

ISOLATED SPHENOID SINUS LESION DIAGNOSIS AND MANAGEMENT (NON-NEOPLASTIC)

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Abstract: Cases of benign isolated lesions of the sphenoid sinus are rare. For descriptive purposes, clinicians divide them into inflammatory and non-inflammatory with prevalence of the former. Symptoms of the sphenoid sinus disease are difficult to characterise, the most common of them being vague headache and visual disturbances. Thorough preoperative evaluation of the lesion is essential - nasal endoscopy must be performed and computerised tomography or magnetic resonance imaging results analysed. The purpose of the study is to present the assessment of endoscopic surgery outcome in the group of patients with isolated benign sphenoid disease. Clinical data of 21 subjects were analysed retrospectively. Female to male ratio is 2:1 with age range between 12 & 58 years old. There were 10 patients with bacterial sinusitis, 6 with fungal sinusitis, 2 with allergic thickening of the mucous membrane with no evidence of bacterial or fungal infection, 2 with mucocele, and 1 with cerebrospinal fluid fistula. Each patient had preoperative nasal endoscopy and CT/MRI imaging performed. Then they underwent endoscopic transnasal sphenoidotomy with removal of the lesion or closure of the fistula. The sphenoid sinus was approached through its front wall. The patients' postoperative course was uneventful. They noted improvement in all preoperative symptoms.

Introduction

Isolated lesions of the sphenoid sinus can be in most cases safely approached and removed endoscopically. All risks of the method must be considered prior to the operation. High frequency of fungal sinusitis should be noted.

Initial symptoms of sphenoid sinus disease are often vague and difficult to characterize. Despite the presence of several critical structures surrounding the sphenoid sinus, including the carotid artery, optic nerves, dura mater, and cranial nerves III to VI, symptoms related to these structures occur less frequently than nonspecific complaints, such as headache.¹⁻⁶ The most common associated symptoms reported in the literature are headache and visual compromise, which may occur with both inflammatory and neoplastic processes. Sphenoid sinus disease is frequently detected radiographically as an incidental finding in the evaluation of some other abnormality. Varied pathologic findings in the region, including vascular neoplasms, vascular malformations, and encephaloceles, can increase the risks of surgery in this region.^{2,7,8} Thus, a thorough preoperative workup, including endoscopic evaluation and advanced imaging techniques, is helpful to allow safe management of lesions located in this region.

Patients & Methods:

In this report, 21 cases of pathologic changes involving

the sphenoid sinus only are identified and reviewed. Female to male ratio is 2:1 with age range between 12 & 58 years old. The purpose of our investigation is to review our experience with lesions located in this region. Special attention is given to the preoperative evaluation, with an emphasis on imaging and its role in treatment planning. A retrospective study was undertaken at Ahmed Maher Teaching Institute, from January 2003 to December 2006 with a diagnosis of isolated sphenoid sinus disease. Preoperative symptoms and physical findings, including endoscopic examination, imaging studies, operative procedures, surgical findings, pathological diagnosis, and postoperative results, were reviewed. All neoplastic lesions were excluded.

Results

Twenty-one cases of isolated sphenoid sinus disease were identified. Fourteen patients were female and 7 were male, with an age range of 12 to 58 years (Mean, 32.7 years). Clinical follow-up ranged from 18 months to 4 years (mean, 23 months). Headache was the most common symptom (15 patients [69%]) among all patients. The headaches were most frequently characterized as retro-orbital or occipital. Other symptoms noted at presentation included facial pain (4 [17%]), decreased visual acuity or diplopia (5 [21%]), purulent rhinorrhea (3 [10%]), and unilateral nasal obstruction (6 [24%]). One patient was asymptomatic and the lesion was found incidentally on imaging performed for another reason (Table 1).

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All 21 patients underwent computed tomographic (CT) imaging, while 6 underwent both CT and magnetic resonance (MR) imaging.

Total No. of cases:21	Headache 15(69%)	Facial Pain 2(9%)	Visual Symptom 5(21%)	Purulent Drainage 3(10%)	Nasal Obstruction 6(24%)
Sinusitis(10)	5 (33%)	1(50%)	2 (40%)	2 (66%)	3 (50%)
Fungal(6)	6 (100%)	1(15%)	2(40%)		1 (17%)
Mucocele(2)	1 (6%)			1 (34%)	2 (33%)
Allergic thickening(2)	2 (13%)				
CSF Leak(1)	1 (6%)		1(20%)		

Table 1: Presenting symptoms for inflammatory lesions of the sphenoid sinus

Sphenoid sinus disease included bacterial sinusitis (10 patients [47%]), fungal (6 [28%]), allergic thickening of the mucous membrane with no evidence of bacterial or fungal infection (2 [9%]), mucocele (2 [9%]), and CSF fistula (1 [5%]). For descriptive purposes, lesions are divided into inflammatory and noninflammatory categories. Surgical treatment of the patients was endoscopic sphenoidotomy.

INFLAMMATORY LESIONS

Sinusitis

The most common presenting symptom was headache (8 of 10 patients). Clinical descriptions of the headache included retro-orbital (6 of 8 patients) and occipital (2 of 8 patients).

The headache was described as positional and throbbing, worse at night. Patients also reported, in increasing order of frequency, visual symptoms, purulent drainage, and nasal obstruction. Of the 2 patients reporting visual symptoms, one noted diplopia and the other described a unilateral decrease in visual acuity.

On endoscopic examination, 6 of 10 Patients were found to have purulent drainage in the sphenoethmoidal recess, while the remaining patients had nonspecific findings. Imaging studies in these patients showed findings consistent with inflammatory disease, such as air-fluid levels, mucosal thickening, opacification, and/or chronic osteitis (**Fig. 1**). Bone erosion was not identified in any of these cases.

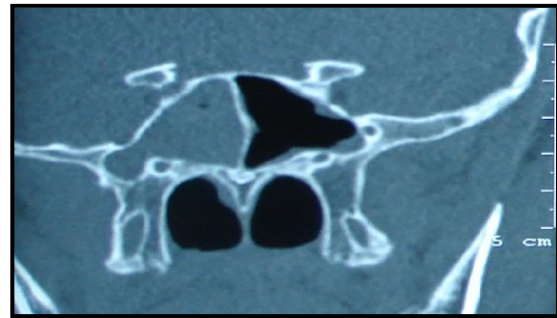


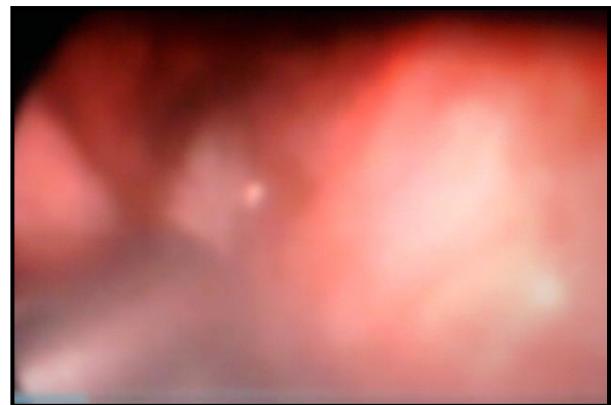
Fig. 1: CT of sphenoid

Surgical therapy consisted of endoscopic sphenoidotomy in all patients, with the use of either an endoscopic transnasal or transtymoid approach in all cases (**Fig. 2**). Postoperatively, all patients noted improvement of their symptoms including their visual symptoms.

Fig. 2: Endoscopic transnasal approach with Suction the inside of the sinus in sinusitis

Fungal Lesions

All patients diagnosed as having fungal lesions presented



with headache. The headache was described in 4 cases as retro-orbital. One patient experienced unilateral decrease in visual acuity along with purulent rhinorrhea nasal endoscopy showed purulent sphenoethmoidal recess drainage in all 6 patients. The CT and MR findings were consistent with fungal disease isolated to the sphenoid sinus (**Fig. 3 & 4**).



Fig. 3: CT of Rt. sphenoid fungal



Fig. 4: CT of Lt. sphenoid fungal sinusitis

Surgical management consisted of endoscopic transnasal sphenoidotomy with findings of fungal mycetoma (*Aspergillus* species) and mucosal thickening (**Fig. 5, 6, 7, & 8**). Histopathologic examination disclosed noninvasive *Aspergillus* species in all cases. Postoperatively, all patients had relief of their symptoms. The patient with decreased visual acuity experienced partial recovery. None of the patients had recurrence of the disease based on postoperative endoscopy and CT.

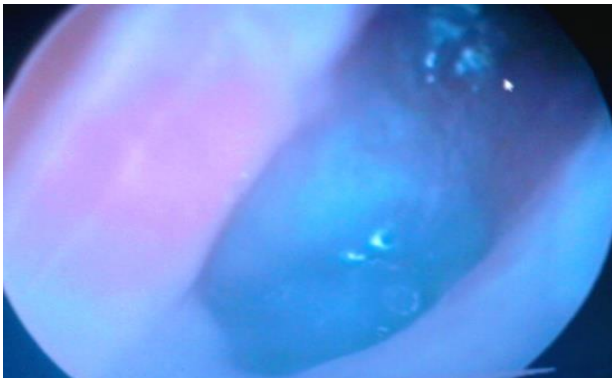


Fig. 5: Endoscopic transnasal approach in Rt.sphenoid fungal sinusitis viewing severe edema around the ostia

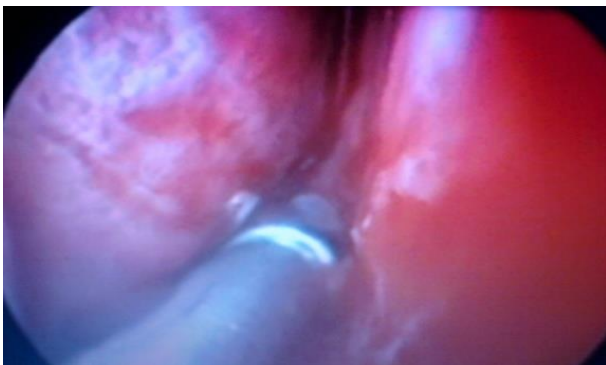


Fig. 6: Widenning of the ostia

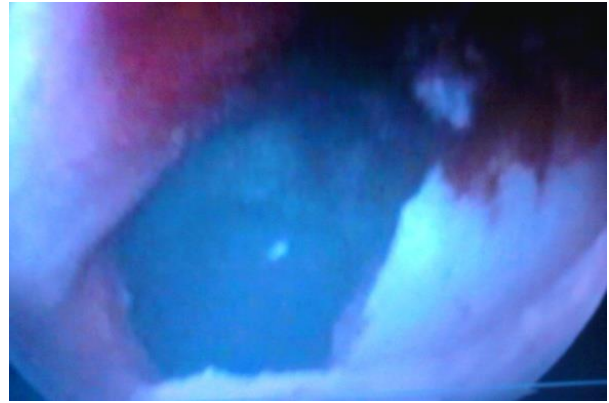


Fig. 7: A wide ostia

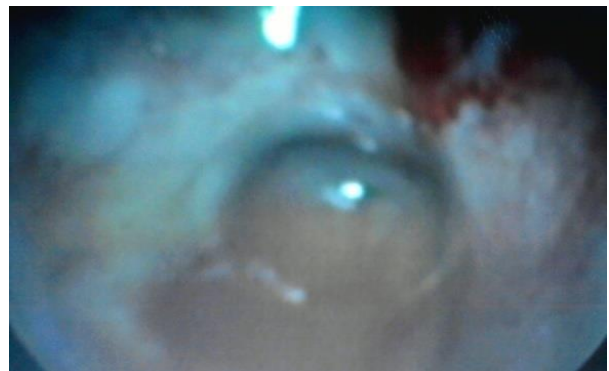


Fig. 8: The inside of sphenoid at the end of the surgery

Mucocele

In our series, 2 patients had mucocoeles or mucopyocoeles. Headache was the most common symptom. Other symptoms included decreased visual acuity, nasal obstruction, and purulent rhinorrhea. Endoscopic findings were nonspecific in one case. In the remaining case, the mucocoele displaced the face of the sphenoid sinus anteriorly. The CT and MR findings were consistent with mucocoele in the patients, with opacification and expansion of the sinus wall (**Fig. 9**).



Fig. 9: Mucocele of Lt. sphenoid sinus (MTI)

The patients underwent endoscopic marsupialization and partial resection of the mucocoele by an endoscopic transthemoid approach. Intraoperative and histopathologic findings were consistent with mucocoele in the 2 cases. Postoperatively, all patients experienced symptom resolution, and no revision surgery has been required. Follow-up evaluations, including nasal endoscopy and CT, showed no evidence of recurrent or persistent disease at a mean follow up period of 24 months.

Allergic Thickening

The presenting symptom was headache. Endoscopic examination showed edema in the sphenoethmoidal recess in one case. Opacity appeared in CT image (**Fig. 10**). Endoscopic sphenoidotomy was done. Postoperative medical treatment (local steroid) advice with marked improvement.

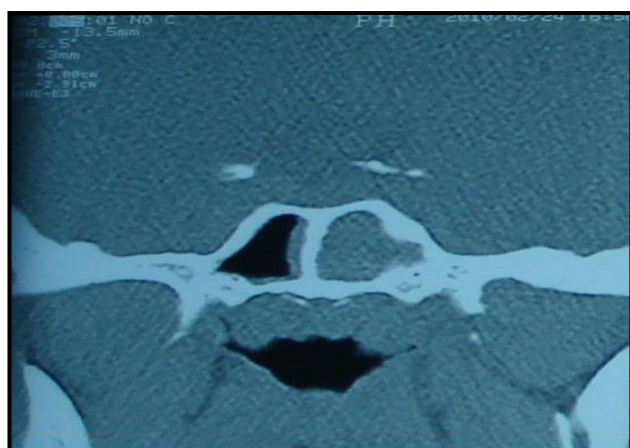


Fig. 10: CT of Allergic thickening

NONINFLAMMATORY LESIONS CSF Leak

One patient was identified with sphenoid sinus CSF fistula confirmed by γ -2-transferrin studies. The cause of the leaks was not apparent on the basis of history and physical examination; presented with clear unilateral rhinorrhea that increased on provocative positioning and headache. On nasal endoscopy finding, CSF was noted coming from the sphenoid sinus ostium when the patient leaned forward during the procedure. The CT study of the patient demonstrated bony dehiscence of the sphenoid sinus roof as well as partial or complete opacification of the sinus (**Fig. 11**). The MR findings included hyperintense signal on T2-Weighted images within the sinus consistent with fluid the patient underwent an endoscopic repair of CSF leak with bone and mucosal graft. At the time of surgery, the patient was found to have herniation of arachnoid granulation in the

superomedial aspect of the sphenoid sinus. No recurrence of the CSF leak at 18 months.

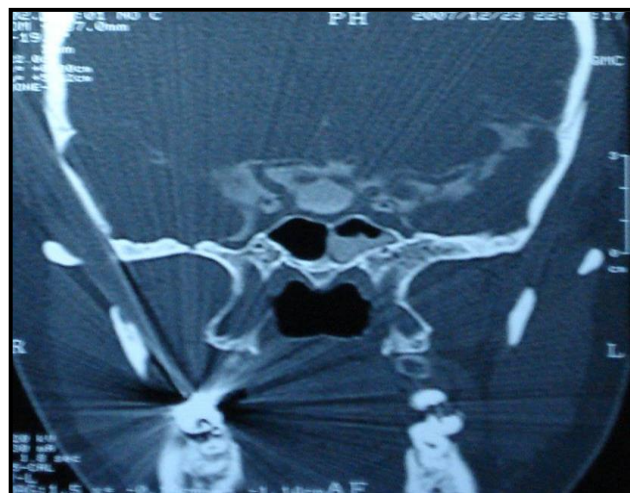


Fig. 11: CT of CSF of it sphenoid sinus

DISCUSSION

Isolated sphenoid sinus disease is recognized as an unusual entity and account for about 2–3% of the all sinus disease.^(9,10) In a large series reported by Wyllie et al.⁽¹¹⁾ in 1975, who reviewed the Mayo Clinic experience during a period of 37 years and identified only 45 patients with isolated sphenoid sinus disease. It is likely that isolated sphenoid sinus disease is underreported for a number of reasons: 1) The presenting symptoms are often nonspecific; 2) The inaccessibility of the sinus precludes optimal physical examination; and 3) Before the advent of CT and MRI scanning, radiological examination of the sinus was inadequate. So it presents several diagnostic and therapeutic challenges. Isolated sphenoid disease is usually insidious in onset and may present with nonspecific symptoms. Headache is the most common symptom leading to presentation and may be present in both inflammatory and expansile lesions of the sphenoid sinus. The incidence of headache as the main presenting symptom ranges from 33% to 81%^(4, 5, 11, & 12) Cakmak et al,⁽¹⁾ reporting on the largest documented series of patients 182 cases of isolated sphenoid sinus disease(seen at the Mayo Clinic between 1935 and 1998), reported headache as the primary presenting complaint in 72.5% of patients. Similarly, headache was the presen-ting symptom in 69 % of cases in our series and was typically retro-orbital. Visual changes were the second most common presenting symptom in our series (21%), which is similar to the incidence found in other series.^(1, 2) Although reported to be more common in malignant neoplastic processes, visual changes occur in inflammatory and benign neoplastic processes as well. When ocular symptoms

Isolated Sphenoid.....

appear and an opaque sinus is revealed at CT, it becomes imperative that surgery is carried out as soon as possible. In our experience, ocular symptomatology declines in relation to the time elapsed between the emergence of symptoms and surgery. In fact, in all cases where surgery was conducted in time resolution or improvement of ocular symptoms occurred.

Routine nasal endoscopy and CT have improved the diagnostic algorithm for the pathology. The correlation of clinical and radiological signs requires surgery. Persistence of symptoms or an opacified sinus after medical treatment indicates and necessitates surgical treatment. CT scan and MRI provide more detailed information and allow fungal sinusitis and neoplasms to be recognized. Fungal disease (Fungal ball) necessitates surgical treatment to allow a complete removal of the fungal debris.

Surgical access to the sphenoid sinus has traditionally been a challenge for surgeons. The most popular technique has been the sublabial transeptal approach, and other reported routes are the transtethmoidal and transpalatal routes.^(1, 13) In 1973, Wyllie et al. had asserted that “the surgical approach to the sphenoid sinus should be transnasal and never be craniotomy”.⁽¹¹⁾ Later on, other authors reported limited series treated with traditional surgical approaches. In 2000, Cakmak reported that most of cases (182) of isolated sphenoid sinus lesion were treated by the transseptal approach. Up until now, this trial is the largest series in the medical literature.^(1, 14) Development of the rigid nasal endoscope has made a direct approach to the sphenoid sinus possible, which is safer for the patient.⁽¹⁵⁾ In 1996, Metson reported the results of 34 patients who underwent endoscopic sphenoidotomy for sphenoid sinusitis using the superior turbinate as a key landmark for identification and enlargement of the natural sphenoid ostium.⁽¹⁰⁾ The endoscope allows the examination of all lateral walls of the sphenoid sinus and provides the possibility of lateral viewing (30°, 45° and 70° scopes). Moreover, in experienced hands, this surgical technique significantly reduces operating time, decreases intraoperative blood loss, morbidity and hospitalization time. The enlargement of the natural ostium is a safe technique, and the risk of damaging of the lateral neurovascular structures is reduced. However, the surgical approach to this sinus is not without danger, and for this reason should only be performed by especially skilled surgeons. The transnasal surgical approaches to isolated sphenoid lesions include the endoscopic transnasal (**Fig. 12**), the endoscopic transtethmoid (**Fig.13**), the transseptal, and the endoscopic pterygoid fossa.⁽¹⁶⁾ In cases involving an inflammatory process, transnasal endoscopic sphenoidotomy using the

superior turbinate as a key landmark has been reported to be safe and effective.⁽¹⁰⁾

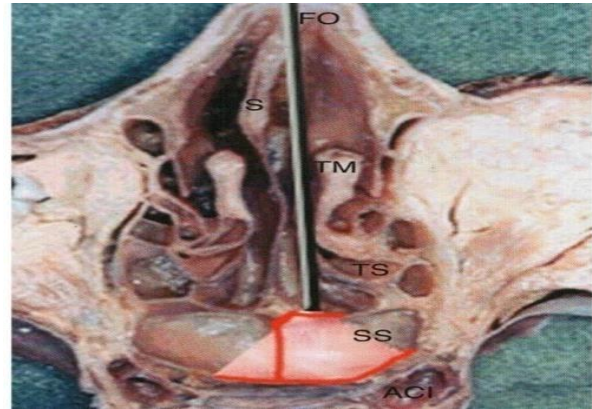


Fig. 12: Endoscopic transnasal approach

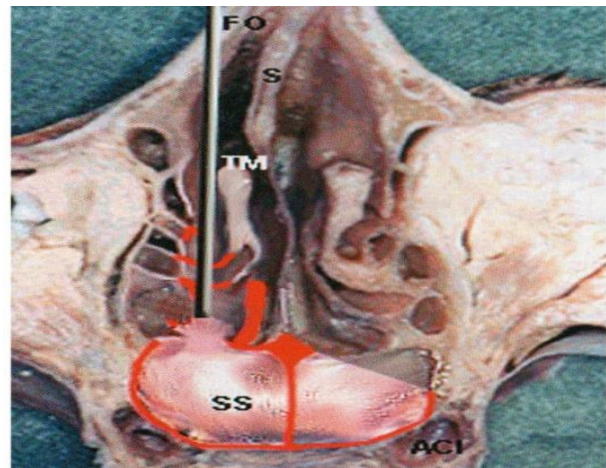


Fig. 13: Endoscopic transtethmoid approach

The transnasal approach is most useful in patients with spacious noses; otherwise, partial middle turbinate resection may be required. A transtethmoid approach may be considered in a narrow nose or if other sinuses are involved in the disease process or wider surgical exposure is required. A transtethmoid approach may also be considered in patients with a complication of sphenoiditis to facilitate post-operative ventilation and debridement. The transseptal approach provides wider exposure of the entire anterior face of the sphenoid and allows the use of both hands for dissection, which is especially helpful in the resection of vascular tumors or lesions and the repair of CSF leaks. Sethi used transnasal sphenoidotomy for all his series except for 2 patients with inverting papilloma.⁽¹⁷⁾ Martin et al,⁽¹⁸⁾ in his series of 29 patients prefer the transnasal transseptal surgical approach.⁽⁸⁾ Castelnuovo et al, prefer the direct transnasal approach where the endoscope is passed medially to the middle turbinate and then advanced into the sphenoethmoidal recess for identification and enlargement of the sphenoid ostium.⁽¹⁹⁾

In this way they leave the superior turbinate intact whenever possible. The Author prefers to localize the natural ostium before entering the sinus according to Metson's technique, but without cutting off the superior turbinate as a routine procedure. The mucocoele requires only marsupialization and subsequent drainage of the sinus. The bone layer overlying the mucocoele is frequently thin or dehiscant.⁽²⁰⁾ The area is identified by palpation with a suction tube; the mucocoele is entered with a curette and then is enlarged with a circumferential punch (Stammberger's "mushroom" punch). (Fig. 6) Chronic sinusitis is treated only by restoring the patency of the natural ostium. The endonasal approach is easier to perform, requires less dissection and results in less morbidity. The fungus ball requires a wide opening of the sphenoid sinus to allow a complete removal of the fungal debris by suction and repeated washing. In this category of patients, the author often use the transnasal approach, with endoscopic resection of middle turbinate in one case and endoscopic partial resection of superior turbinate in 2 cases. Castelnovo et al.,⁽¹⁵⁾ often use a transtympanic approach. In CSF fistula, the defect is located in the superomedial wall, the author used the transnasal route and endoscopic repair of CSF leak with bone and mucosal graft was done.

Conclusion:

Isolated sphenoid disease may have been underdiagnosed in the past. Awareness of the symptoms of sphenoid disease, endoscopic examination and appropriate imaging studies will establish the diagnosis in most cases. Retro-orbital headache with or without visual symptoms is a significant symptom suggesting inflammatory sphenoid disease. Mucosal changes in the sphenoidal recess may be noted on endoscopic examination in most of patients with isolated sphenoid pathology. Imaging studies including CT and MRI are essential in the diagnosis of sphenoid disease. Endonasal routes are nowadays the gold standard for sphenoid sinus surgery, and the endoscopic approach can be considered a safe and effective technique enabling an excellent visualization of the whole sinus inducing less surgical trauma and consequently offering better functional outcome in a long-term follow-up.

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