



## Isolated Sphenoid Sinusitis: Rare, But Vision Compromising Condition

Arunima Viswakaran Sreelatha<sup>1,2\*</sup>, Hetal Marfatia<sup>1,3</sup>, Chandrani Chatterjee<sup>1</sup> and Pranita Bhagat<sup>1</sup>

<sup>1</sup>Department of ENT, Seth GS Medical College and KEM Hospital, Parel, Mumbai, Maharashtra, India

<sup>2</sup>Currently Working as Consultant, Gitanjali EYE and ENT Hospital, Trivandrum, Kerala, India

<sup>3</sup>Professor and Head of the Department of ENT, Seth GS Medical College and KEM Hospital, Parel, Mumbai, Maharashtra, India

\*Corresponding Author: Arunima Viswakaran Sreelatha, Department of ENT, Seth GS Medical College and KEM Hospital, Parel, Mumbai, Maharashtra, India.

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### Abstract

**Background:** Isolated sphenoid sinusitis is a rare entity. Since the sinus is deep seated and surrounded by important neurovascular structures, they present late with multiple cranial neuropathies. So, the need to understand the natural course of sphenoid sinus infection is important. Our study aims at picking up cases under suspicion of isolated sphenoid sinusitis early for making a proper management.

**Methodology:** We have done a descriptive observational study in a tertiary care hospital. Seven patients with radiographic evidence of isolated sphenoid involvement were included in the study. After getting an informed consent from the patient and also institutional ethics committee exemption, their presentation and management process were recorded, analysed, and compared with other studies.

**Results:** Headache was the commonest symptom with which patient presents. Imaging showed involvement of cavernous sinus and multiple cranial nerves. All of them underwent surgical clearance, but their histopathological evidence was varied. They all showed good recovery except for 1 patient who had recurrence.

**Conclusion:** Early detection and prompt intervention according to their aetiology is very crucial to avoid permanent debilitating complications associated with isolated sphenoid sinusitis.

**Keywords:** Sphenoid Sinus; Cavernous Sinus; Ophthalmoplegia; Endoscopy; Headache

### Introduction

Isolated disease of sphenoid sinus is extremely rare [1], most commonly inflammatory in origin, but occasionally it can be neoplastic [2]. The incidence of isolated sphenoid sinusitis is only 2-3 % of all paranasal sinus disease [3]. The sinus being deep seated make it difficult to show the symptoms at an early stage. The main pathology is the inflammation of sphenoid mucosa [4]. Due to its proximity with neurovascular structures such as optic nerve, carotid artery, cavernous sinus, and the cranial nerves, it will lead to life threatening complications like cranial neuropathies, cavernous sinus thrombosis, meningitis, or intracranial abscess. Most important symptom encountered is headache which worsens with head movement [4]. About 64% patients with sphenoid sinus dis-

ease will have visual complaints due to cranial nerve involvement [5]. Rarely, these patients complain of nasal symptoms. In view of these vague symptoms, we often miss the condition, resulting in permanent morbidity and mortality [6]. Our study focusses on understanding the natural course of isolated sphenoid sinusitis so that the delay in diagnosis can be avoided.

### Materials and Methods

We have done a retrospective observational analysis of 7 patients from 2017 through 2020 in a tertiary care hospital. All patients who had isolated sphenoid sinusitis as confirmed on imaging were included in the study. After getting an informed consent from the patients, the details of clinical features, diagnostic strat-

egies and management protocol that were followed for every patient with isolated sphenoid sinusitis were collected. The results were then analysed and compared with other studies. The age of the patients in our series ranges from 14years to 77 years. Among them majority were females (71%) and 2 were males. One patient each comes under the extreme age group of under 15 and above 60 years. All these patients were followed up for a period of 1 year.

### Results

All patients had headache not relieving with medications as the initial symptom, later they developed various degree of ophthalmic complaints. Majority of them (4 patients, 57%) had unilateral drooping eyelids along with double vision (Figure 1). Next two patients came with diplopia on lateral gaze. One patient had reduced vision.

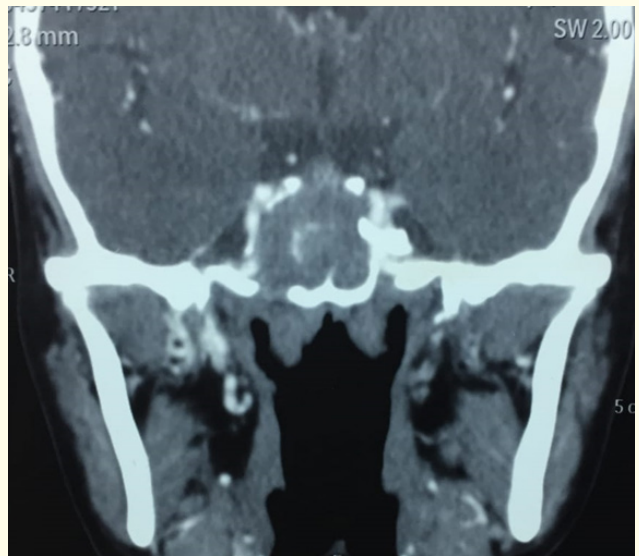
All patients underwent imaging which showed isolated sphenoid sinus involvement. But they showed different patterns of sphenoid sinus enhancement. 2 patients showed typical double density sign (Figure 2), characteristic of allergic fungal rhinosinusitis (AFRS). 2 patients had erosion of walls of sphenoid sinus which indicate impending complications associated with cavernous sinus or intracranial compartment. 1 patient had dural enhancement pointing towards ascending intracranial complication. Imaging in one of our patients showed enhancement and erosion at the anterior clinoid process, indirectly highlighting optic nerve involvement. Cavernous sinus enhancement was seen in 4 patients (57%) denoting the reason of ophthalmic complaints in isolated sphenoid sinus disease.



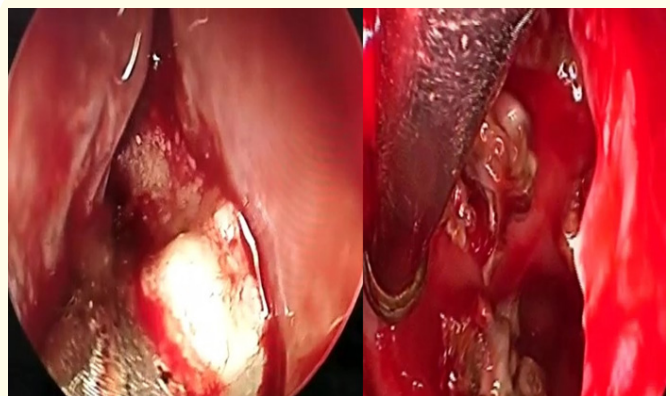
**Figure 1:** Left ophthalmoplegia in a, corrected ophthalmoplegia after treatment in b.

Since all had some degree of complications, they all underwent immediate surgical intervention along with medical therapy. Functional endoscopic sinus surgery (FESS) was done in all patients which showed different intraoperative findings aiding to the diagnosis. Two of the patients had allergic mucin (Figure 3) filling the sphenoid sinus which confirmed the diagnosis of AFRS. These

two patients were managed further with oral and topical steroid resulted in complete restoration of vision. One patient had suspicious pale granulation tissue and its histopathological examination concluded the diagnosis of tuberculosis. This candidate was then treated with anti-tubercular therapy, which completely reversed the ophthalmic symptoms. Rest of the 4 patients had pus collected under tension (Figure 3) in sphenoid sinus which was cleared followed by intravenous antibiotic therapy.



**Figure 2:** CT showing heterogenous opacity in sphenoid sinus with erosion of its wall with double density sign.



**Figure 3:** Intraoperative findings: a showing pus coming out of sphenoid sinus; b showing fungal concretions.

We had 2 patients with AFRS, 4 patients had acute bacterial rhinosinusitis and 1 patient had sphenoid sinus tuberculosis. They all underwent surgical clearance along with medical therapy according to the aetiology respectively.

## Discussion

Sphenoid sinus has a complex anatomy surrounded by vital neurovascular structures and is deeply seated within the skull [7]. Hence the symptoms of isolated sphenoid sinus disease are usually delayed until it spreads to surrounding important structures [8] to eventually present with complications. Even though isolated sphenoid sinus disease is rare, the complications it results are life threatening. But these cases are largely misdiagnosed due to its vague symptomatology. Most common pathology causing isolated sphenoid opacification is inflammatory, but the incidence of neoplasm and malignancy are also in hike [9]. No primary neoplastic cases were seen in our study.

All our study cases had nonspecific headache of varying degree, not relieving with medications as primary symptom. Patients with sphenoid involvement presents with headache and a myriad of ophthalmic complaints to a neurologist or ophthalmologist first and later referred to an otorhinolaryngologist based on imaging [10]. Various study suggests the same as vague headache being the primary symptom [11,12]. By the time they presented to a rhinologist, they all had varying degree of progressively deteriorating ophthalmic complications in our case series. Delay can also be attributed in the hands of otolaryngologist due to the failure to detect the same in diagnostic nasal endoscopy (DNE) when there is no imaging facility available. According to literature, cases of isolated sphenoid sinusitis go undetected in DNE [6].

We had 1 patient who presented with diminution of vision in one eye with headache, which was misdiagnosed as optic neuritis. But fortunately, the patient underwent CT scan before the initiation of steroids in ophthalmology department which helped in avoiding further delay before transferring the patient to our department. Similar history can be seen in literature also [13] as its symptoms camouflage features of optic neuritis. In our study series diagnosis of isolated sphenoid sinus involvement is done based on imaging in the form of CT PNS with 1mm orbital cuts. CT and MRI of paranasal sinus are the most important investigating tools to diagnose isolated sphenoid sinusitis with its spread to adjacent important neurovascular structures [14,15]. The anatomical variations and the margin of spread of infection evident on imaging studies play a

crucial role in complete safe surgical clearance.

According to literature, isolated sphenoid sinusitis usually requires surgical intervention except for few cases which responded and recovered well with medical therapy [16]. Since all our patients presented with one or the other ophthalmic complications, they all underwent surgical management primarily. FESS with sphenoidotomy and clearance is considered as optimal treatment. Aetiology may be different, but initial mode of management was sphenoidotomy [17]. Further management after surgical clearance was based on the pathological and microbiological findings of the sample collected from sphenoid sinus. Surgical complications rate is usually favourable (1.5%) according to studies [17], still a course of antibiotic therapy following surgery is advised.

Most common condition resulting in isolated sphenoid sinus opacification is sphenoiditis [18]. In our study also majority had acute bacterial infection (57%), managed with intravenous antibiotics following surgical clearance. Around 29% cases had allergic fungal rhinosinusitis in otherwise healthy patients, and they were managed further with systemic and local steroid therapy.

We had 1 rare case of primary sphenoid sinus tuberculosis without any other foci anywhere in the body. This patient presented with a chronic dull headache over the vertex followed by diplopia on lateral gaze. Definitive diagnosis was made from histopathology of pale granulations found over the sphenoidal mucosa. Patient showed good recovery of cranial neuropathy within 1 month of starting anti-tubercular therapy. Only few cases of isolated tuberculous infection of the sphenoid sinus are reported so far in literature [11].

In this case series, complete recovery of cranial neuropathies was noted in 85.7%. One patient had recurrence of acute bacterial rhinosinusitis with severe headache after completion of antibiotic course. Second time she presented with contralateral ophthalmoplegia to the side of involvement of sphenoid. This can be justified by the finding noted on imaging where the dominant sphenoid sinus (Figure 4) crossed the midline lying adjacent to contralateral cavernous sinus and was complicated further by thrombosis of contralateral superior ophthalmic vein also. Revision FESS was done with clearance and widening of both sphenoid sinus ostia. Complete recovery was obtained within 3 weeks of antibiotic therapy following surgery. Similar occurrence of contralateral cranial nerve involvement (6<sup>th</sup> nerve palsy) was reported in literature [19].



**Figure 4:** CT showing right dominant sphenoid (\*) sinus with soft tissue density inside.

The outcome mainly depends on the time of intervention from onset of symptoms [5]. However, according to our study, the correlation between anatomical variations, radiological findings and the etiological factors also played a major role to ensure complete recovery.

### Conclusion

Isolated sphenoid sinusitis is a rare condition, but it's a potential cause of headache. Strong suspicion of sphenoid sinus involvement should be kept in mind to suggest a cross consult to an otorhinolaryngologist at the earliest. Every patient who comes with headache and visual symptoms should be screened for sphenoid sinusitis by doing an imaging study. Normal appearance of sphenoidal recess on diagnostic nasal endoscopy should not necessarily limit further investigations to identify isolated sphenoid sinus disease. Even though isolated sphenoid sinusitis is uncommon, early detection and treatment with the help of CT, its anatomical and radiological correlation is the key to prevent catastrophic complications.

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### Authorship Contribution

AVS performed acquisition, analysis, interpretation of data and writing process. CC made drafts and revision during writing process. PB helped in acquisition of data. HM did the final approval of the article before submission.

### Conflict of Interest

We have no conflicts of interest to disclose.

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