

Complications of Mandibular Fracture: Study of the Treatment Methods in Calabar, Nigeria

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ABSTRACT

Objective: The plethora of techniques available for the treatment of mandibular fractures suggests that there is controversy regarding their definitive outcome. The purpose of this study was to clinically study the complications associated with the different treatment methods of mandibular fractures at the University of Calabar Teaching Hospital (UCTH), Nigeria.

Methods: This was a three-year prospective study carried out at the Dental and Maxillofacial Clinic of the hospital. Patients who met the inclusion criteria had their data recorded in a proforma questionnaire.

Results: Out of the 256 patients studied, 17.2% developed complications. Complications were commoner (70.5%) between ages 21 and 50 years. Thirty-five (79.5%) were males while nine (20.5%) were females with a male:female ratio of 4.9:1. Following treatment by closed reduction, conservative and open reduction, 16.6%, 17.2% and 20.7% had complications, respectively. Whereas occlusal derangement was the most common complication, numbness of the cheek and lower lip was recorded following all treatment methods.

Conclusion: Although the complications recorded in this patient population were managed during postoperative follow-up period, the methods of treatment available give good results, are cost-effective and patient compliance is good. This suggests that the older methods of treatment of mandibular fractures can still be used with reliability in contemporary dental practice.

Keywords: Complications, fractures, mandible, treatment methods

Complicaciones de la Fractura Mandibular: Estudio de los Métodos de Tratamiento en Calabar, Nigeria

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RESUMEN

Objetivo: La plétora de técnicas disponibles para el tratamiento de fracturas mandibulares sugiere que existe controversia con respecto a su resultado definitivo. El propósito de este estudio fue estudiar clínicamente las complicaciones asociadas con los diferentes métodos de tratamiento de fracturas de la mandíbula en el Hospital Docente de la Universidad de Calabar (UCTH), Nigeria.

Métodos: Se trató de un estudio prospectivo de tres años, llevado a cabo en la Clínica Dental y Maxilofacial del hospital. A los pacientes que cumplieron los criterios de inclusión se les registraron sus datos en un cuestionario proforma.

Resultados: De los 256 pacientes estudiados, 17.2% desarrollaron complicaciones. Las complicaciones fueron más frecuentes (70.5%) entre las edades de 21 y 50 años. Treinta y cinco (79.5%) fueron varones, mientras que nueve (20.5%) fueron hembras, para una proporción varón: hembra de 4.9:1. Después del tratamiento con reducción cerrada, el tratamiento conservador y la reducción abierta, 16.6%, 17.2% y 20.7% tuvieron complicaciones, respectivamente. Si bien el trastorno oclusal fue la complicación más frecuente, se registró un entumecimiento de la mejilla y el labio inferior tras todos los métodos de tratamiento.

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Conclusión: Aunque las complicaciones registradas en esta población de pacientes fueron tratadas durante el período de seguimiento postoperatorio, los métodos de tratamiento disponibles dan buenos resultados, son costo-efectivos, y el cumplimiento del paciente es bueno. Esto sugiere que los métodos más viejos de tratamiento de fracturas mandibulares pueden todavía utilizarse con confianza en la práctica odontológica contemporánea.

Palabras claves: Complicaciones, fracturas, mandíbula, métodos de tratamiento

West Indian Med J 2014; 63 (4): 350

INTRODUCTION

The mandible is a prominent bone of the face and because of this, fractures of the mandible are common facial injuries (1–5). The presence of the mandible contributes to good facial appearance, biting, swallowing, chewing and speaking. Injuries to the mandible which result in fractures are common both in peace and war times (4,6). Sometimes, these fractures are associated with a significant number of complications (1–3).

The plethora of techniques available for the treatment of mandibular fractures suggests that there is not one acceptable method that gives a satisfactory result. However, the surgical technique employed in each case will depend on the type of fracture, available surgical materials and facilities, surgeon's experience and preference, medical status of the patient and sometimes patient's wish, among others (4). Though the foremost goal in the management of patients with mandibular fracture is to eradicate disease, the ultimate challenge to the surgeon is the ability to skilfully manage complications to a successful outcome, irrespective of the treatment methods employed. The aim of this study was to analyse the complications associated with the different treatment methods available for mandibular fractures at the University of Calabar Teaching Hospital (UCTH), Nigeria, over a three-year period.

SUBJECTS AND METHODS

This is a prospective study of complications of mandibular fractures on subjects who sustained mandibular fractures. The complications were recorded during and after treatment based on the methods of treatment used to eradicate the disease. The study was carried out at the Dental and Maxillofacial Clinic of the UCTH, Nigeria, between January 2010 and December 2012. Ethical approval was obtained from the Ethics Committee of the hospital before the commencement of the study. Patients of both gender whose ages were between one and 80 years, whose informed consent was obtained and who attended a minimum of five follow-up visits were included in the study. Excluded from the study were isolated dento-alveolar fractures of the mandible, those with debilitating medical and surgical conditions like diabetes mellitus, asthma, osteoporosis, malnutrition, and concomitant injuries in the oral and maxillofacial region and other parts of the body. The data obtained were documented in a proforma questionnaire. Patients' age, gender,

oral hygiene status, type, site, number of fractures and method of fracture treatment, follow-up findings and their management were recorded. The oral hygiene status was graded using Gross plaque scoring method (+ = Good, ++ = Fair, +++ = Poor). Conventional plain radiographs relevant to mandibular fractures were obtained to confirm the presence of fractures. Pre- and post-trauma photographs and study models were used when necessary to aid treatment planning and assess treatment outcome. Active treatments of mandibular fractures were carried out by manual reduction and fixation using closed reduction or open reduction techniques with 0.5 mm soft stainless steel wires and/or arch bars. Conservative methods were used in fractures that did not require active treatment and this included placing the subjects on soft diets, and jaw exercises by chewing sugar-free gum if the mandibular condyles were involved.

Selection criteria

Patients with mandibular fractures that were not displaced and the occlusion not deranged were treated conservatively. Favourably or unfavourably displaced fractures of the mandible that were amenable to treatment by closed reduction were treated by this method. Severely displaced fractures that were not amenable to treatment by closed reduction were treated by open reduction.

A minimum of five visits was scheduled for each patient with an average interval of one week in the first three weeks, and fortnightly appointments in the subsequent six weeks; and thereafter one, three, and six monthly appointments in the follow-up period. The outcome of treatment was derived from postoperative complaints, clinical and radiological examination (where necessary) of patients as they presented during follow-up. Two weeks of domestic jaw exercise was recommended for all patients that had intermaxillary fixation (IMF). Those, whose functional problems persisted after eight weeks of commencement of treatment, were referred to the physiotherapist.

Successful treatment was regarded as stable bone, return to pre-trauma occlusion, absence of clinical infection and pain at the fracture site during function. Complication was conditions arising in patients that occurred during and after treatment and persisted beyond eight weeks from the commencement of treatment. The data obtained were analysed with the use of EPI info 2008 version software (CDC, Atlanta, GA, USA).

RESULTS

A total of 269 patients were seen, but 256 (95.2%) met the criteria for inclusion in the study. However, 44 (17.2%) developed complications. Table 1 shows the age distribution

Table 1: Age distribution of patients with complications

Age (years)	Complications		No complications		Total	
	n	%	n	%	n	%
0–10	2	28.6	5	71.4	7	100
11–20	5	8.5	54	91.5	59	100
21–30	11	11.7	83	88.3	94	100
31–40	9	19.6	37	80.4	46	100
41–50	11	35.5	20	64.5	31	100
51–60	3	27.3	8	72.7	11	100
61–70	3	37.5	5	62.5	8	100
Total	44	17.2	212	82.8	256	100

of subjects with complications. Complications were recorded in all the age groups and were commoner in the 21–50 years (n = 31; 70.5%) age category. The age of patients ranged from six to 69 years with a mean of 31.4 ± 5.2 years. No patient was recorded in the eighth decade of life. Thirty-five (79.5%) were males while nine (20.5%) were females with a male:female ratio of 4.9:1. The oral hygiene status of these subjects was graded as fair and good.

The distribution of the aetiology of the fractures shows that road traffic accident accounted for 222 (86.7%), assault 19 (7.4%), fall 10 (3.9%) and gunshot 5 (2.0%). Simple fractures were 19 (7.4%) while 237 (92.6%) were recorded as compound fractures. There were 340 fracture sites recorded in the subjects. The distribution according to site is as follows: condyles (n = 22, 6.5%), angle (n = 28, 8.3%), symphysis (n = 37, 10.9%), ramus (n = 43, 12.6%), parasymphysis (n = 62, 18.2%) and body (n = 148, 43.5%). Also, the distribution of patients according to the multiplicity of fractures showed that 118 patients had one fracture, 76 patients had two fractures and 10 patients each had three and four fractures.

Table 2 shows the distribution of the frequency of the complications according to the treatment received. Occlusal

Table 2: Distribution of complications and treatment received

Treatment	Complication		No complication		Total	
	n	%	n	%	n	%
Conservative	11	17.2	53	82.8	64	100
CR + IMF	27	16.6	136	83.4	163	100
OR + IMF	6	20.7	23	79.3	29	100
Total	44	17.2	212	82.8	256	100

CR = closed reduction, OR = open reduction, IMF = intermaxillary fixation

derangement was the most common complication following treatment, though numbness of the cheek and lower lip due to inferior alveolar nerve dysfunction occurred as a complica-

tion following all treatment methods (Table 3). In the treatment of complications, five (8.8%) patients did not require active treatment (Table 4).

Table 3: Types of complication in relation to treatment received

Method of treatment	Complications	n	%
Closed reduction	Occlusal derangement	10	32.2
	Numbness of cheek/lower lip	6	19.4
	Impaired mouth opening < 35 mm	5	16.1
	Limited mandibular excursion	5	16.1
	Mal-union	2	6.5
	Infection	2	6.5
	Non-union	1	3.2
Total		31	100.0
Conservative	Deviation on mouth opening	7	50.0
	Occlusal derangement	3	21.4
	Numbness of cheek/lower lip	3	21.4
	Facial asymmetry	1	7.2
Total		14	100.0
Open reduction	Numbness of cheek/lower lip	3	50.0
	Hypertrophied scar	2	33.3
	Infection	1	16.7
Total		6	100.0

Table 4: Distribution of treatment of complications

Types of treatment	n	%
Intermaxillary fixation (IMF)	17	29.8
Occlusal grinding	11	19.3
Physiotherapy	10	17.5
Steroid/non-steroidal anti-inflammatory drugs (NSAIDs)	8	14.0
Counselling, no active treatment	5	8.8
Antibiotics	3	5.3
Re-fracture	2	3.5
Debridement	1	1.8
Total	57	100.0

In the 256 patients, the follow-up periods ranged from eight to 65 weeks with a mean of 21.6 ± 9.2 weeks. The patients without complications had a follow-up period of eight to 12 weeks, with a mean of 9.4 ± 3.2 , while those with complications had follow-up period of 12 to 65 weeks with a mean of 31.04 ± 11.2 weeks. The subjects with complications were successfully treated during the follow-up period.

DISCUSSION

With the improvement in the techniques of treatment of mandibular fractures, the incidences of complications have been reduced considerably to the barest minimum (7). However, the emergence of complications may be due to the inability of the patients to overcome the different neuro-

muscular and other functional problems associated with the repositioning of the fractured segments (8). The complication rate of 17.2% obtained in this study is within the range earlier reported (4). However, from the authors' experience, this result in our centre is partly attributable to the ignorance of the people resulting from visits to traditional clinics, patent medicine vendors and sometimes orthodox medical clinics where inappropriate treatments were administered before presenting.

This study has shown that complications of mandibular fractures can occur at any age and that these complications occurred more frequently in the older age group. This agrees with the observation of Dahstrom *et al* (9) who also noted that the incidences of complications are lower in children than young adults. This is probably due to the rich vascularization of the growing mandible compared to the more sclerotic mandible in the older age category. However, only a small proportion of the older patients with mandibular fractures were in this category in the present study. Furthermore, the majority ($n = 31$, 70.5%) of the patients with complications were in the 21–50-year age group. This is in agreement with the study carried out by Nakamura *et al* (10) but differs from that of Mitchell (11) who recorded no identifiable trend. This age group is composed of many young school-leavers that have peculiar escapist tendencies, such as indulgence in drugs, alcohol, smoking and who were more involved in the fractures (12). Likewise, in considering the gender incidence, a male preponderance recorded is in agreement with the result of some authors (13–15). This is expected, as a greater number of males sustained mandibular fractures.

The complications observed in patients treated by closed reduction are within the range of 5%–46% as earlier reported (16, 17). The figure of 16.6% obtained in this study is similar to that obtained by Dodson *et al* (7) who recorded 16.4% but lower than Worsaae and Thorn's (8) figure of 32.0%. The conservative treatment result of 17.2% is within the range of 15.0% to 29.0% earlier reported (4, 9) but higher than that obtained by Worsaae and Thorn (8) who recorded 4.0%, although their studies were restricted to patients with only condylar fractures, unlike the present study. The figure of 20.7% obtained with open reduction is within the range of 3.8 to 40.0% earlier documented (18, 19). It is higher than the 17.0% obtained by Nakamura *et al* (10) but lower than the 60.0% result of Hyde *et al* (20). This finding in the present study is probably due to the small number of patients managed with this technique.

Some researchers (21–23) have stated that the long term sequelae associated with closed reduction technique may also occur with both conservative and open reduction techniques. In both closed reduction and conservative methods, occlusal derangement and deviation on mouth opening were the most common complications following treatment. This is similar to the report of Passeri *et al* (19),

but differs from that of Worsaae and Thorn (8) who recorded nerve dysfunction. These complications and sometimes infection and non-union are related to the mobility of the fractured segments after treatment (24). Adequate stability of the fractured fragments is considered the best protection against complications (25). In contemporary practice, this stability at the fractured sites can only be achieved using rigid internal fixation technique.

The oral hygiene status of patients was considered as fair and good and may not have contributed to the development of infection. However, in an earlier study (14), poor oral conditions were cited as a factor in the development of infection and non-union. Other complications that were recorded under closed reduction have been reported (26, 27).

Of the 11 patients treated conservatively, seven (63.6%) presented with mandibular deviation on mouth opening. This finding differs from the result of Hyde *et al* (20) who reported that all the seven patients managed with this method developed mandibular deviation on opening. Though, in their fracture series, there was more severe displacement of the condylar fractures and the patients did not keep to the follow-up schedule. Rubens *et al* (28) stated that non-surgical therapy may result in complications due to severe displacements, or resorption of much of the condylar head. In the treatment of mandibular fractures by open reduction in this study, numbness of the cheek and lower lip, due to inferior alveolar nerve dysfunction, and hypertrophied scar were the complications most commonly encountered, which is similar to the report of Raveh *et al* (29).

Kaban *et al* (30), in discussing the various methods of treatment, noted that the simplest treatment is usually the most satisfactory and complications are most likely to occur from overzealous therapy. Posnick (31) had a contrary view and stated that this was not always true. However, Marciani *et al* (24) noted that the criteria used for assessing the outcome of treatment methods should not be restricted to cited complication rates.

The duration of this study was three years; therefore, some complications which might have developed later than this period were not included. Because of the problem of affordability and availability, modern methods of treating mandibular fractures and its complications like use of mini-plates and micro-plates were not utilized. Also follow-up of patients in this environment is poor.

CONCLUSION

Although all complications recorded in this patient population were managed during the postoperative and follow-up period, the methods of treatment available gave good results, are cost-effective and patient compliance is good. This suggests that the older methods of treatment of mandibular fractures can still be used with reliability in contemporary dental practice.

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