

Epidemiology of mandibular fractures treated at Kaunas University of Medicine Hospital, Lithuania

Ricardas Kubilius, Tadas Keizeris

SUMMARY

Fractures of the mandible are one of the most common maxillofacial injuries. Because the pattern and incidence of mandibular fractures vary in different countries, there is a need to evaluate aspects of mandibular trauma in Lithuania's population. In this retrospective study hospital files of Oral and maxillofacial surgery unit of Kaunas University of Medicine Hospital were examined. The data that we collected included age, gender, hospitalization time, trauma mechanism, site of fracture, associated injuries, diagnostic and treatment methods. 87.1% of patients were male and they predominated in all age groups with a male to female ratio of 6.8:1. The highest incidence of mandibular fractures in male patients was in the 16-30 year age group and 31-45 year group for females. Interpersonal violence was the main cause of mandibular fractures, followed by falls and road traffic accidents. The incidence of falls in the <16 year age group was higher than expected. The angle was the most common fracture site (34.8%) and 51.7% patients experienced multiple fractures. The mean hospitalization time was 7.34±9.02 days. 55% of patients required Kirschner wire osteosynthesis, open reduction with miniplate osteosynthesis or a combination of both methods.

Key words: mandibular fractures, condyle, interpersonal violence.

INTRODUCTION

Mandible is the only mobile bone of the facial skeleton and its anatomical features make this bone important in speech, mastication and respiration. Skeletal and soft tissues of the face region are prone to injuries as it is the most exposed part of the body [1]. Many authors report mandibular fractures as the most common site of maxillofacial fractures, followed by the zygomatic complex [1,2] and majority of patients fall in the 20-29 year age group [1-3,9-15]. The most common causes of mandibular fractures remain interpersonal violence (IPV), road traffic accidents (RTA), sports and falls with a dominance of IPV [3,4], while some authors point out RTA as the main cause [5,6]. The purpose of this retrospective study is to evaluate current pattern and aetiology of mandibular fractures in middle, southwestern and northwestern Lithuania and provide

detailed information about some aspects of mandibular trauma.

MATERIAL AND METHODS

In this study data of 916 patients who reported to Kaunas University of Medicine Hospital Oral and maxillofacial surgery unit during a 3 year period (January of 2005 to January of 2008) with radiographically and clinically confirmed mandibular fractures were analyzed. 5 patients (.5%) had partially incomplete data but were included in data analysis. Patient details were reviewed retrospectively by examining hospital files. The following data were collected: age, gender, hospitalization time, trauma mechanism, site of fracture, associated injuries, diagnostic and treatment methods.

A database was created in Microsoft Excel. The statistical analysis was performed and results were tested for statistical significance using SPSS 15.0 for Windows. Statistical analyses included descriptive statistics, Student's *t*-test to compare two groups, χ^2 test for bivariate associations and ANOVA followed by Bonferonni test for multiple comparisons. Some results were presented as

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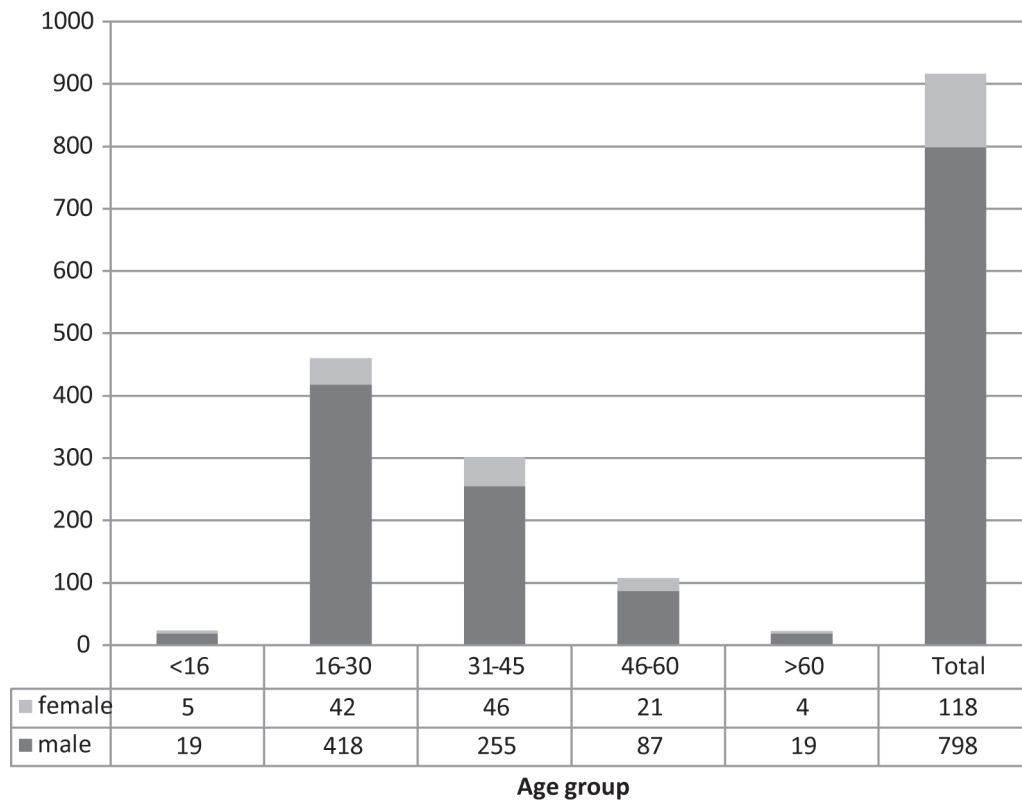


Fig. 1. Distribution of mandibular fractures by age and gender

mean $\pm 1.96 \times$ standard deviation (95% confidence interval).

RESULTS

798 patients were male (87.1% of the population) and 118 patients were female (12.9%) with a male to female ratio of 6.8:1. The patients' age ranged from 1 to 85 years. Mean age of male patients was 31.21 ± 24.24 years and female 35.15 ± 26.63 years and this difference was statistically significant ($p = .001$). The highest incidence of mandibular fractures was in the 16-30 year age group (50.2%), followed by the 31-45 year age group (32.8%) (Figure 1). Men outnumbered women in all the age groups with statistical significance in 16-30 and 46-60 age groups ($p < .05$).

The preponderant cause of mandibular fractures was IPV (71.8%), followed by falls (12.3%) and RTA (6%). The highest incidence of falls was in the <16 year age group at a higher than expected rate. The highest percentage of male and female patients was in IPV (64.6% and 7.2% respectively) and there were no female patients in sports (Table 1).

A total of 916 patients had 1429 mandibular fractures. The most common fracture site by anatomical location was the angle (497 cases, 34.8%), followed by body (382 cases, 26.7%) and condyle (327 cases, 22.9%). 442 patients had isolated fractures (48.3%), among which the commonest was the angle (219

cases, 49.5%) and condyle (97 cases, 21.9%). The dominant fracture site in male patients was the angle (447 cases, 36.1%) and in female patients the mandibular body (61 cases, 31.9%) (Figure 2). Angle, body and parasymphysis fractures statistically significantly occurred more often in male than female patients ($p < .05$). The most common combination of fractures was body and angle (137 cases, 15%), followed by body and condyle (86 cases, 9.4%) and parasymphysis and condyle (43 cases, 4.7%). There were 396 bilateral fractures (43.2%) and right side mandibular fractures were significantly more frequent in male patients (95% CI, $p = .0004$).

69 patients (7.5%) had 102 concomitant maxillofacial fractures, the most common of which was nasal bone and zygomaticomaxillary complex (25 cases each, 24.5% each), followed by maxillary bones (18 cases, 17.6%) and zygomatic complex (9 cases, 8.8%). Preponderant cause of these fractures was IPV (54.7%), followed by RTA (22.1%) and falls (15.1%).

Mean hospitalization time was 7.34 ± 9.02 days. Patients with one fractured mandible site had the shortest hospitalization time (6.74 ± 4.12 days) and the longest (10.86 ± 7.87 days) was for patients with 3 fracture sites (Table 2). There was a statistically significant association between the number of fracture sites and increasing hospitalization time, except those who had 4 fracture sites of the mandible (Table 3).

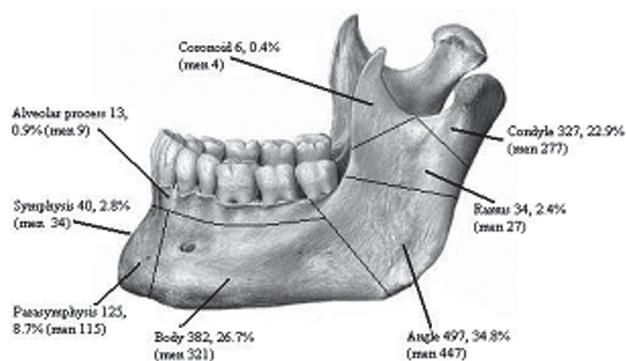


Fig. 2. Site of mandibular fractures

The most common mandibular fracture diagnostic method was anteroposterior craniogram combined with orthopantomogram (65.5%). Only anteroposterior craniogram was taken for 9% of patients and orthopantomogram for 24.9% of patients.

Conservative treatment (intermaxillary fixation) as initial therapy was applied to 685 (74.8%) patients and for 374 of these patients (54.6%) it was successful. Kirschner wire osteosynthesis, open reduction with miniplate osteosynthesis or a combination of both methods were required by 55% of all patients, including those whom conservative treatment was not sufficient, and the most common method (70.6%) was open reduction with miniplate osteosynthesis. When there was more than one fracture site, active treatment was required in 58.2% of patients, statistically significantly more than compared to 51.5% of patients having one fracture site of the mandible (Table 4). 12 patients (1.3%) refused of active treatment.

Table 1. Distribution of mandibular fractures by aetiology and gender

| Aetiology | Men (%) | Women (%) | Total (%) |
|------------------|-------------|-----------|-------------|
| IPV | 592 (64.6%) | 66 (7.2%) | 658 (71.8%) |
| Falls | 88 (9.6%) | 25 (2.7%) | 113 (12.3%) |
| RTA | 41 (4.5%) | 14 (1.5%) | 55 (6%) |
| Daily activities | 32 (3.5%) | 4 (.4%) | 36 (3.9%) |
| Sports | 16 (1.7%) | 0 | 16 (1.7%) |
| Work | 2 (.2%) | 1 (.1%) | 3 (.3%) |
| Others | 26 (2.8%) | 8 (.9%) | 34 (3.7%) |

IPV – interpersonal violence; RTA – road traffic accident.

Table 3. Mean difference of hospitalization time according to number of fractures

| No of fracture sites compared | Mean difference (days) | p (95% CI) |
|-------------------------------|------------------------|------------|
| 1 – 2 | -0.865 | .030 |
| 1 – 3 | -4.123 | .000 |
| 1 – 4 | -0.865 | 1.000 |
| 2 – 3 | -3.257 | .000 |
| 2 – 4 | -0.393 | 1.000 |
| 3 – 4 | 2.865 | 1.000 |

CI – confidence interval.

DISCUSSION

The causes and incidence of maxillofacial fractures varies according to geographical region, culture, socioeconomic status, religion and era [6,7]. In this study men were injured more common and this tendency corresponds to previously published reviews, although male to female ratio varies in different regions [7-14]. The majority of patients (50.2%) were in the 16-30 year age group and this also supports international trends of mandibular trauma [9-15]. K. H. Lee [3] reported falls as a category which accounted for most mandibular fractures in the >60 year age patient group. Contrary to these data we found falls to be responsible for 45.8% (more than expected) of fractures in the <16 year age group and this difference was statistically significant compared to all age groups (95% CI, p<.001). IPV in this age group also accounted for 45.8% (less than expected) of mandibular fractures with a statistically significant difference among all other age groups (95% CI, p<.012) except >60 year age group (95% CI, p=.151). Such results might show a possibility that teenagers tend to report violence as falls because of fear or other reasons. This requires closer investigation. However, we got a striking similarity with K. H. Lee regarding sports. He observed 74% of all sport-related fractures affecting young adults in the 16-30 year age group, compared to 75% of sport injuries falling in the 16-30 year age group in our review.

Many authors have reported road accidents as the main cause of mandibular fractures [5,6,10,14],

Table 2. Mean hospitalization time according to number of fracture sites

| No of fracture sites | Mean hospitalization time (days) |
|----------------------|----------------------------------|
| 1 | 6.74 ± 8.08 |
| 2 | 7.61 ± 8.96 |
| 3 | 10.86 ± 15.42 |
| 4 | 8.00 ± 9.99 |

Table 4. Treatment methods used in cases of one and more than one fracture sites

| Treatment method | 1 fracture site | >1 fracture site | p (95% CI) |
|----------------------------|-----------------|------------------|------------|
| IW | 197 (44.5%) | 177 (37.7%) | .0195 |
| IW followed by KW | 79 (17.8%) | 46 (9.8%) | .0002 |
| ORMO | 83 (18.7%) | 107 (22.8%) | .0637 |
| IW followed by ORMO | 56 (12.6%) | 107 (22.8%) | .0000 |
| IW followed by KW and ORMO | 10 (2.3%) | 13 (2.8%) | .3037 |
| Total active treatment | 228 (51.5%) | 273 (58.2%) | .0203 |

IW – interdental wiring; KW – Kirschner wires; ORMO – open reduction with miniplate osteosynthesis; CI – confidence interval.

while others have reported IPV as the main cause and confirms our results [3,4,12]. This difference is usually explained by different geographical region, culture, socioeconomic status and religion.

We found a statistical significant tendency of hospitalization time increase proportionally to the number of fracture sites of the mandible, except in the group of 4 fracture sites. This might be explained by a small patient population (4 patients, one of them left the hospital without permission after 3 days) in the aforesaid group.

King R. E. *et al* [9] reported a statistically significant association between motor vehicle accidents and parasymphiseal fracture and between assault and angle fracture. In our population the highest incidence of condylar fracture was in RTA, angle fracture occurred most often in sports and IPV.

According to King R. E. *et al* [9], mandibular fractures more often occur in multiple sites. 51.8%

of patients in our study had more than one fracture site, among which the highest incidence was in RTA (67.9%), followed by IPV and falls (52.9% and 47.3%, respectively).

Most fractures which required active treatment were caused by IPV (70.6%), but the highest incidence of active treatment was related to RTA (75.5%). More than half of conservative treatment cases appeared to be successful and the rest 45.4% of patients were treated with Kirschner wires or/and open reduction with miniplate osteosynthesis.

CONCLUSIONS

The leading cause of mandibular fractures is interpersonal violence and most of the affected patients are young men. There is a need of further investigation for possible associations between mandibular injuries and other contributing factors.

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