



Development of Maxillofacial Traumatology and Review of the Epidemiology and Quality of Life of Patients With Facial Bone Fractures

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SUMMARY

Introduction: The treatment of facial bone fractures dates back to ancient civilizations, with various methods of prosthetic immobilization developed and in the second half of the 19th and the beginning of the 20th century. In our literature, there are almost no studies that examined the quality of life of patients with facial bone fractures, although worldwide this is an extremely current topic indicating the importance of this problem.

Methods: This paper will present results from professional/scientific relevant data sources on the historical development of maxillofacial surgery with reference to etiology, epidemiology and instruments for assessing the quality of life of patients with jaw bone fractures.

Topic: Medical treatment of these surgical injuries involves a highly specialized team led by a maxillofacial surgeon. This paper deals with the etiology, epidemiology and quality of life of patients with facial bone fractures.

Conclusion: Surgical interventions for fractures of the facial bones are becoming more and more demanding, resulting in development of maxillofacial surgery as an independent branch. In the etiology of facial bone fractures, traffic accidents are mentioned more and more often as the main way of injury. The incidence of facial bone fractures in human pathology is about 30 per 100,000 hospitalized patients. Research has shown that the quality of life in operated patients with fractures of the facial bones is significantly lower than those operated on some other region.

Keywords: Maxillofacial Surgery, History of Medicine, Trauma, Quality of Life, Fractures Facial Bones

INTRODUCTION

First descriptions of the treatment of fractures of the bones of the face and jaws have been found in the ancient manuscripts of Egypt and Mesopotamia. The instructions of Hippocratesto physicians as well as in Roman manuscripts (Celsus) we also find early treatment guidelines for these fractures. In

the early Middle Ages, the Arab doctors Albukakis and Avicenna recommended the use of alloys of silver and gold, which they covered with wax and used to immobilize facial and jaw bone fractures. Application of intermaxillary fixation began in the 15th century. In the work of Aljinović Ratković N, 2003, quote

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Ambroisa Pare and Hieronimus Brunswig who mentioned different methods for immobilizing facial bones [1]. Periosteal fixation of the mandible with a wire was introduced in 1840 by Jean Baptiste Baudens. Gurdon Buck performed the first osteosynthesis of the mandible with wire in 1847 in New York. In the second half of the 19th and at the beginning of the 20th century, various methods of prosthetic immobilization were developed, mainly individual rails and arches (Hammond, Sauer, Schroder). Bows developed a century ago by Franz Ernst are still in use. Reposition of the zygomatic bone transcutaneously using Single tooth hooks were introduced in 1844 by Louis Stromeyer. Alphonse Guerin in 1886 and René Le Fort in 1901 distinguished themselves in the treatment of fractures of the middle mass of the face. Le Fort's classifications are still used [1]. Osteosynthetic plates for fixation of facial bone fractures were first applied by Karl Hansmann in 1886, where he placed the screws percutaneously, while William Halsted from Baltimore in 1893 placed the screws subcutaneously. Due to poor hygiene and lack of antibiotics, as well as corrosion of osteosynthetic material, bone infections were common, resulting in poor outcomes of trauma surgery [1,2]. The development of maxillofacial traumatology in the first half of the 20th century was influenced by wars, as stated in the work of Kazanjian VH, Converse JM, 1949 [3]. Jovanović S et al., 2012, stated that a significant contribution to the development of wartime traumatology of facial bones and jaws was made by Atanasije Puljo [4]. The history of Serbian dentistry cannot be imagined without the name of Dr. Atanasi Pulja (1878-1944). He was a visionary and pioneer of maxillofacial surgery. He was born in Zemun in 1878 and was the founder of the Faculty of Dentistry in Belgrade and one of the founders of the Zemun Serbian Falcon Society in 1905. He emphasized the importance of teamwork between dentists and surgeons in the treatment of jaw fractures. His Balkan method is recognized all over the world. He was a volunteer in the Balkan wars, an active participant in the First World War and was the first to notice the importance of teamwork between dentists and surgeons in the treatment of jaw and facial injuries[4,5]. Surgical interventions for fractures of the facial bones are becoming more and more demanding, as a result of which maxillofacial surgery is beginning to develop

as an independent branch. Wars contributed to the development of maxillofacial surgery, especially World War II. In World War II, osteosynthetic material was increasingly used in the treatment of facial bone fractures. Adams Milton introduced plate osteosynthesis in 1942 [5]. European maxillofacial surgeons who were among the first to apply osteosynthetic plates are Luhr, Spiessl, Schilli, Michelet, Champy, as well as a group of surgeons associated with the Association for the Study of Osteosynthesis - Association for the Study of Internal Fixation. Rigid osteosynthesis was introduced into European maxillofacial surgery in 1966 [1,3,4,5].

It took another twenty years for this type of treatment to be accepted in the world, including in our country.

METHODOLOGY

This paper will present information from professional/scientific relevant data sources on the historical development of maxillofacial surgery with reference to etiology, epidemiology and instruments for assessing the quality of life of patients with jaw bone fractures.

TOPIC

Regarding the etiology of facial bone fractures, traffic accidents are increasingly mentioned as the main cause of injury [9,10], while some other studies indicate violence as the main factor [11]. Treatment of these injuries involves a highly specialized team led by a maxillofacial surgeon. This paper deals with the etiology, epidemiology and quality of life of patients with facial bone fractures.

Etiology of facial bone fractures

Regarding the etiology of facial bone fractures, traffic accidents are increasingly mentioned as the main cause of injury [7,8], while some other studies indicate violence as the main factor [9].

The share of traffic accidents with facial and jaw bone fractures is from 15% to 75%, and most often from 35 to 60% [10]. In the works of Nakamura T and Gross CV, and Ozkaia O and associates, it is stated that these differences are related to socioeconomic conditions [11,12]. and living standards, which was best pointed out in 1975 by Melmed

[13], who mentioned traffic traumatism in Carpe Tovn as the most common form of injury among whites (67%), while among blacks the most common form of bone fracture is violence (64%). Slightly later comparisons of maxillofacial fractures in the work of Timoney N. and Saiveau M. in the UK and France [14], where the prevalence of traffic injuries in Bordeaux is 48% and in Bristol 24.7%, while violence injuries in Bordeaux is 17.5% versus 40.1 % in Bristol. The above indicates that the crime rate, which is on the rise in the developed world, also affects this parameter. When it comes to facial and jaw bone fractures caused in traffic, drivers and passengers in cars are most often injured, then motorcyclists, and less often pedestrians. In the work of Friedrich KL. et al. [15], independent analyzes of the causes of fractures of individual facial bones show that even with fractures of the mandible and zygomatic bone [16], drivers or passengers in cars are injured four times more often than motorcyclists, although statistics in Italy [17] show the same or in Greece [18] even higher incidence of injuries to motorcyclists, and in Germany to pedestrians [19].

During a collision or landing off the road, the vehicle moves at high speed and the force of the impact is high, so these injuries are called high speed injuries (high velocity trauma, high speed), i.e. high energy trauma (high energy trauma). In these fractures, extensive comminution is common, as in the work of Biju P and Mohan A, and often all levels of the facial skeleton are affected [20]. Pedestrian injuries when hit by a car are similar. The degree of injury partly depends on compliance with traffic safety measures, drivers wearing seat belts and motorcyclists protected by helmets suffer less severe fractures than those who do not comply with these measures [21]. A significant role in the prevention of facial and jaw bone fractures is played by the use of airbags in vehicles. Traffic injuries of cyclists are mostly not caused by the action of large forces because the speed of the vehicle is relatively lower, so the type of injuries are similar to injuries sustained by blows. The most common fracture in cyclists is a fracture of the mandible [22].

In maxillofacial traumatology, the second most frequent are fractures caused by violence, which includes punches, kicks or various blunt objects, less often sharp objects. Blows with sharp objects are more often the cause of soft tissue injuries, and blows with

blunt objects are the cause of facial bone fractures. Regarding the etiology of isolated fractures of the mandible and zygomatic bone, the more common cause is violence, while fractures of the middle third of the face mostly occur in traffic accidents [23]. In these injuries, the force of the impact is usually not as great as in traffic accidents, so the fractures are less extensive and most often affect one of the levels of the face. The rate is different in various parts of the world. The statistics of the Clinic for Otorhinolaryngology and Maxillofacial Surgery of the Clinical Center of Montenegro, as well as the Department of Maxillofacial Surgery within the Dental Clinic in Niš, indicates that violence and traffic trauma are almost equally represented as the two leading etiological factors in the occurrence of facial and jaw bone fractures. According to some authors, falls are the third most frequent [23,24] while some authors do not mention them among the causes. Women are more often injured in falls, while injuries in men are the result of numerous other causes. Fractures of facial bones in sports injuries are represented differently, all depending on the popularity of certain sports in various parts of the world [25].

The most common injuries in men occur in football and basketball, with the highest rate of broken mandibles and zygomatic bone. Fractures of facial bones at work are a very heterogeneous group of injuries whose frequency varies from 3% to 7% [26] and factory workers and construction workers are most affected, and mandibular fractures are also the most common in these injuries, followed immediately by fractures of the middle mass faces. Other causes are diverse and far less common. This includes fractures caused by firearms [27], fractures caused by animal strikes [28], and iatrogenic and pathological fractures [29]. Fracture of the mandible is the most common of all maxillofacial fractures [7,30]. As for the mandible, many studies show that fractures of the angulus and parasymphyseal region predominate as fracture sites [31,32]. However, looking at fractures that do not require surgery but are treated conservatively, the most common are fractures of the neck of the condylar process of the mandible [33].

Epidemiology of facial bone fractures

The incidence of facial bone fractures in hu-

man pathology according to Erol B et al, in 2004 was approximately 30 per 100,000 hospitalized patients [16,33].

Maxillofacial injuries are predominantly present in the younger male population (third decade) (85%). Fractures of the facial bones are far more common in men than in women, although this ratio varies in different studies. According to most reports for total maxillofacial trauma, the ratio is from 3:1 [16] to 7:1 [34]. If etiological factors are taken into account, this result is expected, because men are more frequently participants in traffic and violence. In Nigeria, for every 17 men with facial bone fractures, there is only one female [35]. In elderly patients (over 65 years), this ratio is 1:1 in the São Paulo study [36]. The greatest number of these injuries are between 18 and 30 years of age [33,37]. The frequency of injured children under the age of 10 ranges from 3% to 5%. Children over the age of 11 suffer facial bone fractures four times more often than younger children, and the etiology is also different: up to the age of 10, the most common cause is a fall, and from 10 to 17 injuries while riding a bicycle and injuries in sports. Almost a third of patients with maxillofacial fractures in traffic trauma have injuries to other parts of the body as well [38]. The mandibular angle is most often divided by the posterior teeth. The study of Bruzzoli M. et al confirmed that force during a fall is the most common cause of fracture trauma and that the presence of a third molar may allow force during fracture regardless of whether the tooth is involved or suggests that more multicenter studies be done. It is also necessary to see the fracture mechanism of trauma and the epidemiology of trends in falls [39]. The most common associated injuries are craniocerebral injuries. About 15% of patients with facial fractures have craniocerebral injuries, usually concussion syndrome. However, despite the closeness of the facial skeleton and the neurocranium, brain injuries are not that common because the facial bones cushion the impact and act as protection for the neurocranium. In addition to these injuries, associated injuries to the contents of the orbit, cervical spine, trunk and extremities are common. Facial injuries can appear dramatic due to profuse bleeding, although they are often not the immediate cause of death in themselves, they can lead to a fatal outcome. Fractures of the facial bones can be life-threatening when they lead to airway obstruction (loss of

consciousness, fracture of the lower jaw and tongue falling into the pharynx, aspiration of one's own blood, foreign bodies falling in), and sometimes a tracheotomy is required. There may be injury to large blood vessels (common carotid artery and its final branches), which are not always available for ligation, so bleeding can lead to death. The most frequently injured facial bones are the nasal bones, followed by the lower jaw, the middle third of the face (fractures of the lateral compared to the medial segment of the middle face are somewhat more common), and the rarest are isolated orbital fractures.

Quality of life (QoL)

The quality of life associated with health is one of the most current concepts in the modern medical profession. The World Health Organization defines health as „a state of complete physical, mental and social well-being and not merely the absence of disease or disorder”. The modern health organization emphasized that the quality of life depends on the health status or diseases as a criterion in the approach to the individual, group, diagnostic and therapeutic work, scientific research projects and health policy management [40,41]. Quality of Life (Quality of Life-KoL) was defined by the World Health Organization as the perception of life by individuals in the area of culture and value system in which a person lives in relation to his goals, expectations, standards and interests. The four most important components of quality of life are: health, functional ability, life satisfaction and self-esteem. Quality of life consists of general satisfaction with life, performance of social role and feeling of fulfillment of obligations. Age is not the only indicator of health, because the number of years of life of patients does not indicate the quality of life of patients. The patient's quality of life can also be defined as the possibility that after the treatment, his life will be physically, psychologically and socially as similar as possible to his life before the injuries and treatment. This term is relative, emotional and intellectual functions are put in relation to the existing somatic disease and socioeconomic status. KoL can generally be defined as satisfaction with one's own life. In addition to the general QoL, the health-dependent QoL is also important, consisting of a subjective assessment of the physical, personal and social

domains of health [40].

Quality of life in patients with facial bone fractures

The most important for maxillofacial surgeons is to do a quality reconstruction of fractured bone structures, but it is also very important for them that these patients have a good quality of life. As patients make their own assessment, the quality of life can vary greatly from person to person patients with the same injury. The assessment is also influenced by the patient's overall health, his/her expectations, culture, and social status. The assessment of the quality of life can vary depending on the length of treatment, as well as the existence of comorbidities. The goal is to bring the patient's and surgeon's perception of QoL as close as possible. Research has shown that the QoL in operated patients with fractures of the facial bones is significantly lower than in those operated on some other region [12,42].

Studies show that airbags and seat belts are the only effective solution in preventing facial injuries in vehicles of average mass traveling at speeds below 49.2 km/h (30.6 mph) at the point of impact, but our airbags and seat belts do not protect against facial fractures [43]. The study by Boljević et al. shows that postoperative health and overall quality of life was unsatisfactory in almost half of the examined patient population in Montenegro, where the study was conducted[43].

It is difficult to define the concept of quality of life, as well as to „measure” the quality of life of operated patients with facial and jaw bone fractures. In patients with a fracture of some of the facial bones, there is often a lower quality of life afterwards fractures, as well as some forms of psychological morbidity. Research related to this topic mentions the presence of specific psychosocial factors such as depression, anxiety, changes in the perception of the appearance of one's own body after surgical interventions on the bones of the face and jaws, low self-esteem and poor social relations [12,42].

Some authors state that injuries with facial bone fractures have a great impact on the quality of life patients, which is measured by various quality of life tests, as well as that the surgeon must pay attention to various psychophysical needs of patients [44].

Health assessment instruments are

generally not specific enough for patients with fractured facial bones. Assessment of QoL is not an integral part of clinical practice. This is mostly due to organization of maxillofacial surgeon's work and lack of time. In that case, the surgeon's decisions are mostly related to the results of the clinical examination and radiological findings. However, the information obtained through QoL assessment can be useful in many ways in daily work, so it can influence decisions related to the planning of operations, education of newly diagnosed patients and the importance of coming to regular check-ups. The quality of life should be viewed depending on one's personal position in life, through the context of culture, the value system, one's expectations and interests [46].

Quality of life is measured by tests, most often in the form of questionnaires or visual scales and systems evaluations. The lack of a „gold standard” is the biggest limitation of measuring quality of life, due to uneven quality of life in different populations, regions and over time [47].

The basic approaches to measuring quality of life are generic instruments, which assess the general quality of life, and as they include multiple dimensions, quality of life can be used for a purpose determination of cross-cultural, demographic and health differences. Surgical treatments in the facial area are associated with a specific and strong fear. According to some studies, in 30% of patients immediately after the fracture of the facial bones and after the surgical procedure, there are clearly expressed psychological morbidity (such as anxiety and depression) [46]. Depressive symptoms (which can also be associated with pain) can increase immediately after surgical interventions on the bones of the face and jaws, and be present throughout the entire period of postoperative patient monitoring [1,11]. Some studies show that in maxillofacial injuries frequently result in post-traumatic stress disorder (PTSD) up to 27%, and even up to 47%, with the danger of becoming a chronic condition if not treated in time [47]. Therefore, it is very important to pay attention to the long-term consequences of maxillofacial injury at the very beginning of its treatment [48]. In patients with fractures of the bones of the face and jaws in addition to restitution of anatomical integrity and functions, attention must be paid to the psychological symptoms caused by such an injury [42]. Studies of the

quality of life have relatively recently started gaining momentum in our country, while studies dealing with quality of life issues (with special emphasis on psychosocial factors) after maxillofacial injury extremely rare. In our literature, there are almost no studies that examined the quality of life of patients with facial bone fractures, while in the world this is an extremely current topic and they point to the importance of this problem [43]. The literature states that measured poor quality of life in the initial (baseline) period of treatment predicts the occurrence of depression during the follow-up periods [1]. This indicates the potential value of the quality of life questionnaire and as a screening test for the possible occurrence of psychological morbidity (eg depression, post-traumatic stress disorder) in further periods of treatment, which can often go unnoticed and develop into a chronic condition [45]. So far, no specific questionnaire has been created about the quality of life in patients with facial bone and jaw fractures, although there is a need for such a questionnaire [48]. We believe that the insights gained from this study will help in the development of a specific quality of life questionnaire for patients with facial bone fractures, [45,48].

CONCLUSION

The treatment of jaw bone fractures dates back to ancient civilizations, and in the second half of the 19th and early 20th centuries, various methods of prosthetic immobilization were developed, mainly individual splints and arches that are still used today. Surgical interventions for facial bone fractures are becoming more and more demanding, as a result of which maxillofacial surgery begins to develop as an independent branch. In the etiology of facial bone fractures, traffic accidents are increasingly mentioned as the main form of injury. The incidence of facial bone fractures in human pathology is around 30. Maxillofacial injuries are predominantly present in the younger population (third decade) and among members of the male sex (85%). per 100,000 hospitalized patients. Research has shown that the QoL in operated patients with fractures of the facial bones is significantly lower than in those operated on some other region.

CONFLICTS OF INTEREST

All authors declare no conflict of interest.

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Razvoj maksilofacijalne traumatologije sa osvrtom na epidemiologiju i kvalitet života kod bolesnika sa prelomom kostiju lica

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KRATAK SADRŽAJ

Uvod: Lečenje preloma kostiju lica datira još od drevnih civilizacija a u drugoj polovini 19. i početkom 20. veka razvijale su se razne metode protetskih imobilizacija. Kod nas i u okruženju u literaturi gotovo da nema studije koja je ispitivala kvalitet života pacijenata sa prelomom kostiju lica, dok je u svetu ovo izuzetno aktuelna tema i ukazuju na važnost ovog problema.

Metodologija: U ovom radu biće predstavljene informacije iz relevantnih naučnih/ stručnih izvora podataka u vezi sa istorijskim razvojem maksilofacijalne hirurgije sa osvrtom na etiologiju, epidemiologiju i instrumente za procenu kvaliteta života kod bolesnika sa prelomom kostiju lica.

Tema: Medicinski tretman ovih hirurških povreda podrazumeva visoko specijalizovani tim vodjen od maksilofacijalnog hirurga. U ovom radu autori obradjuju etiologiju, epidemiologiju i kvalitet života pacijenata sa prelomima kostiju lica.

Zaključak: Hirurške intervencije preloma kostiju lica postaju sve zahtevnije, usled čega maksilofacijalnahirurgija počinje da se razvija kao samostalna grana. U etiologiji preloma kostiju lica sve češće se pominju saobraćajne nezgode kao glavni način povređivanja. Incidenca preloma kostiju lica u humanoj patologiji je oko 30 na 100.000 hospitalizovanih pacijenata. Istraživanja su pokazala da je kvalitet života kod operisanih pacijenata sa prelomom kostiju lica znatno niži od onih koji su operisani od neke druge regije.

Ključne reči: maksilofacijalna hirurgija, istorija medicine, trauma, kvalitet života, prelomi kostiju lica

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