MANDIBULAR SITES PRONE TO FRACTURE: ANALYSIS OF 174 CASES IN A NIGERIAN TERTIARY HOSPITAL

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SUMMARY

Background: Mandibular fracture is an important surgical condition in our environment and elsewhere in the world.

Objective: The purpose of this study is to clinically determine the most common sites of the mandible prone to fracture.

Patients and method: This two-year prospective study was carried out at the Dental and Maxillofacial clinic, University of Calabar Teaching Hospital, Nigeria, in 2007 and 2008.

Results: One hundred and seventy four patients' ages between six to 70 years (mean 28.7± 5.3 years) were studied. One hundred and forty two (81.6%) of them were males and 32 (18.4%) females, with a male/female ratio of 4.4:1.Road traffic accident significantly ($\chi 2$=17.1607, P=0.0087) accounted for 139 (79.9%) of the fractures. There were 244 fracture sites in the 174 patients, with the body of the mandible being significantly ($\chi 2$=21, P=0.0008) affected than other sites in fracture (n= 115, 47.1%). However, 96 (39.3%) and 132 (54.1%) of the fractures occurred on the right and left sides of the mandible respectively. Most patients had single (44.3%) and double (31.6%) fractures and this finding was significant ($\chi 2$=60.9314, P=0.0000). The patients encountered were fully (62.6%) and partially dentate (37.4%). The fractures were successfully treated by conservative method, closed reduction and open reduction techniques.

Conclusion: This study shows that the tooth-bearing portion, body, left and right sides of the mandible are most commonly prone to fracture when multiple aetiologies are considered.

Keywords: Mandible, site, fracture, Calabar.

INTRODUCTION

Fractures of the mandible do occur and form a significant part of facial bone fractures encountered by the practising Dental surgeon.[1,2] The occurrence of facial injuries tends to be high compared to injuries in other body areas because the face is without protective covering, and the mandible is one of the prominent bones in this region of the body.[3,4] Depending on the direction and force of the trauma, fractures of the mandible commonly occur at different sites. One classification of fractures describes mandibular fractures by anatomic location.[1] However, the presence of teeth in the mandible is the most important anatomical factor which makes its fracture different from fractures elsewhere in the body.[1,2] This paper investigates clinically the weak regions of the mandible that are prone to fracture and the effect of factors such as age, gender, aetiology, state of dentition and number of fractures sustained with the treatment carried out to effect union of fractures.

MATERIAL AND METHODS

This is a prospective study of patients who sustained mandibular fractures seen and treated at the Dental and Maxillofacial clinic of the University of Calabar Teaching Hospital, Calabar over a two year period from 2007 to 2008. Detailed information on the aims of the study was given to the patients, guardian and parents of the under-aged. Written informed consent for participation in the study was obtained from patients or guardian where applicable while institutional consent was obtained from the Ethics Committee of the hospital. Excluded from the study were patients with medical conditions and drug therapy that have adverse effect on bone physiological status.

History of the injury, medical and drug history were noted, while clinical and radiographic examinations were carried out. Also, written comments from radiologists on x-ray views were obtained and crosschecked clinically where necessary. Information recorded in the data form were age, gender, site, number of fracture, and aetiology. These were carefully crosschecked and documented before treatment commenced on each patient. The data was analyzed with Epi-Info 2000 version software. Chi square evaluation was done and p value <0.05 was considered significant.

RESULTS

A total of 174 patients with mandibular fractures were evaluated during the duration of the study. One hundred and forty two (81.6%) were males and 32 (18.4%) females, with a male/female ratio of 4.4:1. In all age groups there was a preponderance of the male gender (Table I). The youngest patient was six years old while the oldest was 70 years with a mean age of 28.7 ± 5.3 years. The peak incidence was in the third decade (46.0%), followed by the second and the fourth decades with 23.6% and 15.5% respectively. Only three (1.7%) patients were recorded in the seventh decade (Table I).

Table 1 Age and gender distribution of subjects

Age Group	Male		Female		Total	
	N	%	N	%	N	%
0-10	4	2.3	1	0.6	5	2.9
11-20	35	20.1	6	3.5	41	23.6
21-30	66.	37.9	14	8.1	80	46.0
31-40	21	12.1	6	3.4	27	15.5
41-50	9	5.2	3	1.7	12	6.9
51-60	4	2.3	2	1.1	6	3.4
61-70	3.	1.7	0	0.0	3	1.7
Total	**142**	**81.6**	**32**	**18.4**	**174**	**100**

Road traffic accident accounted for 139 (79.9%) of the fractures (Table 2). The commonest causes of the fracture are vehicle road traffic accidents (VRTA, 43.7%) and motorcycle road traffic accidents (MRTA, 36.2%).

Furthermore, the fully dentate patients were 109 (62.6%) while the partially dentate were 65 (37.4%). No completely edentulous patient was recorded.

Table 2 Distribution of subjects according to aetiology

Aeitology	No of Subjects	%
VRTA	76	43.7
MRTA	63	36.2
Assault	20	11.5
Sports	8	4.6
Falls	3	1.7
Gunshot	3	1.7
Industrial accidents	1	0.6
Total	**174**	**100.0**

There were 244 fracture sites recorded in all the patients. The body of the mandible is significantly (χ^2=21, P=0.0008, Table 3) affected than other sites in fracture. No coronoid fracture was recorded. A closer look at the data shows that the left side of the body of the mandible is more affected than the right. The number of fractures occurring in the tooth-bearing portion of the mandible (n=149, 69.3%) was higher than in

non-tooth-bearing portion (n= 75, 30.7%), giving a ratio of approximately 2:1.

Table 3 Distribution of fracture according to anatomical site

Fracture	Right No.	Left No.	No of fracture/ %	
			No.	%
Body	39	76	115	47.1
Parasymphysis	16	22	38	15.6
Angle	12	18	30	12.3
Condyle	15	9	24	9.8
Ramus	14	7	21	8.6
Symphyseal (mid-line)	-	-	16	6.6
Total	**96**	**132**	**244**	**100**

Majority of the patients had single (n=77, 44.3%) and double (n= 55, 31.6%) fracture. This finding was significant (χ^2=60.9314, P=0.0000, Figure 1). However, as the number of fractures per patient increased, less number of patients was recorded. The patients were successfully treated between three to eight weeks by conservative method (n=25, 14.4%), closed reduction technique (n=141, 81.0%) and open reduction technique (n=8, 4.6%).

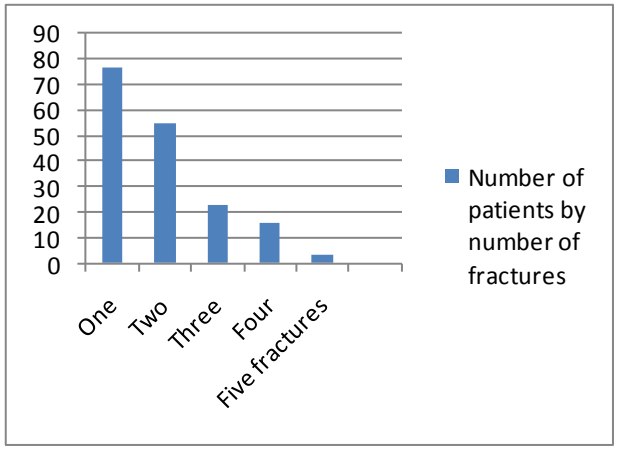

Figure 1 Distribution of patients by number of fractures

DISCUSSION

The mandible is a tubular bone bent into a horse-shoe shape. As with all tubular bones, their strength is derived from the dense cortical plates that encase variable amounts of cancellous marrow spaces. It is

strongest at the midline with progressively less strength towards the condyles.[1,2]

Functional processes such as the angle, condyle, coronoid and the alveolar bone, modify the basic shape. Like other bones in the body, the mandible fractures at sites of tensile strain.[1,3] The amount of force required to fracture the mandible is put at between 44.6 -74.4 Kg/m^2.[1] However, patients' with poor medical conditions such as osteoporosis, bone neoplasm, hyperparathyroidism and on prolonged steroid therapy will have their mandible weakened by these conditions and fracture below this force.[2,3] The presence of teeth makes its fracture positively unique as they help the surgeon to manipulate the bone to restore the occlusion during reduction.

Injuries leading to mandibular fractures are influenced by various factors such as the severity and anatomical sites of impacting force, whether the mouth was opened or closed at the time of injury, the presence or absence of teeth and the cross sectional area of bone.[1,2] Fractures will occur either at the site of direct application of force or in some other distant sites when the force is indirect. If the force is severe enough, both the site of application and the other distant sites may fracture as obtains in *contre-coup* fractures. In other instances, especially following road traffic accidents, fractures may occur at sites of impact irrespective of the thickness of the bone or the presence of muscles. However, if the force is less severe as in blows of the fist, the bones will facture at its weakest point.[3]

The site and relative frequency of fractures of the mandible depend on the number of fractures sustained and the dentition of the jaws.[2] Akama et al.[4] and Roode et al.[5] found out that the region of the mandible that most frequently fractures at one site is the angle of the mandible while the area that fractures at more than one site following a singular impact are the condyles. Our finding in the present study is similar to this observation. This study shows that males in their third decade of life sustained more injuries which are similar to the earlier studies.[6,7,8] In considering the cross sectional area of the jaw, the weakest site of the dentate mandible is the condyle while in the edentulous mandible, it is the molar areas.[9,10,11] The most common aetiological factor for fracture of the mandible was road traffic accident and due to the high velocity nature of this type of injuring force, fractures were often more multiple than they were single. The most common site of fracture in this study was the left body of the mandible. This is possibly because patients more often reflexly turn to their right when there is a sudden impact directed to the face, thus presenting the left side to the injuring force.[12,13] Likewise Le et al[14] suggest that hemispherical cerebral dominance leads the victim to turn to the right in a reflexive manner to avoid being hurt, thus presenting the left side of the face to the injuring force. Also, for motorcycle head – on – collisions, the left sides of the face are more often affected since both riders come from opposite directions.[15,16]

It was also observed from this study that the body of the mandible was commonly fractured while the coronoid process never fractured. The coronoid process is anatomically advantaged; being protected both medially and laterally by thick muscles, which cushion the effects of these forces. This finding is similar to the report of Akama et al.[4] and Roode, et al.[5] but differs from the results obtained by Asadi and Asadi[7] who recorded more mandibular angle fractures. This, they attributed to the violent nature of the society in which their study was carried out where assault was the commonest cause of mandibular fracture.

The tooth-bearing portion form two-third of the mandible while the non-tooth-bearing portion forms the remaining one-third[17] and thus the corresponding fracture at the tooth-bearing area should be higher. The treatment given to the patients in this study have been reported by other authors.[2,4-6.] The patients were successfully treated between three to eight weeks by conservative methods, closed reduction and open reduction techniques.

CONCLUSION

This study indicates that the tooth-bearing portion, body, right and left sides of the mandible are most commonly prone to fracture when multiple aetiologies are considered. These fractures were more multiple than they were single and commonly occur in young adult males who are fully or partially dentate.

REFERENCES

1. Rowe NL, William J. Maxillofacial injuries. 2nd ed. Edinburgh: Churchill Livingstone; 1994. PP216.
2. Banks P, Brown A. Fractures of the facial skeleton. 2nd ed. Oxford, Woburn: Butterworth-Heinemann; 2001. PP 171-185.
3. Huelke DF. Mechanism in the production of mandibular fractures. *J Oral Surg* 1968; 26:86-89.
4. Akama Mk, Chindia ML, Ndungu FL . Occurrence and pattern of mandibular fractures at Kisii District Hospital, Kenya. *East Afr Med J* 1993; 70: 732-733.
5. RoodeGJ, Van Wyk PJ, Botha SJ. Mandibular fractures: an epidemiological survey at the Oral

and Dental Hospital, Pretoria. *SADJ* 2007; 62: 270-274.
6. Chidzonga MM. Aetiological factors of mandibular fractures at Harare Central Hospital, Harare, Zimbabwe. *East Afr Med J* 1988; 65:465-469.
7. Asadi SG, Asadi Z. Sites of the mandible prone to trauma: a two year retrospective study. *Int Dent J* 1996; 46: 171-173.
8. Adebayo ET, Ajike OS, Adekeye EO. Analysis of the pattern of maxillofacial fractures in Kaduna, Nigeria. *Br J Oral Maxillofac Surg* 2003; 41: 396-400.
9. Marciani RD. Treatment of the fractured edentulous mandible. *J Oral Surg* 1979; 37: 569-572.
10. Shetty V, Atchison K, Belin T, Jiamming W. Clinician variability in characterizing mandibular fractures. *J Oral Maxillofac Surg* 2001; 59: 254-261.
11. Parsa T, Adamo A, Calderon MD. Initial evaluation and management of maxillofacial injuries. *J Oral Maxillofac Surg* 2002; 34: 901-910.
12. Joos U, Meyer U, Tkotz T, Schilli W. Use of a mandibular fracture score to predict the development of complications. *J Oral Maxillofac Surg* 1999; 57: 2-6.
13. Grinker RR, Saks AL. The cerebrum- cerebral hemispheres, in Neurology. 6th ed. Springfield 11:Charles C. Thomas; 1984. P 142.
14. Le BT, Dierk EJ, Ueeck BA, Homer LD, Potter BF. Maxillofacial injuries associated with domestic violence. *J Oral Maxillofac Surg* 2001; 59: 1277-1283.
15. James RB, Fredrickson C, Kent JN. Prospective study of mandibular fracture. *J Oral Surg* 1981; 39: 275-280.
16. Oginni FO, Ugboko VI, Ogundipe O, Adegbehingbe BO. Motorcycle- related maxillofacial injuries among Nigerian intracity road users. *J Oral Maxillofac Surg* 2006; 64: 56-62.
17. Joos U, Meyer U, Tkotz T, Schilli W. Use of a mandibular fracture score to predict the development of complications. *J Oral Maxillofac Surg* 1999; 57:2-6.