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ORIGINAL ARTICLE

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Management of maxillofacial trauma in the elderly: A European multicenter study

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Abstract

Background/Aims: Management of maxillofacial trauma in the geriatric population poses a great challenge due to anatomical variations and medical comorbidities. The aim of this study was to analyze the management variables, timing, and outcomes of

facial fractures in elderly patients (aged 70 years or more) at several European departments of oral and maxillofacial surgery.

Materials and Methods: This study was based on a systematic computer-assisted database that allowed the recording of data from all geriatric patients with facial fractures from the involved maxillofacial surgical units across Europe between 2013 and 2017.

Results: A total of 1334 patients were included in the study: 665 patients underwent closed or open surgical treatment. A significant association ($P < .005$) was found between the presence of concomitant injuries and a prolonged time between hospital admission and treatment. The absence of indications to treatment was associated with comorbidities and an older age ($P < .000005$).

Conclusions: Elderly patients require specific attention and multidisciplinary collaboration in the diagnosis and sequencing of trauma treatment. A prudent attitude may be kept in selected cases, especially when severe comorbidities are associated and function is not impaired.

KEYWORDS

elderly, geriatric, management, maxillofacial trauma

1 | INTRODUCTION

Management of maxillofacial trauma in the geriatric population poses a great challenge due to anatomical variations and medical comorbidities.[1–9] Moreover, the frequency of old patients sustaining craniofacial trauma due to an increase in the aging population is leading to a progressive increase of importance of this topic in clinical maxillofacial practice.[10–20]

The principles of management of facial fractures in the elderly population and adults remain basically the same. However, the way they are really managed in the geriatric population may become noticeably different due to anatomical and physiological alterations in this population.[6–11] Bone atrophy, inadequate blood supply, reduced capacity for tissue repair, declining baseline functions, and above all the prevalence of pre-existing diseases and comorbidities may change not only timing of surgery but also the indications for surgery in elderly patients.[6–8]

The management of geriatric patients with facial fractures is often challenging, as they are more severely injured, hospital stay is prolonged, and deaths following trauma occur more frequently compared with younger adults.[6–9]

The peri-operative management of the acutely injured elderly patient is also more complex than that of younger patients, with a disproportionate consumption of health care resources.[9–11]

Publications regarding knowledge and up-to-date management of geriatric facial fractures are still rare.[6–11]

Therefore, several European centers that had already shown research experience in maxillofacial trauma decided to collaborate on a multicenter research project about maxillofacial fracture management in elderly patients.[1–5]

The aim of this study was to analyze the management variables, timing and outcomes of facial fractures in elderly patients (aged 70 years or more) at several European departments of oral and maxillofacial surgery. The results of this multicenter collaboration on maxillofacial trauma management in the elderly over a 5-year period are presented in this study.

2 | MATERIALS AND METHODS

The present multicenter study was conducted in 12 European departments of oral and maxillofacial surgery (Table 1).

This study was based on a systematic computer-assisted database that allowed the recording of data from all geriatric patients (70 years or more) with facial fractures from the participating maxillofacial surgical units across Europe between January 1, 2013, and December 31, 2017.

The following data were recorded for each patient: gender, age, comorbidities, site of facial fractures, synchronous body injuries, timing of intervention, type of intervention (no treatment or "expectative," closed treatment, open reduction, and internal fixation), length of hospital stay, outcome and complications.

The Facial Injury Severity Score according to Bagheri et al[11] was calculated for each patient.

Facial fractures were determined from computed tomography scans at admission to the hospital and classified as fractures of the mandible, orbital-zygomatic-maxillary complex (MZO), orbit, nose, Le Fort, frontal sinus, and naso-orbital-ethmoid (NOE) fracture. Orbital fractures were sub-classified according to the involved walls.

TABLE 1 Participating centers of maxillofacial surgery

Center	City	Country
Departments of Oral and Maxillofacial Surgery, Faculty of Dental medicine, Medical University	Plovdiv	Bulgaria
Department of Maxillofacial Surgery, University Hospital Dubrava	Zagreb	Croatia
Department of Oral and Maxillofacial Surgery, Aalborg University Hospital	Aalborg	Denmark
Department of Maxillofacial Surgery, North Estonia Medical Centre Foundation	Tallinn	Estonia
Department of Oral and Maxillofacial Surgery, Helsinki University Hospital	Helsinki	Finland
Service de Stomatologie et Chirurgie Maxillo-faciale, CHU de Nantes	Nantes	France
Oral and Maxillofacial Surgery—Hospital Dentistry Unit, University Hospital of Besançon	Besançon	France
Division of Maxillofacial Surgery, University of Eastern Piedmont	Novara	Italy
Clinic of Maxillofacial Surgery, School of Dentistry, University of Belgrade	Belgrade	Serbia
Department of *Maxillofacial* and Oral Surgery of the University Medical Centre	Ljubljana	Slovenia
Maxillofacial Department, Hospital Universitario Central de Asturias	Oviedo	Spain
Department for Oral and Maxillofacial Surgery, Bogomolets National Medical University	Kiev	Ukraine

Fractures of the mandible were sub-classified into fractures of the symphysis, parasymphysis, body, angle, ramus, coronoid, or condyle. Data regarding the timing of intervention (within 24 hours from hospitalization, between 24 and 72 hours, after 72 hours from hospitalization) were collected.

As a retrospective study, outcome was rated good in case of re-establishment of an appropriate (more than 3 cm) and painless mouth opening, without complications. The following were considered as complications: infraorbital nerve paresthesia, inferior alveolar nerve paresthesia, infection, visual disturbances such as diplopia or loss of visual acuity, fracture malunion, and dehiscence.

Patient characteristics were analyzed using descriptive statistics. Statistical analysis was used to search for associations among multiple variables. Statistical significance was determined using the chi-squared test or the Fisher exact test if the sample sizes were too small. Statistical significance was set at 0.05. The Helsinki Declaration guidelines were followed, according to local laws. The study was exempt from requiring institutional review board approval as a retrospective study, according to a local institution.

3 | RESULTS

A total of 1334 patients (599 male and 735 female patients) were included in the study.

Mean age was 79.3 years (range, 70-100 years).

Within the study population, 66% of patients (881) reported one or more comorbidities, the most frequent being hypertension (50%), followed by diabetes (14%), atrial fibrillation (9%), heart ischemic disease (6%), and dementia (5%).

MZO fractures were the most frequently observed injuries with 515 fractures, followed by mandibular fractures (414 fractures), orbital fractures (373), Le Fort fractures (174), nasal fractures (165), and frontal sinus fractures (30). The FISS mean score of the whole study population was 1.88 (range, 1-14).

Concomitant injuries were observed in 27.3% of patients (364 patients). Most frequently observed concomitant injuries were orthopedic injuries (172 patients), followed by encephalic (155), thoracic (48), and ocular injuries (44).

On the whole, 665 patients underwent closed or open surgical treatment, whereas in 669 cases an expectative approach without surgery or closed treatment was decided. Among the 665 treated patients, 174 (26%) subjects underwent closed treatment (such as MMF or zygomatic arch closed reduction) whereas 491 patients (74%) underwent open reduction and internal fixation (ORIF) of facial fractures.

Timing of treatment since hospital admission is depicted in Table 2 and Figure 1: almost half of the patients (44% and 43%, respectively) underwent closed treatment or ORIF beyond 72 hours after hospital admission.

A statistically significant association ($P < .005$) was found between the presence of concomitant injuries and a prolonged (beyond 72 hours) time between hospital admission and treatment.

TABLE 2 Timing of closed and open treatment since hospital admission

	Closed		ORIF	
	N	%	N	%
Within 24h	73	42%	162	33%
Within 72h	24	14%	119	24%
Beyond 72h	77	44%	210	43%
Total	174		491	

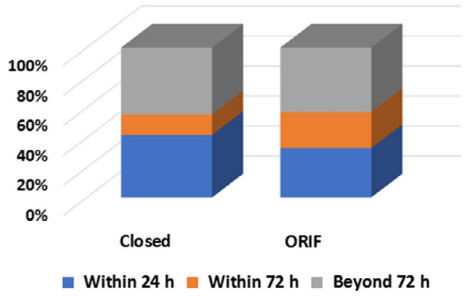

FIGURE 1 Timing of treatment - hours since hospital admission according to type of treatment

Table 3 shows the relationship between the performance of treatment and the following variables: age, FISS, and comorbidities. The absence of indications for treatment (an expectative approach) was significantly associated with comorbidities ($P < .000005$) and an older age ($P < .000005$). Mean length of hospital stay in specialized medical care was 4.49 days (range, 0-7; median, 3; SD, 5.1). Figure 2 shows the mean FISS values and mean hospital stay in the study centers.

The relationship between the length of hospital stay and the variables age, FISS, and comorbidities is outlined in Table 4. A longer hospital stay was significantly associated with a higher FISS ($P < .000005$), and with the presence of concomitant injuries ($P < .000005$). Twenty-two patients (1.6%) died during their hospital stay: in 18 of these cases, severe concomitant injuries had been diagnosed (14 encephalic, six spine, six thoracic).

In 1165 cases, a good outcome was obtained with no complications. The most frequently observed complications were as follows: infraorbital nerve paresthesia (45 patients), inferior alveolar nerve paresthesia (27 patients), infection (24 patients), visual disturbances such as diplopia or loss of visual acuity (14 patients).

4 | DISCUSSION

The objective of the present multicenter study was to assess the management and treatment outcome of facial fractures in the elderly population.

The principles of maxillofacial trauma treatment are almost identical, regardless of age. However, the management of elderly patients with maxillofacial fractures needs appropriate and specific adjustments due to anatomical and physiological variations, which

TABLE 3 Indications for surgery according to decades of age, FISS, and presence of comorbidities

	No treatment	Closed or surgical treatment	*P*
Age			
70-79 y	314	440	<.000005
80-89 y	278	200	
90-99 y	77	25	
FISS	1,65	2,12	.05
Comorbidities			
No	173	280	.000005
Yes	496	385	

increases the complexity and surgical risks. First of all, the pre-operative assessment of an aging patient should be focused not only on the facial condition but also (if not above all) on the physiological and general status of such patients.[6–11]

When the maxillofacial trauma team judges that complex surgical intervention may represent a threat to life or that the risks of surgery may overwhelm its advantages, withholding treatment may be a prudent alternative.[6–8] Surgeons, patients, and family members have to acknowledge when form and function can be incompletely restored without substantial interference in the quality of life of elderly patients.[7–9] To this aim, the surgical management of mandible fractures interfering with mastication is more likely to be indicated, as nourishment is critical to the health and well-being of the geriatric patient. Instead, the surgical management of a slightly displaced zygomatic fracture without associated functional disorders may be avoided in geriatric patients with severe comorbidities, if the only residual defect is represented by a slight cosmetic alteration.

The results of this multicenter study highlight that half of the patients underwent a closed or open treatment, whereas in the other half an expectative approach was decided. It is interesting to note that, among the treated patients, 26% of subjects underwent closed treatment (such as MMF or zygomatic arch closed reduction). Such percentage of closed treatment may represent the first important finding that could confirm the trend to reduce the invasiveness of treatment option in elderly patients that have severe comorbidities.

The second interesting finding concerned the timing of treatment, which was postponed beyond 72 hours after hospital admission in almost half of the patients. This is explained by the need for additional specialized consultations before surgery in elderly patients with polytrauma, which is confirmed by the statistically significant association between the presence of concomitant injuries and a prolonged time between hospital admission and treatment.

Furthermore, the absence of indications for treatment was significantly associated with comorbidities ($P < .000005$) and an older age ($P < .000005$).

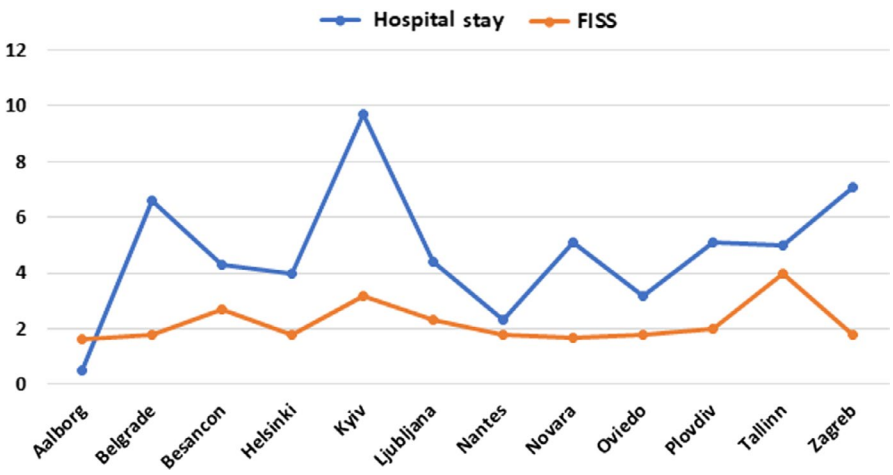

FIGURE 2 Mean FISS values and mean hospital stay in the study centers

TABLE 4 Length of hospital stay according to decades of age, FISS, and presence of comorbidities

	Mean hospital stay (d)	*P*
Age		
70-79 y	5	>.05
80-89 y	4	
90-99 y	3	
FISS		
≤1	3.6	.000005
>1	5.2	
Comorbidities		
No	4.47	.05
Yes	4	
Concomitant injuries		
No	3.6	.000005
Yes	5.1	

As a multicenter retrospective study, no uniform indication for different treatment options could be established. However, the aim of the study was to identify a possible trend, that was in fact the obtained result: when important comorbidities or an older age was encountered, the absence of treatment was more likely to be suggested.

As aforementioned, despite the universal validity of the principles of maxillofacial trauma treatment that can be applied to all trauma victims, surgeons have to consider the real indications in elderly patients on a case by case basis. Facing an elderly trauma patient with severe comorbidities (for example, Alzheimer's disease or dementia, or severe heart disease), the physician may reasonably keep a prudent attitude and an expectative approach, especially if the sequelae consist of minor esthetic alterations without functional compromise. The results confirm that this is a widespread attitude in older patients with severe comorbidities.

As for FISS values and hospital stay, results are quite uniform across the participating European centers, as shown in Figure 2.

This study highlights that longer hospital stays are significantly associated with a higher FISS and with the presence of concomitant injuries ($P < .000005$). This represents a crucial finding, that confirms that peri-operative management of the polytrauma elderly patient may be more complex than that of younger patients, with in some cases a disproportionate consumption of health care resources.

Some (1.6%) of the elderly trauma patients died during their hospital stay. Such a percentage, although it may be considered low, has still to be assessed, especially since in most of these deaths severe concomitant injuries had been diagnosed. In 1165 cases, a good outcome was obtained with no complications. The most frequently observed complications were as follows: infraorbital nerve paresthesia (45 patients), inferior alveolar nerve paresthesia (27 patients), infection (24 patients), visual disturbances such as diplopia or loss of visual acuity (14 patients).

The results of this European multicenter study confirm that the management of facial trauma in the elderly requires selected adjustments in the algorithms commonly applied to the care of trauma victims.[6–11]

A prudent attitude and a careful assessment to pre-injury intercurrent diseases, medical history, nutrition, and psychosocial conditions are critical in elderly patients.

Furthermore, surgeons must take into consideration that several older patients and their families may refuse aggressive treatment unless function is seriously impaired.

The withholding of surgical treatment for facial injuries in selected gravely ill patients may be considered when delaying or omitting care will not result in substantial function loss.[6–10]

5 | CONCLUSIONS

In conclusion, the management of maxillofacial trauma in elderly patients is often challenging, as elderly patients require specific attention and multidisciplinary collaboration in the diagnosis and sequencing of trauma treatment. A prudent attitude for treatment may be kept in selected cases, especially when severe comorbidities are

associated and function is not impaired. More resources are often needed to be allocated for supportive care during hospitalization and assistive care after discharge in elderly patients.

CONFLICT OF INTEREST

The authors have no financial interest to declare in relation to the content of this article.

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