

## Original article

# Dental sequelae of fractures of the tooth-bearing area of the mandible: a retrospective study about 83 cases

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**Abstract** – This clinical retrospective study evaluate frequency and type of dental lesions associated with the fractures of tooth bearing area of the mandible. Eighty-three patients operated of a mandibular fracture were selected. Twenty five of these patients were re-examined. Collected data was age, gender, etiology and location of mandibular fractures, location and type of dental lesions. Dental sequelae at mandible and maxillary teeth are found in 60% of the patients. Between 4 to 5 teeth were injured per patient. Negative vitality test of dental pulp of teeth included in the line of fracture is more frequent when the line of fracture goes through the apex. Endodontic treatment of these traumatized teeth does not have to be systematic.

**Mots clés :**  
dental sequelae /  
mandibular fractures

**Résumé – Séquelles dentaires après fractures mandibulaires intéressant la zone dentée: étude rétrospective sur 83 cas.** Cette étude clinique rétrospective évalue la fréquence et le type de lésions dentaires associées aux fractures de la portion dentée de la mandibule. Quarante vingt trois dossiers de patients opérés d'une fracture de la portion dentée de la mandibule ont été sélectionnés. Vingt cinq de ces patients ont été revus en consultation afin d'évaluer les séquelles dentaires consécutives à cette fracture. Les données relevées étaient l'âge, le sexe, l'étiologie et la localisation des fractures mandibulaires, la localisation et le type des lésions dentaires. Ces patients ont été revus avec un recul moyen de 64 mois. Les données épidémiologiques relevées sont comparables aux autres études. Des séquelles dentaires ont été retrouvées sur les dents mandibulaires et maxillaires chez 60 % des patients à raison de 4 à 5 dents lésées par patient. Le test négatif de la vitalité pulpaire des dents comprises dans le trait de fracture est plus fréquente lorsque le trait de fracture passe par l'apex. Le traitement endodontique des dents traumatisées ne doit pas être systématique.

Mandibular fractures represent more half of the facial traumas [1–7]. The treatment is mainly surgical with the insertion of osteosynthesis miniplates according to Champy principles [8]. Tooth bearing area is fracture in more half of the cases [1, 3]. It transforms this fracture in an open one [5]. Since the systematic use of antibiotics, the procedure opposite teeth in the line of fracture has changed [2, 5, 9–12] and is conservative [10, 13].

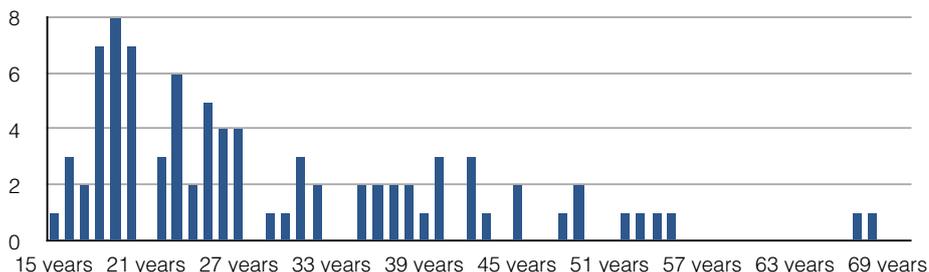
Indeed, an edentation has a functional, esthetic and financial impact. A conservative approach allows a good reduction of the fracture and limits the invasion of microorganisms in the site of fracture, contrary to an empty dental alveolus [12]. Dental traumas consecutive to a mandibular fracture are

frequent [2, 4, 10]. Dental lesions associated at a mandibular fracture are able to be at a distance of the fracture line. The aim of this clinical retrospective study is to evaluate location and type of dental sequelae associated at tooth bearing area fracture of the mandible, correlate frequency of negative vitality test according to the topography of fracture line and to propose an action to be taken opposite of these teeth.

## Materials and method

Eighty three medical records of patients who have tooth bearing area mandibular fractures were selected. These

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**Fig. 1.** Distribution of the ages.  
*Fig. 1. Répartition des âges.*

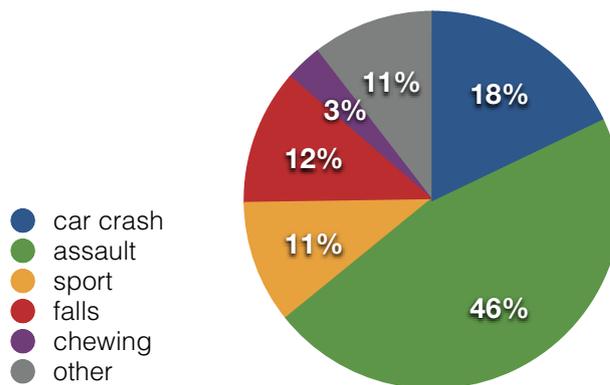
fractures occurred between January 2001 and December 2004. Patients with fracture of the non bearing area of the mandible, edentulous or in primary dentition were excluded of the study. All patients included in the study had on the one hand a surgical treatment by the insertion of osteosynthesis miniplates according to Champy principles [8]. On the other hand patients have a medical treatment: paracetamol, steroid anti-inflammatory, antibiotherapy (amoxicillin, clavulanic acid) and chlorhexidine mouthwash.

Epidemiological data raised for every medical record was: age, gender, date of hospitalization, etiology and location of mandibular fracture, location and type of dental trauma if it is mentioned in the medical record. Panoraphic X-ray pre and postoperative were analysed. These 83 patients were convened by mail and phone for a consultation centred in the screening of dental sequelae of their mandibular fracture. Data raised during this consultation was: teeth present or missed, dental damages caused by the fracture, dental vitality with a cold test and the topography of fracture line plot on the panoraphic X-ray.

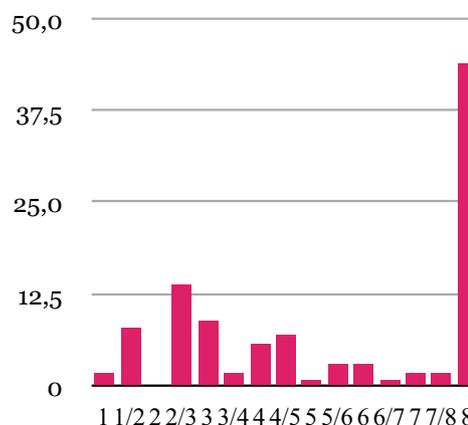
**Results**

About the 83 medical records:

- âge: mean age of the 83 patient was 29.5 years (Fig. 1);
- gender: among the 83 patients, there were 16 women for 67 men. The sex-ratio was 4.18;
- mandibular fractures etiology: etiology mandibular fractures was assault (47%), car crash (20%), falls (17%), sport accident (11%) and other causes (5%) (Fig. 2);
- mandibular fracture location: on the anatomopathological plan as much fractures in the right side and in the left side were found. The most common fractures touched the angle and the parasymphysaire region (Fig. 3) and (Table I). Unifocal and bifocal fractures were the most common (Table II);
- dental sequelae notified in medical records: among 83 medical records, 36 (43%) mentioned dental examination at the caring of the patient by the surgeon.



**Fig. 2.** Mandibular fractures etiology.  
*Fig. 2. Etiologies des fractures de la mandibule.*



**Fig. 3.** Location of mandibular fracture lines.  
*Fig. 3. Localisation des fractures de la mandibule.*

In these patients, dental traumas were 25 crown fractures, 2 root fractures, 1 crown-root fracture and 12 dental luxations. Dental examination during postoperative period had sometimes made it possible to supplement the statement of the dental lesions. On the 83 medical records, 66 tooth extraction (22 maxillary and 44 mandibulary) were found of

**Table I.** Location of mandibular fracture lines.

*Tableau I. Localisation des traits de fractures mandibulaires.*

Location	Absolute number of fractures	%
Condyle	14	11
Ramus	1	0.7
Angle	46	36
Body	27	21
Symphysis and parasymphysis	40	31.3
Total	128	100

**Table II.** Number of mandibular fracture lines.

*Tableau II. Nombre de traits de fractures mandibulaires.*

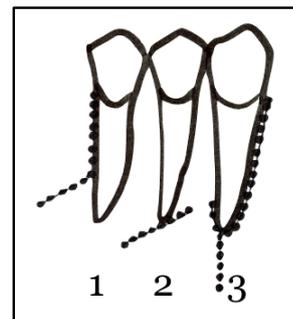
Number of fracture line	Number of patients	%
1	40	48.2
2	41	49.4
3	2	2.4
Total	83	100

with 46 have had the mandibular fracture etiology. Tooth extraction by frequency order was 38, 31 and 41.

In consultation, 25 patients were re-examined in the follow-up consultation. These patients presented 30 tooth-bearing fractures of the mandible imply 56 teeth in the fracture line. Among those teeth, 17 were extracted immediately and 2 more tardily.

- time of follow-up: was 64 month mean (42 to 151 month);
- âge: average age of the 25 patients was 33 years at the time of the fracture;
- gender: 7 women and 18 men was re-examined (sex-ratio 2.57);
- teeth in the line of fracture: 56 teeth was included in the fracture line (37 was present at the follow-up consultation, 17 was extracted immediately and 2 at the remove of osteosynthesis plates; it was third molars in these cases). Among the teeth in the fracture line and present at the follow-up consultation, 25 had a positive test pulp vitality and 13 no (32% of teeth in fracture line had a pulp test vitality negative).

Relation between topography of fracture line and the teeth root and the pulp response to the vitality test was studied. These teeth were distributed in 3 class according to the rapport that fracture line have had with the dental and periodontal structures. In class 1, fracture line walked on along the root. In class 2, fracture line passes only by the dental apex. In class 3, fracture line walked along the root and passes by dental apex (Fig. 4). On the 37 studied teeth, 5 was endodontically treated,



**Fig. 4.** Classification of fracture lines according to their relationship with periodontal ligament and dental apex.

*Fig. 4. Classification des traits de fracture en fonction de leurs rapports avec le ligament alvéolo-dentaire et l'apex dentaire.*

**Table III.** Dental sequelae noticed at the 25 patients re-examined.

*Tableau III. Séquelles dentaires retrouvées chez les 25 patients revus en contrôle.*

	Class 1	Class 2	Class 3
% teeth/total	36	16	48
% vital teeth	100	25	61

5 have decay before mandibular fracture or fractured. Twenty seven teeth was selected: class 1 was present in 36% of the cases, class 2 in 16% of the cases and class 3 in 48% of the cases. Teeth in class 1 have had a pulp test positive in 100% of the cases, teeth in class 2 in 25% of the cases, teeth in class 3 in 61% of the cases (Table III).

- mandibular teeth not in fracture line: 5 teeth have had a pulp test vitality negative;
- maxillary teeth: 18 maxillary teeth was extracted immediately; 7 teeth was fractured but they could be restored.
- globally numbers: 15 patients (60%) have had dental sequelae consecutive at their mandibular fracture. These sequelae was teeth extractions for 7 patients (28%), negative pulp test vitality for 5 patients (20%) and teeth extractions and negative pulp test vitality for 3 patients (12%) (Table IV). At the 15 patients which have dental sequelae caused by their mandibular fracture, their was 68 teeth injured, so between 4 and 5 teeth injured by patients. 10 patients (40%) have had no dental sequelae.

## Discussion

In the clinic study, 60% of the patient victims of a mandibular fracture have had dental sequelae. It was between 4 to 5 teeth touched by patient. This is more than other author, because we have a high average retreat [2, 6, 9, 14, 15].

These dental sequelae are most represent by tooth extractions, dental luxation and pulp necrosis.

**Table IV.** Non vital teeth according to fracture line topography.  
*Tableau IV. Dents non vitales en fonction de la topographie du trait de fracture.*

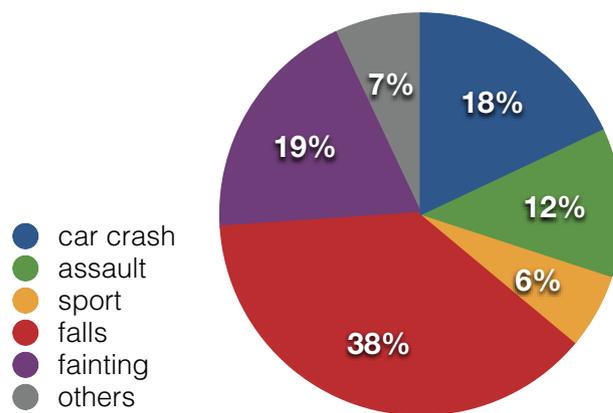
Sequelae	Number of patients	%
None	10	40
Sequelae	15	60
Tooth extractions	7	28
Negative pulp test	5	20
Tooth extractions and negative pulp test	3	12
Total	25	100

In this study, 64.8% of teeth in the line of fracture was extracted, fractured or have a negative vitality pulpar test at the re-examined consultation. This number is most important than others in the litterature because our average retreat was higher [6, 9, 10]. A simplified classification to study topography of fracture line with dental elements and vitality pulpar test of these teeth ratio (Fig. 4) is purpose. This classification had a pronostic interest for concerned teeth.

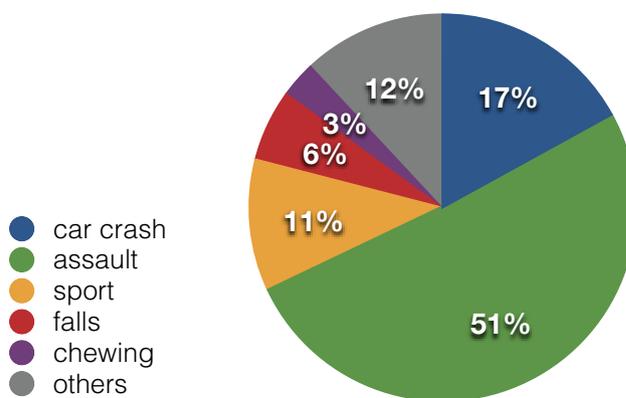
Whole of the denture can be touched when the mandible is fractured. In our study, 72 teeth were injured at 15 patients; 35% of these teeth were in the maxillary and 65% at the mandible. In fact, dental injuries can be present at the maxillary or in the mandible, at distance of fracture line [2]. Five mandibulary teeth at distance of fracture line have had a negative vitality pulpar test. Two of them were certainly touched by drilling when osteosynthesis screws insertion.

If dental examination is difficult when patient come in emergency at hospital for a mandibular fracture, we insist of the need to do an early dental examination to diagnosis maxillary and mandibulary dental injuries. Dental injuries consecutive at facial trauma are underestimated because there is no systematic diagnosis of these injuries [15]. Moreover, dental treatment success is correlated at precocity implementation dental treatments.

On the 83 medical records, panographic X-ray shown 13 osteosynthesis screws or borehole was close to dental roots, what represents 2% of the 640 osteosynthesis screws. Teeth injured were premolars, canines and one mesial root of a six-year molar. In literature, the rate of iatrogenic osteosynthesis screws was 0.4% [16]. In our study, among the 25 re-examined patients, one root presented a drill hole when any osteosynthesis screw was put. The teeth have had a negative pulpar test. At another patient, an osteosynthesis screw was inserted immediately under a canine apex. The teeth have had



**Fig. 5.** Women mandibular fractures etiology.  
*Fig. 5. Etiologies des fractures pour les femmes.*



**Fig. 6.** Men mandibular fractures etiology.  
*Fig. 6. Etiologies des fractures pour les hommes.*

a good response at the cold test. However, dental impairment by drill or screwing does not result sytematically by a pulpar necrosis [16, 17]. Moreover, this rate of iatrogenic osteosynthesis screws was established on panographic X-ray and consequently produce false positive and false negative.

Data collected on the 83 medical records were comparable with equivalent studies [1, 2, 4, 7, 11, 12, 18]. The sex ratio was 4.25. That is with the lifestyle and the conduits at the risks (assault, sport accident) more frequent in men's population. More women came at the re-examination consultation. They represented 19% of the 83 medical records but 38% of patients in re-examination consultation. Etiology of mandibular fractures is different in function of victim gender. For women the most common etiology was falls (Fig. 5), for men assault (Fig. 6). Sport accidents was more frequent in men's population but proportion of car crash was identical in both populations. Most common patients with mandibular fractures are men. These unbalance can be explain by lifestyle more reasonable

of female population, in particularly with exposure at violence. Fractures occurs as much on the right than on the left [2]. On average there is between 1 and 2 fracture line by patient [7]. Etiologies of mandibular fractures in the study are correlated with the other studies [1, 2, 4, 7, 11, 18].

These study is different of others because it have a much higher retreat. The time between mandibular fracture and reexamination consultation is 64 month on average. This is much higher than other studies [6, 9, 10, 13]. The interest of a length re-examination is to show late dental injuries. This is why we found between 4 and 5 dental injuries by patients. We know that the phenomena of secondary silence necroses are common. We insist of the long-term follow-up need.

Prophylactic teeth extractions are proscribed. Teeth extractions are indicated only in the usual indications [13, 16].

Traumatized teeth with a negative pulp test response should not be endodontically treated. Indeed, a non-vital tooth is not necessarily devascularised [9, 16]. That is why it is necessary to put on a regular follow-up. It is indicated to take X-ray every 6 months on these teeth and make the endodontic treatment only if the teeth present clinic or radiographic sign of necrosis [6, 9]. A chek-up at the time of fracture is essential, next all 6 months in order to treated all eventual sequela which can see at distance of the accident. The check-up at the fracture had also a considerable medicolegal interest.

**Competing interests:** none

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