Original Article

Changes in Orbital Volume following Reconstruction with Alloplastic Materials in Patients with Orbital Trauma

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ABSTRACT

Background: Internal orbital reconstruction is a commonly performed procedure in management of zygomaticomaxillary complex (ZMC) fractures; however, it is not indicated in all cases. In management of orbital trauma, surgeons should not only correct the apparent defects, but also must reinstate the function of the orbit.

Purpose: This study aimed to assess the changes in the orbital volume following reconstruction with alloplastic materials in patients with orbital trauma.

Materials and Method: This retrospective study evaluated all patients with unilateral orbital fracture presenting to the Oral and Maxillofacial Surgery Department of Rajaie Hospital (from 2013 to 2016, Shiraz, Iran) who underwent corrective surgery. The computed tomography (CT) scans of patients were analyzed by Volumetry software to quantify the change in the orbital volume after surgical reconstruction of the orbital floor with alloplastic materials compared with the sound contralateral orbit. Data were analyzed using the Chi-square test and Student t-test (alpha=0.05).

Results: Significant differences were found in the volume of the traumatized orbit with sound contralateral orbit and the orbital volume after corrective surgery (p Value< 0.05). Corrective surgery was successful in all patients, and the orbital volume after treatment had no significant difference with the volume of the sound contralateral orbit (p> 0.05).

Conclusion: Corrective surgery with alloplastic materials can successfully regain the orbital volume in patients with orbital floor fracture, with no significant difference with the volume of the sound contralateral orbit.

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Introduction

Orbital trauma is commonly found in trauma patients. It is often associated with functional complications such as diplopia, blurred vision, blindness, and inability to move the globe, as well as appearance-related complications such as enophthalmos, dystopia, and asymmetry. Several materials such as allografts, autografts, and alloplastic materials may be used for reconstruction of traumatized orbital bony walls [1-2]. Because the orbit's precise three-dimensional contours are crucial for globe position and soft-tissue support, reconstruction remains technically demanding, and there is still no consensus on optimal timing, surgical approach, or implant choice [3-5].

The zygomaticomaxillary complex (ZMC) fractures often include the orbital floor fracture. The size and extent of the orbital floor fracture may vary from a crack line to shattering of the entire orbital floor and fracture of the medial and lateral walls. The majority of the ZMC fractures do not cause herniation of the orbital content into the sinus or enophthalmos, and such complications occur in only a small percentage of orbital trauma patients. It has been reported that 47% of patients with zygomatic fractures and two-thirds of those with ZMC fractures have symptoms of orbital floor complications [2, 6].

Some, but not all, surgeons believe that examination

more serious complications. Orbital fracture often occurs due to motor vehicle accidents following direct trauma to the orbit. In such cases, fracture causes inward compression of the eyeball [26]. In orbital fracture, the broken segment(s) may be displaced externally (blow out) or internally (blow in). The blowout fracture of the orbital floor is the most common type of orbital fracture, which occurs through two mechanisms. The first mechanism is known as the hydraulic process, in which, the impact of any hard object or fluids with a diameter larger than that of the orbit increases the orbital pressure and leads to the fracture of the thinnest part of the wall, which is often the posterior-internal part of the inferior wall. In the second mechanism, the impact force is directly transferred through the orbital borders, causing an isolated fracture of the orbital floor. Orbital fracture is often associated with impaired vision, diplopia, ptosis, ectropion, canthus deformity, cranial involvement, anterior cranial damage, paresthesia, and esthetic impairments [26]. Correct diagnosis and prompt appropriate treatment are highly important to minimize such complications.

The present results showed a higher frequency of orbital fracture in males than females (14:1) probably due to their active presence in the community and greater involvement in sports activities [27]; this is consistent with Ji *et al*.'s study [28] which was due to more physical activity of males. This ratio is variable in the literature ranging from 2:1 to 14:1 [5, 29]. Such a high difference in involvement of males and females in the present study is attributed to the careless driving of males, not wearing a helmet, and unsafe use of motor vehicles, especially motorcycles and bikes [30]. In some other countries like the United States, street fights are the main cause of orbital fractures [31-32].

Although our calculated sample size of 73 patients met the requirements for statistical power, the number of female participants was low. This gender imbalance reflects the lower incidence of high-risk activities (e.g. motor vehicle accidents and fights) among women in Iran- as well as legal restrictions on motorcycle riding for women- and is therefore a true feature of our clinical population rather than recruitment bias.

Future multi-center studies with a larger sample size are required for a more comprehensive assessment of the causes and management techniques of orbital fractures in Iran.

Conclusion

Corrective surgery with alloplastic materials can successfully regain the orbital volume in cases with orbital floor fracture with no significant difference with the volume of the sound contralateral orbit.

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Conflict of Interests

There is no conflict of interest to declare.

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