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Research Article

COMPLEX REHABILITATION OF PATIENTS WITH COMBINED TRAUMA OF THE FACIAL SKELETAL

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ABSTRACT

The review article analyzes the literature data on the incidence, diagnosis and complex treatment of combined fractures of the bones of the facial skeleton. Despite a significant number of works, literature data concerning the complex treatment of patients with combined fractures of the facial bones, changes at the level of the microcirculatory bed after injury, in the early stages after surgery, have not been sufficiently studied, which allows us to focus scientific research on improving the complex treatment of combined fractures of the bones of the facial skeleton. taking into account hemostatic parameters.

KEYWORDS

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Concomitant injury, craniofacial injury, midface, hemorheology, osteoreparation, computed tomography, 3D reconstruction.

INTRODUCTION

According to statistical data, the growth of traumatic injuries persists. The prevalence of injuries of the maxillofacial region over the past decade has increased significantly in large industrial cities around the world [10, 20]. This is due to changes in people's living conditions - the stratification of incomes of the population, an increase in the number of unemployment, the use of alcoholic beverages; the continued growth of large cities, an increase in the number of road vehicles, high-speed travel; non-compliance with the usual safety regulations, especially in private enterprises [15, 25]. The frequency of damage to the bones of the facial skeleton in combination with traumatic brain injury is about 6–7% of all types of injuries [11, 19]. As evidenced by numerous works of domestic and foreign authors, there is a significant increase in the frequency and severity of injuries of the maxillofacial region and associated injuries, along with a general increase in cases of injuries [2, 5, 8, 17, 23, 28]. Victims with maxillofacial injuries account for 30 to 40% of patients treated in hospitals providing dental care and up to 21% of all inpatient trauma patients [1, 7, 13, 24, 30].

As shown by the analysis of modern literature data, the leading causes of injuries are: domestic - 83%, transport - 12%, industrial - 4.5%, and sports injury - 0.5% [6, 16, 18, 34, 35] . Based on statistical data, it was found that head and neck injuries are observed in 54% of victims of car accidents.

Experts from the World Health Organization (WHO), traumatologists, and surgeons recorded a change in the specific value of injuries in the overall structure of mortality. The first place in terms of mortality due to injuries indicates the emergence of the main problem of the medical and social sphere, the significance of which is worsened by the fact that young and middle-aged people die or become disabled [9, 22].

In the structure of injuries of the facial skeleton, fractures of the lower jaw are most common, which, according to foreign clinics, range from 70% to 85%. At the same time, the frequency of inflammatory complications of 9%–40% continues to remain high, which greatly complicates the complex treatment of this category of patients [17, 33].

Cranio-maxillofacial injury is understood as a combined craniocerebral injury and trauma to the bones of the face. This term is analogous to the term craniofacial trauma. The term craniofacial injury is often used when there is a combination of fractures of the anterior wall of the frontal sinus, frontal bone, or other bones of the skull roof in combination with injuries of the bones of the middle and lower zones of the face [11, 16].

In this period, the number of patients with cranio-maxillofacial trauma in our country is huge and each time continues to grow, mainly due to road traffic injuries [1]. assistance and treatment of this group of victims Representatives of related specialties are engaged in first aid and complex treatment of this group of patients, these are neurosurgeons, traumatologists, maxillofacial surgeons, ophthalmologists, but not always in stages and effectively. The choice, staging and succession of surgical interventions performed by specialists of a narrow profile practically does not correspond to the degree and volume of injuries. Refusal of

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reconstructive interventions is often motivated only by the fact of brain damage (concussion, brain contusion). All these reasons lead to the formation of persistent facial bone deformities, dooming patients to long-term multi-stage surgical treatment with far from always satisfactory results [1, 17, 27].

In recent years, there has been a tendency to increase the frequency of damage to the middle zone of the facial skeleton in comparison with the data of 10 years ago by 2.4 times or more [18]. At the same time, there was not only a quantitative increase in fractures of the bones of the middle zone of the face, but also a qualitative change, i.e. more often, severe injuries of the middle zone in combination with traumatic brain injury and adjacent areas began to be observed [35].

In fractures of the zygomatic bone with injuries of the anterior wall of the maxillary sinus, according to the assumption of a number of authors [2,18], it is customary to call it “zygomatic-maxillary fractures”, and in case of a fracture of the zygomatic bone and the wall of the orbit, it is customary to call it zygomatic-orbital fractures. With such fractures, as emphasized by F.I. Tarasov that injuries of the zygomatic bone always cause damage to the anterior wall of the maxillary sinus, lateral and inferior walls of the orbit with damage to the eyeball. It is proposed to call zygomatic-orbital damage fractures of the zygomatic bone, arch and wall of the orbit with damage to the eyeball [3,8]. Therefore, during the provision of first specialized care to patients with combined fractures of the bones of the face, an interdisciplinary approach to this issue is necessary.

One of the important methods of examination of victims with combined fractures of the bones of the face is the X-ray method. Determination of the main, most informative methods of X-ray examination of victims can significantly simplify and facilitate the diagnostic process itself. Standard digital radiography in various projections can reveal deformation of the bones of the face, fractures, improper standing of fragments, destruction in the bones, as well as foreign bodies, but despite the fact that it is widespread, it is often uninformative, especially with traumatic injuries of the middle and upper bones. face zones. The development of computed tomography technology has improved the quality of diagnosing cranio-maxillofacial injuries and the planning of surgical intervention. As daily clinical practice shows, computed tomography, along with clinical data, is today the "gold standard" for diagnosing fractures of the zygomatic bone, arch, orbit, upper jaw, naso-orbital region, etc. [4, 5, 14, 21, 34].

The modern possibilities of computed tomography, in particular multislice computed tomography (MSCT), have opened up in the diagnosis of zygomatico-maxillary fractures, which occupy the main place in injuries of the middle zone of the face. A large number of maxillofacial surgeons, traumatologists and neurosurgeons believe that MSCT provides significant information in traumatic injuries, while clinical data and conventional radiography are uninformative. According to R.B. Stanley [14], in the last decade, advances in radiodiagnosis have contributed to the development of improved approaches for the reconstruction of the zygomatic-orbital-maxillary complex, which provide more informative and accurate restoration of destroyed bone structures with tissue grafts and implants.

Fractures of the walls of the orbit deserve special attention, which in more than 50% of cases are combined injuries. Thanks to MSCT, it is possible to diagnose damage to the walls of the orbit, the eyeball and its muscles, as well as paraorbital tissue. Fractures of the lower wall of the orbit most often accompany

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zygomaticomaxillary injuries. With extensive fractures of the lower wall of the orbit, in most cases, a slit-like defect is diagnosed with prolapse of the periorbital fatty tissue into the maxillary sinus and infringement of soft tissue structures, as well as a slit-like defect with prolapse of the soft tissues of the orbit, but without their infringement [8, 14, 17, 18, 22, 24].

Considering the fractures of the lower jaw, the use of MSCT is most often indicated for fractures of the condylar process, in particular for high ones, i.e. intraarticular damage. When diagnosing high articular fractures, it is assumed that the head of the lower jaw can be damaged on both sides, the nature of its fracture, the degree and direction of displacement of fragments are also revealed. A detailed description of the mandibular head injury in most cases determines the correct choice of treatment method, i.e. whether it is necessary to perform replantation of the head with subsequent osteosynthesis [12, 13, 32].

According to the literature data of foreign and domestic sources, in recent years, a huge number of various methods of surgical treatment of fractures of the facial bones have been considered and described. When reviewing conservative treatments, these include orthopedic devices such as appliances and splints, various types of rods that are fixed to a head cap or headband, dental plastic and metal splints, dentogingival splints, and non-laboratory-made appliances. Also made in the laboratory are dental and gingival splints [1, 3, 4, 13, 33]. Operative methods for the treatment of mandibular fractures include various methods of direct and indirect osteosynthesis. Direct osteosynthesis includes intraosseous osteosynthesis (pins, rods, screws, pins), external osteosynthesis (circular ligatures, external plates, staples and frames, grooves), intraosseous osteosynthesis (bone suture, bone sutures in combination with staples, knitting needles, plates) [26, 27].

The method of transosseous osteosynthesis in the treatment of multi-comminuted fractures makes it possible to carry out a closed reposition of the fracture and ensure stable fixation for the period of treatment. To date, there are many both pin and rod external fixation devices [1, 29]. The choice of various options for the design of the external fixation device and fixation methods is carried out taking into account biomechanical conditions (localization, fracture plane, type and direction of fragment displacement), and the state of soft tissues (inflammatory infiltrates, wounds, scars) [3, 7, 12].

METHODS

Methods of surgical treatment of fractures of the upper jaw began to be used relatively recently, and as they improve, more and more supporters of these methods appear. Indications for them are open fractures of the upper jaw, the ineffectiveness of conservative methods, partial or complete adentia [31]. Currently, various methods of craniomaxillary suspension have been proposed, which are based on changes in fixation points, the use of Kirschner wires, screws and other fastening elements, creating stability in the region of the base of the anterior cranial fossa, as a necessary component for the prevention of various purulent complications [25, 27, 29].

Based on the literature data, the question of the timing and extent of surgical intervention remains under discussion. The key direction of the surgical technique is the restoration of the integrity and function of the damaged bone by the surgical method, regardless of whether the injury is isolated or combined.

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The timing and volume of surgical treatment is still debatable. According to supporters of the conservative position, specialized treatment should be started no earlier than 7–10 days after the injury [6]. Proponents of a more aggressive tactic recommend earlier surgery for mild craniocerebral injuries - in the first 2 days [8]. Other authors recommend starting operative measures after 14 days from the moment of injury, when the ossification process is activated. The fourth ones note that the immobilization of the bones of the facial skeleton should be carried out no later than 36 hours from the moment of injury [9, 26].

One of the important factors that can affect the healing of a mandibular fracture is the development of infectious and inflammatory complications in the post-traumatic period. Their frequency, despite the success in the treatment of victims, ranges from 9 to 40% [12].

There is no doubt that the development of purulent-inflammatory complications in a fracture is determined not only by the quality of fixation of fragments, but also by their anatomical and physiological features, both of the lower jaw itself and the soft tissues surrounding it, as well as the presence in the oral cavity of a huge amount conditionally pathogenic microflora. At the same time, the main reasons that contribute to the development of complications are traditionally considered to be the late treatment of patients in specialized medical institutions, as well as incorrect diagnostic and therapeutic tactics in the prehospital and early hospital periods. It is necessary to confirm the fact that it is not individual unfavorable factors that contribute to this, but, as a rule, their combination [1, 3, 4, 11, 21, 30].

Therefore, one of the important tasks at the moment is the creation of a unified and optimal operational tactics to solve the problem of reducing the incidence of complications.

In the pathogenesis of inflammatory complications, an important role is played by infection of the bone wound directly with the contents of the oral cavity and impaired hemomicrocirculation in the area of injury. At the moment, there is no doubt that the main link in the pathogenesis of traumatic osteomyelitis is circulatory disorders in the injured bone [12, 34].

One of the important elements in the development of traumatic conditions is a violation of blood microcirculation with the development of "hemohypercoagulation syndrome" and intravascular thrombosis. The unity of innervation and blood circulation of the facial and cerebral parts of the skull determines the pathomorphological basis of changes in the central nervous system in concomitant maxillo-brain injury with impaired hemostasis, rheology, and other indicators of the aggregate state of the blood [16, 35].

Identification of the intensity of reparations in a bone wound is one of the important factors that determine the direction of scientific research. The bone, as a labile system, responds to damage with common restructuring phenomena, the area of which is determined by the degree of traumatic factors. At the same time, the clinical result of reparative osteogenesis in a fracture in most cases depends on the ability of the bone to recover and the degree of stability of the fragments. Under unfavorable local conditions, such as diastasis of bone fragments, their excessive instability and insufficiency of regional blood circulation, which create obstacles to the formation of intermediary callus, which at the same time causes prerequisites for the development of complications [2, 5, 9, 12].

It should be noted that a significant role in the duration of fracture consolidation is played by the degree of microcirculation disorders in the fracture area, changes

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in cellular and coagulation hemostasis, as well as mineral metabolism. Therefore, improving the effectiveness of complex treatment of fractures of the facial skeleton based on early diagnosis of vascular and hemostatic changes is important for practical healthcare [16].

According to the literature, in fractures of the facial skeleton, one of the important mechanisms of the pathogenesis of purulent-inflammatory complications are violations of blood rheology, the first of which is damage to the endothelium of the vascular wall and a decrease in its antithrombogenic properties. In addition, infectious agents, as factors that induce thrombogenesis, can lead to a slowdown in blood circulation due to toxic damage to the endothelium of the vascular wall, changes in blood composition, and activation of the hemostasis system. [9, 13, 19].

In a few research papers, it is said that violations of the rheological properties of blood play a huge role in the pathogenesis of the inflammatory process, while they do not observe the relationship between aggregation and deformability of erythrocytes and the antithrombogenic activity of the vessel wall. Thus, functional damage to the vascular wall is an important component of the development of the inflammatory process [7, 10, 28].

At the same time, violations of the antithrombogenic activity of the vascular wall, vascular-platelet, coagulant links of the hemostasis system, components of the fibrinolysis system and rheological properties of blood in fractures of the face bones and their complications, such as suppuration of a bone wound, traumatic osteomyelitis, etc., remain poorly studied [9, 12].

Thus, changes in the level of the microvasculature in patients after trauma in the fracture area, after surgery, and also in the early stages after complex treatment have not been studied enough. The study of the relationship between changes in the coagulation properties of blood and the effect of altered hemorheology on the microvascular module in the post-traumatic, as well as in the postoperative period, is one of the urgent problems of medical rehabilitation of this category of patients, which requires further research.

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