

Management of Mandibular Fractures in Children in Ivory Coast: Experience of the Stomatology and Maxillofacial Surgery Department at the University Hospital of Cocody from 2000 to 2019

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Abstract

Introduction: Mandibular fractures in children are becoming increasingly common. Treatment of these fractures is difficult due to their anatomical and physiological complexity. Therefore, there is a need for well-codified management. Our main aim was to develop a decision algorithm for the management of mandibular fractures in children based on our experience. **Materials and Methods:** This was a retrospective descriptive study carried out in the Department of Stomatology and Maxillofacial Surgery at the University Hospital of Cocody over a period of 20 years (2000-2019). **Results:** We enrolled 58 patients. The mean age of the patients was 9.35 ± 2.3 years with a sex ratio of 2.22. Traffic accidents were the main cause of mandibular fractures (60.35%). Condylar fractures were the most common (46.87%). Treatment was orthopedic in 45.76% of cases, mixed (orthopedic and surgical) in 24.14% and surgical in 5.17%. Patients were followed up weekly for 1 month, then monthly for 6 months and annually for 3 years, with panoramic radiographs of the maxilla starting at 21 days. We observed 2 cases of complications: temporomandibular ankylosis and gingival stomatitis. **Conclusion:** Mandibular fractures are common in children. Management is difficult due to anatomical and physiological peculiarities. The choice of treatment depends on several criteria.

Keywords

Fractures, Mandible, Children, Treatment, Ivory Coast

1. Introduction

Maxillofacial fractures in children are rare, accounting for 3.3% to 15% of all facial fractures in the general population [1] [2]. In a study carried out in the USA, Haug states that mandibular fractures are the most common facial trauma in children, with an incidence ranging from 15% to 86.7% [2]. In Africa, Ba *et al.* found a prevalence of pediatric mandibular fractures of 3.60% compared with the general population [3].

Mandibular fractures have a major functional and morphological impact, with serious complications in the absence of appropriate treatment [4] [5]. They remain difficult to treat in children due to their anatomical and physiological complexity. While treatment in adults appears to be better codified, there is no accepted consensus on its management in children.

The aim of this study is to describe the epidemiological, clinical and therapeutic features of mandibular fractures in children, in order to establish a management algorithm based on our experience.

2. Materials and Methods

This was a retrospective descriptive study conducted in the Department of Stomatology and Maxillofacial Surgery at the University Hospital of Cocody, from January 1, 2000 to December 31, 2019, a period of 20 years.

The study population consisted of patients aged 0 to 16 years admitted to our department for mandibular fracture.

Patients admitted during the study period who had a medical record containing a complete clinical examination, a radiological work-up demonstrating a mandibular fracture and a complete post-treatment follow-up were included in the study. Patients with incomplete records were excluded.

Data were collected from the medical records of patients admitted during the study period. Patients treated for mandibular fractures with complete medical records were included in the study. Patients with incomplete records were excluded.

The variables studied were

- Epidemiological.
- Sex, age, date and place of onset.
- Etiology of the trauma: traffic accident, domestic accident, sports accident, game accident, fight, other.

Clinical and paraclinical:

- Location of the mandibular fracture line: mandibular condyle, ascending mandibular ramus, mandibular angle, horizontal mandibular ramus, mandibular symphysis.

Treatment: orthopedic treatment (maxillo-mandibular or mono-maxillary

blocking), surgical treatment (osteosynthesis with mini-plates), functional treatment (no contention, liquid and soft diet), mixed treatment (osteosynthesis and maxillo-mandibular blocking in a relatively short period).

- Orthopedic method (maxillo-mandibular block): yvi, Leblanc, vestibular arch.
- Duration of orthopedic treatment: days.
- Surgical method: mini-plate osteosynthesis, bone suture osteosynthesis.

Outcome: good, temporomandibular joint ankylosis, surgical site infection, debridement of osteosynthesis material, other.

Sampling methods: We used a non-probability sampling method for patients admitted to the Department of Stomatology and Maxillofacial Surgery during the period.

The sample size (N) was determined using the following formula:

$$N = [\varepsilon^2 \times P \times (1 - P)] / m^2 = [(1.96)^2 \times 0.036 \times (1 - 0.036)] / 0.0025 \approx 54.41$$

where N is the sample size, P is the prevalence (3.6%) [3], m is the margin of error of 5%, and ε is 1.96.

Data entered using Excel 2016. Tables and graphs were edited using Excel 2016. Frequencies and percentages were calculated for quantitative variables. For qualitative variables, proportions were calculated.

3. Results

We enrolled 58 patients. The age of the patients ranged from 1 to 16 years, with a mean of 9.35 ± 2.3 years. The majority of our patients were male, with a sex ratio of 2.22. Road traffic accidents were the predominant cause, accounting for 60.35% of cases, followed by domestic accidents (22.41%) (Figure 1). The condyle was the preferred site for these fractures (46.8%). All types of treatment were performed, with orthopedic treatment being the most common (47%) (Figure 2).

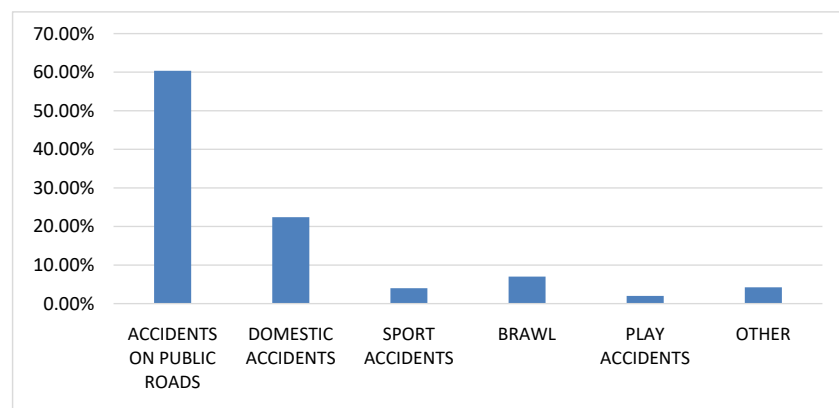


Figure 1. Distribution by etiology.

One patient was admitted to the intensive care unit indefinitely; no deaths were recorded in our series. Almost all patients under 6 years of age had engaged or incomplete fractures of the mandible. As a result, they received functional treatment. Patients between the ages of 6 and 11 years (most between the ages of 09 and 10 years) had minimally displaced fractures of the toothed portion and

received orthopedic treatment (maxillo-mandibular locking and, in some cases, monomandibular locking). The majority of children aged 12 years and older received orthopedic, surgical, or mixed treatment (Table 1). Yvi ligation was the most commonly used orthopedic method (Figure 3). The duration of maxillo-mandibular blockade varied from 15 to 30 days (Figure 4). The most commonly used surgical method was mini-plate osteosynthesis (67%), with plates removed after 6 months (Figure 5).

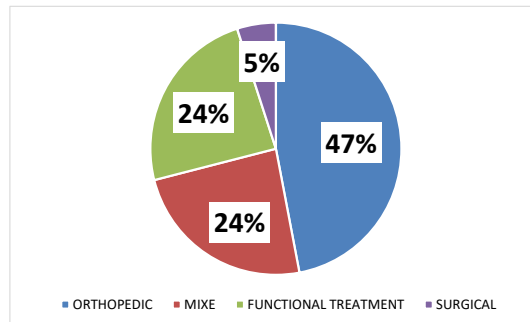


Figure 2. Distribution by type of treatment.

Table 1. Types of treatment by age group.

Age group	Functional treatment	Orthopedic treatment	Surgical treatment	Mixed treatment	Total
[0 - 6]	14	0	0	0	14
[6 - 12]	0	24	0	0	24
[12 - 16]	0	3	3	14	20
Total	14	27	3	14	58

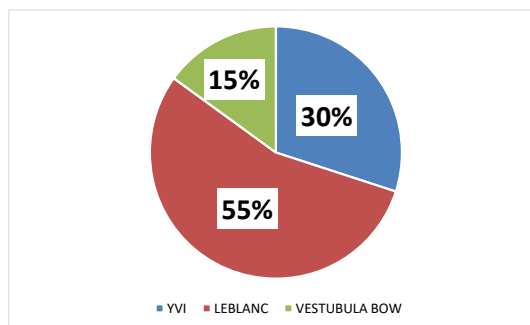


Figure 3. Orthopedic treatment method.

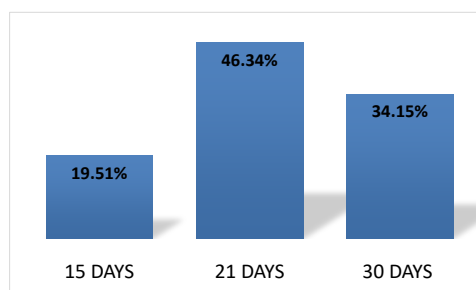


Figure 4. Duration of blockade.



Figure 5. Postoperative orthopantomogram showing steel wire osteosynthesis of the right mandibular angle and maxilomandibular block in a 9-year-old patient.

Our patients were reviewed once a week for 1 month, then once a month for 6 months, and once a year for 3 years, with panoramic radiographs of the maxilla from 21 days. We observed 2 cases of complications such as ankylosis of the temporomandibular joint, which was treated surgically (lifting of the ankylosis block), and medically treated gingival stomatitis.

4. Discussion

The mean age of our patients was 09.35 years, a result similar to that of Ogunlewe *et al.* in Nigeria [6], who found a mean age of 9.1 years. Quang, on the other hand, estimated a mean age of 10.42 years [7]. The sex ratio in our study was 2.22, a similar result to that reported by Glazer and Djemi, who found ratios in favour of males of 2.4 and 4.66 in England and Côte d'Ivoire, respectively [8] [9]. This male predominance could be explained by hyperactivity in boys.

Our patients were seen again once a week for 1 month, then once a month for 6 months, and once a year for 3 years, with panoramic radiographs of the maxilla starting at 21 days. We observed 2 cases of complications such as temporomandibular joint ankylosis and gingival stomatitis. Temporomandibular ankylosis occurred in a patient with a high condylar fracture who had undergone functional treatment. The ankylosis was treated surgically and the stomatitis was treated medically.

The most common cause of these fractures was road traffic accidents (60.35%). According to several authors, this is the main cause [6] [9] [10]. There are several reasons for this: poor road conditions, lack of playgrounds, which often leads children to play on public roads, and disregard for traffic rules.

The condyle was the preferred fracture site (46.88%). Our results are in agreement with those of many authors: Ogunlewe [6] in Nigeria, Glazer [9]. The goals of treatment of pediatric mandibular fractures are similar to those of adults, but the management is different. It takes into account age, mandibular development, dentition, occlusion and type of injury [9] [11] [12].

The use of antibiotics significantly reduced postoperative infections, and all our patients received preoperative and postoperative antibiotic therapy in accordance with the literature [12] [13].

Our treatment modalities were guided by the patient's age and fracture type.

The results of our work do not differ from those in the literature, and according to some authors, conservative treatment and/or closed reduction (orthopedic treatment) are most commonly used for pediatric mandibular fractures, especially since the majority of these fractures are minimally or non-displaced or "green wood" [6] [9] [10] [14]. The work of Rowe and Killey recommended a 3 to 4-week blocking period. However, more recent studies suggest that 2 weeks is sufficient for good consolidation. In fact, some authors argue that given the osteogenic potential and rapid healing of children, anatomic reduction should be performed rapidly and the shortest immobilization period is 2 weeks [8] [15]-[17].

Our results are consistent with the literature. The duration of immobilization varied from 15 to 30 days, depending on the patient's age, fracture location, and complexity. In children aged 6 to 10 years with low condylar fractures and slightly displaced body fractures, we used 15 days of immobilization with early rehabilitation to avoid the possible occurrence of TMJ ankylosis. In contrast, 21 days were observed in children aged 10 to 12 years with highly displaced fractures. In children aged 12 to 16 years with complex, highly displaced fractures, the duration of immobilization was 30 days, with anatomical and physiological characteristics similar to those of adults.

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We observed 1 case of ankylosis of the temporomandibular joint in a 16-year-old adolescent who consulted us 2 years after his maxillofacial trauma, which had resulted in a neglected condylar fracture. Management was surgical and consisted of the removal of the ankylosis block followed by mechanotherapy. Maxillofacial trauma in children should be the subject of systematic consultation and careful clinical examination.

Limitations of the study: During the literature review related to our study, we were confronted with insufficient data in the African literature on the management of mandibular fractures in children. In addition, it should be noted that a large number of medical records were unusable at the time of data collection, which reduced the sample size. Nevertheless, we were able to obtain a representative sample of the population.

5. Conclusion

Mandibular fractures are common in children. Management is difficult due to

their anatomical and physiological peculiarities. The choice of treatment depends on several criteria. At the end of this study and in light of the data in the literature, we have established the following decision-making algorithm (Figure 6).

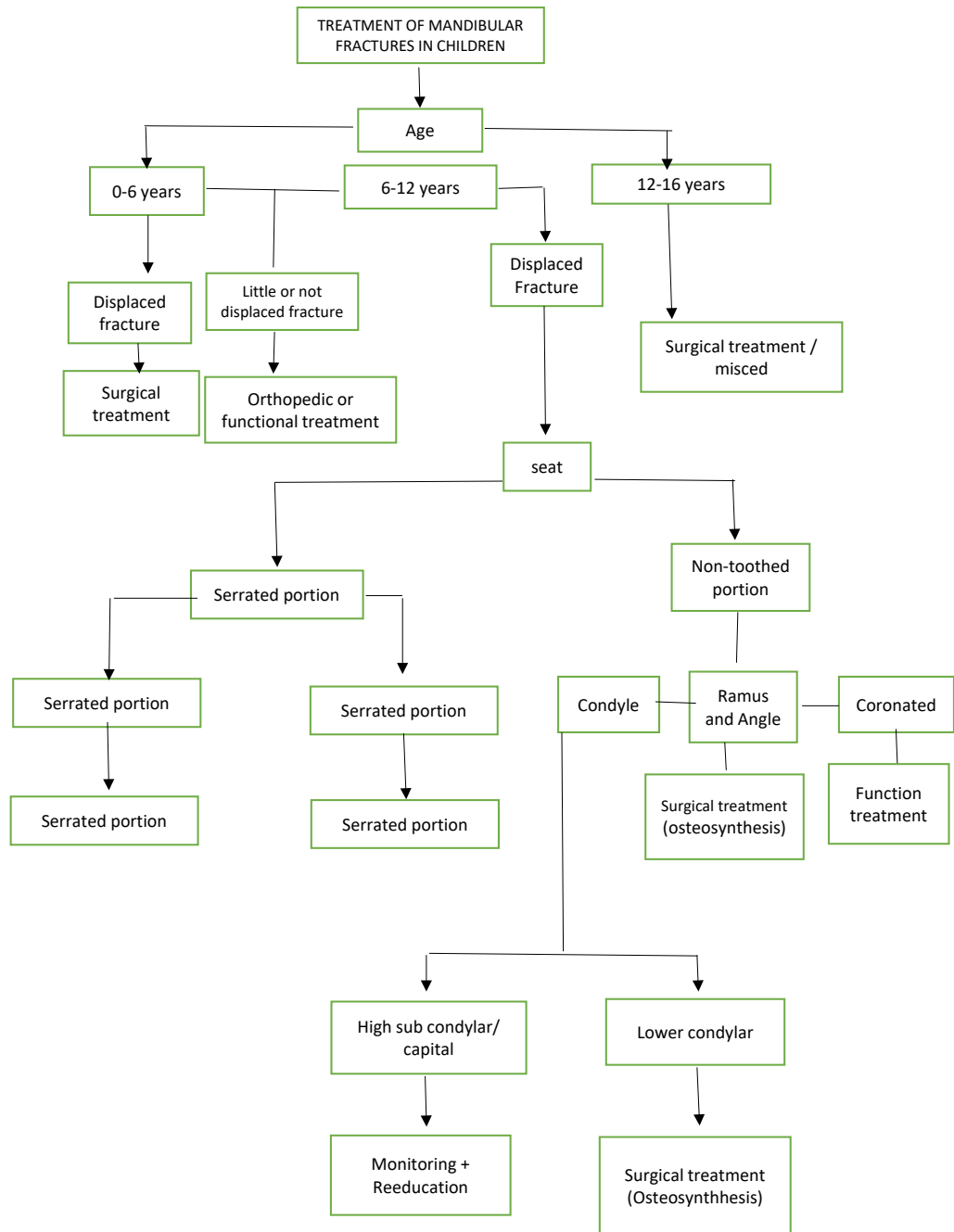


Figure 6. Decision algorithm.

Data Availability

The data used to support the results of this study are available on request from the corresponding author.

Conflicts of Interest

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

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