

A Proposed Easy-to-Use Classification of Mandibular Fractures

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ABSTRACT

There are many classifications for mandibular fractures but all are not without complexity, making it difficult to use in emergency departments. A radiologist, maxillofacial surgeons and other clinicians feel problems in classifying these fractures. Researchers proposed many classifications to facilitate clinicians in describing these fractures. All these efforts remained unsuccessful as no such classification has been put forward. A comprehensive and easy to use classification is being proposed in this article. **OBJECTIVE:** 1. To analyze mandibular fractures on clinical and radiological bases. 2. To classify mandibular fractures on the basis of this analysis. **MATERIAL & METHODS:** In this study we evaluated 2767 fracture lines in 1745 patients. The location and the number of fracture lines were analyzed. **RESULTS:** The patterns of multiple mandibular fractures show the fracture of the body of the mandible on both side (b-b) occurred in 421 (24.1%) patients while fracture of the body of the mandible with condylar process fracture (b-c) occurred in 456 (26.1%) cases and numerous fractures hit 72 (4.1%) cases. Fractures of the body of the mandible with condylar process fractures on both sides (b-c-c) have occurred in 8 (0.5%) cases, while fractures of both side of the body of mandible with the condylar process (b-b-c) occurred in 5 (0.3%) cases. **CONCLUSION:** Easy-to-use classification of mandibular fractures have been proposed on the basis of finding of this study. **CLINICAL RELEVANCE:** FLIDOT is an easy word to remember and describing a mandibular fracture very conveniently as F stands for fracture type, L for fracture site, I for presence of infection, D for fracture dislocation, O for occlusal disturbances and T for presence of tooth in fracture line.

Key words: Classification of jaw fractures, Mandible fractures, Facial fractures, Facial injuries

المخلص

هناك العديد من التصنيفات لكسور الفك السفلي ولكنها كلها لا تخلو من التعقيد، مما يجعل من الصعب استخدامها في أقسام الطوارئ. يعاني كل من طبيب الأشعة وجراحي الفكين والأطباء الآخرين من مشاكل في تصنيف هذه الكسور. اقترح الباحثون العديد من التصنيفات لتسهيل عمل الأطباء في وصف هذه الكسور لكن كل هذه الجهود لم توفق في تسهيل وصف كسور الفك السفلي. يقترح المؤلفون في هذه المقالة تصنيفاً شاملاً وسهل الاستخدام لكسور الفك السفلي. **الأهداف:** ١- تحليل كسور الفك السفلي على أسس سريرية وشعاعية. ٢- تصنيف كسور الفك السفلي بناء على هذا التحليل. **منهج البحث:** في هذه الدراسة قمنا بتقييم ٢٧٦٧ خطأ للكسر لدى ١٧٤٥ مريضاً. تم تحليل موضع وعدد خطوط الكسر لدى كل مريض. **النتائج:** في أنماط الكسور المتعددة لوحظ تموضع خط الكسر في جسم الفك السفلي في كلتا الجهتين (ج - ج) في ٤٢١ (٢٤,١%) من المرضى، في حين تموضع خط الكسر في جسم الفك السفلي وفي النّائِي اللّقمِي معاً (ج - ل) في ٤٥٦ (٢٦,١%) من الحالات، أما خطوط الكسر المتعددة المواقع فقد رصدت لدى ٧٢ (٤,١%) من الحالات فقد تموضع خط الكسر في جسم الفك بجهة واحدة وفي النّائِي اللّقمي بكلتا الجهتين (ج - ل - ل) في ٨ (٠,٥%) من الحالات، في حين تموضع خط الكسر على جانبي جسم الفك السفلي وفي النّائِي اللّقمِي (ج - ج - ل) في ٥ (٠,٣%) من الحالات. تم اقتراح تصنيف سهل الاستخدام لكسور الفك السفلي على أساس نتائج هذه الدراسة. **الاستنتاج:** (Fracture, Location, Infection, Dislocation, Occlusion, Tooth) بأخذ الحرف الأول من كل كلمة تُكوّن كلمة لها أهميتها السريرية وهي: FLIDOT هي كلمة سهلة التذكر وتصف كسر الفك السفلي بطريقة مريحة بعد وضع الرقم المناسب أمام كل حرف F. تعبر عن نوع الكسر، بينما L تدل على موقع الكسر، I وتعني وجود عدوى في الكسر، كما أن D تعبر عن تبدل خط الكسر و O تعني اضطرابات إطباق الأسنان، أما T فتدل على وجود الأسنان في خط الكسر.

INTRODUCTION

There are many classifications put forward for describing mandibular fractures but all are complex, making it difficult to use for clinicians especially in emergency situations. It is therefore, of paramount importance to develop a simple classification which

should be easy-to-use. A classification was proposed in 1969 which classified the mandibular fractures into five groups[1]. These groups are not easy to memorize making the classification unusable. Another classification by other researchers tried to simplify the previous classification[2], but it has further complicated the classification. Pogrel &

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Kaban in their classification divided the mandibular fractures into five groups according to location of the fracture[3]. Though it is most currently used classification, but it doesn't fulfil clinical requirements. Yet, another classification was given by Gratz. He used tumor classification (TNM) pattern to classify the mandibular fractures[4]. It is an accepted classification but it is missing information about presence or absence of teeth in fracture lines, or whether dislocation has occurred or not. Pankratov & Robustowa proposed a classification which uses numericals for fracture[5] but doesn't give radiological findings. A classification approved by WHO has divided the fractures into 10 groups[6]. These groups give information about the location of the fracture only. Clinicians prefer to use easy and ready-to-be used type of classification. Le forte classification for maxillary fractures though not very comprehensive but is used by most clinician because of its simplicity. Keeping the necessity of easy-to-use classification in mind, a retrospective study has been performed on 1745 patients treatment records. These patients attended Maxillofacial Department at Warsaw Medical University for treatment of mandibular fractures.

OBJECTIVES

1. To analyze mandibular fractures on clinical and radiological bases in the patients treated for mandibular fractures.
2. To classify mandibular fractures on the basis of clinical and radiological evaluation.

MATERIALS & METHODS

This is a retrospective study of patients treatment records and radiographs who attended maxillofacial unit of Warsaw University in the year 1988-1992 and 2001-2005. It was found that a single fracture was easy to mention and any previous classification could serve the purpose. Difficulty arises when the fracture is multiple. Therefore, records of 1745 patients were analyzed including 1492 males and 253 females who were treated for mandibular fractures. Based on clinical and radiological evaluation, fractures lines were identified. The patients were divided into two groups: 1st group included unilateral fractures, and the 2nd group included multiple fractures. The first group was further divided depending on the location of the fracture to eight locations: 1- incisors, 2- canines and premolars, 3- molars, 4- mandibular angle, 5- ramus, 6- coronoid process, 7- condylar

area and 8- alveolar area. The multiple fractures of the mandible were divided into five patterns:

1. Bilateral in the body of the mandible (b-b).
2. Bilateral in the body and in the condylar process (b-c).
3. Trilateral in the body and in the condylar process (b-b-c).
4. Trilateral in the body and in both condylar processes (b-c-c).
5. Numerous fractures (n).

RESULTS

Records of 2767 fracture lines in 1745 patients showed that most of the fracture line were found at the angle of the mandible (31.5%), and then in the condylar process (26.9%). The third most common place was in the canine and premolar area (19.4%). Unilateral fractures occurred in 739 (42.4%) patients, while multiple fractures occurred in 1006 (57.6%) patients. Unilateral fractures occurred at the angle of the mandible (14.6%), then in the condylar process (11.4%), and the third place of occurrence was in the area of canine and premolars (7.6%) (Table 1).

The patterns of multiple mandibular fractures show the fracture of the body of the mandible on both side (b-b) occurred in 421 (24.1%) patients while fracture of the body of the mandible with condylar process

Table 1: Locations of fracture lines according to the anatomical areas in 1745 cases (number and %) treated of mandibular fractures.

Location of fracture lines	Number and % of patients according the type		
	Unilateral	Multiple	Total
Condylar process	200 (11.4%)	271 (15.5%)	471 (26.9%)
Coronoid process	5 (0.3%)	10 (0.6%)	15 (0.9%)
Ramus	8 (0.5%)	22 (1.3%)	30 (1.8%)
Angle	255 (14.6%)	295 (16.9%)	550 (31.5%)
Body (molars area)	73 (4.2%)	92 (5.2%)	165 (9.4%)
Body (canine and premolars area)	132 (7.6%)	206 (11.8%)	338 (19.4%)
Body (incisors area)	42 (2.4%)	103 (5.9%)	145 (8.3%)
Alveolar process	24 (1.4%)	7 (0.4%)	31 (1.8%)
Total	739 (42.4%)	1006 (57.6%)	1745 (100%)

fracture (b-c) occurred in 456 (26.1%) cases, and numerous fractures hit 72 (4.1%) cases. Fractures of the body of the mandible with condylar process fractures on both sides (b-c-c) have occurred in 8 (0.5%) cases, while fractures of both side of the body of mandible with the condylar process (b-b-c) occurred in 5 (0.3%) cases, (Figure 1).

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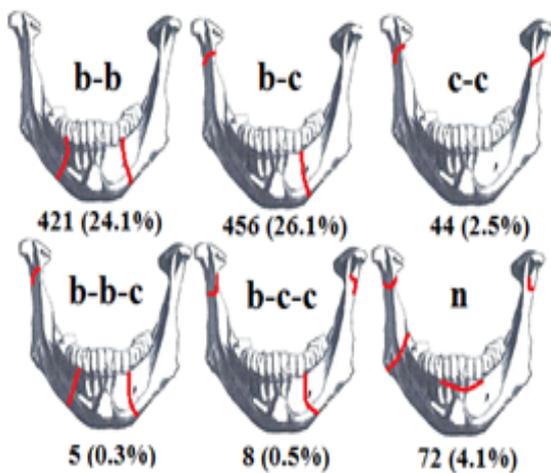


Figure. 1. Patterns of multiple mandibular fractures.

DISCUSSION

In this study it was found that most vulnerable location was the mandibular angle (31.5%) followed by condylar process (26.9%) and then the canine and premolar region (19.4%). Our results in this regard agree with the study of Boole et al.[7]. The mandibular fractures in the molar region were three times less and the condylar process fractures were more than twice as compare to our earlier study[8]. Finding of this study also match with the finding of Czerwinski et al. in regard to the occurrence of the multiple mandibular fractures[9]. Frequently noticed pattern in this study for multiple mandibular fracture is the fracture of the body of the mandible

on both sides (b-b) followed by the body fracture and condylar process (b-c), and then the fracture of condylar process on both sides with the fracture of body of the mandible. Kelly & Harrigan divided the mandibular fractures in six groups to simplify the classification, but it is similar to the previous classification except the canine site was dropped. Pogrel & Kaban classified mandibular fractures in 5 groups according to the location of the fracture. This classification only mentioned about the site of the fracture. Other information like presence of infection, tooth in the fracture line was not covered. Gratz, tried to find a common formula, and suggested digital alphabetical classification similar to tumors. This classification does not contain set of data such as dislocation of fracture and the teeth in fracture line. A classification approved by WHO is very difficult to follow and its last class "unspecified mandibular fractures" is ambiguous and does not mean anything in terms of clinical consideration.

Pankratov & Robustowa divided mandibular fractures in seven groups. This classification focuses on only clinical symptoms and does not contain the information that reflects the radiological symptoms. Buitrago-Téllez CH et al. evaluate a comprehensive classification system for mandibular fractures based on imaging analysis[10]. This system allows standardization of documentation of mandibular fractures, although improvement in the definition of categories and their application is required. Schuknecht & Graetz proposed Spiral multislice CT to accurately categorizing mandibular fractures based on location, into alveolar, mandibular proper, and condylar fractures[11]. This classification can only be utilized where tomography facilities are available.

CONCLUSION

Unilateral mandibular fractures often localize in the angle of the mandible, while multiple mandibular fractures often involve both sides of body of the mandible and the condylar process. Based on analysis of our study of 2767 fracture lines, easy-to-use clinical and radiological classification of mandibular fractures is being proposed as follows (Fig. 2)

CONFLICTING INTEREST

Unilateral There were no financial and personal relationship with other people or organization that could inappropriately influence our work.

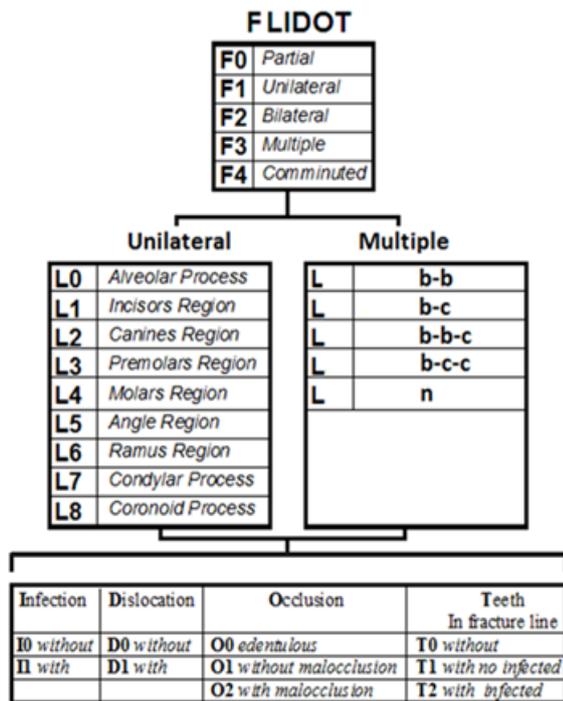


Figure. 2. A proposed easy-to-use classification of mandibular fractures.

The proposed classification can be described by FLIDOT.

F here stands for fracture, L for location of the fracture, I for presence/absence of infection on the fracture site, D for dislocation of the fracture, O for disturbance in occlusion and T for presence/absence of teeth in fracture line.

Fracture F0-F4

The numbers (0-4) represent the types; (F0) partial fracture, (F1) unilateral fracture, (F2) bilateral fracture, (F3) multiple fracture, (F4) comminuted fracture.

Location L0-L8

The determination of the location is done using numerals (0-8) from anterior to posterior of the mandible; (L0) alveolar process fracture, (L1) incisors region fracture, (L2) canine region fracture, (L3) premolars region fracture, (L4) molars region fracture, (L5) angle region fracture, (L6) ramus region fracture, (L7) condylar process region fracture, (L8) coronoid process region fracture.

In case of unilateral fractures letter "r" or "l" will determine the side.

In multiple fractures for the sake of simplicity location of fractures can be determined by alphabets

b for body of the mandible, c for condylar process. For example L (b-b) will mean fracture on the body of the mandible on both sides. And L (b-c-c) will mean fracture on the body and condyle on one side and condyle on the other side.

Infection I0-I1

I0 means the absence of infection, and I1 means the presence of infection at fracture side.

Dislocation D0-D1

D0 means that the fracture is without dislocation and D1 means that the fracture is with dislocation.

Occlusion O0-O2

O0 means that the arch is edentulous, and O1 means that the dental arch is complete or partial without change in the occlusion, and O2 means that the dental arch is complete or partial but with malocclusion.

Tooth in fracture line T0-T2

T0 means that no tooth in fracture line, and T1 means that there is healthy tooth in fracture line, and T2 means that there is tooth in fracture line but suffering from caries or periodontal diseases.

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