Orbital subperiosteal abscess, when to drain

Dr. Labelb Sailan F1

Monday 3.4.2017
Subperiosteal orbital abscess: volumetric criteria for surgical drainage

Florian Tabarino, Monique Elmaleh-Bergès, Stéphanie Quesnel, Mathie Lorrot, Thierry Van Den Abbeele, Natacha Teissier

Abstract

Objective: To investigate predictive factors of surgical management of subperiosteal orbital abscess in children.

Methods: A retrospective monocentric study was conducted between 2000 and 2011 with children hospitalized for acute pediatric orbital cellulitis (APOC). Clinical, biological and radiological data as well as medical and surgical management were collected and analyzed. All patients received intravenous antibiotics and underwent a CT-scan. Orbit and subperiosteal intraorbital abscess dimensions were measured on axial and coronal planes and the abscess volume was calculated using a spheroid model.

Results: Eighty-three children with APOC (mean age: 4.3 years) were included, 53 were boys (63.9%). Thirty-two children (38.6%) presented with a subperiosteal orbital abscess. Mean abscess volume was 570 mm³ and mean exophthalmos was 4.7 mm. Twenty patients were treated surgically, 11 of which by an endoscopic approach. A positive correlation was observed between the volume of the abscess or exophthalmos and surgical drainage: 57.8% of patients underwent surgery when exophthalmos was >4 mm, 29.4% between 2 and 4 mm, and none when <2 mm. All patients with an abscess volume >500 mm³ or >5% of orbital volume were operated on whereas only 30% or 39% of patients, respectively, in case of smaller volumes (P < 0.05).

Conclusion: Surgery for subperiosteal orbital abscess is usually performed in case of visual complications or unfavorable medical outcome. The importance of the exophthalmos and the volume of the abscess measured on the CT-scan are predictive factors of surgery in children with subperiosteal orbital abscess without visual complications.
Introduction:

Anatomical and anthropological data have demonstrated that the volume of the orbit increases on an individual basis with age and follows the growth of the rest of the skull.

The growth is most important between the ages of 1 and 3; the orbit reaches **90% of adult size at the age 10 yrs**.

The orbit grows progressively with age and varies with individuals; therefore, the same abscess may not occupy the same percentage of the orbit depending on the age and the individual.

The mass effect may then vary while the volume is the same for different patients.
<table>
<thead>
<tr>
<th>Class</th>
<th>Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I</td>
<td>Inflammatory edema/preseptal cellulitis</td>
</tr>
<tr>
<td>Class II</td>
<td>Orbital cellulitis</td>
</tr>
<tr>
<td>Class III</td>
<td>Subperiosteal abscess</td>
</tr>
<tr>
<td>Class IV</td>
<td>Orbital abscess</td>
</tr>
<tr>
<td>Class V</td>
<td>Cavernous sinus thrombosis</td>
</tr>
</tbody>
</table>
Objective:

No previous study have analyzed the ratio of the volume occupied by the abscess to the volume of the orbit.

The objective of this study was to determine the prognostic factors of the surgical management of subperiosteal abscess in the case of APOC considering the volume of the orbit.
Patients and methods:

Hospital records from January 2000 to December 2011 for patients hospitalized in pediatric or ENT departments with a clinical and radiological diagnosis of APOC were retrospectively reviewed.

Pediatric otorhinolaryngology department, Robert Debre’ Hospital, APHP, University Paris
Measurements

Measures of the abscess and of the orbit using reference planes on the contrast-enhanced CT-scan films.

The proptosis was measured using the bicanthal line and a perpendicular line passing by the center of the eyeball.

The volume of the abscess: the model of a prolate spheroid volume

The volume of the orbit: the model of a cone

The orbit was considered as a conical cavity with the bicanthal line and the inferior part of the superior orbital fissure as anterior and posterior landmarks.
The percentage of the volume occupied by the abscess compared to the volume of the orbit

**Fig. 1.** Method for calculating the volume of the orbit and of the abscess.
Results:

83 patients with APOC.
  53 boys (64%).
The mean age was 4.5 years for the boys and 4.8 for the girls.
50 children presented with left APOC
31 right APOC
two were bilateral.
The mean duration of hospital stay was 5.1 days.
All patients presented with fever on admission.
Fig. 2. Medical and surgical management of patients with APOC.
**Use of antibiotics:**

3rd generation cephalosporins associated with anti-staphylococcal antibiotics such as vancomycin.

Cefotaxime was prescribed for 98% of the patients. Patients were given 2 weeks of amoxicillin plus clavulanic acid following discharge from the hospital.

Before the use of antibiotics, 20% of patients presented with visual complications such as blindness.

17% of the mortality were due to neuromeningeal extension. In spite of the use of antibiotherapy and surgical management, 15–30% of the patients still develop visual sequelae.
Patients with subperiosteal orbital abscess

The mean volume of the SAO was 570 mm³ 
the mean percentage of the orbital volume occupied 
by the abscess was 5%

The mean measure of proptosis was 4.7 mm 
Seven patients had ocular complications including 
limitation of eye movements, diplopia and vision 
loss

No ocular complication was noted in the subgroup 
without abscess
Volume of the abscess:

Table 3
Mean volume of the abscesses in surgical and medical management.

<table>
<thead>
<tr>
<th></th>
<th>Surgery</th>
<th>Without surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean volume of the abscess (mm³)</td>
<td>1003</td>
<td>133</td>
</tr>
<tr>
<td>Mean volume of the abscess (%)</td>
<td>6.8</td>
<td>1.7</td>
</tr>
</tbody>
</table>

P < 0.006
P < 0.005

Fig. 3. Percentage of surgical management considering the volume of the abscess.
**Proptosis:**

For a proptosis greater than 4 mm, 58% of the patients underwent surgery, whereas no surgery was necessary when the proptosis was less than 2 mm.

The presence of a proptosis greater than 4 mm was positively correlated with the percentage of the volume of the orbit occupied by the abscess.
Fig. 4. Percentage of surgical management considering the importance of the proptosis.
Conclusion:

several predictive factors for surgical management for SPOA were identified:

  Ocular complications
  persisting or progressing after 48 h of intravenous anti-biotherapy

volume of the abscess greater:
  500 mm³

5% of the volume of the orbit,
  proptosis greater than 2 mm.
Evaluation and Management of Orbital Subperiosteal Abscess
## Deciding on Surgery

<table>
<thead>
<tr>
<th>AGE (YEARS)</th>
<th>LIKELY BACTERIOLOGIC CAUSE</th>
<th>NEED FOR SURGICAL DRAIN?</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 9</td>
<td>Sterile or single aerobic organism</td>
<td>No</td>
</tr>
<tr>
<td>9 to 14</td>
<td>Mixed aerobic and anaerobic organisms</td>
<td>+ / -</td>
</tr>
<tr>
<td>&gt; 14</td>
<td>Mixed or only anaerobic organisms</td>
<td>Yes</td>
</tr>
</tbody>
</table>
If any of the following criteria are present, then surgical intervention is warranted:

- Presence of frontal sinusitis
- Large, nonmedial SPA
- Suspicion of anaerobic infection (presence of gas in abscess on CT)
- Re-accumulation of SPA after previous drainage
- Evidence of chronic sinusitis (e.g., nasal polyps)
- Acute optic neuropathy
- Infection of dental origin where anaerobic etiology is more likely

If none of those criteria is present, conservative management with medical therapy can be offered.
Why orbital complication is unilateral
Comparison of Surgical Approaches of Subperiosteal Abscess in Children

Huang SF1,2*, Lee TJ1, Young CK3 and Wang CN4

1Department of Otolaryngology, Chang Gung Memorial Hospital, Taiwan
2Department of Public Health, Chang Gung University, Taiwan
3Department of Otolaryngology, Chang Gung Memorial Hospital, Taiwan
4Universal eye center, Taiwan

Abstract

Background: Subperiosteal abscess (SPA) is a life-threatening condition in children because of its rapid growth and risk of osteomyelitis. The purpose of this study is to compare surgical approaches in children with SPA.

Methods: A retrospective review of medical records of patients with SPA at a tertiary hospital over a 10-year period was conducted. Patients were divided into two groups: Group A underwent early surgical drainage and Group B underwent delayed surgical drainage.

Results: A total of 45 patients were included in the study. The mean age at presentation was 5.7 years. The infection was most commonly caused by Staphylococcus aureus. Group A had a shorter duration of symptoms (mean 23 hours vs 63 hours, p<0.01) and a shorter hospital stay (mean 3 days vs 6 days, p<0.01) compared to Group B.

Conclusion: Early surgical drainage is associated with shorter duration of symptoms and hospital stay in children with SPA.
Discussion

Ocular complications from rhinosinusitis arise from close anatomic relationships shared by the orbits, paranasal sinuses, and facial venous system [2]. The reason why orbital involvement is usually unilateral is probably related to asymmetry in the dehiscence of the lamina papyracea, the so-called Zuckerkandl dehiscence [24]. Retrograde thrombophlebitis through valveless channels could cause infection spreading to the brain or cavernous sinus thrombosis.

In Tu et al. [18], ocular complications started initially...
Figure 1: a & b: Normal sinus CT is shown on the right figure. On the left, sinus CT with contrast showed two areas of congenital dehiscence of left lamina papyracea.
Medical Versus Surgical Management of Pediatric Orbital Subperiosteal Abscesses

Joshua R. Bedwell, MD; Sukgi S. Choi, MD

QUESTION
Which children with orbital subperiosteal abscess are able to be managed medically versus surgically?

BACKGROUND
Other groups have presented retrospective series aiming to tease out the differences between those that are successively treated with antibiotics alone versus those who require surgery. Rahbar examined a series of 19 patients with SPA due to sinusitis. Of these, five
<table>
<thead>
<tr>
<th>Author</th>
<th>Number of Patients</th>
<th>Medical</th>
<th>Surgical</th>
<th>Differences Between Groups</th>
<th>Recommendations for Medical Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Souliere (1990)</td>
<td>10</td>
<td>5</td>
<td>5</td>
<td>n/a</td>
<td>48-hr trial of antibiotics</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Q2hr ophthalmologic exam</td>
</tr>
<tr>
<td>Garcia (2000)</td>
<td>29</td>
<td>27</td>
<td>2</td>
<td>n/a</td>
<td>Age &lt; 9 yrs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Q6hr ophthalmologic exam</td>
</tr>
<tr>
<td>Rahbar (2001)</td>
<td>19</td>
<td>5</td>
<td>14</td>
<td>Proptosis</td>
<td>Twice daily ophthalmologic exam</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Abscess volume</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Proptosis</td>
<td>No gaze restriction</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Severe gaze restriction</td>
<td>IOP &lt; 20 mmHg</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IOP &gt; 20 mmHg</td>
<td>Proptosis &lt; 5 mm Width &lt; 4 mm</td>
</tr>
<tr>
<td>Ryan (2009)</td>
<td>68</td>
<td>47</td>
<td>21</td>
<td>Age</td>
<td>Age &lt; 6 yrs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Temperature on admission</td>
<td>Width &lt; 10 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Size (10 mm cutoff)</td>
<td></td>
</tr>
</tbody>
</table>

*Only proptosis significant in multivariate analysis. IOP = intraocular pressure.*
BEST PRACTICE

Taken as a whole (Table I), the literature suggests that orbital SPA in children is not an absolute indication for immediate surgical intervention. Patients presenting with advanced ophthalmologic findings (impaired visual acuity, elevated IOP, ophthalmoplegia, proptosis >5 mm) or with large abscesses (width >10 mm) are best treated surgically. Patients with a less serious presentation may improve with conservative management (intravenous antibiotics, nasal saline lavage, topical decongestants). There is evidence that older patients are less likely to be adequately treated with medications alone; however, age
LEVEL OF EVIDENCE

All studies are level 4 (case series), with all but one being retrospective. Further research in the area with a large prospective randomized trial would be ideal, but given the relatively low incidence this would be very difficult to achieve.
Comparison of Surgical Approaches of Subperiosteal Abscess in Children

Huang SF\textsuperscript{1,2}, Lee TJ\textsuperscript{3}, Young CK\textsuperscript{4} and Wang CN\textsuperscript{4}

\textsuperscript{1}Department of Otolaryngology, Chang Gung Memorial Hospital, Taiwan
\textsuperscript{2}Department of Public Health, Chang Gung University, Taiwan
\textsuperscript{3}Department of Otolaryngology, Chang Gung Memorial Hospital, Taiwan
\textsuperscript{4}Universal eye center, Taiwan

Abstract

Surgical definitive treatment of subperiosteal abscess in children has not been well established.
Methodology: The medical records of children less than 18 years old hospitalized from 1996 through 2007, at the Chang Gung Memorial Hospital, with a diagnosis of SPOAs confirmed by computed tomography scan were reviewed. Surgical intervention was indicated only with failed medical therapy, progression of symptoms, or onset of complications. For SPOAs located in the medial aspect of orbit, we use transnasal endoscopic (TNE) approach; SPOAs in the superior aspect of orbit, we use external (EXT) approach; and SPOAs in both the medial and superior aspects of orbit, we use combined approach.

Results: Twenty-two patients, 14 boys and 8 girls, were identified (mean age, 5.45 years [range, 12 days to 18 years]). Ten patients were treated with a TNE approach, 8 patients required an EXT
Conclusion: The selection of surgical approach for pediatric SPOAs according to their radiographic location was proved successful in all our patients.

Keywords: Surgical; Subperiosteal; Children

Introduction

Orbital decompression is usually conducted under local anesthesia in children.
References:

THANKS