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ORIGINAL ARTICLE

Is specialized ophthalmologic evaluation necessary after orbital fractures? A prospective 64-case study

Renato Marano[1] · Petterson Rayken Silva Lino[1] · Fernando Zanetti[1] · Alfio Jose Tincani[2] · Laisa Oliveira[3]

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Abstract

Introduction and objective The objective of this study was to determine whether there is a need for ophthalmologists to perform a specialized assessment after the occurrence of orbital fractures.

Materials and methods Sixty-three patients (64 orbits) diagnosed with orbital fractures were evaluated preoperatively (up to 24 h after the trauma) and in 90-day postoperative period.

Results Eight injuries required either specialized clinical or surgical ophthalmologic intervention. Of these patients, four required emergency eye surgery: two patients with corneal lacerations had lesions larger than 2 mm. Two patients had extensive ocular lesions after multiple traumas with uveal exposure and without light perception. Another four patients (iridodialysis associated with lens subluxation, anterior uveitis, direct lesion on the optic nerve, and chorioretinitis sclopetaria) received conservative management.

Conclusion This study concluded that a specialized ophthalmologic examination as soon as possible is important, particularly in cases in which the signs and symptoms of severity are associated. The non-ophthalmologist surgeon must have the basic medical knowledge required to provide basic primary ophthalmologic care and to discern the severity of the injury.

Keywords Orbital fracture · Diagnostic technique · Ophthalmology · Orbit

Introduction

Orbital fractures commonly occur in cases of facial trauma due to the position of the orbit, its exposure to foreign bodies, and the thinness of its walls [1]. These fractures can occur in isolation or in combination with other fractures of the middle third and upper third of the face, including zygomaticomaxillary complex fractures, Le Fort II and III fractures, nasoorbitoethmoid fractures, and frontal orbital fractures [2]. Overall, it can be said that the greater the energy of the trauma, the more the fracture is comminuted and the higher the risk of injuries to the attached structures, such as the eyeball. Previous studies have found rates of ocular injury in the context of orbital fractures in the range of 26 to 40% [3, 4].

Some authors believe that, because the eye is considered an essential component of the face, the status of the eye is the first priority for any periorbital injury, and it is wise to have ophthalmologic consultation on all internal orbital fractures. Studies have shown that an ophthalmologist can discover injuries that are not recognized by non-ophthalmologists [5–7]. A thorough periocular and ocular examination should be performed to look for foreign bodies, laceration/rupture of the

✉ Laisa Oliveira

Renato Marano
renato@renatomarano.com.br

Petterson Rayken Silva Lino
prsloftalmo@gmail.com

Fernando Zanetti
zanetti.fernando@hotmail.com

Alfio Jose Tincani
alfio@tincani.net

[1] Dr. Jayme Santos Neves State Hospital, Avenida Paulo Pereira Gomes, s/n, Morada de Laranjeiras, Serra/ES, Serra, Espírito Santo CEP 29.166-828, Brazil

[2] State University of Campinas School of Medical Sciences (FCM-UNICAMP), Rua Tessália Vieira de Camargo, 126—Cidade Universitária Zeferino Vaz. Campinas, São Paulo CEP 13083-887, Brazil

[3] Faesa, Vitória, Espírito Santo, Brazil

eyeball, retinal detachment, lens dislocation, and other signs of injury. The mobility of the eyeball is important because there is always the possibility that the extraocular muscles and periocular tissues can be incarcerated into the fracture lines or by jagged pieces of bone. Visual acuity, pupillary response, and fundoscopic examinations are mandatory [2].

However, an immediate evaluation may not be possible because of other clinical demands; it may actually be suboptimal, for example, if the patient is intubated, unstable, inebriated, or otherwise unable to be transported to an ophthalmological center.

Material and methods

Patients

This study was performed by the State University of Campinas School of Medical Sciences in Brazil (FCM/UNICAMP) and developed in partnership with the Dr. Jayme Santos State Hospital in the Brazilian city of Serra, in the state of Espírito Santo. All of the patients in the study had been diagnosed with orbital fractures by the oral and maxillofacial surgery team through a physical exam and a CT scan with 1-mm-thick cross-sectional axial, coronal, and sagittal images.

Inclusion criteria

Patients with pure or impure fractures; minimum of 16 years of age; preoperative ophthalmologic exam with the same ophthalmologist; any type of bone or ocular trauma with orbital fractures, as long as there had been no loss in vision; 30-, 60-, and 90-day postoperative follow-up; and another ophthalmologic exam 90 days after the surgery.

Exclusion criteria

Previous orbital fractures, loss of vision prior to the trauma, and a consultation with an ophthalmologist not involved in the study.

The oral and maxillofacial exam

The patients underwent preoperative exams in the form of physical exams and CT scans. The results were then noted as the answers to the questionnaire created (Fig. 1).

The ophthalmologic exam

After the oral and maxillofacial exam, the ophthalmologic exam was performed no more than 24 h before the surgery by the same team of physicians (one senior ophthalmology resident and one attending ophthalmologist) and included biomicroscopy, a visual acuity test, fundoscopy, and a pupillary assessment.

Follow-up

Another CT scan was performed after surgery. Outpatient follow-up appointments took place 30, 60, and 90 days after surgery. Follow-up with the ophthalmologist occurred at the 90-day follow-up visit.

Statistical analysis

The analyses were performed using Fisher's exact test.

Results

Patients

A total of 76 patients were selected for this study, 13 of whom were excluded. Of these 13, two were excluded because of difficulty in arriving at follow-up visits, two were excluded because they required ocular evisceration surgery, and nine were excluded because they missed one of the scheduled follow-up visits. A total of 63 patients and 64 orbits remained.

Fractures

Of the 64 fractures, 50 were classified as impure and 14 were classified as pure. Surgeries were scheduled 1 to 15 days after the fracture occurred. One case was treated 6 months after the traumatic event.

The oral and maxillofacial and ophthalmologic exam

All of the cases were evaluated and treated by two specialists. Depending on the trauma, these specialists either worked together or each treated the patient individually. The ocular and periocular abnormalities were separated into treatments performed by the Department of Oral and Maxillofacial Surgery and the Department of Ophthalmology (Table 1).

Eight injuries required either specialized clinical or surgical ophthalmologic intervention (Table 1). Of these patients, four required emergency eye surgery (Table 2): two patients with corneal lacerations had lesions larger than 2 mm. They were treated immediately through surgical repair to reposition the tissues. Two patients had extensive ocular lesions after multiple traumas with uveal exposure and without light perception. They were treated with the evisceration of the ocular content. Another four patients received conservative management: one patient had iridodialysis associated with lens subluxation. Surgery was indicated, but due to the poor prognosis, the patient chose not to receive the surgery. The patient is currently being

Fig. 1 Questionnaire. This exam was performed with the aid of an exophthalmometer

Sheet 1 – Questionnaire

1. Type of Fracture
   ( ) Pure – Walls affected:_____
   ( ) Impure – Associated fracture(s):_____
2. Presence of diplopia?
   ( )Yes – Field affected:_____
   ( )No
3. Limited ocular motility?
   ( )Yes– Muscle involved:_____
   ( )No
4. Presence of enophthalmos?*
   ( )Yes – Number of milimeters:_____
   ( )No
5. Infraorbital nerve paresthesia?
   ( )Yes
   ( )No
6. Other periocular injuries?
   ( )Yes– Please describe:_____
   ( )No
7. Other ocular injuries?
   ( )Yes– Please describe:_____
   ( )No

*This exam was performed with the aid of an exophthalmometer.

monitored in the ambulatory center of the Department of Ophthalmology. One patient was diagnosed with anterior uveitis. He was treated clinically with on-steroidal anti-inflammatory drugs and received outpatient follow-up care, in which he exhibited satisfactory improvement in vision. Another patient had a direct lesion on the optic nerve due to the high impact of the trauma. This patient developed ocular hypotonia and permanent blindness in this eye. A last patient presented with chorioretinitis sclopetaria. Despite the clinical treatment implemented, he quickly developed vision loss due to damage to the retina and the choroid.

In the cases of the treatments performed by the Department of Oral and Maxillofacial Surgery, all of the patients underwent reconstruction of the orbital cavity with biomaterials. One article published by this author describes these reconstructions and the specific management of orbital reconstructions [8].

Follow-up

With the exception of the cases of evisceration and amaurosis, the exam performed 90 days after surgery found complete improvement in the visual acuity of the patients treated by the Department of Ophthalmology.

Discussion

Much has been written about orbital fractures, and within the field of craniomaxillofacial trauma, this type of injury may be the most controversial in the literature in terms of conduct and treatment. This may happen because this type of fracture receives different approaches from different specialties, such as oral and maxillofacial surgery, plastic surgery, otorhinolaryngology, ophthalmology, and head and neck surgery [9], but it is possible that the greater challenge is the lack of protocols following similar methods. These variations hinder the standardization required for a systematic review of the subject [7].

In the case of orbital fractures, one point that is less commonly addressed in the literature may be the true need for and the best time for the patient to receive a specialized ophthalmologic exam. Different authors have reported that the diagnosis of ocular injuries after orbital fractures may vary from 9

Table 1 Ocular and periocular injuries

	Patients
Issues treated by the Department of Oral and Maxillofacial Surgery	
Infraorbital nerve paresthesia	44
Periorbital ecchymosis	60
Subconjunctival ecchymosis	45
Limited eye movement	12
Binocular diplopia	11
Enophthalmos	30
Chemosis	3
Issues treated by the Department of Ophthalmology	
Corneal laceration	2
Globe rupture	2
Iridodialysis and lens subluxation	1
Anterior uveitis	1
Chorioretinitis sclopetaria	1
Damage to the optic nerve	1

to 93% when the assessment is performed by ophthalmologists and from 2% to 23% when performed by non-ophthalmologists [10–15]. These numbers are understandable—not only because of the higher number of complementary exams in an ophthalmologic consultation, but also because of the specific training received by ophthalmologists in their residency. Thus, it can be confidently stated that periocular (and particularly ocular) analyses are more complete when performed by ophthalmologists. However, this does not mean that non-ophthalmologist surgeons are making some kind of mistake or somehow being negligent. Some authors argue that ocular and periocular injuries can be divided into three categories: mild, moderate, or severe [16]. Other authors have separated them into normal findings and abnormal findings [7]. It is important to explain that, when abnormal findings or severe injuries are evaluated, a specialized evaluation from an ophthalmologist is already routinely requested by the non-ophthalmologist surgeon in most cases. In cases of mild or moderate injuries or those considered normal after an orbital fracture, most are safely and successfully treated by non-ophthalmologists, even when a specialist's opinion is not requested [6]. This outcome is corroborated by the analysis of studies in which specialized ophthalmologic evaluations were routinely performed in patients with orbital fractures and with any type of ocular injury (mild, moderate, or severe). The results show that in cases of mild clinical findings, almost no ocular injuries were associated (7.7%). Meanwhile, in cases with more substantial injuries, this number increased considerably (62.5%) [7]. Other authors agree that these findings are complementary to other recent reports in multiple specialties, including that by Mellema et al. (2009), who found that visually intact patients with orbital fractures who do not have visual symptoms do not require emergent evaluation [16]. However, most of these studies have been retrospective performed a prospective study and found that, out of 80 patients with orbital fractures, 10 experienced ocular injuries that justified an ophthalmologic evaluation, and that of these 10, only four required an urgent treatment [17]. According to the authors, regardless of the type of fracture, injuries that result in changes in visual acuity and pupillary reaction present the greatest risk of permanent eye damage. In our prospective study, all of the cases were previously evaluated by two ophthalmologists (one resident and one coordinator), regardless of the severity of the injury. Out of the 63 patients, only eight cases were diagnosed as severe injuries requiring immediate ophthalmologic intervention (Table 2). All of the other cases in our study were treated conservatively by an ophthalmologist or by an oral and maxillofacial surgeon without the aid of an ophthalmologist. In all of these cases, the treatments were effective and visual acuity was not compromised.

Some difficulties arose when determining the ideal time for the specialized ophthalmologic assessment. An immediate evaluation may not always be possible because of other clinical demands; it may actually be suboptimal, for example, if the patient is intubated, unstable, inebriated, or otherwise unable to be transported to an ophthalmological center [7]. Another difficulty in this study involved the articles found in the literature. Many studies include a specialized ophthalmologic evaluation for patients with orbital fractures. However, many fail to describe the ideal time for this ophthalmologic

Table 2 Ocular injuries

Ocular injury	No. of patients	Treatment category	Type of treatment	Status 90 days postop.
Corneal laceration	2	Surgical	Corneal suture	Visual improvement
Globe rupture	2	Surgical	Evisceration	Loss of vision
Iridodialysis and lens subluxation	1	Surgical	Patient decided to delay surgery	Blindness
Anterior uveitis	1	Conservative	Clinical	Visual improvement
Chorioretinitis sclopetaria	1	Conservative	Clinical	Partial loss of vision
Damage to the optic nerve	1	Conservative	Patient decided to delay surgery	Blindness

evaluation [18]. Only Al-Qurainy et al. (1991) reported only about patients who were evaluated by an ophthalmologist within 1 week of the injury. The lack of this specific information makes the results of these studies difficult to use in comparisons and interpretations [19–21]. The times described varied from just a few hours (5.6 h) to up to a week after the injury [6]. All of the cases in our study were evaluated by an ophthalmologist in the first 24 h, regardless of the type of injury or the patient's overall condition. A second evaluation was performed within 90 days of the orbital reconstruction.

Conclusion

Orbital fractures are frequently associated with ocular injuries. A specialized ophthalmologic examination as soon as possible is important, particularly in cases in which the signs and symptoms of severity are associated. The non-ophthalmologist surgeon must have the basic medical knowledge required to provide basic primary ophthalmologic care and to discern the severity of the injury.

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Author contributions R.M: Study design; Head surgeon; Manuscript preparation. AJT: Surgeon recruitment, manuscript revision; F.Z: Ophthalmologist; P.R.S.L: Ophthalmologist.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Consent and ethics committee approval This study was approved by the Ethics Committee of the State University of Campinas School of Medical Sciences (FCM-UNICAMP), and all participants signed an informed consent agreement.

Informed consent Informed consent was obtained from all individual participants included in the study.

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