Dental Journal
Majalah Kedokteran Gigi
Vol. 43. No. 1 March 2010

Research Report

Relationship between trauma mechanism and etiology on mandibular fracture patterns

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ABSTRACT

Background: *Mandibular fracture occurs more commonly than maxillary fracture because of its prominent position and its arrow arch like bone anatomy. Many factors may cause mandibular fracture. Motorcycle accident is the main etiology of mandibular fracture in the world. Based on the literature, 43% mandibular fractures are caused by motorcycle accident, 34% by violence, 7% by accident at work, 7% by fall, 4% by sports and the others were caused by various things.* ***Purpose:*** *The purpose of this study was to know the relation between the etiology and mechanisms of trauma and the patterns of mandibular fracture at Hasan Sadikin Hospital, Bandung, from January 2006 to October 2007.* ***Method:*** *The study was taken on patients with mandibular fractures who came to Hasan Sadikin Hospital Bandung. The data were taken retrospectively by documenting the etiologies of mandibular fracture, the mechanisms of fracture, and the location of mandibular fracture. The data were analyzed with Chi Square statistic test.* ***Result:*** *The result showed that There were 83 mandibular fractures. The mandibular fracture more commonly attacks men about 77%, and women about 22.9%. Mandibular fracture occurs more often between the age group of 21–30 years old, about 31 people (37.3%). Mandibular fracture was mostles often caused by motorcycle accident, affecting about 71 people (85.5%). Parasymphysis fracture is the most common fracture location among mandibular fracture cases, about 47 people (56.6%).* ***Conclusion:*** *It can be concluded that there is no significant relationship between the etiology and mechanisms of trauma and the pattern of mandibular fracture.*

Key words: *Mandibular fracture location, etiology, trauma mechanisms*

ABSTRAK

Latar Belakang: *Fraktur mandibula lebih sering terjadi dibandingkan dengan fraktur maksilla karena posisinya yang lebih prominen dan bentuk anatomi tulang seperti busur panah. Banyak faktor yang dapat menyebabkan terjadinya fraktur mandibula. Kecelakaan kendaraan bermotor merupakan etiologi utama penyebab fraktur mandibula di dunia. Literatur menyebutkan bahwa 43% fraktur mandibula disebabkan oleh kecelakaan kendaraan bermotor, 34% disebabkan oleh kekerasan, 7% kecelakaan kerja, 7% akibat jatuh, 4% pada kecelakaan olahraga dan sisanya oleh bermacam-macam sebab lainnya.* ***Tujuan:*** *penelitian ini untuk mengetahui apakah ada hubungan antara etiologi dan mekanisme trauma dengan pola fraktur mandibula pada penderita fraktur mandibula di Rumah Sakit Hasan Sadikin Bandung dari bulan Januari 2006 sampai Oktober 2007.* ***Metode:*** *Penelitian dilakukan pada pasien dengan fraktur manibular yang datang ke Rumah Sakit Hasan Sadikin Bandung. Data dikumpulkan secara retrospektif dengan cara mencatat etiologi,mekanisme, dan lokasi terjadinya fraktur mandibula. Data dikumpulkan dan dikelompokkan kemudian dianalisis dengan uji statistik Chi-square.* ***Hasil:*** *Dari hasil didapatkan 83 kasus fraktur mandibula. Fraktur mandibula lebih sering terjadi pada laki-laki yaitu sebanyak 77% dibandingkan wanita 22,9%. Fraktur mandibula sering terjadi pada usia 21–30 tahun, yaitu sebanyak 31orang (37,3%). Fraktur mandibula lebih banyak disebabkan tabrakan motor yaitu 71 orang (85,5%). Fraktur parasimfisis merupakan yang terbanyak yaitu 47 orang (56,6%).* ***Kesimpulan:*** *Penelitian ini dapat disimpulkan bahwa antara etiologi dari fraktur mandibula, mekanisme trauma dengan pola fraktur mandibula tidak terdapat hubungan yang bermakna.*

Kata kunci: *Lokasi fraktur mandibular, etiologi, mekanisme trauma*

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INTRODUCTION

Mandibular fracture actually can be classified into many terminologies that have not been standardized yet, which are simple, compound, greenstick, comminuted, pathologist, multiple, impaction, atrophic, indirect and complex fracture. Nevertheless, mandibular fracture sometimes is also classified based on the involved anatomy, such as symphysis, corpus, angulus, ramus, processus condyloideus (condylus), coronoideus, and alveolaris.[1,2]

There are some factors causing mandibular fracture. Motorcycle accident is the main etiology causing mandibular fracture in the world. Some literatures even mention that 43% of mandibular fracture are caused by motorcycle accident, 34% are caused by violence, 7% are caused by working accident, 7% are caused by falling, 4% are caused by sport accident, and the rest is caused by other causes.[2]

In the United States, trauma is considered not only as the third factor causing death in all levels of age, but also as the first factor causing death in children, teenagers, and youth, who are in the age of 1-44 years old. Motorcycle accident is considered as the most common factor causing both trauma on face and multiple injuries. Violence and falling from the height also occur in developing countries. The type and direction of trauma power actually can help to conduct diagnosis. Thus, the big power resulted during collision, and motorcycle and car accidents usually tends to make patients get multiple, compound, comminuted mandibular fracture, in which at the first time of hit the patients tend to get single, simple, and nondisplaced facture. The object of collision target also affects the type and the number of fracture.[3,4,5]

In addition, the direct hit on chin can cause bilateral fracture in condylus, and the hit on the angle of parasymphysis can cause condylus contralateral fracture or angulus fracture. If the patient sits on the car, moreover, it can help to diagnose mandibular injury or other injuries. For instance, injury on the chest is caused by being hit on the handlebar, and facial fracture is caused by being hit on the dashboard and by facial laceration.[3]

The reason of conducting the study, furthermore, is because there was no published study about the relation between the etiology and mechanisms of trauma and the pattern of mandibular fracture. The objective of the study, was to find out whether there is a relation between the etiology and mechanisms of trauma with the pattern of mandibular fracture on mandibular fracture patients at Hasan Sadikin Hospital, Bandung, from January 2006 to October 2007.

MATERIAL AND METHOD

The study had retrospectively been conducted for a year and 10 months, from January 2006 to October 2007, with the number of patients about 83 people hospitalized at Hasan Sadikin Hospital, Bandung.

Moreover, the data of patient were taken based on the characteristic of demographic data, which were gender, age, the cause of trauma, the mechanisms of trauma, and the location of mandibular fracture. The inclusive criteria involved patients with mandibular fracture visiting at Hasan Sadikin Hospital, Bandung. The data then were collected, classified, and analyzed with SPSS program for Windows version 13.0 using Chi-square Test.

RESULT

The characteristics of the subject based on the gender and age can be explained in the following Table 1. The cases of mandibular fracture, based on the etiology of trauma, the speed of trauma, the location of mandibular fracture, and the object of collision target, can be explained in Table 2.

Table 1. The characteristics of mandibular fracture based on gender and age

Variable	N	%
Gender		
Male	64	77.1
Female	19	22.9
Group of Age (Year)		
0–10	5	6.0
11–20	27	32.5
21–30	31	37.3
31–40	11	13.3
41–50	6	7.2
51–60	3	3.6
Total	83	100.0

Table 2. The cases of mandibular fracture based on the mechanisms of trauma, the location of mandibular fracture, and the object of collision target

Variable	N	%
Mechanisms of Trauma		
Motorcycle Accident	71	85.5
Car Accident	1	1.2
Falling	7	8.4
Violence	4	4.8
Location of Mandibular Fracture		
Parasymphysis Fracture	47	56.6
Angulus Fracture	9	10.8
Corpus Fracture	7	8.4
Ramus Fracture	4	4.8
Condylus Fracture	2	2.4
Parasymphysis, Angulus Fracture	5	6.0
Parasymphysis, Corpus Fracture	4	4.8
Parasymphysis, Condylus Fracture	5	6.0
Object of Collision Target		
Asphalt	71	85.5
Handlebar of motorcycle	5	6.1
Hand	3	3.6
Car	4	4.8
Total	83	100.0

Table 3. The relation between the mechanisms of trauma and the location of mandibular fracture

Location of Mandibular Fracture	Mechanisms of Trauma				Total
	Motorcycle Accident	Car Accident	Falling	Violence	
Parasymphysis	42 (59.2%)	0 (0.0%)	3 (42.9%)	2 (50.0%)	47
Angulus	7 (9.9%)	1 (100.0%)	1 (14.3%)	0 (0.0%)	9
Corpus	6 (8.5%)	0 (0.0%)	1 (14.3%)	0 (0.0%)	7
Ramus	3 (4.2%)	0 (0.0%)	1 (14.3%)	0 (0.0%)	4
Condylus	2 (2.8%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2
Parasymphysis, Angulus	4 (5.6%)	0 (0.0%)	1 (14.3%)	0 (0.0%)	5
Parasymphysis, Corpus	4 (5.6%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	4
Parasymphysis,Condylus	3 (4.2%)	0 (0.0%)	0 (0.0%)	2 (50.0%)	5
Total	71 (100.0%)	1 (100.0%)	7 (100.0%)	4 (100.0%)	83

Score of p=0.709

Table 4. The relation between the object of collision target and the number of mandibular fracture location

Location Number Mandibular Fracture	Object of Collision Target				Total
	Face hit on asphalt	Face hit on handlebar of motorcycle	Face was hit by hand	Face hit on car	
1 Location	54 (76.1%)	4 (80.0%)	1 (33.3%)	1 (25.0%)	60
2 Locations	15 (21.1%)	1(20.0%)	2 (66.7%)	3 (75.0%)	21
3 Locations	2 (2.8%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2
Total	71 (100.0%)	5 (100.0%)	3 (100.0%)	4 (100.0%)	83

Score of p = 0.256

The cases of mandibular fracture more commonly attacked motorcycle drivers wearing helmet, about 45 people (61.6%), meanwhile those not wearing helmet, about 28 people (38.4%). Moreover, the relation of the mechanisms of trauma and the location of mandibular fracture can be explained in Table 3.

From 71 people whose face hit on asphalt, most of them had fracture location in parasymphysis, about 41 people (57.7%), and the least of them had fracture location in condylus and in both parasymphysis and condylus, each of which was 2 people (2.8%). Meanwhile, for those whose face hit on handlebar of motorcycle, 4 (80%) of them had fracture location in parasymphysis. For those whose face was hit by hand, 66.7% of them had fracture location in both of parasymphysis and condylus. For those whose face hit on car, furthermore, they had fracture location in parasymphysis, in angulus, in corpus and in both of parasymphysis and condylus, each of which was about 22.5%.

From 45 people wearing the safety equipment, there were 29 people (64.4%) who had fracture location in parasymphysis, and among those not wearing the safety equipment there were also 13 people (46.4%) who had fracture location in parasymphysis. The relation between the object of the collision target and the number mandibular fracture location, can be explained in Table 4.

DISCUSSION

In this study, it found that mandibular fracture attacked more men, about 64 people (77.1%) than women, about 19 people (22.9%). This phenomenon was appropriate with some literatures discussing that the ratio of mandibular fracture patients, between male and female patients, is 3-6:1. The reason is because men drive or get involve in violence or fight more than women. Moreover, it is also known that mandibular fracture commonly attacked the age group of 21-30 years old, about 37.3%; the age group of 11–20 years old, about 32.5%; the age group of 31–40 years old, about 13.3%; the age group of 41–50 years old, about 7.2%; and the age group of 0–10 years old, about 6% (Table 1). This finding is appropriate with the result of another research stating that mandibular fracture commonly attacks the age group of 15–30 years old since that group is considered as the productive age group.[1,4,6–8]

Actually, there are some factors causing mandibular fracture. The motorcycle accident is the main etiology causing facial trauma in the world.[7–12] Some literatures mentions that 43% of mandibular fracture are caused by motorcycle accident; 34% are caused by violence; 7% are caused by working accident; 7% are caused by falling; 4% are caused by sport accident; and the rest is caused by many others. The location of mandibular fracture is

more commonly found in parasymphysis than in other areas.[1,3,7,9,12–14] Those phenomena are also appropriate with the result of this study finding that mandibular fracture was commonly caused by motorcycle accident, about 71 people (85.5%); the most common type of collision target was collision to asphalt, about 71 people (85.5%); and the location of mandibular fracture was at parasymphysis, about 47 people (56.6%), meanwhile, other fracture locations was about 2.4% to 10.8% (Table 2).

In this study, mandibular fracture more commonly attacked motorcycle drivers wearing helmet. In other words, the result of the study indicates that mandibular fracture more commonly attacked motorcycle drivers wearing helmet than those not wearing helmet. The reason is because most of motorcycle drivers in Indonesia seldom wear standard helmet for protecting head and face.

Based on the result of study conducted by Fridrich *et al*.,[15] it is also known that mandibular fracture caused by car accident is more often located in condylus. Mandibular fracture caused by motorcycle accident often occurs at symphysis or parasymphyisis, meanwhile when caused by violence often occurs at angulus. This fact is also found in this study that from 71 people with trauma mechanisms obtained from motorcycle accident, most of them had fracture location in parasymphysis, which were about 42 patients (59.2%) and among cases of falling from the height, most of them also had fracture location in parasymphysis, about 42.9%, while in violence cases, the fracture location often occurred in parasymphysis and in both parasymphysis and condylus, each about 50%. Nevertheless, the statistic test result, chi square test, with the reliability degree about 95% showed that there were no significant relation between the mechanisms of trauma and the location of mandibular fracture, with the score of p=0.709 (p>0.05) (Table 3).

Based on the result of some studies, it was found that most of mandibular fractures caused by motorcycle accident often occur in parasymphysis.[4,7,12,14] The reason was because in the motorcycle accidents, most of patients face hit on asphalt. This finding was appropriate with the result of this study showing that from 71 people whose face hit on asphalt, most of them had fracture location in parasymphysis, and the fewest of them had fracture location in condylus. However, based on the Chi square test, with the reliability degree 95% it was shown that there were no significant relation between the object of collision target and the location of mandibular fracture with the score of p = 0.550 (p>0.05).

It was shown that from 45 people wearing the safety equipment there were 29 people who had fracture location in parasymphysis, and among those not wearing the safety equipment there were also 13 people who had fracture location in parasymphysis. Nevertheless, based on the statistic test result, chi square test, with the reliability degree 95% it is shown that there were no significant relation between the using of safety equipment and the location of mandibular fracture with the score of p=0.369 (p>0.05). It means that based on the study result, the location of fracture in parasymphysis occurs mostly either in patients wearing safety equipment or those not wearing safety equipment. The reason was because most of motorcycle drivers in Indonesia seldom wear standard helmet for protecting their head and face. The study also finds that mandibular fracture often occur in motorcycle accident, and most of them located in parasymphysis.[4,7,12,15]

Specifically, based on the study result, from 71 people whose face hit on asphalt, there were 54 people (76.1%) who had 1 site fracture location; there were 21.1% who had 2 site fracture locations; and there were 2.8% who had 3 site fracture locations (Table 4). Those findings were appropriate with some literatures mentioning that mandibular fracture occurs in 1 site fracture location (unilateral), about 53%, in 2 site fracture locations, about 37%, and 3 site fracture locations, about 9%.[1] This finding was appropriate with the result of Ajmal *et al*.,[9] study stating that single mandibular fracture was found in 54% while multiple mandibular fractures were seen in 46% of patients. However, based on the chi square test, with the reliability degree 95% it was shown that there was no significant relation between the object of collision target and the location number of mandibular fracture with the score of p = 0.256 (p>0.05).

Based on the result it can be concluded that there was no relation between the etiology the mechanisms of trauma and the pattern of mandibular fracture. There is some limitation in this study, the secondary data and the writer had no opportunity to do exploration on the cases. The exploration that was supposed to do involves things describing trauma specifically, such as the speed of the vehicles, the position of falling/target of collision, and the power of collision. It needs further studies with the larger sample number in order to analyze whether there is a cause-effect relation between the etiology and the mechanisms of trauma and the pattern of mandibular fracture.

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