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Transnasal endoscopic drainage of a medial subperiosteal orbital abscess

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Abstract The exact incidence of orbital complications due to sinusitis in children is unknown. However, a medial subperiosteal orbital abscess is the most common serious complication to occur. Surgical intervention is mandatory whenever antibiotic treatment fails. Most authors prefer open surgical procedures such as external ethmoidectomy, while others recommend transnasal endoscopic drainage as the first attempt at sinus decompression. Five out of 12 children with proven subperiosteal orbital abscess and sinusitis on computed tomographic scans failed antibiotic treatment and required surgical drainage. Transnasal endoscopic drainage of the abscess was performed on four patients, while one child underwent external ethmoidectomy. Our experience with endoscopic surgery in these four cases is discussed, along with a brief review of the advantage of this procedure over external surgery.

Key words Sinusitis in children · Subperiosteal abscess · Treatment · Functional endoscopic sinus surgery

Introduction

Approximately 60 to 80% of pediatric orbital infections originate in the sinuses [4, 11, 18]. The most common serious orbital complication from pediatric sinusitis is a medial subperiosteal abscess [10, 12, 16, 20] which has also been classified as a "postseptal" orbital infection [1]. Although the ethmoid sinuses are most commonly involved, infection involving both the ethmoid and maxillary sinuses has been documented by computed tomography (CT) scans in over 80% of cases [31].

The pathogenesis of a subperiosteal abscess (SPA) is the result of direct spread of an inflammatory process

from the ethmoid sinuses through natural dehiscences of the medial orbital wall, through the lamina papyracea, and along vascular channels. Anatomically, there is a collection of pus between the periostium and the lamina papyracea. Clinically, there is progressive proptosis with displacement of the globe laterally and anteriorly due to swelling of the involved ipsilateral medial rectus muscle and/or pressure on the globe by the collection of pus [25, 30].

Once the clinical diagnosis of SPA is made, axial and coronal CT scan views should be obtained of the sinuses and intravenous antibiotic treatment begun. Currently, surgical intervention is recommended after 24–48 h of intravenous antibiotic therapy have failed and there is progression of orbital changes [13, 18].

There are two surgical options for the drainage of SPA: an external approach via a Lynch incision and an intranasal endoscopic procedure [15, 22]. In our department, the transnasal endoscopic approach to SPA and the affected sinus has been employed. Our good results and the absence of any major complications to date prompt us to recommend this latter procedure as the preferred surgical technique.

Materials and methods

Twelve cases of SPA in children were reviewed retrospectively (Table 1). There were seven boys and five girls, aged 3 to 16 years (average, 10.3 years). All patients had axial and coronal CT scans of the sinuses performed that verified the diagnosis of SPA. All of the children had received a course of 2 to 5 days of oral antibiotic therapy prior to admission. Antibiotics included amoxicillin or Amoxicillin-Clavulanic Acid.

A course of intravenous cefuroxime sodium was started once a diagnosis of SPA was made. Surgical intervention was indicated when one of the following criteria existed: persistent fever > 104°F (40°C) for more than 48 h despite intravenous antibiotic treatment or progression of orbital signs.

Transnasal endoscopic sinus surgery (ESS) was performed using 2.7-mm and 4-mm 0°C and 30°C telescopes under local anesthesia for the older children (cases 10, 11), while the younger children were operated on under general anesthesia (cases 3, 4). One child (case 2) underwent external ethmoidectomy under general

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Table 1 Clinical signs and symptoms of sinus-induced medial subperiosteal orbital abscesses in children treated at Assaf Harofeh Medical Center

Patient no.	Age (years)	Sex	Fever	Proptosis	Chemosis	Ophthalmoplegia
1	3	M	+	+	-	-
2	3.5	F	+	+	+	-
3	6	M	+	+	+	-
4	7	M	+	+	+	-
5	6.5	M	+	+	+	-
6	8	F	+	+	+	-
7	12	F	+	-	+	-
8	13.5	F	+	-	+	-
9	14	M	+	+	+	-
10	16	M	+	+	+	-
11	15.5	M	+	-	+	-
12	13.5	M	+	+	+	-

anesthesia due to the lack of adequate pediatric instrumentation at that time.

The transnasal procedure was started by medialization of the middle turbinate to expose the ostiomeatal complex and the bulla ethmoidalis. Opening the bulla and evacuating pus and inflammatory debris were the next steps. The lamina papyracea was then opened with a sickle knife, resulting in SPA drainage. Evacuation of pus was followed by irrigation with physiologic saline. No stent or packing was required at the end of the ESS.

Results

A fever of 104 °F (40 °C) or greater with signs of periorbital edema and chemosis were the constant findings in all patients. Proptosis was found in 9 of the 12 patients, while photophobia was found in only 2 children. However, visual acuity was performed by an ophthalmologist and was found to be normal.

The ethmoid sinus was involved in all cases with involvement of other sinuses in ten cases, while the frontal

Table 2 Radiological findings of sinus disease and the method of treatment

Patient no.	Age (years)	Sex	Sinus involvement on CT			Surgery
			Ethmoid	Maxillary	Frontal	
1	3	M	+	-	+	-
2	3.5	F	+	-	-	Open
3	6	M	+	+	+	ESS
4	7	M	+	+	+	ESS
5	6.5	M	+	-	+	-
6	8	F	+	+	-	-
7	12	F	+	+	-	-
8	13.5	F	+	+	-	-
9	14	M	+	+	+	-
10	16	M	+	-	-	ESS
11	15.5	M	+	+	-	ESS
12	13.5	M	+	+	-	-

sinus (5/12) and the maxillary sinus (8/12) were less frequently involved. Unilateral pansinusitis was found in three children, two of whom required subsequent surgical drainage.

In 7 of the 12 children with SPA the orbital signs of infection resolved with intravenous antibiotic treatment and patients could be sent home from hospital after 7.5 days. The five patients undergoing decompressions of their sinuses with drainage of the abscess were discharged 4 to 7 days after surgery (Table 2). No significant postoperative complications occurred. Evaluation of the nose and sinus CT scans 6 months after surgery showed aeration of the paranasal sinuses with no evidence of disease. One patient, a 16-year-old boy, was found to have an incidental concha bullosa of the right middle turbinate. However, no patient developed sinusitis during the follow up period of 1 year.

Discussion

The growing number of children attending day care has led to a significant increase in the incidence of upper respiratory infections, and subsequently of acute and chronic sinusitis [13]. It has been estimated that 5–10% of upper respiratory infections in children are complicated by sinusitis [2, 29]. Most new authors advocate performing CT scans of the paranasal sinuses whenever suppurative complications occur, or in severe acute sinusitis resistant to medical therapy [13, 25, 27].

Although many cases (40–50%) of pediatric acute sinusitis can resolve spontaneously, antibiotic therapy is mandatory for persistent symptoms. If a child's condition does not improve within 10 days of treatment, or in cases where complications such as orbital cellulitis occur, use of a broad-spectrum antibiotic is necessary [28]. All of our patients received amoxicillin-clavulanate potassium prior to developing orbital cellulitis, while intravenous cefuroxime axetil was instituted after hospitalization.

Statistical analysis could not be performed because of the small number of our children treated for SPA. However, we did not find any of the following factors to be an indicator of failure of antibiotic therapy: age, history of recurrent sinusitis, allergy, asthma or anatomic pathology.

Orbital and/or intracranial sequelae are the most dangerous complications of sinusitis [5, 17], with SPA representing the most common orbital complication. While the exact incidence of these complications is unknown, they may represent between 1 and 3% of sinus infections, occurring more commonly in children than in adults [9, 14, 30].

The ethmoid sinuses are most commonly involved in orbital complications of sinusitis [11, 18]. Ipsilateral pansinusitis on CT scan was the most common diagnostic finding in our series. Weber and Mikulis [31] reported that 84% of their children with orbital infections had ethmoid and maxillary sinusitis. However, when such complications occur, the cardinal question is when surgical intervention is indicated. Most authors recommend close clin-

ical monitoring of such orbital signs as proptosis, gaze restriction and visual acuity as the best criteria for deciding upon surgical treatment [1, 3, 9, 12, 19, 22, 24]. Antibiotic therapy was successful in 7 of 12 children (58%) in our series. This experience is comparable to that of Soulière et al. [21], who reported a success rate of 50% with various combinations of intravenous antibiotic therapy which included chlomaphenicol and amoxicillin, cefuroxime, oxacillin and gentamycin. The remaining 50% in the series by Soulière et al. required drainage of the SPA [21].

Our policy is to begin administration of intravenous antibiotics with cefuroxime sodium for 24–48 h and use surgical intervention in those patients in whom clinical signs fail to improve or become worse. We exposed the osteomeatal complex and were able to evacuate pus under pressure as soon as the area between the lateral nasal wall and the middle turbinate was incised. This procedure was solely performed for abscess drainage and to open the anterior ethmoidal cells, with no further surgery required to open the posterior ethmoid, sphenoid or frontal sinuses.

Although many clinicians recommend open surgical drainage of a sinus abscess [6, 26], both Stammberger [22] and Stankiewicz et al. [23] recommend an endoscopic attempt at transnasal sinus decompression for cases with SPA. Endoscopic drainage is contraindicated when there is any evidence of an intracranial complication or additional orbital involvement, such as diminished vision or ophthalmoplegia. When the latter complication occurs, the traditional external approaches such as external ethmoidectomy are necessary [7, 8]. Our review of the literature showed that Page and Wiatrak [15] successfully treated seven of eight children by using endoscopic drainage of SPA. These cases had significantly less postoperative edema than those treated with open drainage, and hospital stays were somewhat shorter as well. However, we are in agreement with Manning [12] that only those surgeons who are experienced with pediatric sinus endoscopy should perform these operations.

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