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True abscess formation is rare in bacterial orbital cellulitis; consequences for treatment

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ABSTRACT

Background: Pre- or retroseptal bacterial orbital cellulitis (pOC/rOC) is not an uncommon orbital disease. Treatment consists of antibiotics with or without surgical drainage. Several questions regarding course, complications and outcome of treatment are unanswered and the indication for surgery is not well defined. The aim of this study is to: 1. describe the outcome of orbital cellulitis (OC) in a large cohort, 2. assess the significance of Chandler's classification, 3. assess the incidence of abscess formation in OC, and 4. redefine criteria for surgery.
Methods: Retrospective case series of patients with OC seen between 1-1-2007 and 1-1-2014 in a tertiary referral center.
Results: Sixty-eight patients presented with (presumed) bacterial pOC. Two out of these 68 developed rOC. All 68 patients had a full recovery. Forty-eight patients presented with rOC. Four out of 48 (8%) had intracranial extension of the infection at the time of admission. No admitted patient developed distant seeding. Only four (8%) patients with rOC had a true orbital abscess. In the other 92% we found a diffuse orbital inflammation or a subperiosteal empyema. Forty-four (92%) patients with rOC had a full recovery.
Conclusions: 1. The prognosis of both pOC and rOC nowadays is generally favorable. 2. Chandler's classification is of little use. 3. True abscess formation in OC is rare. 4. The indication for surgical intervention must be based on the clinical presentation and the assessment of true orbital abscess formation.

1. Introduction

Orbital cellulitis (OC) affects children and adults and has a reported incidence of 0.1–3.5/100.000 [1]. Children are more commonly involved [2]. OC is an infectious inflammation of the soft tissues of the orbit anterior and/or posterior to the orbital septum and can be caused by bacteria, viruses, fungi and protozoa, bacterial infection being the most common cause. OC most commonly results from paranasal sinus or eyelid pathology [3,4]. Notorious for its bad outcome is cellulitis from orodental spread [5]. Severe complications, including vision loss - for instance due to central retinal artery occlusion, cavernous sinus thrombosis, intracranial abscess formation, meningitis and death have been reported [6,7]. Whereas the clinical presentation of pOC is limited to redness and swelling of the eyelids, rOC is characterized by pain, impaired motility, proptosis, optic neuropathy and loss of visual acuity.

In 1970, Chandler described five different stages of orbital cellulitis, as shown in Table 1 [2]. This description suggests a chronologic succession of events and a tool for the approach and treatment of the affliction.

Treatment of bacterial OC traditionally consists of antibiotics and surgical drainage [8]. Oral antibiotics are given for milder presentations such as pOC and intravenously administered antibiotics for more severe presentations. Possibly based on the old surgical adagium: 'Ubi pus, ibi evacua', the common approach used to be surgical intervention once the diagnosis 'abscess' was made. Harris et al. already started to question this dogma in 1993 [8]. Harris recommended a more conservative treatment consisting of intravenous antibiotics and close monitoring of patients who were less than 9 years old, with no visual changes, medium sized medial 'abscess' and no intracranial/frontal sinus disease. He based this treatment on the fact that in this subcategory of patients, the type of infection consisted of a uniform and less aggressive type of bacteria in contrast to the more multiform and more aggressive bacteria stems found in older patients. We wondered whether a less aggressive approach might be applicable to other subgroups of patients with OC as well and therefore studied the course of OC patients in a large cohort. In addition, we studied the occurrence of true orbital abscess formation in OC. Although the terms abscess and empyema are often used synonymously, they are in fact distinct entities. An abscess is a collection of pus and bacteria surrounded by a wall created by the bacteria through which antibiotics can hardly penetrate and therefore surgery is required to open the abscess and evacuate pus. In contrast, an empyema is a

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Table 1
Chandler's classification of orbital cellulitis.

Stage I	Inflammatory preseptal edema of the eyelids (pOC)
Stage II	Orbital cellulitis with diffuse edema of the orbital contents, posterior of the septum
Stage III	Subperiosteal abscess, a collection of purulent material between the periorbit and the orbital wall
Stage IV	An orbital abscess within the orbit
Stage V	Further extension of the infection and phlebitis posterior into the cavernous sinus, causing sinus thrombosis and/or cerebral infection

collection of pus and bacteria in a pre-existing anatomical space to which antibiotics can penetrate relatively easily. From a theoretical point of view, the approach of an orbital empyema therefore could be less invasive than treatment of an abscess. Knowledge of the incidence of a true abscess formation in bacterial orbital infection is thus mandatory to develop new guidelines for the treatment of OC.

2. Material & methods

We retrieved files from all patients in whom a diagnosis of presumed bacterial OC had been made between 1-1-2007 and 1-1-2014 at the Department of Ophthalmology of the Academic Medical Center of the University of Amsterdam. Excluded were patients with incomplete data, without relevant orbital imaging, with non-infectious inflammations such as idiopathic inflammations, sarcoidosis, Wegener's disease, and allergic reactions. Also patients with dacryocystitis or presumed non-bacterial orbital inflammation (viral, fungal) were excluded.

Demographic characteristics included age and gender. Charts were reviewed for duration of symptoms prior to admission, cause of cellulitis, antibiotic use and general condition. Ophthalmic examination included assessment of visual acuity, degree of eyelid swelling and redness, presence of chemosis, pupillary reactions, Hertel measurement, ocular motility, and fundoscopy with assessment of disk swelling. General examination included body temperature, previous and present sinus pathology and laboratory checks. The length of the hospital admission, specific antibiotic use, bacterial culture and surgical interventions were noted. On imaging (CT or MRI) the localization, extension and abscess formation were reviewed by two radiologists specialized in orbital pathology. An orbital abscess (Fig. 1) was defined on CT or MRI as a fluid collection with peripheral enhancement and intraorbital extension through a defect of the periorbit. Fluid collections between the orbital wall and periorbit were defined as empyema (Fig. 2). If these criteria could not be fulfilled, the cellulitis was categorized as diffuse infiltration (Fig. 3).

Patients presenting with only swelling and redness of the eyelids with or without chemosis in the setting of presumed bacterial inflammation were considered having preseptal orbital cellulitis (pOC), whereas those with either proptosis, and/or motility restriction, RAPD, disk swelling, retinal vascular involvement were considered having retroseptal orbital cellulitis (rOC). This was confirmed by radiologic imaging.

Complications were divided into early complications (present at admission) and late complications. Early complications were defined as distant extension of infection, ophthalmic vein thrombosis and retinal artery infarction. Late complications were defined as any sequels of OC. These appeared to be: residual visual impairment, ptosis, lagophthalmos, ectropion and restricted ocular motility with or without diplopia.

3. Results

In a period of seven years, 116 patients fulfilled the inclusion criteria; 68 had pOC and 48 had rOC. 316 patients did not fulfill the inclusion criteria.

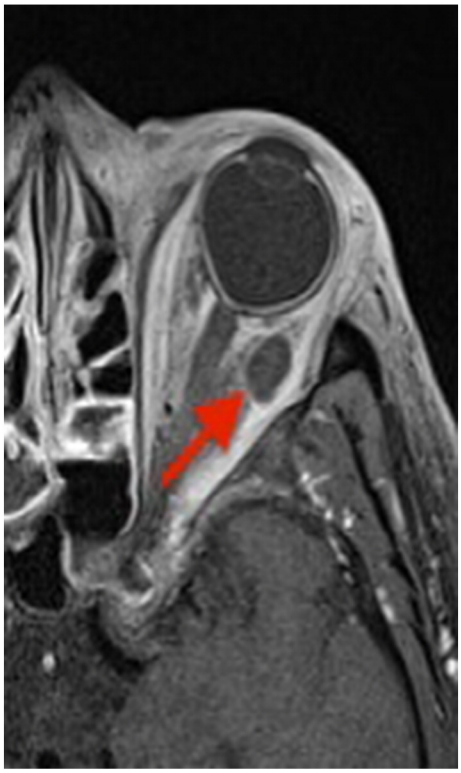

Fig. 1. Orbital abscess.

3.1. Preseptal orbital cellulitis

Of the 68 patients with pOC, 32 (47%) patients were male. Using Harris' classification, 17 (25%) patients were younger than 9 years old. 24 (35%) patients were admitted to the hospital, with a mean admission of 5 days (1–12 days). In 29 (44%) patients the diagnosis of pOC was confirmed by a CT of MRI scan.

Twenty-five (37%) of them had sinusitis, thirteen (20%) had cellulitis secondary to skin disease. In 25 (37%) patients no cause could be found.

Seven (10%) patients had surgery prior to the cellulitis (2 patients had surgery for basal cell carcinoma, 3 for blepharoplasty, 1 orbital decompression, 1 had photothermal coagulation of the puncta). Four patients had diabetes mellitus, one patient was known with non-Hodgkin disease with recent stem cell transplantation. One patient

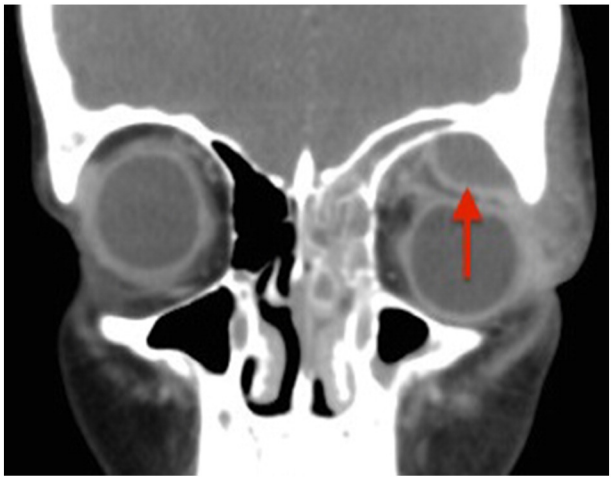

Fig. 2. Subperiosteal empyema.

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