

Clinical and radiological features of traumatic orbital emphysema cases

Travmatik orbital amfizem olgularında klinik ve radyolojik özellikler

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ABSTRACT

Aim: In this study, we aimed to evaluate the clinical course and treatment requirements of orbital emphysema cases resulting from orbital trauma.

Material and Method: We included the 112 orbits of 82 patients who had presented to the emergency service of our hospital between 2016 and 2019 in this retrospective study. The common feature was severe orbital trauma due to various causes and referrals to the ophthalmology department with a preliminary diagnosis of ocular or orbital damage. The orbital computerized tomography images were evaluated for orbital emphysema and a classification was performed according to the location of the air as preseptal, extraconal, intraconal and intraocular.

Results: We included a total of 82 subjects consisting of 65 males and 17 females in the study. The mean age was 37.85 (3-78) years in general, 36.09 (3-78) years in the males, and 44.58 (15-78) years in the females. Emphysema was present in the preseptal area in 80 cases, the extraconal area in 26, and the intraconal area in 5 of the 112 orbits. Intraocular emphysema was detected in only a single case. The orbital compartment syndrome was not present in any of our cases.

Conclusion: Orbital emphysema is a common condition in orbital trauma. It may be associated with the orbital compartment syndrome. Orbital emphysema after orbital trauma is usually a benign, self-limiting condition.

Key Words: Orbital trauma, orbital tomography, orbital emphysema

ÖZ

Amaç: Çalışmamızda, orbita travmalarına bağlı görülen orbital amfizem (OA) olgularının klinik seyri ve tedavi ihtiyaçlarını değerlendirmeyi amaçladık.

Gereç ve Yöntem: Bu retrospektif çalışmaya 2016-2019 yılları arasında hastanemiz acil servisine başvuran 82 hastanın 112 orbitası dahil edildi. Hastalarımızın ortak özelliği farklı nedenlerle ciddi yüz ve orbita travması yaşamış olmalarıydı. Glob veya orbita yaralanması ön tanısı ile göz hastalıklarına konsülte edilmiş bu hastaların orbita bilgisayarlı tomografileri (BT) OA yönünden değerlendirildi. Orbital havanın yerleşim yerine göre, preseptal, ekstrakonal, intrakonal ve intraoküler olarak sınıflandırıldı.

Bulgular: Çalışmaya dahil edilen 82 hastanın 65'i erkek, 17 tanesi ise kadındı. Hastaların genel yaş ortalaması 37,85 (3-78) idi. Cinsiyete göre bakıldığında erkek hastaların yaş ortalaması 36,09 (3-78), kadın hastaların yaş ortalaması ise 44,58 (15-78) olarak bulundu. 112 orbitanın 80 tanesinde preseptal sahada amfizem saptandı. Orbital havanın yerleşimi 80 gözde preseptal, 26 gözde ekstrakonal, 5 gözde intrakonal, 1 gözde ise intraokülerdi. Hiçbir hastamızda orbital kompartman sendromu tespit edilmedi.

Sonuç: Orbital amfizem orbita travmalarında sık karşılaşılan bir durumdur. Orbital kompartman sendromu ile ilişkili olabilir. Travma sonrası izlenen orbital amfizem genellikle iyi huylu kendini sınırlayan bir durumdur.

Anahtar Kelimeler: Orbital travma, orbita tomografisi, orbital amfizem

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INTRODUCTION

Orbital emphysema (OE) is the presence of air in the orbital or periorbital tissues. It is usually a result of orbital bone fractures due to trauma which result in air displacement from the paranasal sinuses to the orbit (1). OE is a common radiographic sign in orbital fractures and is the second most commonly associated with medial wall fractures following blunt trauma [2,3]. It can also be the result of forceful blowing of the nose, sneezing, weightlifting, retinal surgery, and exposure to air under pressure without an orbital fracture [4-8]. Palpebral emphysema may lead to unnecessary antibiotic treatment following a misdiagnosis of sinusitis or periorbital cellulitis, in non-trauma-related cases.

Orbitopalpebral emphysema can also develop if there is an orbital septum defect. Air collection in the orbit leads to increased intraorbital pressure and air can pass freely from the orbit to the eyelids if there is an orbital septum defect. Heerfordt injected air experimentally into cadavers and suggested that a mean intraorbital pressure of 40 to 50 mm Hg is required to perforate the septum [10]. Elderly persons' cadavers required a lower mean pressure than young ones for septum perforation, as the septum weakens with increasing age.

Orbital traumas are common ophthalmologic emergencies. Such trauma can lead to fractures in the bone structures of the orbital walls. Although there are many case reports about orbital emphysema in the literature, very few case series have been reported. We aimed to evaluate the clinical characteristics and follow-up process of OE cases due to orbital trauma in this study.

MATERIAL METHOD

We included the 112 orbits of 82 patients who presented to the emergency department of Alanya Alaaddin Keykubat University Training and Research Hospital between 2016 and 2019 in this retrospective study. The study was conducted in accordance with the principles of the Declaration of Helsinki, after the approval of the institutional ethics committee was obtained. The common characteristic of our patients was a history of severe orbital trauma because of various reasons. These patients were referred to the ophthalmology

department with a preliminary diagnosis of orbital or globe injury and the orbital computed tomography (CT) was evaluated for OE. An anatomical classification of preseptal, extraconal, intraconal or intraocular was established, according to the location of the air. Patients who were found to have OE were evaluated for age, gender and etiology.

Cold compresses were recommended to the patients. The medical treatment consisted of a topical antibiotic (netilmicin sulphate 0.1%), topical steroid (dexamethasone disodium phosphate 0.3%) and an oral nonsteroidal anti-inflammatory drug (flurbiprofen 100 mg). A systemic antibiotic (amoxicillin clavulonate 875/175 mg) was added if a sinus infection finding was present.

RESULTS

The 82 patients included in the study consisted of 65 males and 17 females with a mean age of 37.85 (3-78) years. The mean age was 36.09 (3-78) years in the male patients and 44.58 (15-78) years in the females.

In our classification of the source of the orbital trauma, of the 55 cases of vehicular accidents, 37 cases suffered the injury from inside a vehicle, 4 from outside a vehicle, and 14 resulted from a motorcycle accident. One patient was found to have suffered the trauma after falling from a bicycle. A total of 15 patients had presented to the emergency department due to an injury sustained after an assault, 3 after falling from heights, and 8 due to trauma during sports activities (Figure 1).

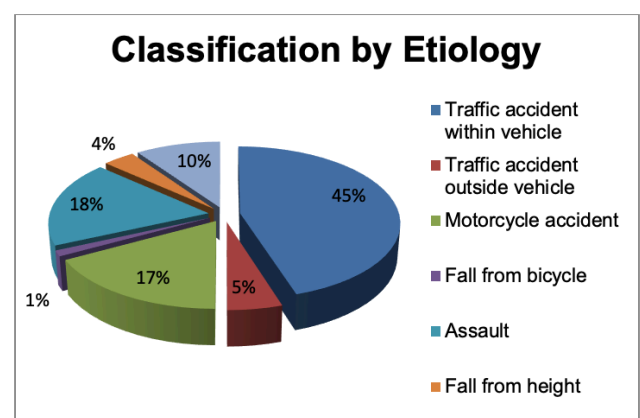


Fig1. Distribution of the orbital emphysema cases by etiology

The radiological distribution of our OE cases by

the location of the air is presented in Figure 2. Preseptal emphysema (Figure 3a) was found in 80 of the 112 orbits, while there were 26 extraconal (Figure 3b) and 5 intraconal (Figure 4a) emphysema cases, in addition to a single intraocular emphysema case (Figure 4b). There was no orbital compartment syndrome or central retinal artery occlusion in any patient. An intraocular foreign body due to a penetrating eye injury was detected in the patient with intraocular air and she was referred to a retina center for vitreoretinal surgery.

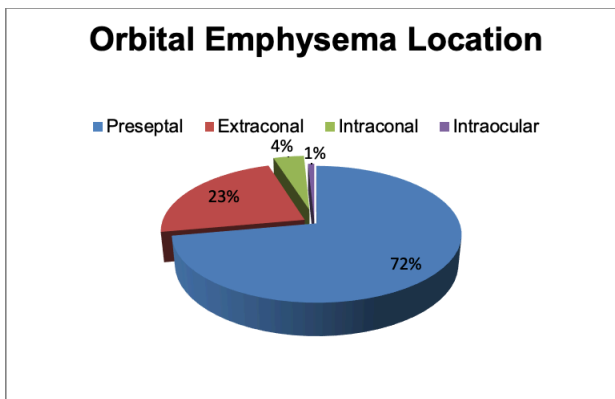


Fig 2. Distribution of the orbital emphysema cases by location



Fig 3. Computed tomographic images demonstrate preseptal (a: white arrow) and extraconal (b: black arrow) emphysema.



Fig 4. Computed tomographic images demonstrate intraconal (a: black arrow) and intraocular (b: white arrow) emphysema.

DISCUSSION

Orbital emphysema in the literature was described

and classified by Heerfordt in 1904 [10]. This classification included palpebral emphysema, true orbital emphysema and orbitopalpebral emphysema. Isolated palpebral emphysema is rare. It may result from fracture of the lacrimal bone and secondary tear of the lacrimal sac in front of the orbital septum. Nasal air can then pass through the nasolacrimal drainage system and enter the eyelid tissues. Palpebral emphysema can also occur as a result of subcutaneous air spreading to the eyelids along the fascial plane. The air remains limited to the eyelid as long as the orbital septum is intact.

When planning our study, we wanted to emphasize that orbital fractures associated with blunt orbital trauma may cause OE, as the emphysema may also be associated with serious complications that can lead to permanent vision loss. Although it is often a minor problem and regresses with follow-up and medical treatment [1-3], it may occasionally be associated with more serious problems such as orbital compartment syndrome and central retinal artery occlusion [1]. Urgent orbital decompression may be required in the presence of compression signs, such as optic disc edema, weakening of the pupil reaction, a sudden decrease in visual acuity or limitation of eye movements [9].

There are only a few studies analyzing large orbital emphysema series. Moon et al. have found OA in 70 of their 348 patients with a medial orbital wall fracture. Intraorbital air was most commonly found (70%) in the superior extraconal region. In the current study, the main location was preseptal as seen in 80 (71.5%) of the 112 patients. Emphysema was present in a total of 32 cases (28.5%) in the extraconal, intraconal and intraocular regions.

A “blow-out” fracture is the most common fracture type following blunt orbital trauma [10,11]. These fractures are located on the bone structure separating the maxillary sinus from the orbital cavity and the maxillary sinus air can be displaced into the orbit. Another reported complication of orbital emphysema is a dramatic but temporary increase in intraocular pressure, up to 100 mm Hg in the case of trauma and/or barotrauma, where the integrity of the orbital septum is not impaired [12]. When the pressure in the upper

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respiratory tract is artificially increased as seen with sneezing, coughing, vomiting, or blowing air through the nose - or following orbital fractures - air is forced from the sinus to the orbit [13]. The air can, similarly, easily exit from the fracture zone and a high intraorbital pressure is not maintained in most cases. However, if a unidirectional valve mechanism originating from a bone fragment or orbital fat at the fracture site is present, air may enter the orbit and become trapped [14]. The result is an increase in intraorbital pressure and sometimes an increase in intraocular pressure. Proptosis of the orbital content, rupture of the orbital septum or Tenon's capsule, and air escaping into the eyelids or conjunctival space act as preventive measures to reduce the intraorbital pressure. The intraorbital pressure can be monitored indirectly by measuring the intraocular pressure [15].

The diagnosis of OE can be made easily with the anamnesis, physical examination and orbital CT [14]. The latter should be the radiological imaging method of choice for patients presenting with orbital trauma to the emergency department [16].

In our previous study, at least one of the clinical signs of diplopia, laceration, afferent pupillary defect, hypoesthesia and exophthalmos was found to be present at a rate of 47.1% in traumatic orbital fractures. A statistically significant relationship between basal fractures and diplopia was also present in our previous study ($p= 0.002$). However, there was no significant relationship between other radiological and clinical findings [17].

In conclusion, orbital emphysema is a rare clinical condition. It is most commonly caused by orbital trauma and usually constitutes a coincidental and benign finding that improves over time. Careful observation is the only treatment required unless the orbital wall fracture involves an infected sinus, in which case oral prophylactic antibiotics may be administered.

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