

# Medical and Surgical Management of Late-Term Posttraumatic Orbital Abscess

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## ABSTRACT

Orbital cellulitis and abscesses are typically secondary to a maxillary, ethmoid, or frontal sinus infection. Rarely, it may also be seen after orbital trauma. In cases of penetrating orbitofacial trauma caused by a foreign body, the presence of any foreign body in the intraorbital tissues should be investigated with radiological imaging, however, an initial examination may be insufficient. Suspicious examination findings require close follow-up and surgical exploration for non-visualized foreign bodies. Though orbital abscesses are often bacterial in origin, the causative agent varies depending on the etiology, and in cases of a possible infection, the culture should be studied and treated appropriately. Vision loss of some 10% can occur in an untreated orbital infection. Early recognition and timely treatment of an orbital infection is important in order to avoid potentially deadly conditions, such as cavernous sinus thrombosis, brain abscess, or meningitis. In this case report, a case of orbital abscess occurring after a tree branch-related orbital injury and the clinical approach applied for a 76-year-old patient are reviewed in the context of the relevant literature.

## INTRODUCTION

Fractures are common in cases of orbital trauma, and may occasionally lead to orbital cellulitis.<sup>[1,2]</sup> In the event of a penetrating injury with a wooden or plant-based foreign body, bacteria and parasites can easily adhere and penetrate the wound site and cause infection since these materials are organic and porous. A foreign body penetrating the orbit can cause acute orbital inflammation if not removed promptly. However, determining the presence of a wooden foreign body with initial computed tomography (CT) or magnetic resonance imaging (MRI) can be challenging.<sup>[3]</sup>

The aim of this study was to present the clinical and surgical approach used in a case of orbital cellulitis and abscess developing in the late period after periorbital trauma in the context of the relevant literature.

## CASE REPORT

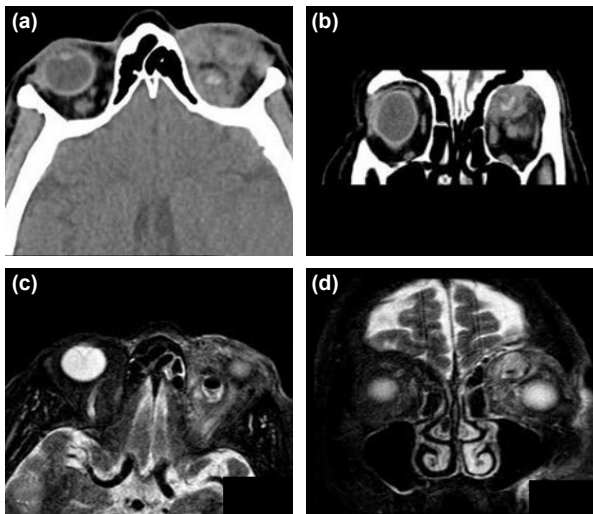
The examination of a 76-year-old female patient who presented with reduced vision, pain, redness, swelling, and diplopia in the left eye revealed a visual acuity of 6/10 in

the right eye and 1/10 in the left eye. Chemosis, conjunctival hyperemia, proptosis, and limitation of eye movement in all directions, and hypotropia in the left eye were present, as well as ptosis, hyperemia, and edema in the left eyelid (Fig. 1). The patient had a fever of 38.5°C, and a blood test indicated that the C-reactive protein (CRP) level was 36 mg/mL and the leukocyte count was 9300/mm<sup>3</sup>. The patient history indicated the presence of chronic obstructive pulmonary disease (COPD), rheumatoid arthritis, and diabetes mellitus.

The patient was clinically diagnosed with orbital cellulitis and an abscess formation in the upper orbit based on CT and MRI examinations (Fig. 2). Primary suturing for an open injury to the upper eyelid inner canthal region caused by a tree branch had been performed 3 weeks earlier. The patient indicated that she had presented at a neurology clinic 5 days prior due to hypoesthesia in the periocular region. An orbital CT performed at that time revealed the presence of intraorbital air and a fracture in the frontal sinus (Fig. 3). The patient was hospitalized and empirical intravenous antibiotic treatment (ampicillin+sulbactam 2x2 g, metronidazole 0.5% 3x1,



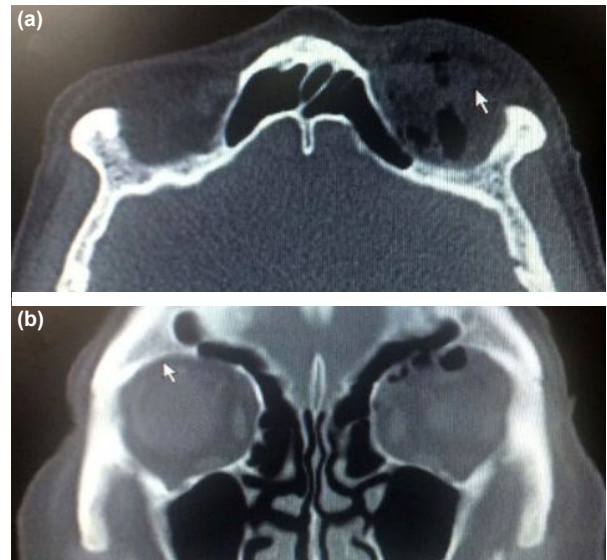
**Figure 1.** Pre-treatment view of the orbital cellulitis and abscess. Intense chemosis in the upper nasal area, eyelid hyperemia, and edema can be seen.



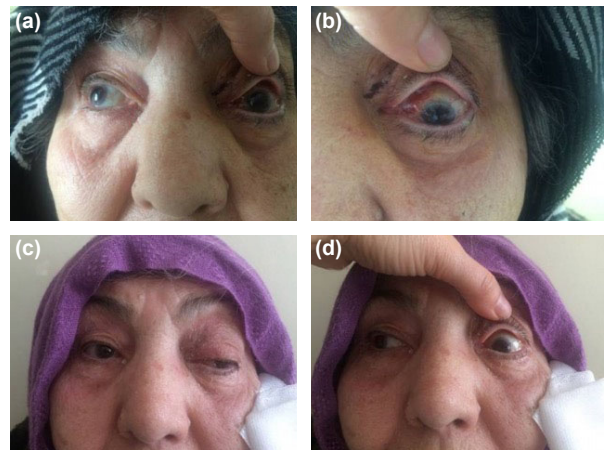
**Figure 2.** (a, b) An irregularly demarcated abscess formation 32x20 mm in size in the upper medial orbit near the upper rectus muscle and optic nerve is visible in preoperative axial and coronal computed tomography images; (c, d) an abscess formation, 22x12.30 mm in size, involving the upper rectus as observed in preoperative magnetic resonance images.

voriconazole 200 mg 2x1) was initiated. A pus sample was taken from the abscess area with an injector and a culture antibiogram was performed, which revealed growth of *Staphylococcus epidermidis*. The initial antibiotic treatment was replaced with meropenem and voriconazole. Abscess drainage was performed with an upper anterior orbitotomy through the skin due to a lack of improvement on the fifth day of treatment, an increase in CRP to 52 mg/mL as well as an increase in the leukocyte count to 11,500/mm<sup>3</sup>, increased abscess size observed with a control MRI, and the suspicion of a foreign body.

**First surgery:** An incision was made on the upper eyelid fold and advanced toward the medial upper orbit. It was observed that the septum was open, the preaponeurotic fat pouches were prolapsed, and that the levator muscle



**Figure 3.** (a, b) An orbital computed tomography image performed during the initial post-trauma period shows a fracture in the frontal sinus and a view of the intraorbital air.



**Figure 4.** (a, b) Fifth day and (c, d) 15<sup>th</sup> day images of abscess drainage after cutaneous orbitotomy surgery. The edema and hyperemia in the upper medial area gradually decreased, and inward (mild) and upward (significant) gaze restriction is observed.

was partially cut. The pus was drained by moving backward over the levator muscle, however, no foreign body was found. The surgical area was irrigated with 5% diluted povidone iodine solution and saline solution. The levator muscle was repaired and the skin was sutured.

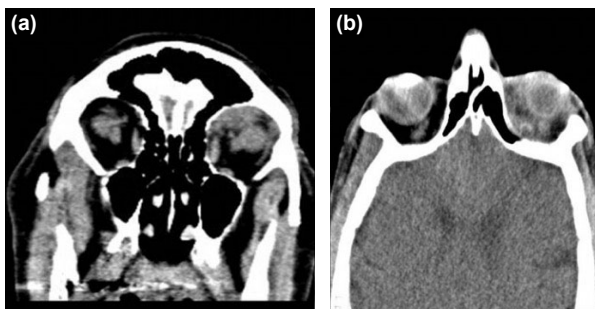
It was observed in follow-up that eye movement was unrestricted, other than limited upward gaze in the left eye, that visual acuity had increased, and that the chemosis and ptosis had regressed. On the fifth day after surgery, the CRP had decreased to 6.68 mg/mL and the leukocyte count to 7300/mm<sup>3</sup>. Although the clinical examination findings were seen to improve upon examination on the 15<sup>th</sup> day (Fig. 4), due to an increase in CRP to 12 mg/mL and the continued suspicion of a foreign body based on a control MRI, exploration with a transconjunctival anterior orbitotomy was performed.

**Second surgery:** A full-thickness eyelid incision of one-third of the medial upper eyelid was made, and exploration was performed through the tenon to the posterior of the globe medial to the upper orbit; no pus, foreign body, or bone fragment was found. The surgical area was irrigated with saline solution. Surgery was concluded by suturing the tenon and upper eyelid.

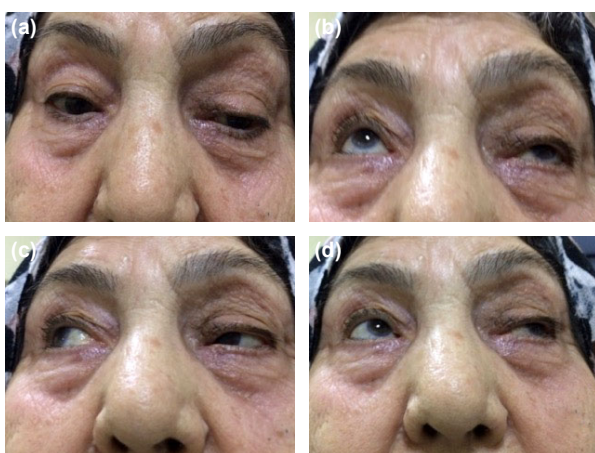
Chest and infectious disease as well as ear-nose-throat disease examinations were performed due to the onset of a fever, sore throat, and cough, as well as a CRP value of 62 mg/mL, a sedimentation rate of 55 mm/hour, and a leukocyte count of 7500/mm<sup>3</sup> were noted. A viral lower respiratory tract infection was diagnosed and antiviral and COPD treatment was added to the antibiotic treatment. The patient's general condition improved and she was discharged after hospitalization for 1 more week.

One month later, a control orbital CT image demonstrated the presence of soft tissue edema and granulation tissue, and the upper medial abscess formation had almost disappeared. The hyperdense image in the upper medial area was interpreted as a bone fragment detached from the frontal sinus wall (Fig. 5).

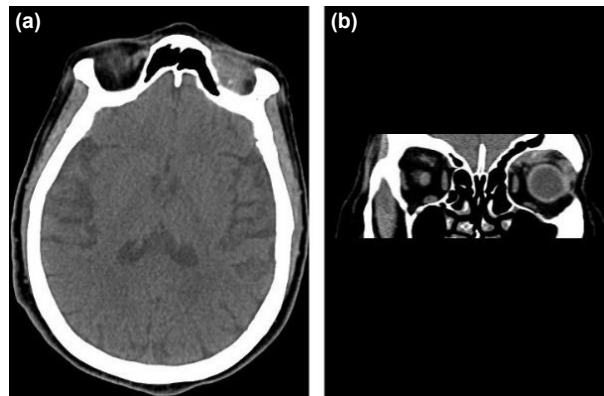
In the third- and sixth-month follow-up visits it was observed that left visual acuity had increased to 0.7, chemosis



**Figure 5.** (a, b) A control computed tomography images illustrating that the abscess formation in the upper medial area has almost disappeared 1.5 months postoperatively. Edema and granulation tissue can be observed in the soft tissue.



**Figure 6.** (a-d) No pathological finding was observed at the sixth month, except ptosis in the left eyelid and limited left inward and upward gaze.



**Figure 7.** (a, b) A control orbital computed tomography image demonstrates granulation of the thickened soft tissue in the medial upper anterior orbit and a hyperdense 1–2 mm area compatible with a fragmented bone fragment of the inner orbital wall of the frontal sinus.

had completely disappeared, and all eye movements had improved, except upward and upper medial gaze restriction, and there was sequela of ptosis in the left upper eyelid (Fig. 6). In a control orbital CT, no pathological finding was observed other than granulation in the thickened soft tissue in the medial upper anterior orbit and a hyperdense 1–2 mm image compatible with the bone fragment detached from the inner orbital wall of the frontal sinus (Fig. 7).

Written, informed consent was obtained for all medical and surgical procedures.

## DISCUSSION

Orbital cellulitis and abscess usually develop due to paranasal sinus infections. Rare cases have been reported after nasal or orbital fractures.<sup>[2]</sup> In 1970, Chandler classified orbital infections into 5 subgroups: stage 1: preseptal cellulitis, stage 2: orbital cellulitis, stage 3: subperiosteal abscess, stage 4: orbital abscess, and stage 5: cavernous sinus thrombosis. While stages 1 and 2 are treated with medical treatment, surgical drainage is required in stages 3, 4, and 5.<sup>[2,4]</sup> Intraorbital foreign bodies are frequently encountered in cases of an orbital penetrating injury after a fall. Our case had a penetrating orbital and frontal sinus injury due to a tree branch as a result of a fall, and orbital cellulitis and abscess developed 3 weeks later.

A CT examination can be used to grade orbital inflammation and the presence of a metallic foreign body. However, orbital injuries with a tree branch or a similar wooden object may not be seen with CT or MRI in the early period and may be missed.<sup>[5]</sup> Wooden or similar intraorbital foreign bodies can cause complications such as infection, abscess, and fistula in the long term and exploration is required.<sup>[6]</sup> A high-density shadow due to calcium salt accumulation and a low-density shadow surrounding it are frequently observed after the first month. In our case, the presence of a marked abscess formation, and hyperdense and hyperechogenic areas observed on orbital CT and MRI images aroused the suspicion of a foreign body.



Despite this suspicion, no foreign body was found in 2 explorations and improvement of the findings were achieved as a result of the treatments applied. Orbital cellulitis and abscess may have developed due to a polluted orbit and a sinus injury that disrupted anatomical integrity without an intraorbital foreign body. The final opinion due to the etiology was that the invasion of microorganisms in the sinus to the deep orbital tissues due to a frontal sinus fracture and deep orbital tissue injury with perforation of the orbital septum caused the development of infection.

Orbital infections are usually caused by *Staphylococcus aureus*, *Staphylococcus pneumoniae*, and *Haemophilus influenzae*.<sup>[2,7]</sup> The culture of this patient was positive for *Staphylococcus epidermidis*, which is present in the sinus and skin flora. In cases of orbital infection, the appropriate intravenous treatment should be initiated as soon as the agent is detected, and if accompanied by an orbital abscess, surgical drainage should be performed immediately.<sup>[8]</sup> An intraorbital abscess secondary to sinus infection usually develops medial to the orbit. Endoscopic nasal drainage is generally preferred for drainage. In upper orbital abscesses, an anterior orbitotomy can be performed through the skin or with a conjunctival approach to more easily provide drainage.<sup>[2,9]</sup> In our case, an anterior orbitotomy was performed first via a skin incision and then through the conjunctiva to achieve abscess drainage in the medial upper orbit and permit a second exploration. The treatment objective in this type of orbital infection is to improve vision and to prevent the spread of the infection and the development of potentially deadly complications, such as cavernous sinus thrombosis, meningitis, or brain abscess.<sup>[1,2,10]</sup>

## CONCLUSION

Orbital cellulitis and orbital abscess can develop in the late period following orbital trauma. In open orbital injuries involving a tree branch or other wooden foreign body it may be difficult to detect a foreign body with orbital imaging. Therefore, close follow-up and treatment should confirm orbital exposure and drainage of an abscess when necessary, and the possibility of a foreign body should be investigated. Orbital traumas that cause disruption of anatomical

integrity should be closely monitored for infection. Early diagnosis and treatment can yield satisfactory results.

### Informed Consent

Written informed consent was obtained from the patients for the publication of the case report and the accompanying images.

### Peer-review

Internally peer-reviewed.

### Authorship Contributions

Concept: Ö.R.Ö.; Design: Ö.R.Ö.; Supervision: G.D.G.; Materials: S.B.; Data: G.D.G.; Analysis: S.K.; Literature search: S.K.; Writing: Ö.R.Ö., G.D.G.; Critical revision: Ş.Ş.

### Conflict of Interest

None declared.

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## Orbita Travması Sonrası Geç Dönemde Görülen Orbital Abse Olgusu Tıbbi ve Cerrahi Tedavisi

Orbital selülit ve abseleri çoğunlukla maksiller, etmoid ve frontal sinus enfeksiyonlarına sekonder gelişmektedir. Orbital travma sonrasında nadir olsa da görülebilmektedir. Yabancı cisim ile meydana gelen penetran orbitafacial travma olgularında orbita içi dokularda yabancı cisim varlığı radyolojik görüntüleme yöntemleri yardımıyla dışlanmalıdır. Görüntülenemeyen yabancı cisimler için şüpheli muayene bulguları varsa yakın takip ve cerrahi eksplorasyonu gerekmektedir. Orbital abseler sıklıkla bakteriyel kaynaklı olsada değişkenlik gösterebilir. Olası enfeksiyon durumunda kültür alınarak etken saptanmalı ve uygun tedavisi ivedilikle yapılmalıdır. Tedavi edilmeyen orbital enfeksiyonlar sonrası %10 olguda görme kaybı görülür. Kavernoöz sinus trombozu, beyin absesi ve menenjit gibi ölümcül olabilen durumlarla sonuçlanabileceğinden erken tanınması ve zamanında tedavi edilmesi önemlidir. Bu olgu sunumuyla, ağaç dalı ile orbital yaralanma sonrası geç dönemde meydana gelen orbital abse olgusunu ve klinik yaklaşımımızı literatür bilgileri ışığında sunmayı amaçladık.

**Anahtar Sözcükler:** Abse; orbital selülit; orbita travması.