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Management of Condylar Fractures at the Sylvanus Olympio (SO) University Teaching Hospital in Lomé (Togo)

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Abstract

Introduction: Condylar fractures can cause serious functional and aesthetic sequelae if inadequately treated. The overall objective of this study was to evaluate the management of these fractures in the Stomatology and Maxillofacial Surgery Department of Sylvanus Olympio University Teaching Hospital in Lomé. **Patients and Methods:** This was a retrospective and descriptive study based on medical records of patients hospitalized for a fracture involving the mandibular condyle from January 2015 to December 2023. **Results:** We collected 49 cases of condylar fractures. The annual frequency was 6.77. The average age of the patients was 32.85 ± 13.25 years, with extremes of 7 years and 80 years. The sex ratio was 11.25. The main etiology was road traffic accidents (85.72%), predominantly involving motorcyclists at 92.84%. The average delay in consultation was 48 hours. Fractures associated condylar and symphyseal regions accounted for 75.52% of the fracture topography. Functional treatment was performed on all patients, surgical treatment on 34.69% of patients, orthopedic treatment on 28.57% of patients, and mixed treatment (orthopedic and surgery) on 12.24% of patients. Sequelae were found in 6.12% of patients. **Conclusion:** Condylar fractures concerned mainly young adult males. Their management is complex and controversial and should be performed early to avoid complications and sequelae. In Africa, their etiologies are primarily dominated by road traffic accidents, mostly involving two-wheeled vehicles. Emphasis must be placed on prevention, particularly the use of full-face helmets by all motorcyclists.

Keywords

Mandible, Condylar Fractures, Management, Lomé-Togo

1. Introduction

Condylar fractures are very common in maxillofacial trauma, as the mandible acts as a true bumper to the face due to its anterior prominence. They can be unilateral or bilateral, articular or extra-articular. According to the Dingman and Natvig classification of mandibular fractures, 36% of mandibular fractures involve the condyle. They mainly affect young males [1]-[3]. In our context, road traffic accidents (RTAs) are the main causes [3]. The clinical signs of condylar fractures are pain in the pretragal region, laterodeviation of the mandible toward the fractured side when opening the mouth, and impaired dental articulation [4]. The diagnosis of these fractures is clinical but confirmed by imaging. Orthopantomogram is the key diagnostic test. However, CT Scan still has its place in the diagnosis and choice of treatment method for certain clinical forms, including articular fractures. The method of therapeutic management depends on several parameters, including the patient's age, the consultation time and the type of fracture. It can be functional, orthopedic, surgical or sometimes combine several of these methods. The treatment of condylar fractures has evolved in recent years, gradually moving from "all functional" to more nuanced approaches: functional treatment for "minimally displaced" fractures, childhood fractures and capital fractures; reduction and osteosynthesis in other cases [5]. These fractures can go unnoticed during the examination of a facial trauma patient, which leads to functional complications without treatment. In addition, the mandibular growth nucleus is located at the level of the mandibular condyle [6]. Thus, a fracture in this area in a growing child can also lead to aesthetic and functional complications. These complications can be severe, including temporomandibular ankylosis in adults in the case of an intra-articular condylar fracture, mandibular growth disorders in children, including facial asymmetry in the case of a unilateral fracture or more or less severe hypomandibulia in the case of a bilateral fracture, giving a "bird profile" appearance described by Obwegeser [4]. The aim of this study was to evaluate the management of these injuries in our working context.

2. Patients and Methods

We conducted a retrospective descriptive study of compiled patient records from January 1, 2015, to December 31, 2023, a period of nine years. We included in this study all patient records who presented with a mandibular condyle fracture during the study period. We excluded incomplete and unusable records and patients who were lost to follow-up after treatment. Data collection was conducted using a pre-established survey form. The data collected came from the hospitalized patients' medical records and surgical report registers. We examined sociodemographic

data (age, sex, occupation, place of residence, etc.), diagnostic, therapeutic, and outcome data. Functional treatment consists of active or passive mobilization of the temporomandibular joints through opening and closing of the mouth, liquid or mixed diet; orthopedic treatment consists of maxillomandibular blocking in correct dental articular on vestibular arches of Dautrey, on Ivy ligatures or on quick-locking screws. Surgical treatment consists of bloody reduction, then stabilization of the fractured bone fragments by titanium plates and screws. Statistical analysis was performed using Excel 2019 and Epi info 7.2.5 software. Access to patients' medical records was subject to handwritten authorization from the head of the Stomatology and MFS department of the Sylvanus Olympio University Teaching Hospital and the Director of the SO University Teaching Hospital. Patient anonymity was respected throughout the study.

3. Results

3.1. Epidemiological Aspects

3.1.1. Frequency and Annual Distribution

We collected 234 cases of mandibular trauma over our study period (9 years). Sixty-one (61) involved the mandibular condyle region, which equates to an annual frequency of 6.77 cases/year. We finally retained 49 patients for the analysis. Taking into account the exclusion criteria mentioned in the patients and methods section, we excluded 12 files (incomplete records, lost to follow-up).

3.1.2. Sex and Age

In our study, males accounted for 91.83% (45) of cases. The sex ratio was 11.25. The 20 - 40 age group accounted for 69.4% of cases. The average age of patients was 32.85 ± 13.25 [7 years and 80] years. The distribution of patients by age group is summarized in Figure 1.

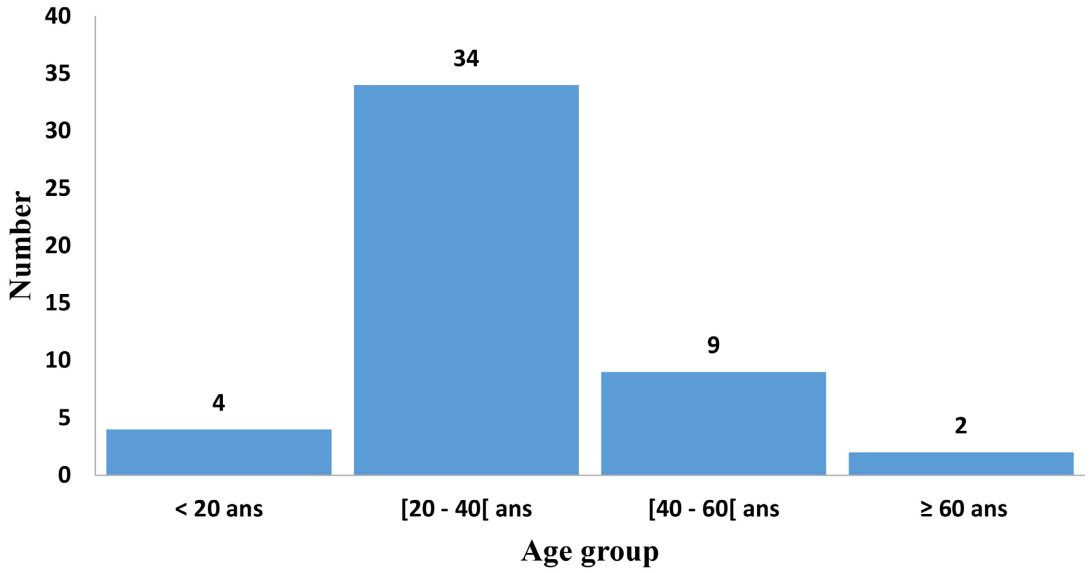

Figure 1. Distribution of patients by age group.

3.1.3. Occupation

Of the 49 patients in our study, 51.02% were from the informal sector. The distribution of patients by occupation is summarized in Table 1.

Table 1. Distribution of patients by occupation.

	Number (n)	Percentages (%)
Informal sector	**25**	**51.02**
Civil servant	9	18.36
students	7	14.28
Shopkeeper	6	12.24
No specified	2	4.10
Total	**49**	**100.00**

3.1.4. Circumstances of Occurrence

Road traffic accidents (RTAs) were found as the circumstance of occurrence of condylar fractures in 85.72% of cases. The distribution of patients by circumstance of occurrence is summarized in Table 2. Motorcyclists were involved in 92.84% of the RTAs and distributed as follows: motorcycle-motorcycle collision was involved in 33.33%, motorcycle-car collision in 28.57%, motorcycle-obstacle collision in 21.42%, and motorcycle-pedestrian collision in 9.52%.

It should also be noted that helmet use was not recorded in the files.

Table 2. Distribution of patients by circumstances of occurrence.

	Number (n)	Percentages (%)
RTAs	**42**	**85.72**
Workplace accident	3	6.12
Stabling with knife	3	6.12
Sport accident	1	2.04
Total	**49**	**100.00**

RTAs = Road traffic accident.

3.2. Clinical Aspects

3.2.1. Consultation Time

After the injury, 75.51% (n = 37) of patients were taken to the hospital within 24 hours; and 24.49% (n = 12) were admitted after 24 hours. The average consultation time was 48 hours.

3.2.2. Clinical Signs

The distribution of patients according to the signs found during the clinical examination is summarized in Table 3.

Fractures concerned low subcondylar in 51.02% of patients. The distribution of patients according to the type of condylar fracture found on imaging is summarized in Table 4.

Table 3. Distribution of patients according to clinical signs.

Signs	Number (n)	Percentages (%)
Exoral examination		
Periauricular pain	**46**	**93.87**
Mental wound	43	87.75
Facial edema	33	67.34
Otorrhagia	4	8.16
Labiomental hypoesthesia	2	4.08
Intraoralexamination		
limitation of mouth opening	**47**	**95.91**
Premature molar contact associated with a contralateral open bite	**38**	**77.58**
Deviation of the interincisal point	**38**	**77.58**
Tooth avulsion	14	28.57

Table 4. Distribution of patients by type of condylar fracture.

	Number (n)	Percentages (%)
Lower subcondylar fracture	**25**	**51.02**
Upper subcondylar fracture	16	32.65
Capital fracture	8	16.33
Total	49	100.00

3.2.3. Radiological Diagnosis Data

CT scaning of the facial bones (Figures 2-4) was performed in 44 patients (89.80%) and an orthopantomogram (Figure 5) was performed in 5 patients (10.20%).

In our study, 85.72% of patients had a condylar fracture associated with a fracture of the symphyseal region.

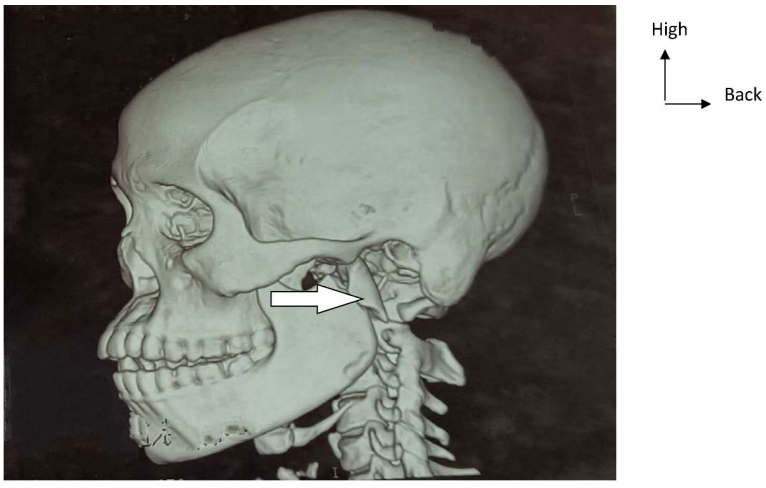

Figure 2. 3D CT scan of the skull showing a left lower subcondylar fracture (Stomatology and Maxillofacial Surgery Department, CHU SO).

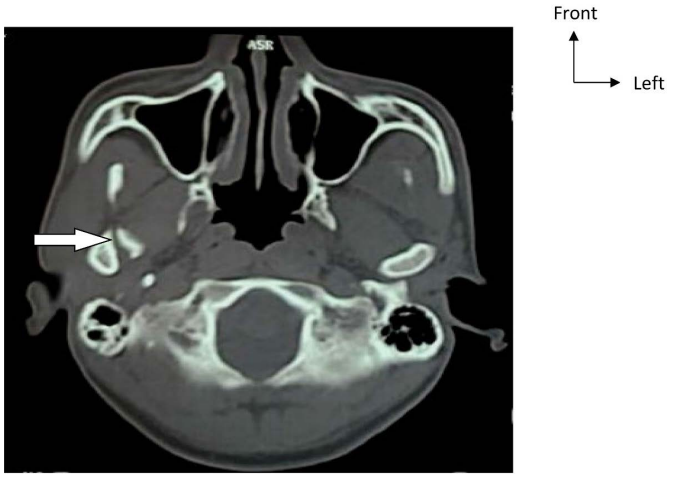

Figure 3. Axial section of a CT scan of the skull showing a right capital condylar fracture (Department of Stomatology and Maxillofacial Surgery, CHU SO).

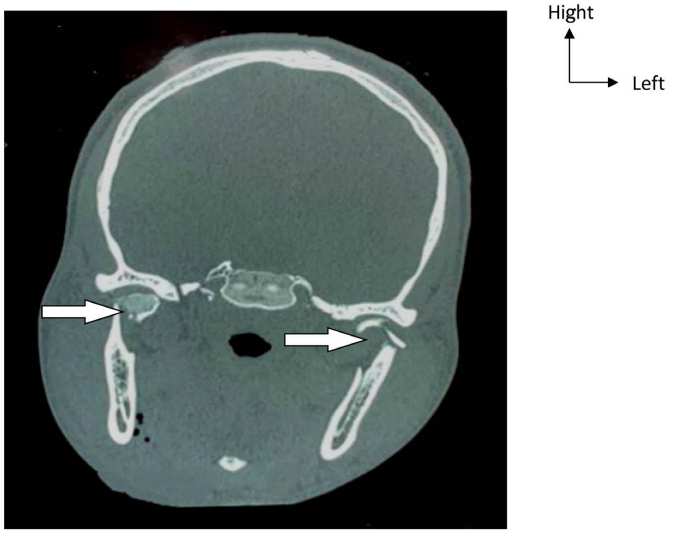

Figure 4. Coronal section of a CT scan of the skull showing a bilateral condylar fracture: capital condylar on the right and high subcondylar on the left (Department of Stomatology and Maxillofacial Surgery, CHU SO).

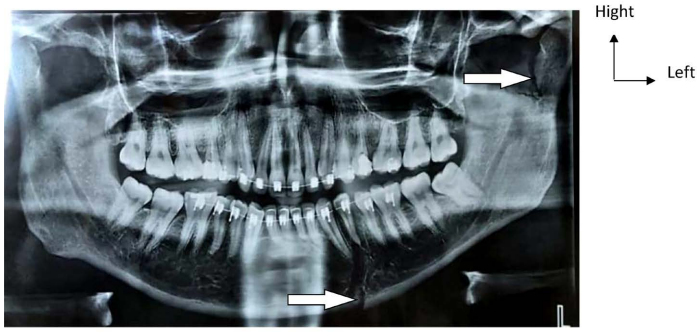

Figure 5. Orthopantomogram showing a left high subcondylar fracture with detachment of the sigmoid notch associated with a fracture of the left horizontal branch (Stomatology and Maxillofacial Surgery Department, CHU SO).

The distribution of patients according to fracture site is summarized in Table 5.

Table 5. Distribution of patients according to associated lesions on the mandible.

	Number(n)	Percentages (%)
Mandibular Topographic Association		
Condyle + symphyseal region	**37**	**75.52**
Condyle + symphyseal region + angle	**3**	**6.12**
Condyle + symphyseal region + angle	**2**	**4.08**
Anatomical sites in the non-dentate portion		
Condyle alone	5	10.20
Condyle + ramus	1	2.04
Condyle + coronal	1	2.04
Total	**49**	**100.00**

3.3. Therapeutic Data

Of the 49 patients in our study, 46.95% were treated beyond 14 days. The average duration of treatment was 13 days.

The distribution of patients according to the time to maxillofacial treatment is summarized in Table 6.

Functional treatment was performed in all patients.

Table 6. Distribution of patients by time to maxillofacial care.

	Number (n)	Percentages (%)
1 - 7 days	17	34.69
8 - 14 days	9	18.36
>14 days	**23**	**46.95**
Total	**49**	**100.00**

The distribution of patients according to the type of treatment received is summarized in Table 7.

Table 7. Distribution of patients by type of treatment received.

	Number (n)	Percentages (%)
Functional	**49**	**100.00**
Surgery alone	17	34.69
Orthopedics alone	14	28.57
Surgery + orthopedics	6	12.24

Maxillomandibular blockade (MMB) with an Ivy ligature was performed in 34.69% of cases (n = 17), and maxillomandibular blockade with a quick-release

screw in 6.12% of cases (n = 3). The duration of maxillomandibular blockade was between 16 and 24 days in 70% of patients (n = 14) and between 8 and 15 days in 30% of patients (n = 6).

In our study, mini-Y screw plates (Figure 6, Figure 7) were used during osteosynthesis in 34.78% of patients.

The types of mini-screw plates used during osteosynthesis are summarized in Table 8.

The retromandibular approach (Figure 6, Figure 8) was used during osteosynthesis in 47.82% of patients.

The distribution of patients according to surgical approach is summarized in Table 9.

Table 8. Distribution of patients by type of mini-screwed plates used during osteosynthesis.

	Number (n)	Percentages (%)
Mini Y-shaped plate	**8**	**34.78**
Mini Straight plate	5	21.74
Mini L-shaped plate	4	17.40
Mini X-shaped plate	3	13.04
Mini Arcuate plate	3	13.04
Total	**23**	**100.00**

Table 9. Distribution of patients by surgical approach.

	Number (n)	Percentages (%)
Retromandibular approach	**11**	**47.82**
Upper subangulomandibular aproach	7	30.43
Ginestet-type pretragal approach	4	17.40
Lower subangulomandibular approach	1	4.35
Total	**23**	**100.00**

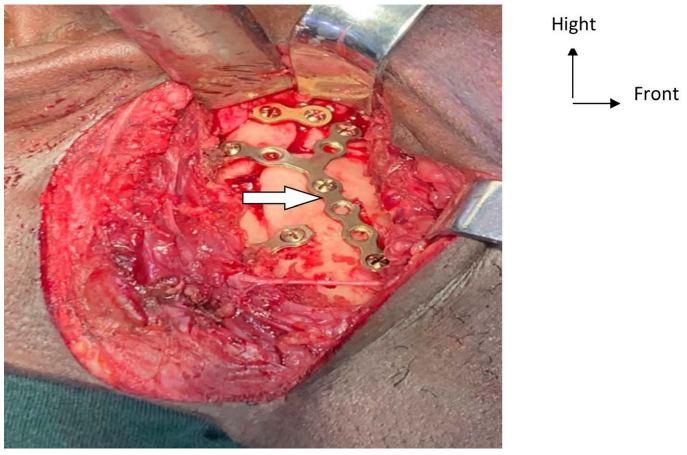

Figure 6. Mini Y screw plate peroperatively (Stomatology and Maxillofacial Surgery Department, CHU SO).

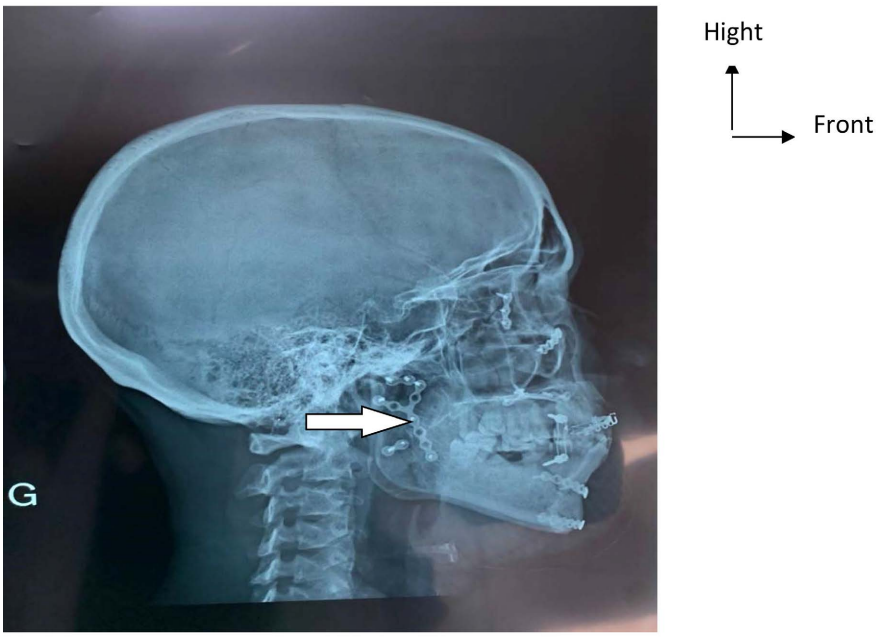

Figure 7. Mini Y-shaped screw plate seen on a post-operative control radiograph (Stomatology and Maxillofacial Surgery Department, CHU SO).

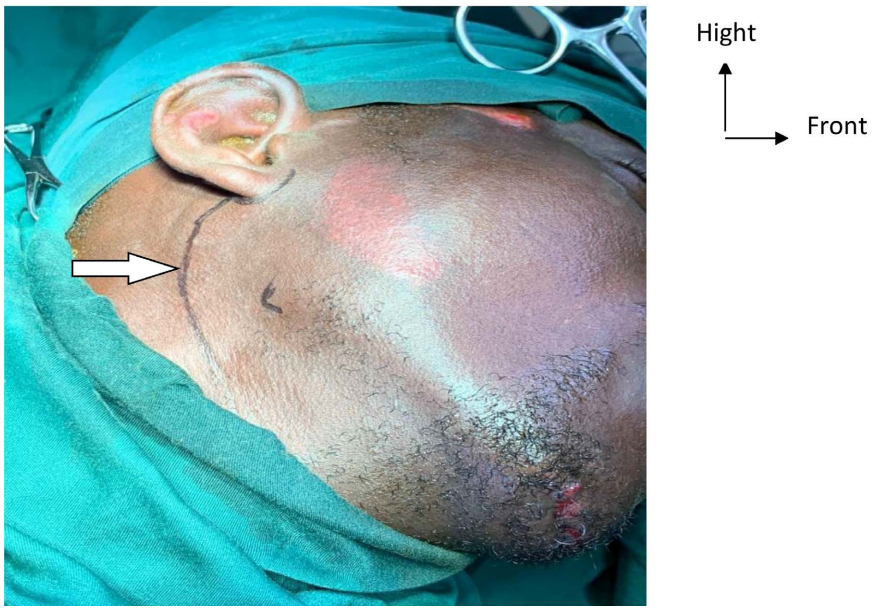

Figure 8. Combined pre-auricular and retro-mandibular approach using the classic Redon "S" approach (Stomatology and Maxillofacial Surgery Department, CHU SO).

3.4. Outcome

The outcome was favorable in 79.60% of patients. The postoperative course was marred by complications in 14.28% of patients. Three patients experienced sequelae (6.12%), including less mouth opening and dental disorders.

The distribution of patients according to complications and sequelae is summarized in **Table 10**.

Table 10. Distribution of patients by complications and sequelae.

	Number (n)	Percentages (%)
Complications		
peripheral facial paralysis (PFP)	3	6.12
Hyperesthesia of the V3 territory	2	4.08
Pseudarthrosis	2	4.08
Sequelae		
Temporomandibular joint disorders	2	4.08
Dental disorders	1	2.04

4. Discussion

4.1. Originality, Internal Validity, and Limits of the Study

The management of condylar fractures is part of the management of maxillofacial trauma pathologies. Previous studies have been conducted in Lome on mandibular fractures in general. They highlighted a predominance of symphyseal and parasymphyseal fractures [7] [8]. However, no study has specifically addressed condylar fractures. A correlation between symphyseal/parasymphyseal fractures and condylar fractures is known. This study is the first in Togo, hence its originality.

The Department of Stomatology and Maxillofacial Surgery at the SO University Teaching Hospital is the only national referral department in this specialty. As a result, it attracts almost all patients suffering from pathologies falling within this framework and whose treatment needs hospitalization; hence the choice of this setting for our study.

The results obtained allowed us to highlight the epidemiological, clinical, radiological, and therapeutic aspects of these injuries.

Our study is of real interest because it sheds light on condylar fractures.

Our study had limitations due to the retrospective nature of any study, including the incompleteness of medical records, missing tracking data, which reduced the sample size.

It should also be noted that helmet use was not recorded in the files.

4.2. Epidemiological Aspects

4.2.1. Sex and Age

Male was the most represented with 91.83% and a sex ratio of 11.25. Male predominance has been reported by most authors with a sex ratio between 3.2, and 9.83 [9]-[13]. This male predominance could be explained by the fact that men are more exposed to trauma, due to their dynamism, their professional activities, and their tendency to take risks.

The most represented age group was 20 - 40 years (69.4%). This age group represents the most active population, users of motorized vehicles, and is therefore

more mobile and more exposed to road traffic accidents. Similar results have been reported by several authors in the literature. Indeed, Zachariades *et al.* in Greece [14], Emmanuelle Vernhet *et al.* in France [15], and Oumayma in Morocco [9] reported 51.6%, 50%, and 58%, respectively, as the proportion of patients in this age group. Furthermore, all authors, whether from developed or developing countries, agree that maxillofacial trauma is generally the prerogative of young people, and often males [16] [17].

4.2.2. Occupation

The most represented socio-professional category in our study was the informal sector, with 51.02% of patients.

In their series, Bissa *et al.* in Togo [7] and Tine *et al.* in Senegal [18] also found the informal sector to be the socio-professional category most affected by mandibular fractures in general, with 41.20% and 25.25%, respectively.

Our results can be explained by the fact that more than 70% of young people, who represent the working population, are found in the informal sector, which is a major hub of the Togolese economy [19].

4.2.3. Circumstances of Occurrence

Road traffic accidents accounted for 85.71% of the circumstances of condylar fracture occurrence in our study, followed by workplace accidents (6.12%), assaults (6.12%), and one case of a play accident (2.04%). No fall from a tree was found as a circumstance of occurrence. However, a study conducted in Burkina Faso among children aged 3 to 15 years found falls from trees to be the main circumstance of occurrence of mandibular fractures in general [20]. Motorcyclists were involved in 92.84% of RTAs.

Most studies in Africa have shown that road traffic accidents, primarily accidents involving two-wheeled vehicles, represent the leading cause of condylar fractures. According to Elmansouri's study in Morocco, they accounted for 66.67% of the circumstances of condylar fracture occurrence [11]. The same is true of Keita's study in Mali, where road traffic accidents accounted for 66.66% of the etiologies [21].

This can be explained in our context by the road safety conditions described as unfavorable, by the non-observance of the systematic wearing of full-face helmets and the non-compliance with the highway code by road users, as well as the rapid increase in the vehicle fleet in recent decades, and the defects of certain public roads.

In developed countries, assaults are the most frequent causes (57% in France, 79% in the United States) despite a highly developed vehicle fleet [10] [17] [22]. This situation could be explained by the better quality of the road network, the better application of the various policies to raise public awareness about respecting traffic laws, wearing protective equipment, and strictly enforcing road safety regulations [10]. This recommendation is being supported by the high incidence of motorcyclist injuries and established public health knowledge.

4.3. Clinical Aspects

4.3.1. Consultation Time

In our study, 24.49% of patients consulted after 24 hours. The average consultation time was 48 hours.

Tine *et al.* in Senegal [18] and Edouma *et al.* in Cameroon [23] reported 6.50% and 39.19% of consultations after 24 hours.

This delay in consultation could be explained by limited financial accessibility for patients who delay consulting, and by the fact that some patients were referred from other facilities in the interior of the country, with travel time to take into account.

4.3.2. Clinical Signs

The diagnosis of mandibular condylar fractures was suspected clinically and confirmed by orthopantomogram or CT scan of the facial bones. We noted, regarding the clinical examination, that periauricular pain was found in 93.87% of patients, limited mouth opening in 95.91% of patients, premature molar contact associated with a contralateral open bite in 77.58% of patients, and a deviation of the interincisal point in 77.58% of patients.

These results are consistent with those of Ahmedou in Morocco [12], who found clinical signs of periauricular pain in 84.31% of patients, limited mouth opening in 90% of patients, and premature molar contact associated with a contralateral open bite in 67.74% of patients. Keita in Mali [21] also found the main clinical signs to be periauricular pain in 85.17% of patients, limited mouth opening in 90.47% of patients, and dental articulation disorder in 57.14% of patients.

These signs are the cardinal signs of mandibular condyle fractures [24].

4.3.3. Diagnostic Radiological Data

1) Radiological Examinations Performed

In our study, CT of the facial mass was performed in 89.80% of patients. This result is close to that of Keita in Mali [21] and Elmansouri in Morocco [11] where 100% and 55% of patients benefited from it, respectively.

Orthopantomogram was performed in 10.20% of patients in our study, which differs from the results of Elmansouri [11] and Keita [21], where 100% of patients benefited from it.

This difference could be explained in our context by the existence of associated facial fractures, which immediately justified the use of CT of the facial mass.

2) Fracture Types on Imaging

We recorded 49 cases of condylar fractures in our study, including 51.02% lower subcondylar fractures, 32.65% upper subcondylar fractures, and 16.33% capital fractures. These results are similar to those of Elmansouri in Morocco [11], who recorded 58% of lower subcondylar fractures, 27% of upper subcondylar fractures, and 15% of capital fractures in his series; Zachariades *et al.* in Greece [14] also recorded 12% of capital fractures, 31% of upper subcondylar fractures, and 57% of lower subcondylar fractures in their series.

Indeed, the neck of the condyle is a weak area of the mandible [6]. Chin trauma therefore tends to lead to subcondylar fractures, through an indirect mechanism.

3) Mandibular Topographic Associations

In our study, 85.72% of patients had a condylar fracture associated with a fracture of the symphyseal region. These results are consistent with those of Ahmedou [12], who found an association between the condyle and the symphyseal region in 39.21% of cases. Elmansouri [11] found a condylar fracture associated with a symphyseal fracture in 46% of patients.

Fractures of the mandibular condyle are often caused by indirect trauma from an impact to the chin. This upward force can cause fractures in the fragile areas of this region, the neck of the condyle, relative to the base of the skull [25].

4.4. Therapeutic Data

4.4.1. Maxillofacial Treatment Time

Forty-six point ninety-five percent (46.95%) of patients received treatment within more than 14 days, and 34.69% of patients within 7 days. The average treatment time was 13 days. This timeframe is almost similar to that of the Keita study in Mali [21], where 52.64% of patients were treated between 6 and 11 days.

This timeframe was longer compared to that of the Elmansouri study in Morocco, where treatment was completed within an average of 5 days [11]. Rocton *et al.* in France found an average timeframe of 30 hours [10].

This delayed response time could be explained in our context by, among other things, the existence of associated bone lesions of the limbs, which were initially treated in trauma care, therapeutic errors (referral to private clinics or traditional therapists), or the reduced financial accessibility of patients for their care.

However, the difference with developed countries could be explained by effective insurance and social security systems that promote access to care, which is not the case in our developing countries. This could also be explained by the existence of a sufficient number of maxillofacial surgeons available at all times to provide rapid treatment in these countries.

4.4.2. Therapeutic Modalities

In our study, all patients received functional treatment. All major fractures received functional treatment only. These results are similar to those of Elmansouri and Oumayma in Morocco [9] [11]. Since mandibular condyle fractures are articular fractures, regardless of the type of treatment, rehabilitation is always associated to restore masticatory function.

The retromandibular approach was used in 47.82% of cases in our study. Our results are similar to those of Oumayma [9], where the retromandibular approach was the most commonly used. In Mali, according to the study by Keita [22], the high subangulo-mandibular approach (modified Risdon) was used in 52.63% of patients.

The approach depends on the fracture topography and its degree of displacement [26].

Trapezoidal condylar osteosynthesis plates are easier to place thanks to their curved shapes that adapt to the anatomy. They are used to treat high and low subcondylar fractures [27]. These plates were not used in our study. However, in the studies by Elmansouri and Ahmedou in Morocco, these plates were used for all osteosynthesis [11] [12].

In Togo, these plates are not available. Ordering them from abroad would be prohibitively expensive for patients due to the low socioeconomic status of the population.

The minimum duration of MMB in our study was 8 days, with a maximum of 21 days. This result is comparable to that of Keita in Mali [22], where the duration of MMB was between 8 and 23 days.

This maximum period of 21 days is explained by the risk of sequelae of mouth opening limitation due to temporomandibular ankylosis after 3 weeks of maxillomandibular locking [28].

4.5. Outcome

The outcome was favorable in the majority of cases (79.60%). Seven patients experienced postoperative complications, which were managed. This involved peripheral facial paralysis (PFP) in 6.12% of cases, hypoesthesia of the V3 territory in 4.08% of cases, and non-union in 4.08% of cases. Three patients had sequelae, including temporomandibular joint disorders in two patients and dental disorder in one patient.

Delayed treatment of condylar fractures leads to delayed healing, malpositioned condylar healing, and/or poor healing of the joint ligaments. This can lead to limited mouth opening, complex joint dysfunction (CRD) of the masticatory system, or, at most, temporomandibular ankylosis.

In growing children, growth retardation may be observed, with a characteristic facial deformity.

In Keita's study in Mali [22], postoperative complications were facial nerve paralysis and surgical site infection in 10.52% each. Oumayma and Ahmedou in Morocco found sequelae in 14% and 14.81%, respectively [9] [12]. For Elmansouri [11], the outcome was favorable in 90% of cases. The occurrence of complications and sequelae could be explained by a long treatment delay, difficult access to the mandibular condyle during the surgical approach, and non-compliance with postoperative instructions.

5. Conclusions

We conducted a descriptive study with retrospective data collection over a period of 9 years, which allowed us to describe the management of mandibular condyle fractures in the Department of Stomatology and Maxillofacial Surgery at the University Hospital of Lomé.

Mandibular condyle fractures were frequently found in young males working in the informal sector. Road traffic accidents caused by two-wheeled vehicles were the leading cause in our series. The outcome of properly managed mandibular

condyle fractures was mostly favorable in our study. The retrospective nature of this study, with its usual limitations, constituted the main bias. Many medical records were incomplete, with missing and sometimes unusable data, and other data destroyed by humidity. A prospective study could have provided a real-time assessment of the incidence of these traumatic injuries, assessed their epidemiological, clinical, radiological, and therapeutic aspects, and, above all, addressed these various observed shortcomings.

To better assess the true prevalence and obtain more reliable data on the management of these injuries and their progression, prospective research should be considered in the future.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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