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Management of superior subperiosteal orbital abscess

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Abstract A superior subperiosteal orbital abscess (SSPOA) is a collection of purulent material between the periorbit and the superior bony orbital wall, and is typically a complication of frontal sinusitis. SSPOA is characteristically managed by classic external surgical drainage. The aim of our study was to assess the role of surgical intervention in SSPOA. A retrospective medical chart review of patients diagnosed with SSPOA secondary to rhinosinusitis between the year 2005 and 2013 was conducted. Collected data included age, gender, co-morbidity, clinical presentation, prior antibiotic management, CT scans, surgical approach, outcome and complications. Six patients were included in our study, three males and three females with a mean age of 22.8 (range 9–58). Two patients were treated with amoxicillin clavulanic acid for 3 days prior to admission. Only the youngest patient with the smallest abscess responded successfully to conservative treatment, while the rest were managed surgically: three patients were treated successfully by the endonasal endoscopic approach and two patients were treated by utilizing the combined endonasal endoscopic and external approach. In patients who underwent the combined approach, the abscess was located in a more antero-lateral position than those treated endonasal endoscopically only. The location of a SSPOA dictates the surgical approach. The most antero-lateral SSPOAs should be drained by the combined approach, while more posterior abscesses should be approached endoscopically. Furthermore, a small SSPOA is first to be reported to resolve with conservative treatment. Level 4 (case series).

Keywords Subperiosteal orbital abscess · Sinusitis · CT scan · Surgical treatment · Management · Superior · Endoscopy

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Introduction

Acute rhinosinusitis (ARS) is one of the common causes of orbital infections in children. Orbital complications (OC) can deteriorate and result in permanent blindness or death if not treated promptly and appropriately [1]. The severity of orbital complications secondary to rhinosinusitis can be grouped into stages according to Chandler's classification, which was introduced in the early 1970s, and which is the most popular classification used for staging sinugenic OC [2]. The reported prevalence of subperiosteal orbital abscesses (SPOA) is approximately 12–17 % of all orbital infections that require hospital admission [3].

Although surgical drainage has traditionally been recommended for SPOA secondary to sinusitis [4, 5], more recent studies have recommended more conservative treatment consisting of intravenous antibiotics and close monitoring of visual status in young children, while surgical drainage is indicated in cases of failure to improve under medical treatment for 48 h or when visual compromise is suspected [2, 6–11].

Superiorly based SPOA (SSPOA) is a rare entity scarcely reported in the literature and seldom observed in clinical practice [12]. Frontal sinusitis is considered as a possible causative factor in these cases, while the infectious process is assumed to involve the orbital content through

existing bony foramina, direct extension or through valveless valves in the frontal sinus floor [13]. It is reported that patients with SSPOA due to frontal sinusitis have a more serious disease requiring surgical drainage [14]. In the handful of studies reporting successful management of SSPOA, the external and combined approaches are the most commonly reported means of evacuating the SSPOA [12, 15, 16]. The aim of our study was to assess the role of surgical intervention in SSPOA.

Patients and methods

The study was approved by the Institutional Review Board.

Charts of all the patients with SSPOA admitted to our institute from January 2005 to December 2013 were included.

Age, gender, symptoms, physical findings, body temperature, complete white blood count and differential analysis, C-reactive protein (CRP) levels, CT findings, treatment before and during admission, surgical treatment, outcome and the final diagnosis were retrieved from patient files.

The CT scan of all patients was evaluated using the Lund Mackay scoring system [17]. The dimensions of the abscess as well as the exact location were evaluated by measuring five parameters developed by the authors of this study: the three abscess dimensions and two parameters describing its location. The abscess dimensions evaluated were length and width as measured in the coronal view, and AP length (depth) as measured in the axial view (Fig. 1). The abscess location was evaluated in reference to two anatomic sites: the nasolacrimal duct axis in the axial view and the frontoethmoidal suture line in the coronal view (Fig. 2). All patients were evaluated and followed by the Ophthalmology Department. Ocular exams included assessment of acute vision when possible, pupillary function, periorbital edema, periorbital erythema, chemosis, proptosis, intraocular pressure, globe motility and retinal appearance.

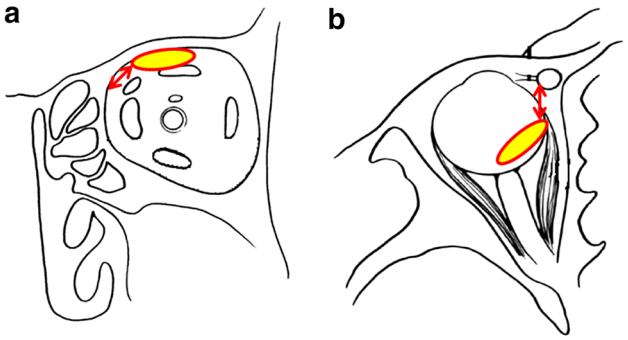

Fig. 2 Abscess location: **a** distance from frontoethmoid suture line in the coronal view; **b** distance from nasolacrimal duct axis in the axial view

Endonasal endoscopic drainage, when indicated, was performed under general anesthesia in all surgically treated patients, preceded by complete ethmoidectomy and extensive removal of the lamina papyracea. The abscess was reached by manipulating the periorbit laterally in the most superior aspect of the orbit for draining the abscess. Cultures were taken from the sinuses and the orbital abscess. At the end of the drainage procedure, the nasal cavity was irrigated thoroughly and the nose packed with a Merocele tampon [16].

The external ethmoidectomy was also performed under general anesthesia. A gull-wing incision was made with a No. 15 scalpel and continued through the periosteum. An elevator lateral elevation was used to lift the lacrimal sac from the fossa, and periorbital dissection was continued until the abscess was encountered and evacuated. At the end of the procedure, the incision was closed in two layers and drained externally with a rubber band.

Results

A total of six patients with SSPOA, three males and three females were included in our study. The mean age was 22.8 years (9–58). Five patients had an abscess on the left

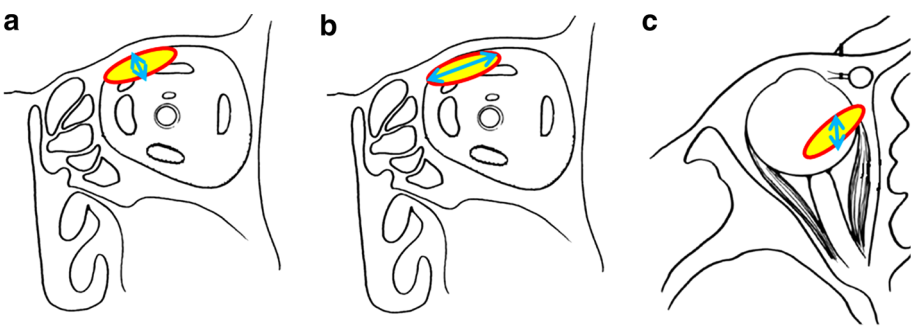

Fig. 1 Abscess dimensions. **a** Width in the coronal view; **b** length in the coronal view; **c** depth in the axial view

side. All patients were examined by an ophthalmologist and otolaryngologist, while the children were also evaluated by a pediatrician.

Two patients received amoxycillin–clavulanate due to symptoms and signs of ARS for 3 days prior to admission. One patient underwent a sinus X-ray prior to admission showing no signs of sinusitis and another underwent a CT scan demonstrating right side opacification of all the sinuses and left maxillary sinus opacification.

Orbital pain, nasal discharge and eyelid edema were the most common clinical symptoms observed in each of five patients, followed by fever in three patients and headache in two. Eyelid edema was the most common sign reported by the ophthalmologist and was found in five patients, followed by eyelid redness and chemosis in each of three patients, ophthalmoplegia in one patient and very mild vertical limitation in another. Proptosis was reported only in one patient.

A CT scan of the orbits and sinuses was performed in all patients demonstrating the abscess. The Lund MacKay Score was between 8 and 12 in the involved side. The patient with evident ophthalmoplegia was rushed to the Operating Room and underwent an endoscopic procedure for drainage of the SSPOA, while the rest had a trial of antibiotic treatment. Five patients received amoxycillin–clavulanate at admission and the sixth patient received ceftriaxone and clindamycin. Only one patient showed clinical improvement with conservative treatment, while the remaining four patients were observed to deteriorate clinically, including the development of ophthalmoplegia. All four patients were rushed to the Operating Room when the deterioration was observed (within 12–90 h of a trial of antibiotic treatment). Two had undergone endoscopic procedures and the other two, a combined approach for drainage of the abscess. The decision regarding the specific approach for each patient was made by the department's senior consultants prior to surgery, based on the CT scan findings and was based on the five parameters described in the "Patients and methods" section (Figs. 1, 2). The only patient who was not operated upon had the thinnest abscess and one of the smallest volumes (Table 1). The abscess in this case was situated in the posterosuperior part of the orbit. In the three cases treated endoscopically, the most medial part of the abscess was at the frontoethmoidal suture line, and between 4.4 and 8 mm posterior to the nasolacrimal duct axis (Fig. 3); while the additional two cases

Fig. 3 An inferiorly located SSPOA in the coronal view treated with the endoscopic approach

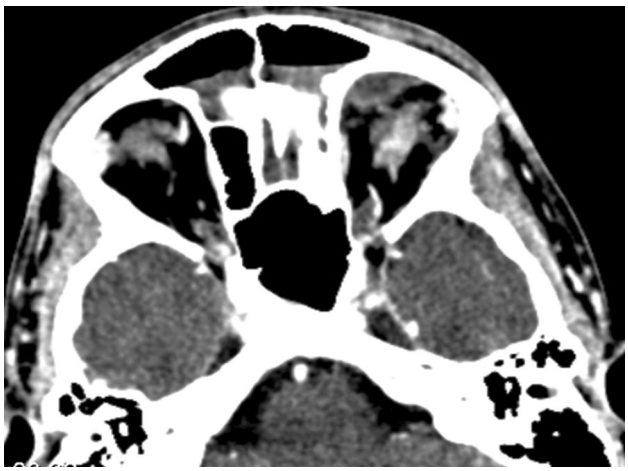

Fig. 4 An anteriorly located SSPOA in the axial view treated with the combined approach

Table 1 SSPOA dimensions and location

Treatment	Abscess location		Abscess features			No
	Distance from NLD	Distance from frontoethmoid	Depth	Width	Length	
Conservative	7.4	6	17.6	2.9	18	1
Endoscopic	7	0	30	6	24	2
Endoscopic	8	0	19	10	30	3
Endoscopic	4.4	0	13.9	3.1	14.4	4
Combined	0	4	17.2	5.8	16.6	5
Combined	3	6.7	12.8	5	16	6
	4.96	2.78	18.41	5.46	17.8	Average

NLD nasolacrimal duct

treated with the combined approach had an abscess high and lateral in the orbit, at least 4.4 mm superolateral to the frontoethmoidal suture line (Fig. 4). These two abscesses were also the most anterior ones situated directly at the nasolacrimal axis in one case or only 3 mm posterior to it in the other case.

Surgery was uneventful in most cases. One of the patients who underwent endoscopic drainage of the abscess was found to have a small amount of air in a CT scan performed 2 days postoperatively resulting in a headache appearing after sneezing. This complication resolved in a couple of days and the patient was discharged 5 days postoperatively. A patient who had the combined approach for drainage of the abscess was discharged asymptomatic 10 days after surgery and re admitted due to a frontal epidural abscess 2 weeks after discharge. He was treated with antibiotics for several weeks and healed completely.

Hospital stay was between 4 days (in the patient treated conservatively) and 10 days.

Discussion

SPOA is one of the most common yet severe stages of sinugenic OC as described by Chandler [2]. While stages 1 and 2 in Chandler's classification are frequently treated

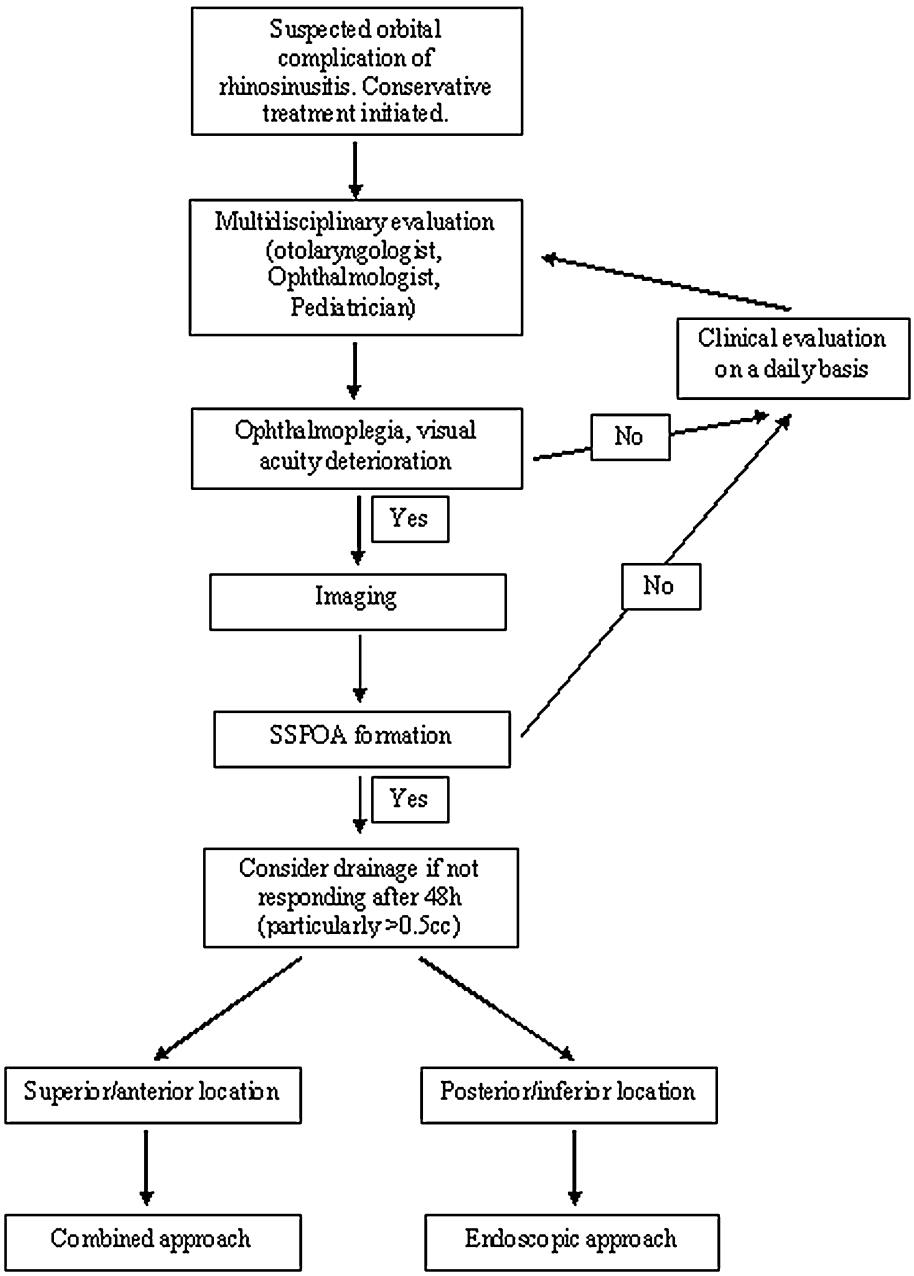

Fig. 5 Flow chart for management of SSPOA

conservatively, and Chandler's stages 4 and 5 are usually treated surgically, a controversy exists regarding the most appropriate treatment modality for Chandler's stage 3 SPOA.

Our approach to patients with suspected orbital complications secondary to ARS includes broad spectrum intravenous antibiotics, intranasal saline irrigation and decongestants, ophthalmology consultation including frequent ocular examinations, and contrast axial and coronal CT scans of the orbit and sinuses when clinical findings include ophthalmoplegia, proptosis or acute vision deterioration and in cases of failure of conservative treatment. Patients presenting with significant or progressing ocular findings or failure to improve after 48 h of medical therapy together with an abscess volume of more than 0.5 ml are strongly considered for surgical drainage [18].

It is widely accepted that pure endoscopic management of SPOA is useful in cases with medially located SPOA and that the superiorly located SPOA needs an external approach [12, 15]. A meticulous search of the literature revealed only one report presenting successful endoscopic management of a superiorly located SPOA [16] and no manuscripts were found reporting conservative treatment in cases of SSPOA. As the endoscopic approach is strongly advocated in cases of medial SPOA, we decided to implement this approach in the treatment of SSPOA. Furthermore, as conservative management is becoming more common in cases of medial SPOA, and it was recently shown that smaller abscesses of <0.5 cc in young children can safely be treated conservatively [19], we have sought for cases in which conservative treatment in SSPOA is feasible.

In our experience, there are two major key points in the decision-making in SSPOA (Fig. 5). The first is abscess dimensions and the second is location. An abscess volume of <0.5 cc has been proven previously to be safely treated conservatively in cases of medially located SPOA, and in our experience this is also true with SSPOA. We therefore would encourage managing smaller abscesses conservatively. When surgical drainage is required due to failure of conservative treatment, the more accessible SSPOA, situated in a more posterior and more medial location should only be treated endoscopically. This approach bears less morbidity, enables treating the involved sinuses during the drainage procedure with no skin scars, and is proven in our cohort to be both safe and effective.

The most laterally located abscesses are very demanding anatomically. We have found it to be very difficult accessing these abscesses endoscopically due to the long distance of intraorbital dissection required in a narrow surgical field. The use of the combined approach in these cases enabled mutual assistance and better safety due to better localization of the abscess. The most anterior SSPOAs are very demanding technically when trying to utilize the endoscopic approach for evacuation. We have encountered the need for difficult angles required for the use of both the camera and the instruments, putting the nasolacrimal duct and the nasal and orbital soft tissue at risk. Furthermore, an anterior SSPOA is very easily approached through the Lynch procedure, leaving a reasonable scar. Hence, the combined approach is recommended in these circumstances.

Since the development of secondary intracranial complications has in cases of SSPOA always be taken under consideration, secondary brain imaging should be considered in patients with persisting or recurring symptoms, as in two of our patients, one with small amount of air in a CT scan performed 2 days postoperatively and the other with a frontal epidural abscess presenting with headache 2 weeks after discharge.

Conclusion

It is advisable to treat the most antero-lateral SSPOAs using a combined endonasal endoscopic and external approach, while more posterior abscesses should only be approached endonasal endoscopically. Furthermore, a small SSPOA is first to be reported to resolve with conservative treatment, with no need for surgical intervention.

Conflict of interest None.

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