COMPARISON BETWEEN SURGICAL AND NON-SURGICAL METHODS FOR THE TREATMENT OF MANDIBULAR FRACTURES

Horaţiu Urechescu [1], Marius Pricop [1], Simona Apostol [2], Corina Vernic [3]

[1] "Victor Babeş" University of Medicine and Pharmacy Timisoara, Department of Maxillofacial Surgery
[2] "Tibiscus" University of Timisoara, Faculty of Computer and Applied Computer Science
[3] "Victor Babeş" University of Medicine and Pharmacy Timisoara, Department of Functional Sciences

Corresponding author: Horaţiu Urechescu, uhc_83@yahoo.com

ABSTRACT: The mandible is the most common fractured bone of the facial skeleton. The aim of the study is to make an analysis mainly regarding the two options of treatment, the surgical and non-surgical methods. The study included all 65 patients (mean age 32.08±15.024 years) who were treated for mandible fractures within Timisoara's Department of Maxillofacial Surgery in 2013. Considering the current social and economical context we thought that a cost analysis of the two methods of treatment is useful. We took in consideration the days of hospitalization and the hospitalization cost.
KEYWORDS: mandible fracture, hospitalization cost, hospitalization days.

1. INTRODUCTION

The mandible is the most common fractured bone of the facial skeleton. Due to its structure the mandible has an impact strength four times higher than the maxillary bone. However, because of its position and prominence, the mandible is more frequently exposed to trauma.

Men are more likely to suffer mandible fractures than women, approximately 70% of mandible fractures are found in male patients. Young adults aged 20 to 45 years are most affected by this kind of trauma. Often mandible fractures are associated with other injuries of the head and region.

There are many classifications of the mandible fractures but the most useful is the one considering the location, because both the signs and symptoms, and also the treatment are dependent upon the location of the fracture. The mandible is divided into the following zones for the purpose of describing the location of a fracture: condylar, coronoid process, ramus, angle of mandible, body, parasymphysis and symphysis. Due to anatomical considerations the most often injured parts of the mandible are the body and the condylar region. The least affected is the coronoid process and a fracture at this level is usually associated with other mandibular fracture or with a fracture of the zygomatic complex.

Regarding the etiology, human assaults and vehicular accidents are the primary causes of mandible fractures worldwide. Other causes include work-related causes, falls, sporting accidents, miscellaneous causes.

Objectives of treatment include anatomic reduction of fracture segments, restoration of initial pretrauma occlusion, and avoidance of complications. The two treatment options to consider are closed or open reduction. Closed reduction (or orthopedic treatment) maintains the segments by maxillomandibular fixation. Open reduction (or surgical treatment) allows for direct evaluation of the mandibular segments and further for internal or external fixation. Internal fixation (osteosynthesis) can be accomplished by wire (used more historically), titanium plate and screw fixation.

2. MATERIAL AND METHODS

This retrospective research was performed in all 65 subjects (mean age 32.08 ± 15.024 years) who were hospitalized for mandible fractures within Timisoara's Department of Maxillofacial Surgery in 2013.

The subjects were selected using the Info World – Hospital Manager Suite, the software used by all departments of Timisoara's City Emergency Hospital. The subjects were organized in a data base created in Microsoft Office Excel 2007 containing the following fields: age, sex, urban-rural classification, days of hospitalization, diagnosis, type of fracture, etiology, type of treatment, hospitalization cost, food cost, medication cost, sanitary materials cost, laboratory tests cost, total cost. In order to compare the hospitalization days and cost we have split the subjects in two groups. The first group included the patients that underwent surgical treatment and the second group the patients with ortophedic treatment.

Statistical analysis was performed with SPSS 20 and OpenEpi. Means, standard deviation and proportions are presented. Student's t test was used to compare mean values between groups and proportions as appropriate. A P-value <0.05 was considered statistically significant.

3. RESULTS

Within the 65 patients, 5 (7.7%) were women and 60 (93.3%) were men as shown in Table 1. This confirms the data found in literature reporting the incidence of mandible fracture as being higher in men compared to women.
34 patients (52.3%) were from urban areas and 31 (47.7%) were rural patients.

Table 1. Sex distribution of the patients

Sex					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	F	5	7.7	7.7	7.7
	M	60	92.3	92.3	100.0
	Total	65	100.0	100.0	

The subjects were aged 7 to 87 years; mean age was 32.08 ± 15.024. (Table 2) Regarding the distribution on life decades, the most affected were the patients aged 21 to 30 years (20%, n=13). The majority of patients were aged 11 to 50 years (86.15%, n=56) as shown in Figure 1.

Table 2. Age distribution of the patients

Age		
N	Valid	65
	Missing	0
Mean		32.08
Std. Deviation		15.024
Minimum		7
Maximum		87

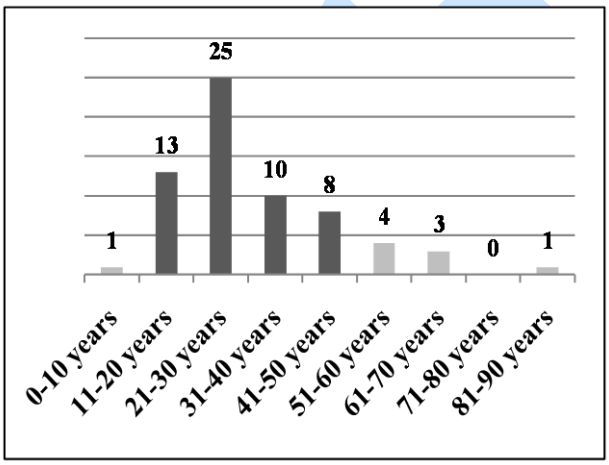

Fig.1. Patients distribution by life decades

The research confirms the data from the literature regarding the etiology of the mandible fractures. The main cause of injury is represented by the human assaults (87.7%, n=48), followed by vehicular accidents (10.8%, n=7), falls (9.3%, n=6), animal assaults (1.5%, n=1) and pathologic fracture (1.5%, n=1). (Table 3)
When analyzing etiology reported to age we observe that the number of human assaults is higher amoung subjects aged 11 to 40 years (n=38) with a maximum (n=21) for subjects aged 21 to 30 years. Also, from a total of 48 human assaults included in the present research, 45 were suffered by men and only 3 by women.

Table 3. Patient distribution by etiology

Etiology					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Work-related causes	2	3.1	3.1	3.1
	Vehicular accidents	7	10.8	10,8	13.8
	Human assaults	48	73,9	73,9	87.7
	Falls	6	9,3	9,3	97
	Pathologic fracture	1	1.5	1.5	98.5
	Animal assaults	1	1.5	1.5	100.0
	Total	65	100.0	100.0	

Regarding the type of treatment that was conducted, 56.9% (n=37) of the subjects underwent surgical treatment, 40% (n=26) ortophedic treatment, 1.5% (n=1) no treatment was necessary and in case of 1.5 (n=1) the treatment proposed was refused by the patient. (Table 4)

Tabel 4. Type of treatment

Treatment					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Surgical	37	56,9	56,9	56.9
	No tratment	1	1.5	1.5	58.5
	Treatment unnecessary	1	1.5	1.5	60.0
	Ortophedic	26	40	40	100.0
	Total	65	100.0	100.0	

All patients included in the present research were hospitalized within Timisoara's Department of Maxillofacial Surgery. The number of hospitalization days varied from 1 to 20 days (mean 5.54±3,523). (Tabel 5) Statisticaly the most common number of hospitalization days was 3 (16.9%, n=11).

Tabel 5. Hospitalization days

Hospitalization days		
N	Valid	65
	Missing	0
Mean		5.54
Std. Deviation		3.523
Minimum		1
Maximum		20

In order to compare the hospitalization days and cost we have split the subjects in two groups. The first group included 37 patients that underwent surgical

treatment (Table 6) and the second group included 26 patients with ortophedic treatment (Table 7).

When analyzing the first group of the patients that underwent surgical treatment the mean of hospitalization days was 7.51±3.185. The minimum number of hospitalization days was 3 and the maximum number was 20.

The mean of hospitalization cost was 1877.05 ±827.961 RON, with minimum of 678 RON and a maximum of 4896 RON.

The mean of food cost was 34.678±15.5231 RON, with a minimum of 9.4 RON and a maximum of 94 RON.

The mean of medication cost was 402.78595±219.514783. The mean of sanitary materials cost was 54.1330±26.46061 RON.

Laboratory tests were necessary only for 27 of the 37 subjects that underwent surgical treatment and the mean cost was 76.0926±71.42575 RON.

The mean of total cost regarding the subjects that underwent surgical treatment was 2396.51649±1026.084154. The minimum cost was 1154.527 RON and the maximum cost was 6354.453.In case of the second group, that of the patients who underwent surgical treatment, the mean of hospitalization days was 3±1.897. The minimum number of hospitalization days was 1 and the maximum number was 8.

The mean of hospitalization cost was 819±517.981 RON, with minimum of 273 RON and a maximum of 2184 RON.

The mean of food cost was 14.158±8.9225 RON. The mean of medication cost was 51.20212±37.180333. The mean of sanitary materials cost was 14.7284±14.97377 RON.

Laboratory tests were necessary only for 4 out of the 26 subjects that underwent ortophedic treatment and the mean cost was 50.1575±27.07663 RON.

Table 6. Group 1 - Subjects that underwent surgical treatment

Surgical treatment								
		Hospitalization days	Hospitalization cost (RON)	Food cost (RON)	Medication cost (RON)	Sanitary materials cost (RON)	Laboratory tests cost (RON)	Total cost (RON)
N	Valid	37	37	37	37	37	27	37
	Missing	0	0	0	0	0	10	0
Mean		7.51	1877.05	34.678	402.78595	54.1330	76.0926	2396.51649
Std. Deviation		3.185	827.961	15.5231	219.514783	26.46061	71.42575	1026.084154
Minimum		3	678	9.4	70.904	6.48	13.06	1154.527
Maximum		20	4896	94.0	1186.914	118.81	421.79	6356.453

Table 7. Group 2 - Subjects that underwent ortophedic treatment

Ortophedic treatment								
		Hospitalization days	Hospitalization cost (RON)	Food cost (RON)	Medication cost (RON))	Sanitary materials cost (RON)	Laboratory tests cost (RON	Total cost (RON)
N	Valid	26	26	26	25	25	4	26
	Missing	0	0	0	1	1	22	0
Mean		3.00	819.00	14.158	51.20212	14.7284	50.1575	899.20127
Std. Deviation		1.897	517.981	8.9225	37.180333	14.97377	27.07663	557.257163
Minimum		1	273	4.7	3.640	.45	11.46	288.169
Maximum		8	2184	37.6	123.036	47.93	68.87	2355.142

Table 8. Student's t test mean values comparison

Statistics				
	Surgical treatment	Ortophedic treatment	p	Significance
Hospitalization days	7.51 ± 3.185 (n=37)	3.00 ± 1.897 (n=26)	< 0.001	ES
Hospitalization cost	1877.05 ± 827.961 (n=37)	819.00 ± 517.981 (n=26)	< 0.001	ES
Food cost	34.678 ±15.5231 (n=37)	14.158 ± 8.9225 (n=26)	< 0.001	ES
Medication cost	402.78595 ± 219.514783 (n=37)	51.20212 ± 37.180333 (n=25)	< 0.001	ES
Sanitary materials cost	54.1330 ± 26.46061 (n=37)	14.7284 ± 14.97377 (n=25)	< 0.001	ES
Laboratory tests cost	76.0926 ± 71.42575 (n=27)	50.1575 ±27.07663 (n=4)	0.04962	S
Total cost	2396.51649 ± 1026.084154 (n=37)	899.20127 ± 557.257163 (n=26)	< 0.001	ES

The mean of total cost regarding the subjects that underwent ortophedic treatment was 899.20127±557.257163. The minimum cost was 288.169 RON and the maximum cost was 23355.142 RON.

Student's t test was used to compare mean values between groups. A P-value <0.05 was considered statistically significant. (Table 8)

Excepting the laboratory tests cost, in case of all the parameters analyzed the P-value was <0.001. This means that we have highly significant differences between the surgical and ortophedic treatment regarding days of hospitalization, hospitalization cost, food cost, medication cost, sanitary materials cost, and total cost. In case of the laboratory tests cost the P-value was 0.04962, showing a significant difference between the surgical and ortophedic treatment.

4. DISCUSSIONS AND CONCLUSIONS

The current research shows that in case of mandible fracture the costs associated with the surgical treatment are higher than those associated with the ortophedic treatment. The total cost of the hospitalization is in direct relation with the number of days the patient was admitted.

In case of surgical treatment, beside the hospitalization costs, we need to take in consideration the costs with general anaesthesia and with osteosynthesis plates and screws. This kind of cost was not included in this study. Another fact to consider is the possibility of rehospitalisation of the surgically treated patients for removal of the plates and screws after the bone consolidation is completed. All these further increase the costs of the surgical treatment.

Only 2 of all 65 patients included in this study presented septic complications and required a second hospitalization.

A mandible fracture is a severe medical condition and, regardless of the treatment option, this kind of trauma needs a recovery period in which the person involved is professionally and socially inactive. Our research confirms the fact that the incidence of mandible fracture is higher in men and the main cause is human assault.

We can observe that the incidence is higher until the age of 50, period of life when an individual is the most active professionally.

REFERENCES

[Boc85] **Bochlogyros P. N.** - *A retrospective study of 1,521 mandibular fractures*. J Oral Maxillofac Surg 43:597, 1985.

[Buc09] **Bucur A.** - *Compendiu de chirurgie oro-maxilo-facială*. Q med Publishing, 2009.

[Bur08] **Burlibasa C.** – *Chirurgie orală şi maxilo-facială*. Ed. Medicală 2008.

[FOA03] **Fasola A. O., Obiechina A. E., Arotiba J. T.** - *Incidence and pattern of maxillofacial fractures in the elderly*. Int J Oral Maxillofac Surg 2003;32:206–8.

[F+04] **Fernandez Garcia A., Garcia Recuero I., Sanchez Aniceto G., Garcia Marin F.** - *Tratamiento de las fracturas de mandibula. În: Navarro Vila C (ed.): Cirugia oral y maxillofacial*. Aran Ediciones, Madrid, 2004.

[HPI90] **Haug R. H., Prather J., Indresano A. T.** - *An epidemiologic survey of facial fractures and concomitant injuries*. J Oral Maxillofac Surg 48:926-32,1990.

[LK05] **Lore J. M., Klotch D. W.** - *Fractures of facial bones. In: Lore JM, Medina JE (eds.): An atlas of head & neck surgery, Fourth Edition*. Elsevier Saunders, Philadelphia, 2005.

[OBB03] **Ogundare B. O., Bonnick A., Bayley N.** - *Pattern of mandibular fractures in an urban major trauma center*.J Oral Maxillofac Surg 2003;61:713–8.