

Orbital abscess and inflammation of odontogenic origin

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ABSTRACT

The aim of this paper is to report a case of orbital abscess, cellulitis and sinusitis secondary to infection originating from recently endodontically-treated maxillary teeth, and review the relevant literature. Appropriate treatment in this 33-year-old male patient was delayed due to lack of consent for dental extractions. Infectious orbital affliction of odontogenic origin is a rare and uncommon condition, comprising 1-

3 % of all cases. Early recognition and prompt management of orbital infection of dental origin is of great importance, since failure to do so may lead to disastrous complications, including death. Depending on the progression of the inflammatory process, cooperation between specialties is essential. A brief review of the literature is also presented.

Keywords: Orbit, Orbital cellulitis, Orbital abscess, Paranasal sinuses, Odontogenic inflammation, Endodontic treatment

INTRODUCTION

Odontogenic infection of the paranasal sinuses and the orbit is a rare but ominous condition, as it may lead to disastrous complications such as blindness, cavernous sinus thrombosis, brain abscess or even death [1-12]. Odontogenic orbital infection appears as cellulitis but sometimes an abscess formation can be seen on radiologic examination. In 70-80 % of the cases, it results from the spread of odontogenic sinusitis caused by the extraction of maxillary teeth [13-14]. A smaller percentage is due to transduction of the infection from the eyelids, tonsils, middle ear, intracranial areas, or may be caused by a systemic disease [5, 15].

We present here a case of acute orbital infection of dental origin which had an unusually long course due to delayed diagnosis and which was further prolonged by the patient's refusal to allow dental extractions.

CASE REPORT

A 33-year-old male with chemosis, exophthalmos, edema of the lower eyelid and pain in the infraorbital area presented to the emergency of the ophthalmology department. Pupil reflexes were normal but the patient had decreased ocular

mobility, diplopia and moderate decrease in visual acuity (Vos=8/10). On admission, his temperature was 37.7 °C and leukocyte count was 22,000 / mm³ with 92.9 % neutrophils. The patient was prescribed amoxicillin/clavulanic acid 626 mg, per ost.i.d.; despite treatment, his clinical condition deteriorated the following day, while edema and pain spread to the upper eyelid, the orbit and the periorbital region. *Bacteroides stercoris* was isolated from cultures obtained from the conjunctival sac and the patient's antibiotic coverage was broadened to vancomycin 500 mg intravenously t.i.d., metronidazole 500 mg intravenously b.i.d. and ceftazidime 1000 mg intravenously t.i.d. However, there was no clinical improvement. Magnetic Resonance Imaging (MRI) of the face showed opacification of the left maxillary sinus, the anterior left ethmoid cells and the lower part of the left frontal sinus, proptosis of the left eyeball and fluid accumulation (characterized as swelling or pus) between the orbital roof and the superior and medial rectus and superior oblique muscles, extending to the medial orbital wall and affecting the optic nerve (Figure 1a). A maxillofacial surgeon was consulted and further dental history was obtained. The patient reported

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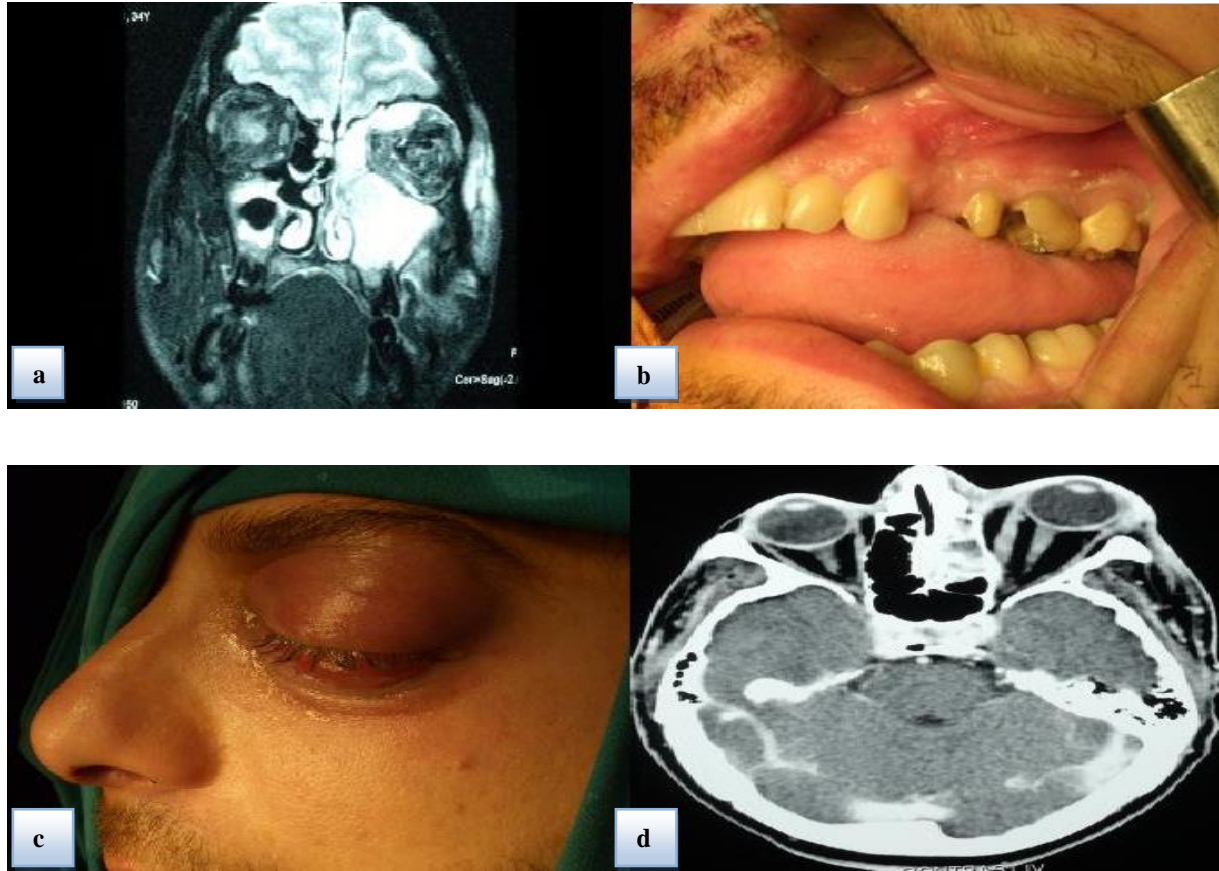


Figure 1: MRI demonstrating subperiosteal abscess (1a) Clinical presentation of teeth (1b) responsible for orbital inflammation, exophthalmos, chemosis (1c) Preoperative CT (1d)

endodontic treatment of upper left first and second premolar molar teeth by a private dentist (Figure 1b). The patient recalled a feeling of "air blow" into his sinuses during irrigation of the root canals with sodium hypochlorite. On the day following tooth extraction, the patient developed swelling of his left facial area with pain and saw an ENT surgeon who diagnosed sinusitis of the maxillary sinus and prescribed cefuroxime axetil 500 mg b.i.d., metronidazole 500 mg b.i.d., anti-inflammatory drugs orally and decongestant nasal spray for eight days. The antibiotic regimen led to some improvement in the patient's clinical picture and he was recommended to continue the endodontic therapy. Ten days after completion of the endodontic therapy, the patient presented to the ophthalmology emergency. After a detailed dental history and examination by the maxillofacial surgeon, teeth extractions and antrostomy were suggested. However, the patient

refused to undergo dental extractions.

In an effort to decompress the maxillary sinus, intranasal antrostomy under local anesthesia was performed by an ENT surgeon, and a silicone catheter was placed for drainage of pus and irrigation of the maxillary sinus. A new specimen was collected via the tube and sent for culture. The procedure offered temporary relief from the symptoms that lasted one day. There was further deterioration of clinical signs (worsening edema, erythema, proptosis, chemosis, and limitation of ocular mobility) and symptoms (diplopia and reduction of visual acuity on 4/10, (Figure 1c). Patient underwent an urgent CT scan (Figure 1d) which confirmed the previous MRI findings; no involvement of the cavernous sinus or the cerebral parenchyma was recorded. The patient was taken to the operation theatre and underwent widening of existing antrostomy under general anesthesia by oral and maxillofacial surgeons. A copious flow of purulent material was

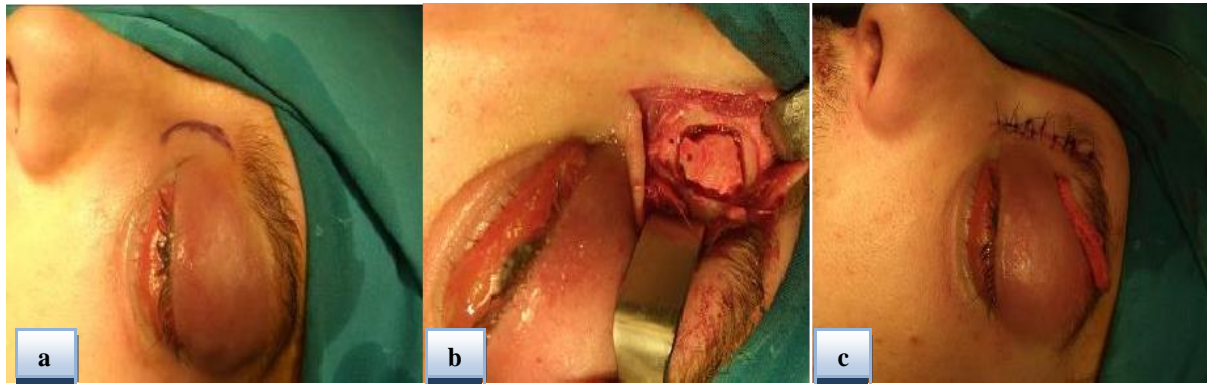


Figure 2: Intraoperative incision (2a), osseous window (2b) and drainage (2c) of orbital subperiosteal abscess

encountered. A new, wider catheter (2 cm in diameter) replaced the preexisting drainage. The operation was completed with a crescent-shape incision beneath the medial eyebrow and along the nasofrontal angle (Jansen-Ritter incision, Figure 2a) for drainage of the frontal sinus. An osseous window (Figure 2b) was then created at the inferior-lateral wall of the frontal sinus, which was thoroughly irrigated with saline. A culture of the pus from the maxillary and frontal sinuses grew *Streptococcus mitis* and *Staphylococcus epidermidis*, respectively. Through the same incision beneath the proximal eyebrow, a blunt instrument was inserted to gain access to the inflammatory accumulation within the orbit previously seen on MRI (Figure 1c). Before closure of the incision an iodoform gauze strip was placed to drain the orbital cavity continuously, coming out from a small laceration at the upper eyelid (Figure 2c). Both collateral premolars and the first molar were extracted. The patient continues to improve clinically, and on the second postoperative day, the orbital drainage strip was removed (Figure 3a). Pain, periorbital edema, chemosis, visual acuity, and exophthalmos recovered quickly (Vos=9/10), while diplopia reverted gradually.

The left maxillary sinus was irrigated with antiseptic solution twice daily through the drain catheter (Figure 3b). On the sixth postoperative day, the triple intravenous antibiotic schema was replaced with oral amoxicillin / clavulanic acid and metronidazole, and the following day, the patient was discharged from the hospital with fully reverted visual acuity (Vos=10/10).

One week later the patient returned for a follow-up; his diplopia had improved remarkably and his sinus catheters were removed.

DISCUSSION

Since the advent of the antibiotics, orbital cellulitis of odontogenic origin is a rare condition [1, 5, 16], with a preponderance of pediatric [17-19] and male [5, 7, 20-23] populations. Infectious involvement of the orbit may result from various causes. Paranasal sinusitis is predominantly responsible for the spread of infection toward the orbit [19, 24-27]. The orbit is in close proximity to the frontal sinus superiorly, the ethmoid sinus medially and the maxillary sinus inferiorly. These structures have been reported to be rather thin, not providing an effective barrier against the spread of the infection [5, 28]. Nevertheless only 1-2 % of all cases of paranasal sinusitis lead to orbital involvement [29]. Other factors that can cause orbital cellulitis include spread of infection from eyelids, tonsils, intracranial areas, middle ear and odontogenic structures, either directly or through the lymphatic and vascular system [5, 13]. In a small number of cases, orbital involvement has been reported to be associated with scarlet fever, thyroid ophthalmopathy, tuberculosis, syphilis, influenza A, herpes simplex, herpes zoster and subacute bacterial endocarditis [1, 15]. Although maxillary sinus infections are common and 10% of these are of dental origin, complications from these infections have greatly decreased since the advent of antibiotic therapy [5]. Nevertheless, infectious involvement of the orbit remains a challenge for oral, maxillofacial and ENT surgeons as it may lead to intracranial involvement and high case fatality rates.

Odontogenic infection can spread to the orbit through several routes. Infection from the maxillary premolar and molar (first molar



Figure 3: Postoperative clinical presentation of the patient the day of drain gauze removal (3a) and one day later at an irrigation session (3b)

presents the highest incidence [30]) teeth may perforate the maxillary buccal plate and spread posteriorly into the pterygopalatine and infratemporal fossae, both finding their way into the orbit through the inferior orbital fissure, or perforate the posterior maxillary wall to enter the maxillary sinus [1, 13, 15]. Spread of infection can also be accomplished through the valveless anterior facial, angular and ophthalmic veins [1, 13, 31]. Other pathways for secondary infection of the orbit can be via odontogenic abscess of the cheek with spread through the soft tissue [1].

Although the staging system according to Chandler [14] is still in use, it has been complemented by Osguthorpe et al [31], whose classification discriminates inflammatory conditions with regard to the involvement of the orbital septum (preseptal edema, cellulitis, and abscess versus postseptal inflammatory edema, subperiosteal abscess, orbital abscess and cavernous sinus thrombosis) [31]. Orbital cellulitis comprises diffuse edema of the orbital contents and infiltration of the adipose tissue with white blood cells and bacteria. If the process continues, an abscess can be observed [1, 15, 16]. The case reported herein falls to the subperiosteal abscess category due to presence of marked exophthalmos and chemosis and the subperiosteal collection depicted in the MRI scan; nonetheless, a discrete collection of pus was not found intraoperatively. However, the efforts to discover such a collection involved significant risk of damaging the oculomotor musculature and were therefore not attempted.

The bacteriologic profile of the orbital infections has been a concern of a large number of reports in the medical literature [6, 17, 32-34]. Review of these reports showed that the most common isolated bacteria were *Staphylococcus aureus*,

Staphylococcus epidermidis, *Streptococcus pneumoniae* and *Haemophilus influenzae*, as predominantly responsible for these infections. In very young children *Haemophilus influenzae* has been predominantly reported [18, 35].

Prompt diagnosis of the orbital infection is essential in order to avoid disastrous complications such as, optic nerve compression, brain abscess, meningitis and cavernous sinus thrombosis [1-12]. Alerting symptoms are edema and erythema of the eyelids, chemosis, exophthalmos, ophthalmoplegia, decreased visual acuity and cranial nerve paralysis. Although the diagnosis of the orbital cellulitis is mainly clinical, conventional radiographs (Water's view, orbital view, orthopantomogram) should be ordered, as they assist to quickly establish the diagnosis [6]. In cases where conventional radiographs are positive, a CT or MRI scan should follow, which can readily demonstrate edema or abscess formation in both pre- and post-septal regions and detect potential displacement of the muscle cone, the globe, and optic nerve; CT and MRI scans further present a guide for surgical intervention and drainage [24, 30, 32, 36]. Additionally, orbital ultrasound can be used in the diagnosis of orbital infections. However, due to the lack of expertise of the clinicians in interpreting the intraorbital findings, orbital ultrasound is not implemented in the daily routine [1].

The management of the orbital infections includes broad spectrum intravenous antibiotics. Antibiotics are almost always started empirically and the choice is usually between amoxicillin, flucloxacillin or with clindamycin (in cases of allergy to penicillin) and tailored further based on bacterial sensitivity [17, 37]. Following conjunctival sac culture result, vancomycin 500

mg b.i.d. and metronidazole 500 mg b.i.d were prescribed. For vancomycin, manufacturer recommends 500 mg IV every 6 hours or 1 g IV every 12 hours. The recommendation for metronidazole is 500 mg t.i.d. Added with ceftazidime 1000 mg t.i.d, this empirical schema, although not common, might be effective. The schema was maintained until patient discharge. However, extensive surgical drainage was probably responsible for the improved clinical outcome. The treatment of orbital infections should include surgical incision and drainage of the subperiosteal or intraorbital abscess [2, 16]. The orbital floor can be accessed via subciliary incision while the roof, the medial, and the lateral regions of the orbit can be reached via incision just beneath the eyebrow. To facilitate drainage, a silicon catheter or gauze should be inserted. Drainage of the orbital abscess through the orbital floor into the maxillary sinus and hence via a generous nasal antrostomy has been successfully performed [2, 16]. The surgical intervention is completed by incision and drainage of paranasal sinuses. To ensure the drainage and irrigation of the sinuses with saline, catheters should be placed. Sometimes, to eradicate the primary source of the infection, extraction of the responsible tooth/teeth is indicated [2, 11, 38]. In our case, the patient's refusal resulted in deterioration of his condition. In conclusion, clinicians should be aware of the close anatomic relationship of the orbit and adjacent structures so as to make a prompt diagnosis of odontogenic infectious involvement of the orbit and start immediate and appropriate treatment to prevent potentially disastrous complications. The clinical suspicion can be confirmed with a CT or MRI scan, and once diagnosed, appropriate antibiotic coverage and surgical intervention with drainage should be considered. Preoperatively, a complete ophthalmologic exam of the patient should be performed; this evaluation may be of great help during patient follow-up. With the above-proposed diagnostic and therapeutic guidelines, infectious involvement of the orbit may be restrained.

DECLARATION

The authors hereby declare that written consent was obtained from the patient for publication of this case in a medical journal.

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