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Research Article

ANTHROPOMETRIC ASSESSMENT OF PATIENTS WITH FRACTURES OF THE ZYGOMATICO-ORBITAL COMPLEX

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ABSTRACT

Severe facial injuries are often associated with deformations, changes in the volume of the orbit, dislocation of its contents, impaired mobility of the eye and, consequently, functional disorders of various severity. Traumatic injuries of the zygomatico-orbital complex (ZOC) and orbital walls are characterized by displacement of bone fragments, formation of small slipped fractures of the lower wall of the orbit, leading to deformation of orbital forms, prolapse of its entire contents, excluding the eyeball, and the maxillary sinus, which leads to impingement of the inferior oblique muscle of the eye and the development of restricted mobility of the eyeballs. The result of severe injuries of the middle zone of the face is not only anatomo-functional disorders, but also significant disfigurement of patients. Nowadays the radial diagnostics of traumatic injuries of the middle zone of the face has evolved from radiological examination to emergency multispiral computed tomography, cone-beam computed tomography, the use of specialized models for visualization, planning and design of custom-made implants.

KEYWORDS

Zygomatic-orbital complex fractures, orbital floor, anthropometric analysis, computer models, multi spiral computed tomography.

INTRODUCTION

The midface is a complex part of the maxillofacial zone, both anatomically and functionally. This zone contains important bony and soft tissue structures, including the organ of vision and the appendages of the eye, perinasal sinuses, blood vessels, nerves, and salivary glands. The middle zone of the face is also commonly divided into central and lateral sections. Injuries of the lateral parts of the orbit occur 63% more often than injuries of the central parts. As a consequence of polymorphism of injuries of bone and soft tissue structures of the middle zone of the face, the victims of this group in most cases are categorized as severe.

Variants of orbital fractures vary greatly in shape and localization. Since the bony orbit is a formation of irregular pyramidal shape with significant individual

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deviations, it is very difficult to obtain any landmarks by which to reconstruct the orbital walls.

According to Karayan A.S. (2008) "...severe injuries of the middle zone of the face are the cause of development not only of functional disorders associated with changes in the location of the eyeball, nasal breathing and bite disorders, but also significant disfigurement of the patient's face, leading, as a rule, to severe mental disorders and social maladaptation".

Severe facial injuries are often associated with deformations, changes in the volume of the orbit, dislocation of its contents, impaired mobility of the eye and, as a consequence, functional disorders of various severity. Classical semiotics includes: enophthalmos, hypophthalmos, limitation of eye mobility in the vertical plane, the appearance of vertical binocular diplopia, impaired sensitivity of the facial skin in the zone of innervation of the subocular nerve, deepening of the orbito-palpebral sulcus.

In recent years, the application of new technologies in maxillofacial surgery and exhaustive knowledge of the complex anatomy of the internal structures of the orbit have contributed to the evolution of the tactics of management of patients with orbital trauma. Enophthalmos, as a frequent complication of orbital trauma, may not appear immediately and is often diagnosed at late stages and inadequately treated. Management of patients with enophthalmos is difficult and can be unpredictable because of the consequences associated with uncontrolled tissue reactions within the orbit following trauma to the bony orbital walls or undiagnosed orbital wall fractures.

Purpose of the work. The aim of this study was to investigate the assessment of anthropometric data of patients with fractures of the zygomatico-orbital complex before and after surgical treatment.

Material and methods. When analyzing 117 radiographs, we obtained general information about the condition, interposition, and presence of violations of the integrity of the bony structures of the facial skull in the area of the zygomatic suture, zygaloalveolar ridge, alveolar process of the maxilla, the condition of the maxillary sinuses, and visualized the complex of zygomatic processes and zygomatic bones.

However, these types of studies reproduce the image in a two-dimensional plane, do not sufficiently affect the state of the ocular walls, providing only indirect information about their condition: violation of the integrity of the mandibular margin, darkening of the maxillary sinus, in some cases blurred visualization of the ocular structures.

For an objective assessment of the volume, number and interposition of bone fragments of the oculomandibular walls, the above methods of radial diagnosis are uninformative.

At present, these types of radiologic examination are the most accessible, but with regard to the injuries of the zygolabial complex with damage to the walls of the eye cavity, they perform a "screening" function.

Insufficient diagnostics of ocular wall injuries in fractures of the zygomaticomandibular complex can cause the development of posttraumatic deformities, displacement of soft tissues of the eye socket and eyeball, and disturbance of binocular vision.

To objectivize the diagnosis, we studied anthropometric parameters of the maxillary sinus wall structure with regard to width and length, and analyzed the wall defects.

RESULTS

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MSCT made it possible to detect damage to the bone structures of the SOC in all 117 patients (100%).

Changes in symmetry, position and shape of the traumatized orbit were determined visually according to CT data in 39 patients (33.3%). In 2 patients (1.7%) the violation of symmetry, position and shape of both orbits due to bilateral trauma of the middle facial zone was determined.

90.6% of patients had sensory disturbances in the suborbital area and in the area of the nasal ramp on the side of the injury. 42.7% had diplopia, 4.3% had restricted eyeball movement, and 1.7% had impaired mouth opening. The face was examined in full-face, profile, and with the head tilted back, which made it possible to determine changes in the topography of bone and soft-tissue structures in different planes.

In fresh trauma, swelling of the zygomatic region and subconjunctival hemorrhage on the affected side were most often noted. In the second week after trauma, deformation in the form of depression and flattening of the zygomatic region prevailed.

Palpatory examination was used mainly to determine the bony step along the lower and outer edge of the eye socket, in the area of the zygomatic arch, and during intraoral examination to assess the condition of the zygaloalveolar ridge. The presence of diastasis along the zygomatic suture was also checked.

Attention was paid to changes in the volume of the eye socket, the condition and motility of the eyeballs, their position in relation to each other and in the orbital cavity.

Fractures of the inferior wall of the orbit were found in the majority of patients (n=96; 82.1%). Fractures of the lateral wall of the orbit were found in 65 cases (55.6%), medial wall - 45 patients (38.5%), upper wall - 23 patients (19.7%). Isolated fractures of one orbital wall were noted in 37 patients (31.6%), two orbital walls - in 30 cases (25.6%), three orbital walls - in 24 cases (20.5%) and fractures of all orbital walls were determined in 5 patients (4.3%). Total fractures of the lower orbital wall were found in 22 patients (18.8%). In other cases (n=95, 81.2%) the localization of fractures in the region of the lower orbital wall was distributed as follows.

Signs of intraorbital emphysema were noted in 47 patients (40.2%). The distribution of patients depending on the bony traumatic injuries of the bones of the middle zone of the face and perinasal sinuses.

The majority of patients had bone-traumatic injuries of the maxilla, including injuries of the maxillary sinus, alveolar process, and teeth. In the smallest number of patients, lacrimal bone injury was noted (n=26; 22%).

Total fractures of the lower wall of the orbit were found in 22 patients (18.8%). In other cases (n=95, 81.2%) the localization of fractures in the region of the lower orbital wall was distributed as follows.

The number of observations exceeds 100%, as the injuries had a combined character.

In 68.4% of patients (n=80) there was prolapse of the orbital contents into the maxillary sinus and it had different degrees of protrusion.

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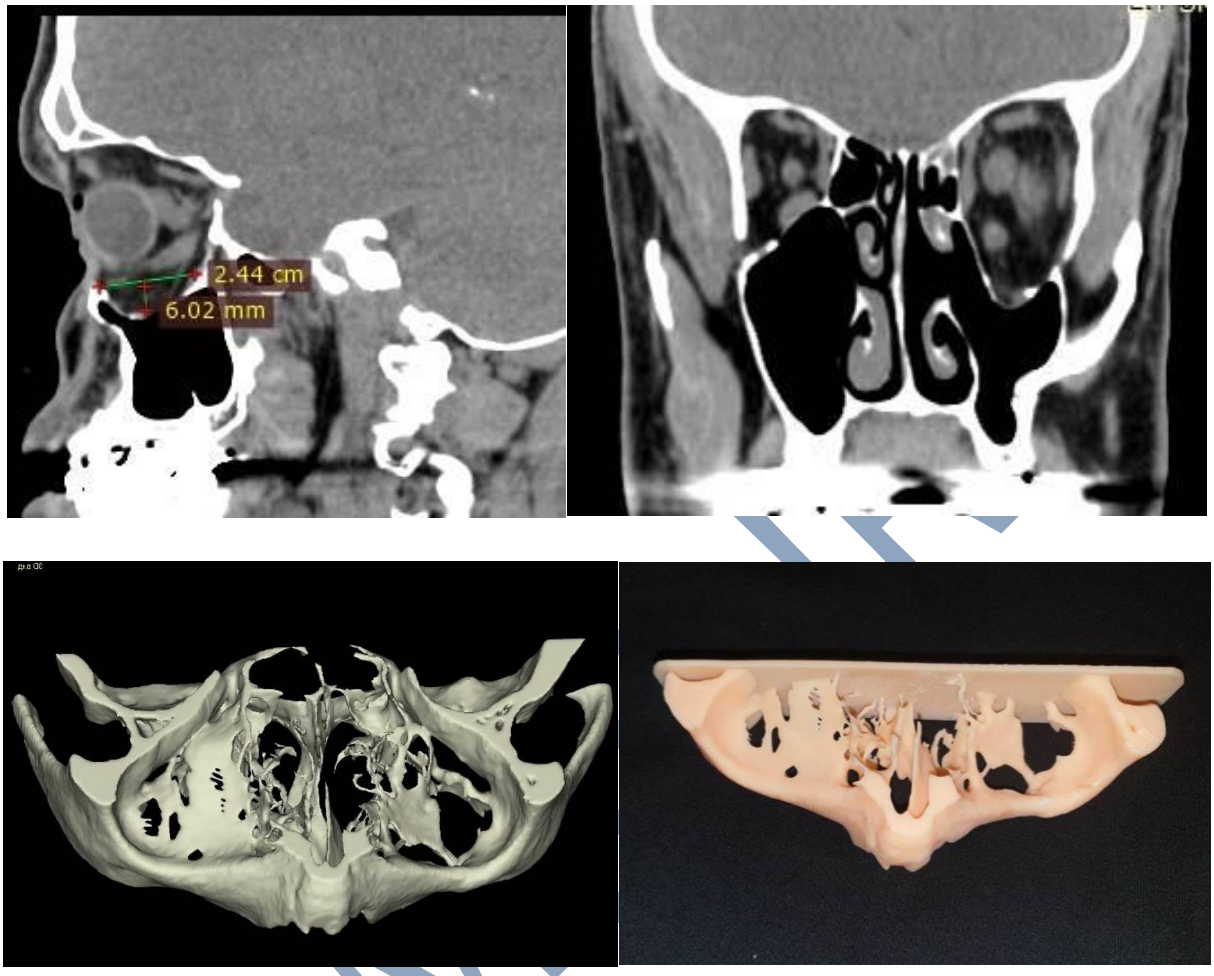

Fig. 1 MSCT, three-dimensional model and stereolithographic template of the patient before surgery

CONCLUSIONS

Thus, the conducted examination allowed: to clarify the localization and nature of the injury, to assess the state of the oculomotor muscles, the position of the eyeball, to detect prolapse of the orbital fibers and to clarify the size of the orbital wall defect, which is especially important for the selection of the orbital implant and planning of surgical intervention. The tactics of patients' management included 2 main directions: surgical treatment with implant selection according to the calculated volume and area of the defect, lower wall prosthetics with implants according to the defect size with the addition of metal osteosynthesis elements (MOS) in the area of the middle facial zone structures.

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