of alcohol while on ‘duty’. This tends to increase their recklessness on the road, thereby making them particularly accident-prone. However, in some instances, the professional riders claim to be students in a bid to gain prompt attention and sympathy from the attending health workers. These professionals, in addition to being lawless, are not educated well enough to recognize, read and interpret road signs. They often claim to be students to avoid being scolded by casualty staff who already know of their menace on the roads.

Forty (40.8%) occurring in the months of November (10), December (12) and January, 2006 (18) accounted for the highest incidence of facial fractures in the 12 months of this study. This is because intra and intercity traffic generally increases during this period. It became more pronounced in the year 2005 when the state government declared a well-intended month-long vacation to all its workers and organized a Christmas festival. Alcohol consumption during this period may have contributed to the incidence of accidents the led to fractures of facial bones during this festive period.

Generally, females tend to be more conscious of their looks. In addition to the fear of minor alterations on the face, which often results in unpredictable psychological morbidity in them, prompts them to present for treatment as soon as they sustain injuries. This accounts for 15 out of 20 female patients in the study presenting within 48 hours of trauma while 22 out of 78 males presented after 72 hours for treatment.

Simple closed reduction and placement of eyelet, arch bars or both in some instances, elevation of depressed zygomatic fractures with Bristows' elevators, correction of nasal bone displacements, some Le fort I fractures with Walshams' elevators and septal forceps in others, proved to be very effective in the management of these patients. Depending on the type and severity of fracture, the general health condition of the patients at presentation, simple closed reduction and fixation techniques produces good results provided that these patients are seen and treated within 36 hours and the follow-up intervals are not far spaced. This allows for a more accurate and easier manipulation of fractured fragments into place and earlier detection of any abnormal healing process.

The patients that developed Chronic Osteomyelitis during treatment were mostly those males who presented later than 72 hours. This delay in presentation may have allowed for a deeper spread of infection into the marrow spaces. They were however treated conservatively with specific antibiotic medications (after results of pus microscopy, culture and sensitivity were obtained) and selective extractions.

The parotid duct salivary fistula was treated first by identification of the duct and securing it with catgut sutures. Then patients were placed on a low dose (0.3mg) atropine oral tablet medication for four days.

The patients with limited mouth opening were simply reassured and daily jaw exercises instituted at home and at follow-up visit recommended. They achieved adequate mouth opening between three to four weeks later.

This study is limited by the short duration it lasted hence the overall number of facial fractures was low. This is also reflected in the range of possible etiological factors as only three factors were represented. It is likely that given adequate time, other factors such as falls, sports, industrial and boat related traumas might be represented as it was in the five- year studies carried out in Kaduna (Adekeye,1980) and Ibadan (Fasola *et al*., 2002).

CONCLUSION

Motorcycle related accidents accounts for majority of facial fractures particularly when helmets are not worn. This appears to be a male dominant type of injury. The mandible was mostly involved and students were particularly prone to this form of mishap. The females reported for treatment more promptly than their male counterparts. Simple treatment procedures were adequate as complications were low in figure and remedies applied were sufficient.

It is recommended that the economic policies that make it easy for the importation of high capacity, uncontrollable motorcycles should be reviewed. The use of these types of automobiles for the purpose of commercially conveying commuters should be abolished in preference for the low speed motorcycles that have limited carrying capacities. Laws that make it compulsory, the use of protective helmets should be enacted and enforced.

Though management of facial fractures with modern diagnostic and operative procedures should be encouraged in as many health institutions as possible, the older techniques must not be completely discarded rather attention to fine surgical details in the course of practice must be emphasized.

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