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Incidence and etiology of mandibular fractures treated in Vilnius University Hospital Žalgiris Clinic, Lithuania: a review of 1 508 cases

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Relevance of the study: this is the first Lithuanian study, which analyzes in detail the incidence, etiology and circumstances of mandibular fractures treated in the Vilnius University Hospital, Lithuania. The data and findings of this study are compared with other studies, identifying specific mandibular trauma patterns in Lithuania.

Background. During past few decades, the socioeconomic situation in Lithuania has been changing significantly, and there is a need to evaluate data about mandibular fracture epidemiology and etiology. The aim of the study was to analyse the incidence, etiology, circumstances and localization of mandibular fractures treated in the Department of Oral and Maxillofacial Surgery, Vilnius University Hospital Žalgiris Clinic, Lithuania.

Materials and methods. The medical records of 1 508 patients with mandibular fractures, treated between 1 January 2005 and 31 December 2009, were reviewed. The following data were analysed: age, gender, trauma date and time, etiology and circumstances of trauma, fracture area.

Results. The male : female ratio was 7.3 : 1. The majority of patients (53.6%) were young people, aged 16–30 years. Mandibular fractures most often (53%) occurred between May and September, mostly at weekends (61%) and in the late evening (60%). The main cause of mandibular fractures was interpersonal violence (70%), followed by falls and accidents (19%), and road traffic accidents (6%). Even 15% of men and 10% of women were alcohol intoxicated at the time of trauma. The most common fracture area was mandibular angle (32%) and condylar process fractures (31%).

Conclusions. The incidence of mandibular fractures was remarkably larger in the male, during the second and third decade of life. Most mandibular fractures occurred in the warm period of the year, especially at weekends and late evening. The mandibular basis region was the most common fracture site. The most common cause of mandibular fractures was assault.

Key words: mandibular fractures, etiology, localization

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INTRODUCTION

Mandibular fracture is the second most common facial injury after nasal bone fractures (1). Despite the fact that the mandible is the heaviest and strongest facial bone, it is prone to fractures for some specific reasons. This bone is an open arch and is located in the lower portion of the face. Soft tissues in the mandibular area are thin and there are weak areas of the mandible, such as central incisor, canine, condylar process regions, which are especially prone to fracture (1). The mandible also gets atrophy as a result of aging. Causes of mandible fracture have an extremely variable incidence depending on social, geographic and economic characteristics (2–6). In Austria, the main cause of mandible fracture is related with sport activities (5). Other countries, such as Hawaii (2), Zimbabwe (3), Canada (6), present interpersonal violence as the most common cause. Road traffic accidents are reported to be the leading causes of mandibular fractures in USA (7) and Pakistan (8).

During past few decades, the socioeconomic situation in Lithuania has been changing significantly, and there is a need to evaluate data about mandibular fracture epidemiology and etiology. Some data about mandibular fractures from the middle part of Lithuania has been published (9), but no detailed analysis about the circumstances of mandibular fractures has been performed.

The purpose of this retrospective study was to analyse the incidence, etiology, circumstances and localization of mandibular fractures treated in the Centre of Oral and Maxillofacial Surgery, Vilnius University Hospital Žalgiris Clinic, Lithuania (VUHZC), and to find out the distribution of mandibular fractures according to patients' age, gender, alcohol intoxication prevalence, time, cause of injury and type of fracture.

MATERIALS AND METHODS

The medical records of 1 508 patients with mandibular fractures, treated during the period from 1 January 2005 to 31 December 2009, were reviewed. During this five-year period in the VUHZC, 1 845 patients with mandibular fractures were treated. Approximately 369 ± 26 patients are treated annually. This type of facial injury makes about 61% a year of all oral and maxillofacial patients treated due to facial bone fractures in the VUHZC. Medical records with some inconsistent data were excluded from the study (n = 337). The following data were analysed: age, gender, trauma date and time, etiology and circumstances of trauma, fracture area. The fracture area was recorded from diagnosis and revised from conventional radiograms (anteroposterior, lateral-oblique and Towne radiographs) and ortopantomograms, which were reviewed in the medical record archive. The fractures were classified according to their sites as condylar process fractures, coronoid process fractures, ramus fractures, angle fractures, body fractures and alveolar ridge fractures. All condylar process fracture diagnoses were revised radiologically and classified as condyle fractures, neck fractures and subcondylar fractures. Statistical analysis was undertaken using SPSS version 17.0 software packages. The data was statistically examined by chi square tests.

RESULTS

The mean age of patients with mandibular fractures was 31.67 ± 12.67 years. The mean age of male patients with mandibular fractures was 31.05 ± 12.62 years and that of female patients was 36.37 ± 12.63 years. More than half of all patients (53.6%) were from 16 to 30 years old. They suffered mandibular fractures more often compared with other age groups (Fig. 1). The majority of patients (88% of all) were men and only 12% of them were women. The male to female ratio was 7.3 : 1.

Most of all mandibular fractures (53%) occurred in the warm period of the year, between May and September, especially in July (Fig. 2). During the week days mandibular fractures mostly occurred at the end of the week (61%) (Fig. 3). The higher incidence of mandibular injuries was noted mainly between 6 PM and 1 AM (60%), with a peak value at 11 PM (11%) (Fig. 4). Only 14% of mandibular fractures occurred from 4 AM to 1 PM and only few of them occurred at 8 AM.

The present study revealed the reasons of mandibular fractures, such as assault (70%), followed by falls and accidents (19%), which included trauma at work place, sports trauma, injuries by animals, injuries during an epileptic fit. Only 6% of mandibular fractures were due to traffic accidents and 5% of mandibular fracture causes were unclear.

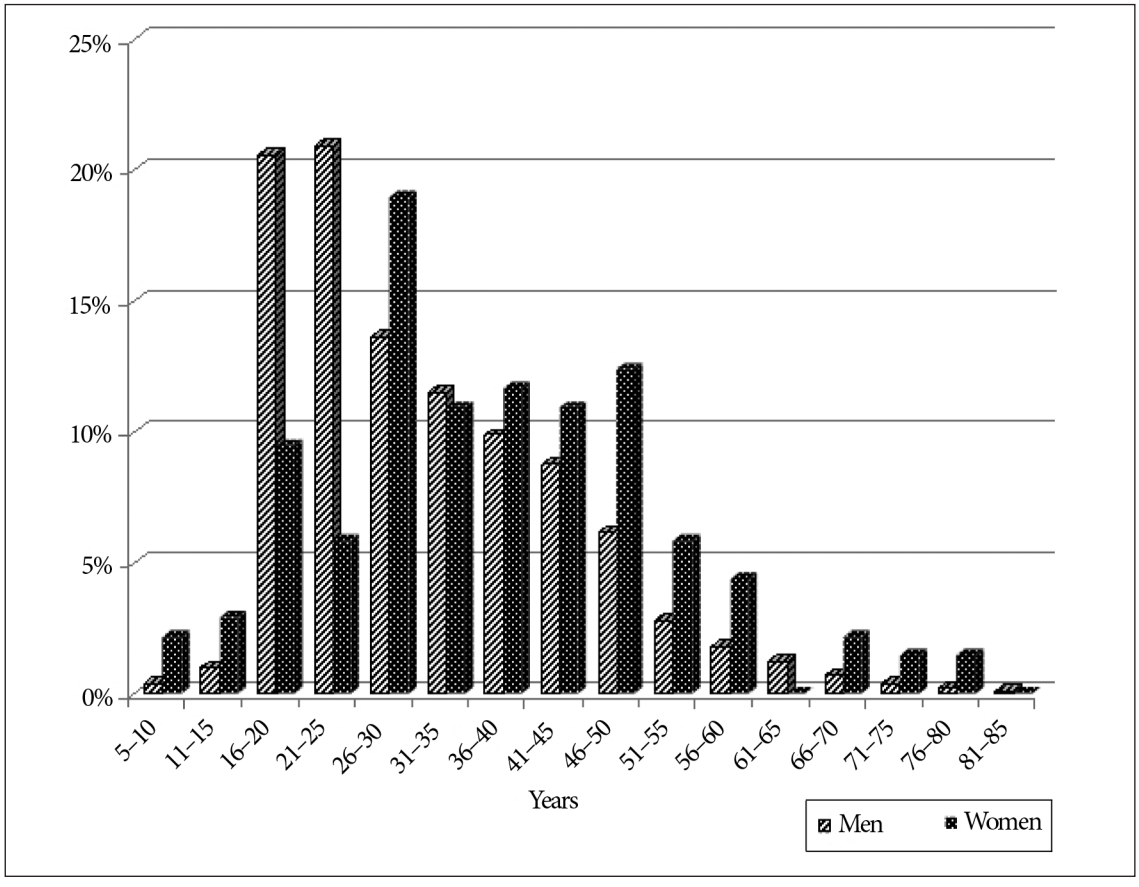

Fig. 1. The distribution of mandibular fractures according to patient's age

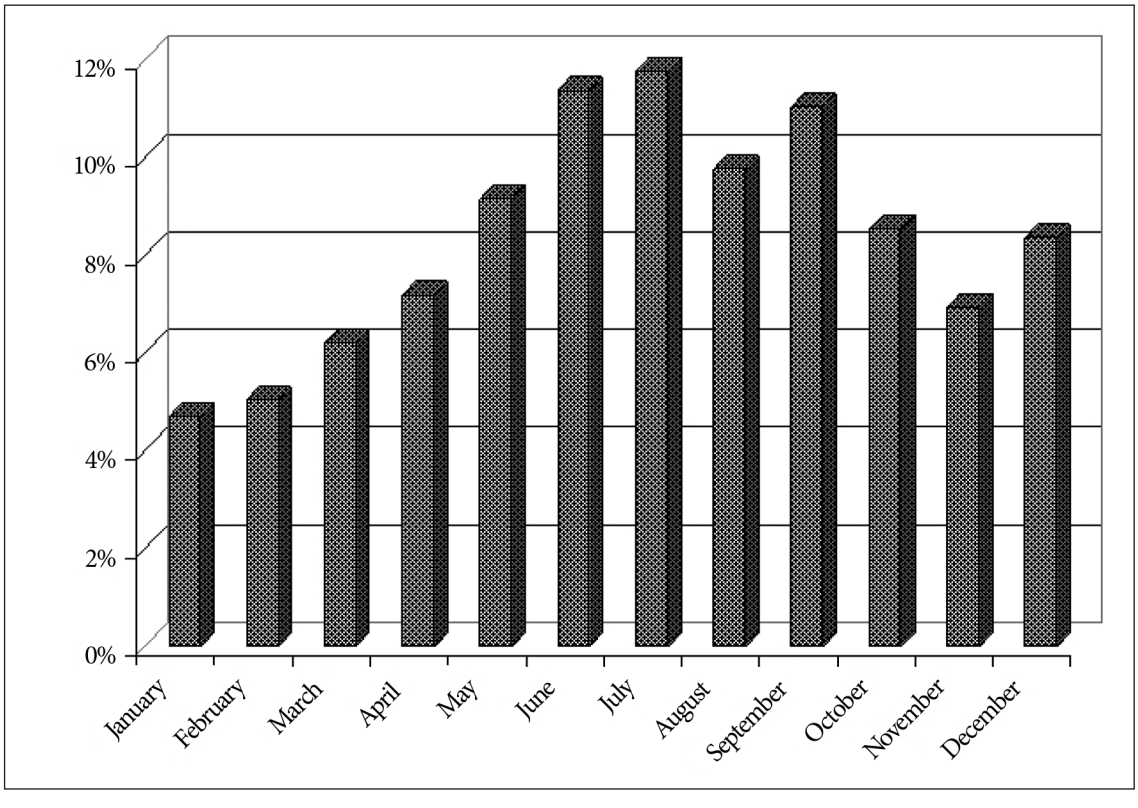

Fig. 2. Distribution of mandibular fractures according to the month of the year

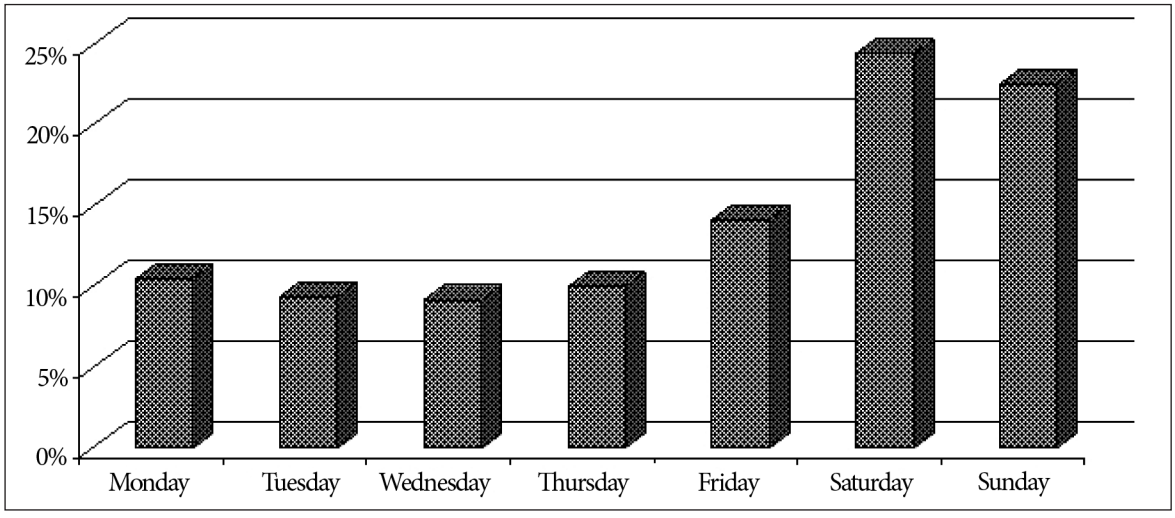

Fig. 3. Distribution of mandibular fractures according to the day of the week

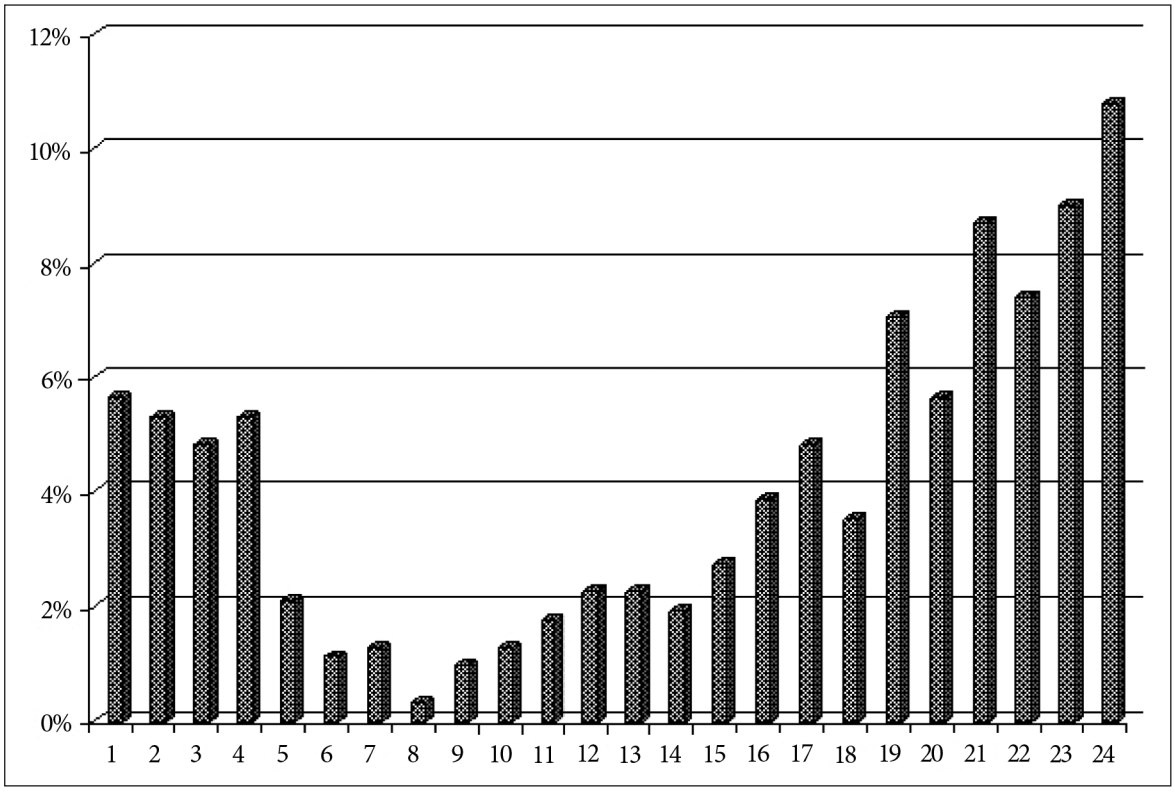

Fig. 4. The distribution of mandibular fractures during 24 hours

Assault was reported to be the most common cause of mandibular fractures. Even 71% of patients were assaulted by unfamiliar people, 27% by familiar people – friends, relatives, neighbors etc. 2% of patients suffered mandibular fracture during robbery or at work. In the present study, a statistically significant difference was found between patient's age and the cause of injury. People from 16 to 30 years old suffered more mandibular fractures due to assault compared with other age groups ($\chi^2 = 24.428$; df = 6; $p < 0.01$). Men, aged 16–25, suffered mandibular fractures more frequently than women. Although in general there were more male patients than female, but the percentage of mandibular fractures was greater among women, who were over 35 years old (Fig. 1).

Falls and accidents were the second most common cause of mandibular fractures. The majority of

Table. The distribution of patients' mandibular fracture causes according to alcohol use at the time of trauma

Causes of mandibular fractures	Sober n = 861		Intoxicated n = 217		Unclear n = 430	
	Men n = 756	Women n = 105	Men n = 199	Women n = 18	Men n = 372	Women n = 58
Assault	69%	53%	79%	93%	70%	50%
Falls and accidents	22%	33%	9%	7%	13%	43%
Traffic accidents	5%	13%	6%	–	9%	–
Sport	4%	1%	–	–	2%	–
Do not remember	–	–	6%	–	6%	7%

them (68%) were outdoor falls, followed by indoor falls (19%). 5% of patients were injured by animals (horses and cows), 5% suffered mandibular fractures at work and 3% were injured during an epileptic fit.

Even 15% of men and 10% of women were alcohol intoxicated at the time of trauma. Alcohol intoxicated patients were more frequently assaulted than not intoxicated patients and this difference was statistically significant ($\chi^2 = 23.754$; df = 6; $p < 0.01$). Men, both sober (57%) and intoxicated (15%), suffered most of mandibular fractures due to assault. Women, who were alcohol intoxicated (10%), more often were assault victims compared to those, who were not intoxicated (58%) and this difference was statistically significant ($\chi^2 = 54{,}608$; df = 8; $p < 0.001$) (Table). The number of alcohol intoxicated patients might be higher because 28% of men and 32% of women were difficult to determine whether they were alcohol intoxicated during trauma. Many patients delay seeking medical care after trauma, try to conceal alcohol intoxication or deny the influence of alcohol or drugs because it directly affects health insurance and a patient loses money while in a hospital.

The most common fracture area was mandibular angle (32%) and condylar process fractures (31%). The mandibular canine region was the most common mandibular body fracture site (15.73% of all fractures), followed by the mandibular premolar region (15.17% of all fractures). All condylar process fractures were revised radiologically and classified into 3 groups: condyle fractures (23%), neck fractures (42%) and subcondylar fractures (35%). There were more double (48.6%) mandibular fractures than single (48.1%) or multiple fractures (3.3%). Men suffered more mandibular angle fractures than women and this difference was statistically significant ($\chi^2 = 54.114$; df = 8; $p < 0.01$). Assault victims more often suffered mandibular angle fractures than patients, who sustained mandibular traumata due to other causes ($\chi^2 = 74.114$; df = 10; $p < 0.01$).

DISCUSSION

Many studies have been published on mandibular fractures etiology worldwide (4, 7, 10). The causes, types, and sites of these fractures change with geographic area, population density and cultural differences (11, 12). This type of facial injury makes about 61% a year of all oral and maxillofacial patients treated due to facial bone fractures in VUHZC. This department is the biggest department of maxillofacial surgery in Lithuania, where patients are treated mostly from the eastern and central part of Lithuania. The population of these districts is more than half of the whole Lithuanian population, which in the year 2009 was 3.345 million people (13). Patients from other parts of the country are also treated in this department.

Approximately 369 ± 26 patients due to mandibular fractures are treated annually in the VUHZC. However, the overall number of patients with mandibular fractures is bigger because some patients refuse to be hospitalized or are treated in other hospitals due to politrauma, and they are not included in this study.

Mandibular fractures occur mostly for male patients, because the male to female ratio in the Lithuanian population in 2009 was 1.15 : 1. In the present study, the male-to-female ratio was even 7.3 : 1. This ratio is higher than that reported in other Lithuanian study (6.8 : 1) (9). Ratios in other studies ranged from 2.7–2.9 : 1 (11, 14) to 6.5–6.6 : 1 (10, 12) or even to 9 : 1–11 : 1 (15, 16). According to other studies, high male to female ratio, such as in Kuwait and United Arab Emirates (15, 16), is asso-

ciated with a great percent (55–75%) of mandibular fractures caused by traffic accidents. In countries with lower male-to-female mandibular fractures ratio, such as Germany and Finland (11, 17), the main cause of mandibular trauma was assault. Canada and Brazil studies report similar male-to-female ratios (5.0 : 1 and 6.6 : 1, respectively) to the present study (6, 12). Male predominance in many studies (6, 12, 15, 16) is associated with being prone to traffic accidents and violence. The reason for high male-to-female ratio in the present study might be that men are more subject to forced conflicts and violent injuries, and also they are more often intoxicated with alcohol. Most of all mandibular fractures occurred in the warm period of the year, with significant increase at the end of a week. The trauma peak time (11 PM) also correlates with higher crime rate at night. Only 14% of mandibular fractures occurred from 4 AM to 1 PM when the crime rate is low.

In the present study, violence was the main cause (70%) of mandibular trauma and it usually includes street assaults and domestic violence. These figures are one of the highest among similar studies: 10% in Kuwait (17); 28% in Freiburg, Germany (11); 37% in Oulu, Finland (17) and 54% in Toronto, Canada (6). This might be explained as a result of the social and economic status. The epidemiological factors involved in the development of mandibular fractures have been widely investigated both within Australia and worldwide. In the majority, there is an agreement among population groups with similar social and cultural dynamics. For example, assaults are often the principal mechanism of injury in developed countries such as Australia (10). Lithuania during the period 2005 to 2008 was a growing economy country with the capital Vilnius, which is a strong economic center and attracts many workers from province with different cultural patterns. There are also many high schools which attract young people, who are at increased risk to suffer a mandibular fracture. Like in most of the studies worldwide, the third decade of life is most susceptible to suffer a mandibular fracture, and this could be also associated with increased violence and alcohol abuse. In this study even 217 mandibular fractures were associated with alcohol abuse. However, other studies report different findings. For example, in Sweden, alcohol or narcotic involvement in mandibular fracture has been reported to be as high as 56%, and most of the cases associated with violence (79%) are linked to alcohol abuse (18). In the present study, the percentage of mandibular fractures was greater among women who were over 35 years old (Fig. 1). This could be associated with increasing domestic violence due to alcohol abuse in Lithuania. These problems are common not only in Lithuania, but also across the European Union. According to the Council of Europe, one in four European women experiences domestic violence at some point in her life (19).

The second cause of mandible fractures is falls and accidents. Compared to other studies (6, 11, 12, 14), this is also a high percentage from all mandibular fractures and the reasons for that might be mainly associated with alcohol abuse. Alcohol is a big problem in Lithuania, being a cause of traffic accidents, falls, and violence. For example, in 2009 almost 300 traffic accidents out of 3 750 accidents (8%) were caused by alcohol intoxicated drivers (20). In this study, even 430 of 1 508 patients (29%) were difficult to determine whether they were intoxicated with alcohol or drugs during trauma. Many patients delay seeking medical care after trauma, try to conceal alcohol intoxication or deny the influence of alcohol or drugs because it directly affects health insurance and a patient loses money while in a hospital.

Traffic accidents were found to be the third cause (6%) of mandibular trauma and are less common compared to other countries. According to other studies, the number of traffic accidents, as a cause of mandibular fractures, varies among countries. Traffic accidents are less common in Toronto, Canada (6.6%) (17). More mandibular fractures occur due to traffic accidents in Germany (32%) (11) and Brazil (22%) (12), being the main cause of mandibular trauma in Portugal (53.9%) (21). Some patients (about 20–25 per year) with politrauma are treated in other hospitals of the city, such as Vilnius University Emergency Hospital or Vilnius University Children's Hospital and were not included in this study therefore the percent of mandibular fractures due to traffic accidents could be a little higher.

The results of anatomic fracture location indicate weak sites of the mandible. In the present study, even 32% were localized in the mandibular angle and 31% in the condylar process. The mandibular canine region was the most common mandibular body fracture site (15.73% of all fractures), fol-

lowed by the mandibular premolar region (15.17% of all fractures). Condylar process was found to be most prone to fracture in Germany (42%) (11) and United Arab Emirates (25%) (15). Studies carried out in Australia (10) accentuated the weakness of the mandibular angle. Body fractures as weak sites of the mandible were reported in Brazil (12) and Turkey (22). However, some variations among studies were observed. For example, simphysis, as the weakest site of the mandible, was reported to be in Thailand (45.3%) (23).

CONCLUSIONS

The incidence of mandibular fractures was remarkably larger in the male, during the second and third decade of life. Most mandibular fractures occurred in the warm period of the year, especially at weekends and in the late evening. The mandibular basis region was the most common fracture site. The most common cause of mandibular fractures was assault.

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APATINIO ŽANDIKAULIO LŪŽIŲ, GYDYTŲ VILNIAUS UNIVERSITETO LIGONINĖS ŽALGIRIO KLINIKOJE, DAŽNUMAS IR ETIOLOGIJA: 1 508 ATVEJŲ APŽVALGA

Santrauka

Įvadas. Per pastaruosius dešimtmečius Lietuvos socioekonominė situacija ženkliai pasikeitė, todėl iškilo poreikis įvertinti apatinio žandikaulio lūžių dažnumą ir etiologiją. Šio darbo tikslas buvo ištirti apatinio žandikaulio lūžių, gydytų Vilniaus unversiteto ligoninės Žalgirio klinikos Veido ir žandikaulių chirurgijos skyriuose, dažnumą, etiologiją, traumos aplinkybes ir lūžių lokalizacijas.

Tyrimo medžiaga ir metodai. Išanalizuotos 1 508 patientų, gydytų dėl apatinio žandikaulio lūžių nuo 2005 01 01 iki 2009 12 31, ligos istorijos. Analizuoti šie duomenys: amžius, lytis, traumos data ir laikas, traumos etiologija ir aplinkybės, lūžio lokalizacija.

Rezultatai. Vyrų ir moterų santykis buvo 7,3 : 1. Dauguma pacientų (53,6 %) buvo jauni asmenys – 16–30 metų amžiaus. Apatinio žandikaulio lūžiai daugiausia (53 %) pasitaikydavo tarp gegužės ir rugsėjo mėnesių, savaitgaliais (61 %) ir vėlai vakare (60 %). Dažniausia lūžių priežastis – smurtas (70 %), kritimai ir kiti nelaimingi atsitikimai (19 %) bei eismo įvykiai (6 %). Net 15 % vyrų ir 10 % moterų traumų metu buvo neblaivūs. Dažniausi apatinio žandikaulio lūžiai buvo kampo (32 %) ir sąnarinės ataugos srityje (31 %).

Išvados. Apatinio žandikaulio lūžiai dažniau pasitaiko vyrams antrajame ir trečiajame jų gyvenimo dešimtmetyje. Dauguma lūžių įvyksta šiltuoju metų laiku, ypač savaitgaliais ir vėlai vakare. Dažniausia pasitaikančios lūžių lokalizacijos – apatinio žandikaulio pamatas, dažniausia priežastis – smurtas.

Raktažodžiai: apatinio žandikaulio lūžiai, etiologija, lokalizacija