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Long Term Complications after Treatment of Mandible Fractures in Douala-Cameroon: A Cross-Sectional Study.

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ABSTRACT.
Aim: to describe the prevalence and associated factors of long term complications after treatment of mandible fractures in Cameroon.
Method: A cross-sectional study was conducted in four hospitals in Douala-Cameroon from January 2017 to December 2020 based on patients having had an unfavorable outcome after one monthfollow up subsequentto treatment of non pathologic mandible fracture. Demographic data, etiology, location of fracture, type and lag time to repair were recorded. Chi-square test was used to assess proportional differences. P values < 0.05 were statistically significant.
Results: The prevalence of long term complications was 12.2% (62/508 patients) with malunion (33.8%) and malocclusion (25.8%) being the most frequent. Patientswere predominatelymale (75.8%), in the fourth decade (mean age: 35.21 ± 8 years) involved in an assault (21%) or a road trip accident (27.4%), and experienced multiple concomitant mandible fractures (30.6%),mostcommonlyof thesymphysis, body, andangle (85 cases). More than a half of patients (51.6%) consulted after 3 days. The orthopedic treatment was the main therapeutic modality (54.8%); arch bars being the commonest materials in use.
Conclusion: Prolonged disability from mandible fractures constitutes a main issue to deal with in our practice. These long term complications seemed to be associated with an increased time to surgery and orthopedic treatment.
Key words: mandible fracture, late complications, associated factors, prevalence, Cameroon

I. INTRODUCTION

Mandibular fractures are the second most common fracture of the face after nose, and tenth most common fractured bone in the human body **[1].**This is due to the relative prominence of the mandible and comparative lack of bone and soft tissue support.

The treatment of mandible fractures is nowadays well codified ranging fromnon-operative management (eg,soft diet) to closed reduction with maxillomandibular fixationandopen reductionwith internal fixation, depending onthecharacteristics of the fracture and the surgeon's management preferences **[2]**. However, the aftermath of these treatments can be fraught with complications that hamper the quality of life. These complications include among others,numbness, malocclusion, pain with mastication, local wound complications and bony malunion or nonunion**[3]**with a

prevalence of up to 20% **[4].** Prior studies have associated increased rate of complications with both patient-related (tobacco use and need for dental extraction, fracture characteristics, antibiotic use and type, comorbid illness,) and systems-level factors (treatment delays issues)**[5].**
Hence, knowledge of the frequency and risk factors for the occurrence of these long term complications according to each local specificities appear important for surgeons during the initial management of mandible fractures. Therefore, the aim of this research was to describe the prevalence and associated factors of long term complications after treatment of mandibular fracturesin Cameroon.

II. METHODS

A cross-sectional study was conducted in four hospitals in Douala (Laquintinie hospital, General hospital of Douala, Bonassama district hospital and Logbaba district hospital), the economic capital of Cameroon, with patients data from January 1, 2017, through December 31, 2020.

The study population consisted of records of patients having had maxillofacial trauma with at least a mandibular fracture. We included patients presenting a complication that occurred at least 30 days after the fracture management. Patients lost to follow up and those with pathologic fractures(eg, caused by a tumor) were excluded. The sampling was consecutive and exhaustive.

Data collection includedpatient social and clinical demographic characteristics (age, sex, occupation, comorbidities), mandible fracture characteristics, mechanism and dateand time of injury, date and time of presentation to hospitals, time to treatment, treatment types, complication types, and duration of follow-up.

Statistical analysis was undertaken using the SPSS® software, version 21.0 (SPSS Inc., IL, USA). Data were presented in proportions for categorical variables and median, mean and standard deviationfor continuous variables. Proportional differences were analyzed using a contingency table and Chi-Square analyses, odd ratio assessing the association between variable. P values < 0.05 were consideredstatistically significant.

The study was approved by the ethics committee of the Faculty of Medicine and Biomedical Sciences of the University of Yaounde 1. Patient consent was waived given that the data were deidentified.

III. RESULTS

Presentation of the study population

In all, 62 patients among the 508 seen with mandible fracture during the study period, presented a late complication after fracture treatment i.e. a prevalence of long term complication of 12.2%.These complications were dominated by malunion (21 cases or 33.8%) and malocclusion (16 cases or 25.8%) as illustrated in Figure 1.
The Male: Female sex ratio was 4.2 (47 males and 15 females). The mean age of patients was 35.21 ± 8 years (3 to 79 years) and the most represented age group was 21-40 years. Figure 2 represents the distribution of age group by gender in the study population
The main etiology of those mandible fracture was road traffic accident (17 cases or 27.4%) followed by physical assault (13 cases or 21%). The other causes are presented in Figure 3
Characteristics of mandible fractures
Given that fracture lines could be multiple on the mandible, mandible fractures in this study were dichotomized into 2 groups with most occurring in the toothed portion (symphysis, body, angle) compared to non-toothed portion (ramus, condyle and coronoid process) (85 casesvs 30 cases cases). Those fractures were predominantly comminuted (19 cases or 31%) than simple (10 cases or 16%). Table I resumes the characteristics of mandible fractures in the study population.
Therapeutic aspects of mandible fractures
The mean time before consultation was 75.2 hours (0 to 144 hours) and 32 ofpatients (51.6%) consulted after 3 days. The orthopedic treatment was the main therapeutic modality in the study population with 30 cases (54.8%); arch bars being the commonest materials in use. Table II presents therapeutic aspects of mandible fracture of patients with late complication.

IV. DISCUSSION

In this report, we sought to determine the prevalence and factors associatedwith undesirable outcomes for patients leading to prolonged disability from mandiblefractures.

The prevalence of these undesirable outcomeswas 12.2% in the present study, which is consistent with prior reports where the prevalence of long term complications after treatment of mandible fracturevaries from 6.6%**[5]** to21.2%**[6]**.Bony mal/nonunion and malocclusion were 2 consistent findings in this review that bestrepresented long term undesirable outcomes. Wound dehiscence and/or surgical site infection are also widely reported in literature **[4-6].** This was not described in this study probably due to the predominant use of systemic antibiotics and

chlorhexidine mouthwash in management protocols of otolaryngology and maxillofacial units in our setting. Nevertheless, there is a lack of high-quality evidence about the effect of antibiotics use in perioperative period on the incidence of late complication of mandible fractures. Zallen and Curry**[7]** found a complication rate of 50.3% in patients who did not receive antibiotic coveragecompared with a complication rate of 6.25% in those who did. Conversely, Paterson et al **[8]** concluded that prophylacticantibiotics actually increased the incidence of infection,observing a 58% infection rate with resistant organismsarising in patients previously treated withprophylactic antibiotics.Further studies to determine the bestpractice of prophylactic use of antibiotics inpatientswithmandiblefractures are needed.

Similar to previousstudies, patients in this cohortwere predominatelymale, involved in an assault or a road trip accident, and experienced multiple concomitant mandible fractures,mostcommonlyof thesymphysis, body, andangle**[9-11]**. These results suggest that gender, complexity and location of fracture could be associated with late complication. However, in foregoing studies, after controlling for other variables, these risk factors were not associated with an increased risk of complications**[5].** The other patient-related factors cited in literature included alcohol, tobacco and substance use (eg, methamphetamines) and also medical comorbidities(eg, diabetes or coronary artery disease). It is well known that smoking/alcohol is a risk factor for impaired wound healing due to degeneration of mesenchymal tissues and decreased collagen production and oxygen delivery and has been demonstrated to cause an estimated 6-fold increase in infections in smokers compared with non smokers after repair of fractures **[12].**The present study also suggest that close reduction for the management of mandible fractures is associated to late complications (p=0.036). However this result does not take into consideration the variability in technique and operator experience giving that the recruitment was multicentric. On the other hand, one could rather anticipate on higher complication rate in fractures requiring open reduction with internal fixation because of selection bias toward more severe injuries and multiple fractures. Thus; it is not the authors' intention to make any generalizations based on this particular finding.

Finally, as system-level factor, the present study assumed that an increased time to treatment was associated with long term complication. This result is in line with that of Malanchuk and Kopchak in Ukraine **[13].** On the contrary, Biller et al **[14]** Czerwinski et al **[15]** and Webb et al **[16]** did not find an increase in complication rates when repair was delayed beyond 72 hours. Similarly, Lucca et al **[17]** compared rates of complication when repair was performed within 48 hours and when it was performed after 48 hours and found no statistical significance between these groups.Increased time to treatment can encompass a number ofdifferent factors, including comorbid injuries taking precedence, surgeon or operating roomavailability (particularly forcomplex and time-consuming cases), and transfer froma tertiary hospital. In our experience, the time to surgical repairis mainly affected by ambient poverty, patients having to pay directly for their care since social security is not yet effective in our milieu.

V. CONCLUSION

Patients treated for mandible fractures in Douala had a long term complication rate of 12.2%, which included bony delayed or mal/nonunion, malocclusion, limitation o mouth opening and mandibular ankylosis. Factors seemed to be associated with these complications were an increased time to surgery and orthopedic treatment. Future studies areneeded to evaluate the combined effects of patient-relatedandsystems-level factors that affect outcomes.

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Tables

Table I: Clinical characteristics of mandible fractures inthe study population

		N	%
Location of fracture			
Toothed portion	Body	24	38.7
	(para)symphysis	32	51.6
	Angle	12	19.3
	Alveolarprocess	17	27.4
Non toothed portion	Ramus	21	33.8
	Condyle	9	14.5
Type of fracture			
Comminuted		19	31
Bonedefect		10	16
Greenstick		9	14
Incomplete		8	13
Simple		16	26

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Table II: Radiologic presentation of tumors in the study population

		N (%)	p
Delay before consultation			
<3 days		28 (45.2)	0.03
≥3 days		34 (54.8)	
Treatmentmodality			
Close reduction		30 (54.8)	0.036
Open reduction		18 (35.5)	
Close + Open reduction		6 (9.7)	
No treatment		7 (10%)	
Materialused			
Close reduction	Arch bars	17 (24.4)	
	Ivyloop	11 (17.7)	
	Orthodontic band	6 (9.6)	
Open reduction	Mini plate/screws	9 (14.5)	
	Intraosseoussteelwire	13 (21.1)	

Illustrations

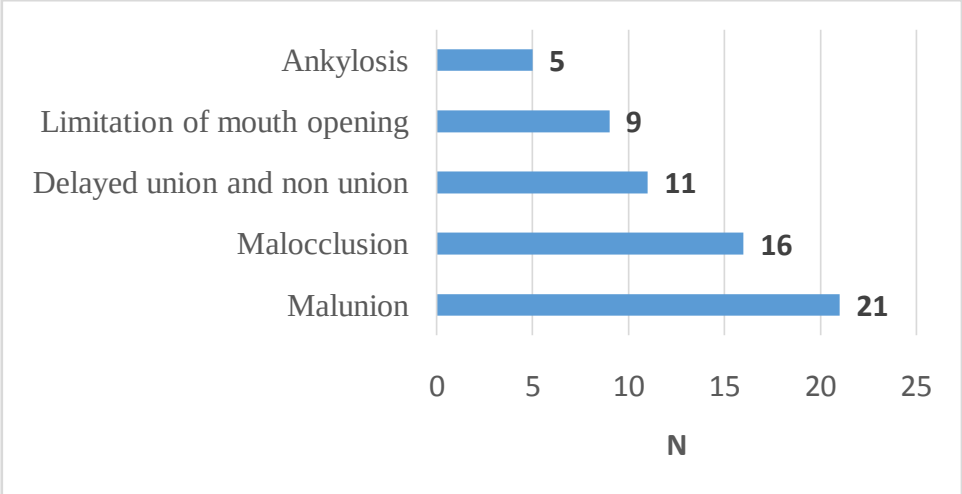

Figure 1: Long term complications in the study population

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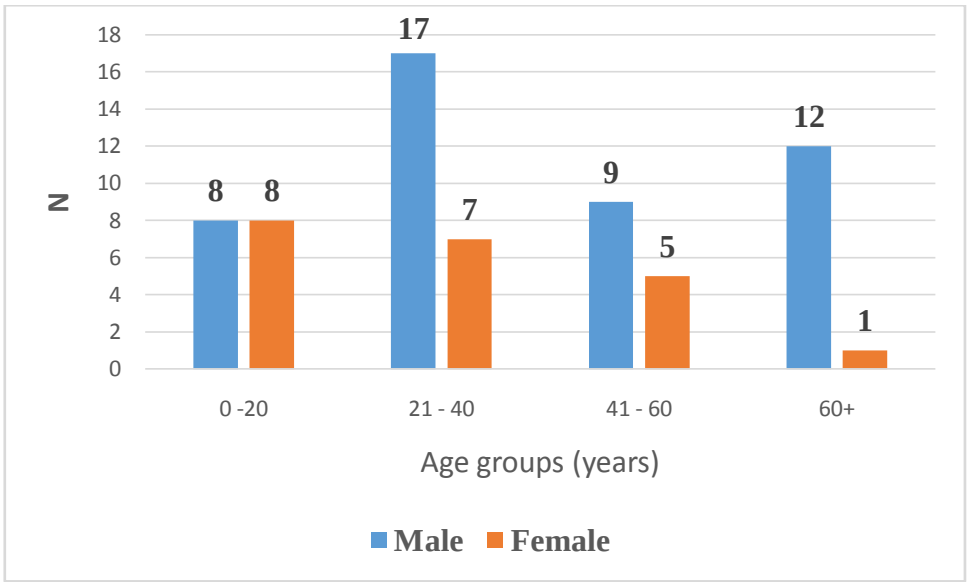

Figure 2: Distribution of age group by gender in the study population

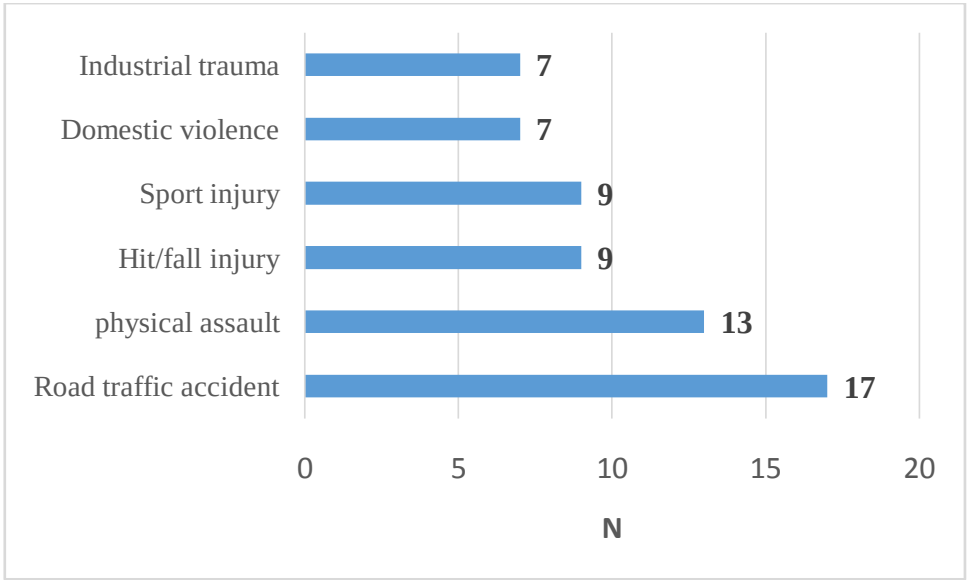

Figure 3: Distribution of the etiologies of mandible fractures in the study population