Facial Bone Fractures in Ile-Ife, Nigeria: An Update on Pattern of Presentation and Care

Fadekemi Olufunmilayo Oginni¹ · Taoreed Oladejo² · Dayo Paul Alake³ ·
Jolaiya Olufunke Oguntoba² · Olawande Funmilola Adebayo²

Received: 26 March 2015 / Accepted: 23 July 2015 / Published online: 26 August 2015
© The Association of Oral and Maxillofacial Surgeons of India 2015

Abstract

Aims Traumatic injuries remain a major cause of morbidity, mortality and economic loss worldwide. An audit of maxillofacial injuries presenting and managed at any facility is key to understanding the trends, strategies for prevention and improving outcome of care. We sought to study the pattern and treatment of facial bone fractures managed at the Department of Maxillofacial Surgery, Obafemi Awolowo University Teaching Hospital, Ile-Ife, between 2005 and 2013. Also, to compare these with the pattern in the preceding 29 years.

Methods Data on patients' socio-demographics, dates of injury and presentation, interval before presentation, agent of injury, type of crash, patient's status, type(s) of fracture, extent of injury, treatment offered and outcome were collected and analyzed.

Results 311 patients aged 5–72 years were reviewed. A male preponderance was observed. Peak age incidence was 21–30 years and 86.1 % of injuries resulted from road traffic crashes (RTC) most (67.5 %) of which were motorcycle related injuries. 215 patients sustained mandibular fractures in 311 sites while 141 patients sustained 225

midface fractures. Of the 242 patients managed definitively, only 11.2 % had open reduction and internal fixation.

Conclusion Motorcycle related RTC remains the major cause of facial bone fractures. Management with osteosynthesis is gradually emerging, although demonstrating fewer complications, it is unaffordable for a majority.

Keywords Facial bone fractures · Trend · Treatment

Introduction

Traumatic injuries constitute a source of considerable economic expense due to procedural costs, disability year lost and the associated income loss [1]. Maxillofacial injuries occur in a significant proportion of trauma patients, consequently, it constitutes an important health and economic issue. The aetiology of maxillofacial injuries varies from one country to another and even within the same country, depending on the prevailing socioeconomic, cultural and environmental factors [2].

Road traffic crash has been reported repeatedly as the leading cause of facial bone fractures in many African countries [3]. Three studies reviewing different time frames in Ile-Ife, Nigeria affirmed this trend [4–6]. Ile-Ife is a southwestern Nigerian town with a population of about 350,000 constituting less than 0.3 % of the national population [7]. Nigeria, Africa's most populous country, is a developing country with a sizable number of unemployed youths [8]. Apart from serving Ile-Ife, the Obafemi Awolowo University Teaching Hospital (OAUTH) is a referral centre for four neighbouring states. It also lies along a major interstate road trunk connecting the southwestern to the eastern and northern parts of Nigeria.

✉ Fadekemi Olufunmilayo Oginni
torera5265@yahoo.com

¹ Department of Oral Maxillofacial Surgery, Faculty of Dentistry, College of Health Sciences, Obafemi Awolowo University, Ile Ife, Osun State, Nigeria

² Department of Oral Maxillofacial Surgery, Obafemi Awolowo University Teaching Hospital, Ile-Ife, Osun State, Nigeria

³ Faculty of Dentistry, Obafemi Awolowo University, Ile Ife, Osun State, Nigeria

Over the last decade in most Nigerian cities, motorcycles have replaced automobiles as the major means of intra-city commuting. The change has been attributed to the unsatisfactory and largely un-motorable road networks [9].

Traditionally in Nigeria, most patients with facial bone fractures have been managed conservatively (usually with mandibulomaxillary fixation (MMF)) and on few occasions, with open reduction and internal fixation (rigid/non rigid) [3, 10]. In the past, the few patients who underwent open reduction had their fractures immobilized with transosseous wires. Facilities for osteosynthesis have recently become accessible to maxillofacial surgeons in Nigeria, although at unaffordable costs for a majority of patients. This has resulted into a change in the treatment protocol to accommodate the use of bone plates and screws in fracture fixation [11].

Periodic verification/audit of the etiology of maxillofacial injuries in a particular location helps to formulate and recommend appropriate preventive strategies. Similarly, review of treatments and their outcome enhances improvement in practice [12].

This study sets out to assess the trends in maxillofacial bone fractures presenting at Obafemi Awolowo University Teaching Hospital (OAUTH), Ile-Ife over the period between January 2005 and December 2013. The pattern of facial bone fractures and demography of patients will be compared to the three previous studies and treatment offered as well as outcome will be assessed.

Materials and Methods

A retro-prospective review of the records of all patients seen at the accident and emergency unit and the outpatient clinic of the Department of Oral and Maxillofacial Surgery of OAUTH, Ile-Ife presenting with facial bone fractures was conducted. The review period covered January 2005 to December 2013. Information on patients' socio-demographics, date of injury, date of presentation, interval before presentation, agent of injury, type of crash, patient's status, type(s) of fracture, extent of injury, treatment offered and outcome were collected.

Facial bone fractures were diagnosed through a combination of history taking, thorough clinical examination and radiographic imaging (plain radiographs and or CT scan depending on what was accessible and affordable). Location and number of fractures were determined for all patients.

The data generated was entered into a computer. Using the SPSS statistical software package version 22. Simple descriptive statistics and Chi square tests were carried out. Findings in this study were compared with previous results

in the centre. Statistical significance was inferred at $p < 0.05$.

Results

A total of three hundred and eleven cases were available for review over the study period of 9 years. Table 1 displays the distribution of fractures and demographic pattern of patients seen over a period of thirty-seven years. Table 2 illustrates the patients' distribution by age group and gender in the present and previous studies. The present study demonstrates a sustained significant male preponderance, with two hundred and fifty-three patients being males (M:F = 4.4:1). The patients' age range was 5–72 years with mean age (SD) at 31 (11.3) years. The peak age incidence was 21–30 years with about 46 % of all patients in this age bracket (Tables 1, 2).

In addition to thorough clinical examination, 97.1 % of patients were diagnosed based on use of plain radiographs while only 9 cases (2.9 %) were investigated with CT scan images. 86.1 % of all cases of facial bone fractures resulted from road traffic crashes (RTC) with motorcycle related crashes accounting for 67.5 % of all facial bone fractures, whereas 18.6 % of patients were victims of motor vehicular crashes (Fig. 1). Only 3 (1.0 %) patients presented on account of sports related injuries. Most of the victims of motorcycle related crashes were riders in contrast to motor vehicular crashes where more passengers were involved than drivers ($p < 0.001$) (Table 3).

Most facial bone fractures (60.9 %) were sustained during the second (33.2 %) and first (27.7 %) quarters of the years. The modal month was May (Fig. 2). 73.3 % of the patients presented within the first week of sustaining injuries with over half of them (42.1 %) presenting within 24 h of being injured (Table 4). There was associated altered level of consciousness (Glasgow Coma Scale less than 15) in 134 (43.1 %) patients. Majority of them 108 (80.6 %) however regained consciousness within an hour of sustaining their injuries. We found no significant relationship between patients' altered level of consciousness and fracture site (i.e. midface or mandible) ($p = 0.21$) however, the aetiology of injuries appear to affect the level of consciousness ($p = 0.001$) Table 6.

One hundred and seventy patients sustained mandibular fractures only, 96 sustained middle face fractures only and 45 had a combination of both.

Altogether, 215 patients sustained mandibular fractures in 311 sites. The most frequently fractured region of the mandible was the parasymphiseal region, 100 (32.2 %), followed by the body, 81 (26.0 %). The dentoalveolar region, 19 (6.1 %), was the least affected part of the mandible (Table 5).

Table 1 Frequency of fractures and demographic pattern of patients seen over the period of thirty-seven years (1976–2013)

Variables	Present study	Third study	Second study	First study
Period	2005–2013	1996–2004	1982–1995	1976–1981
Number of years	9 years	9 years	14 years	6 years
Total number of patients	311	451	442	231
Total number of fractures	535	632	517	441
Average patients per annum	34.6	50.1	31.6	38.5
Average fracture per patient	1.72	1.4	1.17	1.9
Average fracture per year	59.4	70.2	36.9	73.5
M:F	4.4:1	3.5: 1	4.1:1	5.4:1
Age range	5–72	1–70	1–70	1–80
Mean age (SD)	31.0 (11.3)	29.1 (13.04)	30.33 (13.17)	
Peak age group	21–30	21–30	21–30	21–30
Mandible: midface	1.4:1	1.4: 1	2.3: 1	2.1: 1

Table 2 Distribution of facial bone fracture patients by age groups over the thirty eight years

Age Group	Male No (%)	Female No (%)	Total No (%)	Oginni et al. (1996–2004) No (%)	Ugboko et al. (1982–1995) No (%)	Odusanya et al. (1976–1981) No (%)
0–10	3 (1.0)	4 (1.3)	7 (2.3)	36 (8 %)	25 (5.7)	12 (5.2)
11–20	20 (6.4)	14 (4.5)	34 (10.9)	62 (13.7)	69 (15.6)	56 (24.2)
21–30	122 (39.2)	22 (7.1)	144 (46.3)	179 (39.7)	173 (39.2)	85 (36.8)
31–40	69 (22.2)	11 (3.5)	80 (25.7)	98 (21.7)	93 (21.0)	33 (14.3)
41–50	24 (7.7)	5 (1.6)	29 (9.3)	42 (9.3)	53 (11.9)	20 (8.7)
51–60	9 (2.9)	1 (0.3)	10 (3.2)	24 (5.3)	22 (5.0)	12 (5.2)
61–70	5 (1.6)	1 (0.3)	6 (1.93)	10 (2.2)	7 (1.6)	8 (3.5)
>70	1 (0.3)	0 (0.0)	1 (0.3)	0 (0.0)	0 (0.0)	5 (2.2)
Total	253 (81.4)	58 (18.6)	311 (100)	451 (100)	442 (100)	231 (100)

Fig. 1 Aetiology of facial bone fractures in the previous and present study

The midface fractures affected multiple sites more than the mandible as 141 (45.3 %) patients sustained fractures at 225 midfacial sites. Zygomatic complex fracture was present in 108 (34.7 %) patients, but isolated nasal fractures

were seen only in 15 (4.8 %) patients. Le Fort II fracture was the commonest (14.8 %) of the Le Fort type fractures.

In the midface, close to half (48 %) of fracture sites were located in the zygomatic complex. Le Fort type fractures (I, II and III) constituted 37.3 %, palatal split 8 % and isolated nasal bone fractures 6.7 % (Table 5).

Two hundred and forty-two (77.8 %) of the patients received definitive treatment. Most of them (88.8 %) were treated conservatively, predominantly with MMF, while only 27 (11.2 %) of them had open reduction and internal fixation (ORIF). Eighty-nine complications were reported in all, majority (88/89) of which were associated with MMF. The commonest complication observed was trismus (Fig. 3). The only complication associated with ORIF was a single case of unsightly scar (1/89).

Discussion

Cultural, socioeconomic, environmental and geographical factors greatly influence the pattern of maxillofacial fractures worldwide; being determinants of the subsection of a

Table 3 Status of patients involved in road traffic crashes (2005–2013)

Aetiology	Driver/rider No (%)	Passenger No (%)	Pedestrian No (%)	Total No (%)
Motor vehicle crashes	13 (24.1)	40 (74.1)	1 (1.9)	54 (100)
Motorcycle	129 (64.8)	66 (33.1)	4 (2.0)	199 (100)
Total	142 (56.1)	106 (41.9)	5 (2.0)	253 (100.0)

$X^2 = 29.54$ $df = 2$ $p = 0.000$

Fig. 2 Monthly presentation of facial bone fracture patients **Fig. 3** Complications of cases managed**Table 4** Interval before presentation in the hospital

Intervals	Present study (2005–2013)	Oginni et al.	Ugboko et al.
<24 h	55 (31.3)	170 (37.7)	138 (31.2)
24 h to 7 days	74 (42.0)	207 (45.9)	231 (52.3)
8 days to 2 weeks	28 (15.9)	29 (6.4)	27 (6.1)
>2 weeks to 4 weeks	8 (4.5)	24 (5.3)	22 (5.0)
>4 weeks to 4 months	10 (5.7)	15 (3.3)	16 (3.6)
> 4 months	1 (0.6)	6 (1.3)	8 (1.8)
Total	176 (100)	451 (100)	442 (100)

$X^2 = 27.507$ $df = 5$ $p = 0.002$

Table 5 Site distribution of facial bone fractures (2005–2013)

Mandibular fracture sites	Males	Females	No (%)
Condyle	27	8	45 (14.5)
Angle	30	9	40 (12.9)
Body	64	7	81 (26.0)
Parasymphiseal region	76	12	100 (32.1)
Symphysis	23	3	26 (8.4)
Dentoalveolar	14	5	19 (6.1)
Total	234	44	311 (100)
Zygomatic complex	90	18	108 (48.0)
Le Fort I	17	4	21 (9.3)
Le Fort II	36	10	46 (20.4)
Le Fort III	13	4	17 (7.6)
Nasal	11	4	15 (6.7)
Palatal	15	3	18 (8.0)
Total	182	43	225 (100)

population that is most predisposed, the aetiologies, and severity of injuries sustained [3, 13].

The average number of patients per year recorded in this study represents a 31 % drop from the report of the preceding 9 years. This average is however similar to the reports of Ugboko et al. [6] and Odusanya [4] (Table 1) recorded when the population of Osun state was much lower and there were fewer treatment centers in the South western zone.

Thus, we may attribute the drop to establishment of three new maxillofacial centres in neighbouring states. Also, we opine that the mobile telecommunication device revolution may have reduced the need for unnecessary long distance journeys considerably. Transportation among Nigerians is highly connected to communication. Before the year 2001, Nigerian telecommunication system was grossly inefficient; consequently, there were many reasons to travel. Mobile phones were however introduced in 2001;

and have gradually penetrated the population to steadily attain a teledensity of 91.15 % in December 2013 [14]. This no doubt, has vastly enhanced communication and modified travel pattern.

There was a steady drop in the male to female ratio over the years from 1976 to 2004 as more females took up outdoor activities. Many studies in Nigeria have also reported a similar trend [3]. The current study however shows a rise in the proportion of males involved in maxillofacial trauma relative to females (4.4:1) across all age groups with the exception of the first decade of life. We attribute this to the exclusive male dominance, of the motorcycle riders who constituted about 40 % of all patients [15].

The age group most susceptible to maxillofacial fractures remains the third decade of life as widely reported [3]. In this study, about 83 % of patients were in the 2nd to 4th decades of life. This age bracket represents the most productive in any population. Only 2.25 % of patients seen were children under 10 years, which is a 72 % drop in proportion of children observed by Oginni et al. [5].

Between 2000 and 2009, youth unemployment rate was put at 58.6 % among citizens aged 15–44 years [16, 17]. Statistics from the Manpower Board and National Bureau of Statistics reveal that Nigeria has a youth population of 80 million (representing about 60 % of the National population) and 64 million are unemployed while 1.6 million are underemployed [18, 19]. Furthermore, massive youth unemployment rate in Nigeria has been attributed to corruption, decline in the manufacturing sector, rapid population growth and rural urban migration among others [8]. Majority of unemployed youths engage in vocations like street trading/hawking, commercial motorcycling, porters, motor-park boys, etc. which predispose them to RTCs [20].

RTCs are still responsible for most maxillofacial trauma presenting at our facility. This pattern is also reported in most Nigerian studies as well as a large number of developing countries [3]. Reasons alluded for these include bad road networks, poor evaluation of roadworthiness of vehicles and non-enforcement of road traffic rules and regulations [20]. However, this study demonstrates a very high proportion of trauma being related to motorcycle crashes alone (68.2 %) which is a cause for concern.

Additionally, motorcycle has become a major means of intra-city commuting in Nigeria [15]. Its popularity is attributable to ease of navigating through bad road networks and the attendant traffic jam associated with movement delays in towns. In addition, the high unemployment rate makes commercial motorcycling an attractive prospect for the young and unemployed. Commercial motorcycle riders are usually young men who are often not well educated and are adventurous. A lot of them are unlicensed,

wear no protective helmet and often ride under the influence of intoxicants [15].

Motorcycle riders were more predisposed to sustaining facial bone fractures than their passengers. The reverse was observed for victims of motor vehicular crashes. We opine that a fair level of compliance with the seat belt use regulation by motor vehicle drivers and front seat occupants only may be responsible for this [21]. Rear seat passengers tend to go unrestrained and hence sustain more injuries during crashes. Unfortunately, riders rarely wear crash helmets with a protective visor or strapping if any at all [15]. The rise in proportion of RTC victims has overshadowed the proportions due to other causes like assault, falls, and sports which now contribute to even smaller fractions than previously recorded.

Delay in presentation featured quite prominently in the present study with statistically significant fewer patients ($p = 0.002$) presenting for treatment within the first week of injury compared to two of the previous studies. It is important to note that our referral protocol engages the maxillofacial unit and all other managing units (depending on the presence of concomitant injury or injuries) at presentation. Delays however are often informed by the typical economic constraint experienced by commercial motorcyclist who would usually seek alternative cheaper treatment first. Also, some relative delay in presentation may be attributed to delayed referral from primary managing facilities that are unequipped for maxillofacial care delivery. In this series, 43 % of patients had loss of consciousness and 8.4 % were still unconscious after 24 h. While GCS scores may be a predictor of the severity of injuries, our findings suggest that MC related crashes are most likely to result in loss of consciousness (Table 6).

In consonance with popular reports of maxillofacial fractures, mandible was the facial bone most susceptible to fracture in this series [1, 3, 22]. Its prominence and mobility have been adduced as the reason for this predisposition. Likewise among the midface fractures, zygomatic complex fracture was the most common. The ratio of mandibular to midface fractures recorded is similar to Oginni et al's. [5] study and represents a relative reduction to the proportion of mandibular fractures reported between 1976 and 1995.

This study like many Nigerian studies found the mandible to be most susceptible to fracture in the parasymphiseal/body region. Odusanya however reported more condylar fractures [3] with predominant motor vehicle crashes. This is a puzzle that needs to be unravelled. Plausible explanations are the possibility of missed diagnosis, especially with the predominant parasymphiseal fractures in the current series. Possibly the force transferred in motorcycle related crashes was not sufficient to cause condylar fractures.

Table 6 Relationship between levels of consciousness, aetiology and site of injury

Aetiology	Loss of consciousness		Total
	Yes	No	
Motor vehicle accidents	21	37	58
Motor cycle accidents	106	103	209
Assault	3	12	15
Falls	4	12	16
Sports	0	3	3
Gunshot	0	8	8
	134	175	309
	$p = 0.001$		
Site of fractures			
Mandible	89	125	214
Midface	45	50	95
	134	175	309
	$p = 0.205$		

Many studies of the bio mechanism of MC related versus vehicle passenger crashes provide overwhelming evidences in support of the motor vehicle occupant's greater relative protection than the MC rider or passenger [23]. The use of seat belts and presence of air bags in cars as opposed to lack of restraints or support for the rider and pillion passenger may further help to highlight these differences.

Since radiographic assessment was done mostly with the aid of plain radiographs, this may account for a degree of under-reporting of fractures that could have been detected easily on CT scan images. Although more diagnostic centers with CT scan services are opening up in our neighborhood, affordability remains a challenge to majority of patients.

Although maxillofacial fractures occurred all year round, a peak was observed in May (a rainy month in the southwest of Nigeria) and a low recorded in August. The trough observed in August also corresponds to the August break in rainfall. We opine that wet slippery roads and paths contribute to more motorcycle related crashes in the peak period as presented in other studies [4–6, 24]. Proposed special precautions include avoidance of MC riding in the rain/special speed limit on rainy days.

The choice of treatment option was made based on patient's financial capability, availability of materials and kit for rigid fixation, severity of facial bone fracture and availability of theatre space. As such open reduction and rigid internal fixation was seldom employed. However with the availability of a kit for osteosynthesis, the few cases of ORIF done recently, yielded promising results. The pattern of complications recorded reflect the preponderance of MMF related complications (Fig. 3). Although ORIF is

more expensive and invasive, compared with MMF, the low complication and co-morbidity rates are reasons for its use. The only ORIF related complication in this series (unsightly scar); may be termed avoidable. We believe that avoidance of extra-oral incision (more so in the black population) is attainable if a full complement of appropriate instruments are available.

Conclusion

Although the overall pattern of maxillofacial fractures has remained the same in the last few years, the strong emergence of motorcycle as a major means of commuting appears to have tilted the pattern back towards young and exuberant males. Serious and concerted effort at enforcement of road traffic regulations as well as infrastructural development has a potential to reduce road traffic crashes. Restrictions on commercial motorcycling and accommodation of riders in other transport services will also be beneficial in limiting facial fractures. Although osteosynthesis is not very popular yet in our practice, the outcome of its use suggests that its use has the prospect of reducing morbidity associated with management of maxillofacial fractures using the conventional techniques.

Acknowledgments We are grateful to all patients and colleagues who participated in the care of the patients at every point in time.

References

1. Lee K (2012) Global trends in maxillofacial fractures. *Cranio-maxillofac Trauma Reconstr* 5:213–222
2. van den Bergh B, Karagozoglu KH, Heymans MW, Forouzanfar T (2011) Aetiology and incidence of maxillofacial trauma in Amsterdam: a retrospective analysis of 579 patients. *J Cranio-Maxillofac Surg* 40:e165–e169
3. Adeyemo WL, Ladeinde AL, Ogunlewe MO, James O (2005) Trends and characteristics of oral and maxillofacial injuries in Nigeria: a review of the literature. *Head Face Med* 1:7
4. Odusanya SA (1985) Maxillofacial fractures in southwestern Nigeria (1976–1981). *Odonto-Stomatol Trop* 8:153–155
5. Oginni FO, Ugboko VI, Odusanya SA (2009) Changing pattern of maxillofacial fractures in a sub-urban Nigerian teaching hospital. *Niger Postgrad Med J* 16:54–58
6. Ugboko VI, Odusanya SA, Fagade OO (1998) Maxillofacial fractures in a semi-urban Nigerian teaching hospital. A review of 442 cases. *Int J Oral Maxillofac Surg* 27:286–289
7. State Population by the National Population Commission. Available on <http://www.population.gov.ng/index.php/state-population>. Accessed 23 Mar 2015
8. Adebayo AA (2013) Youths' unemployment and crime in Nigeria: a nexus and implications for national development. *Int J Sociol Anthropol* 5:350–357
9. Oginni FO, Ajike SO, Obuekwe ON, Fasola O (2009) A prospective multicenter study of injury profile, severity and risk factors in 221 motorcycle-injured Nigerian maxillofacial patients. *Traffic Inj Prev* 10:70–75

10. Ogundipe KO, Afolabi AO, Adebayo O (2012) Maxillofacial fractures in Owo, south western Nigeria. A 4 year retrospective review of pattern and treatment outcome. *Dentistry* 2:132–134
11. Okoturo EM, Arotiba GT, Akinwande JA, Ogunlewe MO, Gbotolorun OM, Obiechina AE (2008) Miniplate osteosynthesis of mandibular fractures at the Lagos university teaching hospital. *Niger Q J Hosp Med* 18:45–49
12. Owotade FJ, Fatusi OA, Ojo MA (2004) Call hour maxillofacial emergencies presenting to a Nigerian teaching hospital. *Afr J Oral Health* 1:17–24
13. Batista AM, de Ferreira FO, Marques LS, Ramos-Jorge ML, Ferreira MC (2012) Risk factors associated with facial fractures. *Braz Oral Res* 26:119–125
14. Nigerian Communication Commision: Statistics of monthly subscriber
15. Oginni FO, Ugboko VI, Ogundipe O, Adegbehingbe BO (2006) Motorcycle-related maxillofacial injuries among nigerian intra-city road users. *J Oral Maxillofac Surg* 64:56–62
16. National Bureau of Statistics: statistical news: labour force statistics. The NBS Publication 2010
17. National Bureau of Statistics: social statistics in nigeria. The NBS Publication 2009
18. Awogbenle AC, Iwuamadi KC (2010) Youth unemployment entrepreneurship development programme as an intervention mechanism. *Afr J Bus Manag* 4:831–835
19. Okafor EE (2011) Youth unemployment and implication for stability of democracy in nigeria. *J Sustain Dev Afr* 13:358–373
20. Oginni FO (2008) Causes of road traffic accidents in developing countries. In: Bartley GP (ed) *Traffic accidents: causes and outcomes*. NOVA, New York, pp 225–260
21. Cox D, Drake G, Vincent MD, McGwin G, MacLennan PA, Holmes JD, Rue LW (2004) Effect of restraint systems on maxillofacial injury in frontal motor vehicle collisions. *J Oral Maxillofac Surg* 62:571–575
22. Olasoji HO, Tahir A, Arotiba GT (2002) Changing picture of facial fractures in northern nigeria. *Brit J Oral Maxillofac Surg* 40:140–143
23. Richter M, Otte D, Lehmann U, Chinn B, Schuller E, Doyle D, Sturrock K, Krettek C (2001) Head injury mechanism in helmet-protected motorcyclists: prospective multicenter study. *J Trauma* 51:949–958
24. Fasola AO, Lawoyin JO, Obiechina AE, Arotiba JT (2003) Inner city maxillofacial fractures due to road traffic accidents. *Dent Traumatol* 19:2–5