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ORIGINAL ARTICLE

Radiographic evaluation of treatment by orthopedic procedures of mandibular fractures in Abidjan Odonto-stomatological consultation and treatment center

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Keywords: Mandibular fractures, Orthopedic procedures, Radiographic evaluation

ABSTRACT

In Abidjan, mandibular fractures are generally treated surgically in the stomatology and maxillofacial surgery department of the Hospital and University Centers (HUC) of Cocody and Treichville. They are also treated with orthopedic devices at the Dental Surgery Consultation and Treatment Center in Abidjan, within the Maxillofacial Prosthesis (PMF) section of the Clinical Prosthesis and Occlusodontics department. Are these orthopedic devices effective in the management of mandibular fractures?. Do these methods achieve satisfactory results in the management of mandibular fractures?. This is a retrospective descriptive analytical study based on the evaluation of usable clinical and radiographic files of patients admitted to the maxillofacial prosthesis section of Odonto-Stomatological Consultation and Treatment Center (CCTOS) who presented fractures to the mandible. The data was processed using epi data software and the search for correlations was carried out using the khi-deux test. Maxillo-mandibular restraint is the most used with a rate of 85%. 83% of patients have good bone density on radiography after healing. Orthopedic treatment of mandibular fracture could be indicated in cases of non-displaced fracture with excellent alignment or approximation of bone fragments and some easily reducible fractures. (IJP 2025;6(1):80-85)

Introduction

Fracture is defined as a bone injury consisting of a complete or incomplete loss of continuity with or without displacement of the fragments. Mandibular fractures represent 2/3 of cases of facial fractures. They can be open to the skin, or oral or closed mucosa without communication with the outside.[1,2] The aetiology of fractures is varied. We distinguish: Traumatic causes such as road accidents, fights, falls, sports, ballistic trauma, etc; Iatrogenic causes such as extractions of impacted wisdom teeth, excision of large cysts, etc; Pathological causes such as significant osteitis, tumors, specific infections (osteoradionecrosis).[3-7]

Mini-plate osteosynthesis surgery is the appropriate treatment for mandibular fractures.[8-11] However, the orthodontic and/or orthopedic method can be used. In certain cases, abstention is appropriate.[12] The orthopedic technique is also carried out in certain cases of mandibular fractures and uses devices with essentially dental support.[13] In Abidjan, mandibular fractures are generally treated surgically in the stomatology and maxillofacial surgery department of the Hospital and University Centers (HUC) of Cocody and Treichville. They are also treated with orthopedic devices at the Dental Surgery Consultation and Treatment Center (DSCTC) in Abidjan, within the Maxillofacial Prosthesis (PMF) section of the Clinical Prosthesis and Occlusodontics department.[14]

Are these methods effective in the management of mandibular fractures?. Do these methods achieve satisfactory results in the management of mandibular fractures?. Different radiographs are taken in the evaluation of these devices. Indeed, evaluation is defined as the process which consists of collecting a set of relevant, valid and reliable information, then examining the degree of adequacy between this set of information and a set of suitably chosen criteria with a view to base decision-making.[15] It is in this context that our study aims to evaluate the impact of orthopedic devices in the management of mandibular fractures.

Material and Methods

It consisted of: Clinical and radiographic records of trauma patients; Computer equipment. This is a retrospective descriptive analytical study based on the evaluation of usable clinical and radiographic files (pre, per and post operative) of patients admitted to the maxillofacial prosthesis department of the (DSCTC) who presented fractures to the mandible. The data was processed using epi data software and the search for correlations was carried out using the khi-deux test. 41 clinical files were retained and consisted of panoramic radiographs (pre, intra and post-operative) of patients registered in the maxillofa-

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Table 1. numerical summary of ages

Minimum	8
1st Quartile	23
Median	30
Average	29.59
3rd Quartile	35
Maximum	58
Variance	87.85
Standard deviation	9,37

Table 2. Digital summary of treatment duration

Minimum	21
1st Quartile	45
Median	45
Average	47.34
3rd Quartile	45
Maximum	90
Variance	103.78
Standard deviation	10.8

Table 3. Distribution according to the location of mandibular fractures

Fractures	Multiples	Parasymphyseal	Angular	Symphyseal	Horizontal Branch	
numbers	15	11	7	6	2	41
%	36.59	26.83	17.07	14.63	4.88	100

Table 4. Distribution of subjects according to the used orthopedic device

Devices	Vestibular arch	Leblanc	Gutter and vestibular	Vestibular arch	8 Ligature and leblanc	Total
numbers	30	3	1	6	1	41
%	73.17	7.32	2.44	14.63	2.44	100

cial prosthesis (MFP) department for mandibular fractures. Poorly completed or incomplete files of patients with mandibular fractures and non-usable paper radiographs were excluded.

Results

The average age of the subjects in our population is 29 +/-9 years. We have a strong age distribution reflecting the heterogeneity of our population.

The average duration of treatment for the subjects in our sample is 47 days+/-10. We note that the duration of treatment varies greatly from one subject to another (Standard deviation=10.18). Most patients present with multiple fractures with a rate of 36.59%. Displaced fractures are the most common fractures with a rate of 66%. Maxillo-mandibular restraint is the most used with a rate of 85%. The most used device is the vestibular arch with a rate of 73.17%. 83% of patients have good bone density on radiography after healing. 80.49% of patients present good bone consolidation. There is a strong correlation between bone density and the alignment of bone fragments. This implies that when the bone fragments are well aligned, consolidation is better. The bivariate statistical analysis also gives us a strong correlation between bone density and the level of consolidation of bone fragments. There is no significant link between bone density and the shape of mandibular fractures. There is no significant link between bone density and the type of mandibular fractures.

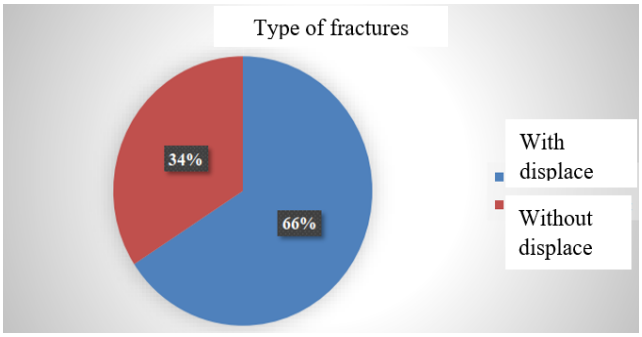

Figure 1. Distribution of subjects according to the shape of the Mandibular fractures

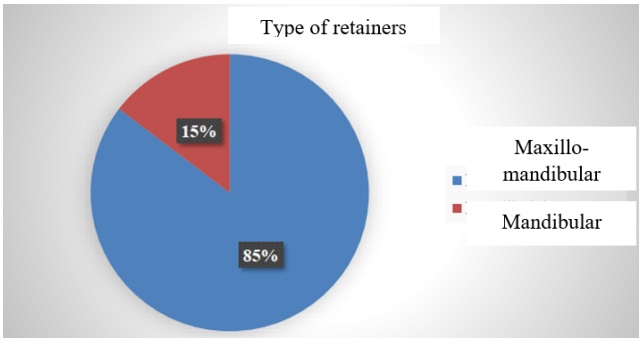

Figure 2. Distribution of subjects according to the type of used restraint

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Table 5. Distribution of patients according to the level of bone consolidation

Bones' consolidations	Good	Avarage	Bad	Total
numbers	33	4	4	41
%	80.49	9.76	9.76	100

Table 6. Statistical analysis of bone density based on alignment bone fragments

Alignments Densities	Good	Gap	Total
Good	31	3	34
Avarage	3	4	7
Total	34	7	41

X-squared=6.4639, df=1, p-value=0.01101

Table 7. Statistical analysis of bone density according to level of bone consolidation

Consolidations Densities	Good	Bad	Avarage	Total
Dense	31	1	2	34
Not Dense	2	3	2	7
Total	33	4	4	41

X-squared=22.386, df=2, p-value=0.0001679

Table 8. Statistical analysis of bone density according to the shape of the mandibular fractures

Shape of fractures Densities	With shifting	Without shifting	Total
Dense	23	11	34
Not Dense	4	3	7
Total	27	14	41

X-squared=0.0092287, df=1, p-value=0.9235

Table 8. Statistical analysis of bone density according to the type of reduction

Types of reduction Densities	Mandibular	Maxillo-Mandibular	Total
Dense	5	29	34
Not Dense	1	6	7
Total	6	35	41

X-squared=1.0606e-30, df=1, p-value=1

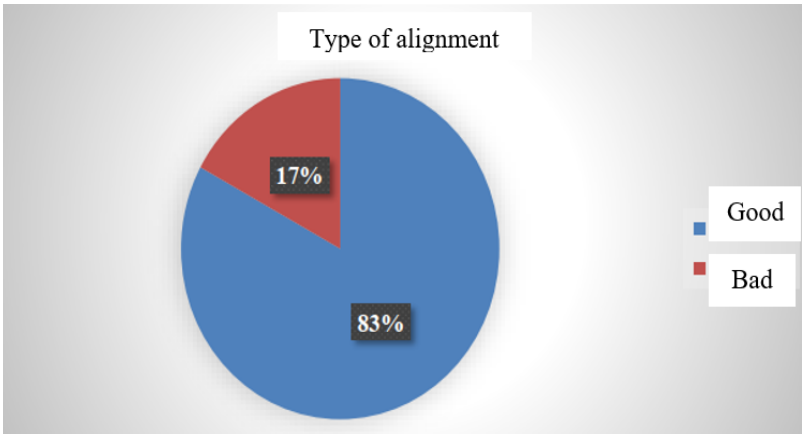

Figure 3. Distribution of patients according to the type of fragment alignment bony

Discussion

Mandibular fractures can occur at any age. In our study, most affected age 's average is 29 years table 1. These results are consistent with those of Soukèye and al.; Keubou and al. for whom the age range is between 27 and 30 years.[16,17]

The orthopedic devices for treating mandibular fractures were generally maintained for 47 days table 2. These results are in accordance with those of Champy J.P., Kouakou N. and Crezoit.[12,14,18]

The minimum duration of 21 days was observed in patients of young ages. The maximum duration is 90 days table 2. Indeed, the less restrictive mandibular devices can be maintained in order to achieve perfect consolidation after blocking. Thus, Menard and al. advise leaving the mandibular device in place until bone densification occurs.[19]

In our study, 36.59% of mandibular fractures are multifocal figure 8. Then, parasymphyseal fractures which are at 26.83%, mandibular angle fractures are at 17.07% figure 4, symphyseal fractures are at 14.63%, and fractures of the horizontal branch are at 4 .88% table 3. Our results differ from those of Keubou for whom only 21.28% were multifocal and the horizontal branch was the most affected with 35.08%.[17]

Mandibular fractures with displacement of the fracture segments are the most encountered cases, the rate of which is 65.85% in our study figure 1.

This explains the choice of using maxillo-mandibular restraints, the rate of which was 85% in our study figure 2.

In the presence of any mandibular fracture with displacement, some authors recommend rigid bimaxillary retention after reduction in order to avoid possible mobility of the fracture fragments. This type of treatment gives almost identical results to the surgical method.[20,21]

The most used devices in our study are the vestibular arches fixed by associated peridental ligatures or not with LEBLANC ligatures, with a rate

Figure 4. Intraoperative panoramic radiography (left angular fracture) of a patient aged 20

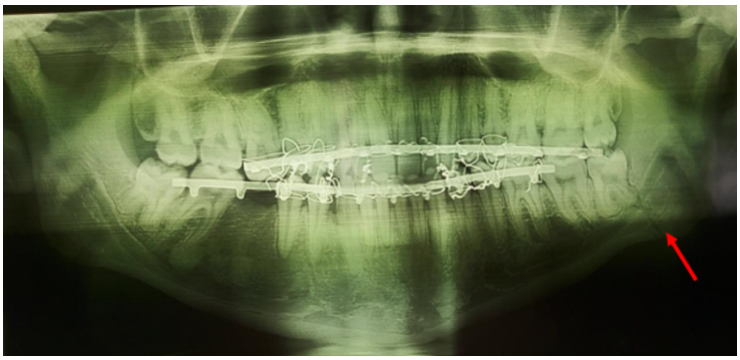

Figure 5. Intraoperative panoramic X-ray control on day (D) 14 of a patient aged 20

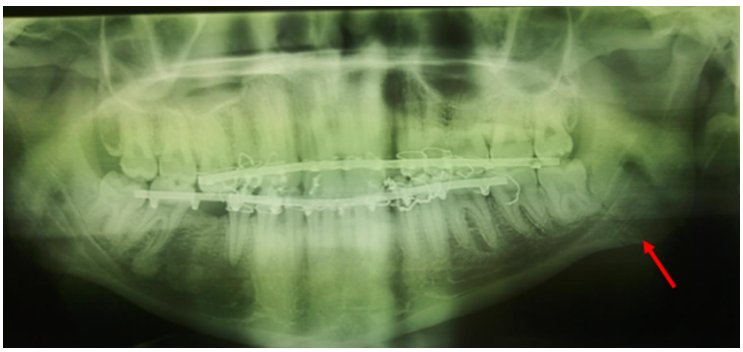

Figure 6. Intra-operative panoramic radiograph for control on day 30 of a patient aged 20

of 73.17% but different from Keubou and al. where intermaxillary blockade by Ivy ligation was most often performed table 4.[17]

Bone consolidation takes place in two main phases: the first concerns the union of the bone fragments and the second the remodeling of the fractured bone. This process requires bone and vascular changes.

In our study, 80.49% of fractures had good bone union table 5. Based on the post-operative panoramic x-ray (the last control x-ray), we note an opaque radio image at the level of the fracture line(s) figure 7 and figure 11. Indeed, we note the disappearance of the fracture line. On the first control x-ray images, we also observe the intimate rapprochement of the fracture edges, which will allow the formation of bone callus which is the beginning of the process of bone consolidation because it allows the union of the two bone segments figure 5, figure 6, figure 9 and figure 10.

For Joachim, bone healing is visible in medical imaging, it means, a bone callus forms and creates a sort of link between the two segments of the fractured bone, parallel to the circulation. local blood returns to its place; guarantee of good consolidation.[22]

On the other hand, for Goodship and Panjabi, there is an unsatisfactory correlation between conventional imaging (or at least its interpretation) and the real solidity of the fracture site.[23,24] For them, there is no strict radiological criterion allowing an assessment of bone healing. Therefore, the conventional radiographic tool must therefore be used with caution and be correlated at all times with a detailed clinical examination.

Panayiotis, Robin and Florence present the sought radiological criteria to attest to a favourable healing process.[25] For them, initially it is a matter of comparing successive images and ensuring that the reduction is maintained. Secondly, the x-ray allows us to attest to the appearance of a bone callus and the disappearance of the fracture line.

We also noted 9.76% of cases where the healing was not perfect because after two months of treatment, on the x-ray the fracture line persisted because there was a clear x-ray image. But patients did not complain of pain. We can say that the fractured banks were not intimately close. This situation is seen in cases of multifocal fractures with displacement in the mandible.

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For Quevauvilliers, maxillomandibular blocking is often sufficient to treat mandibular fractures without displacement and osteosynthesis indicated for mandibular fractures with displacement.[26]

In our study, 82.93% of cases showed good alignment of the basilar rim; indicating perfect reduction of the fracture figure 3.

We have 17.07% of patients in whom we note bone base shifts figure 3. This complication is observed in cases of multifocal fracture with displacement. This state of affairs was also reflected in Keubou's studies with 19.14% complications including malocclusion and delayed union with 22.22% each.[17]

These offsets are of the order of a millimeter at most. They have an impact on dental occlusion, so at the end of the treatment, i.e. after removing the devices, we carry out an adjustment and balancing of the occlusion to correct the caused occlusal disorders.

For Denhez, O. Giraud the treatment of disorders of the dental articulation ranges from successive grinding to an interruptive osteotomy or not with realignment of the bone segments in the three directions of space.[27]

In our study, we have a strong correlation between bone density and the alignment of bone fragments on the one hand and on the other hand with the level of consolidation of bone fragments table 6 and table 7. In addition, there was no significant link between bone density and the shape of the fractures on the one hand and on the other hand with the type of reduction table 8 and table 9.

Thus, we can say that the treatment of mandibular fractures by orthopedic procedures gives satisfactory results. However, we note some inadequacies such as the offset of the bone bases and the non-approach of the fracture segments.

These results are almost identical to those of N'Gouoni with a prevalence of 81% success for orthopedic treatment.[21]

For Sylvie, orthopedic devices are often sufficient to treat mandibular fractures as shown by the results of our treatment of mandibular fractures using orthopedic procedures at DSCTC.[28]

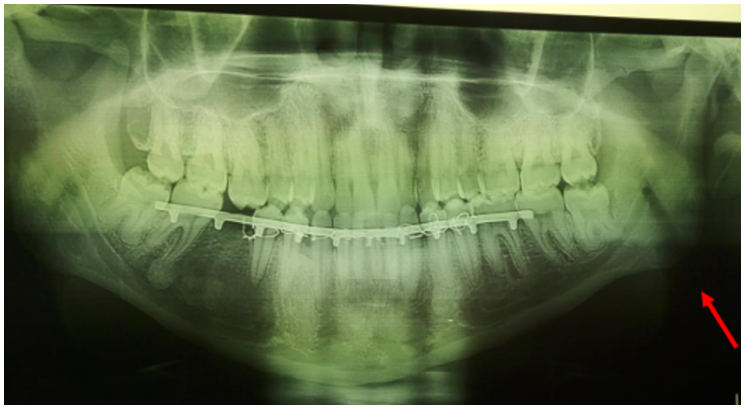

Figure 7. Intra-operative panoramic radiograph for control on day 45 of a patient aged 20

Figure 8. Panoramic x-ray (fractures between 37-38, 44-45) of a patient aged 23

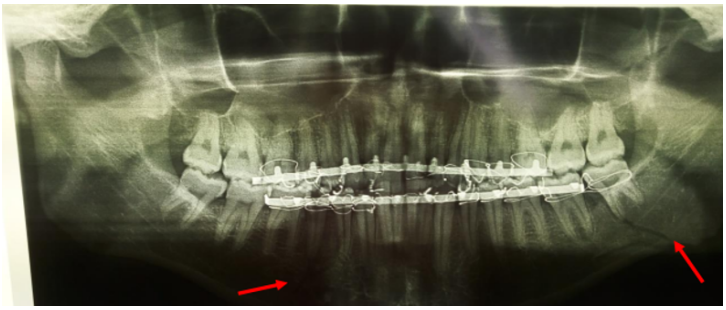

Figure 9. D14 panoramic control radiograph of a 23year old patient

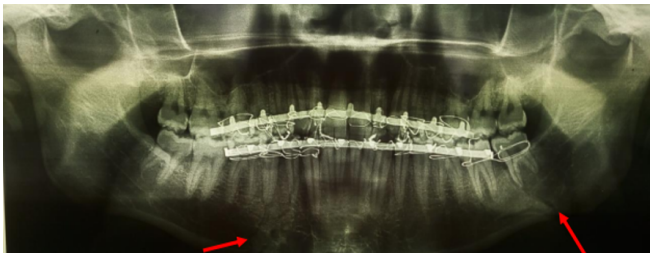

Figure 10. D30 panoramic control radiograph of a 23year old patient

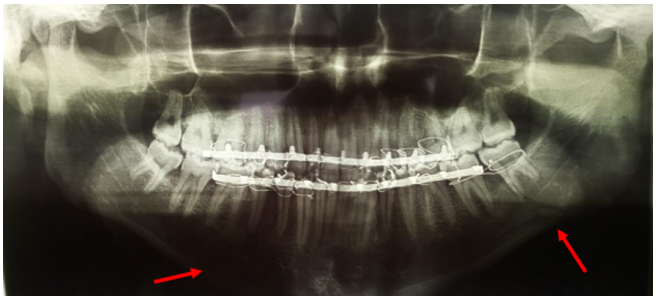

Figure 11. D45 panoramic control radiograph of a 23year old patient

Conclusion

Mandibular fractures are a frequent reason for consultation in Odontology and Stomatology. Their treatment must be judged on the quality of restoration of the occlusion, the manducative function, the anatomy of the bone contours, in the short and long term. In our study, we set out to assess pre-, intra- and post-operative radiographs during the treatment of mandibular fractures using orthopedic procedures.

Consolidation and bone density are the determinants of excellent treatment which would be linked to the quality of the reduction of bone fragments. Orthopedic treatment of mandibular fracture could be indicated in cases of non-displaced fracture with excellent alignment or approximation of bone fragments and some easily reducible fractures.

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