

## ORIGINAL ARTICLE

## Endonasal Endoscopic Approach to Sphenoid Sinus Lesion

IKRAM ULLAH<sup>1</sup>, ANEES UR REHMAN<sup>2</sup>, SAULAT SARFRAZ<sup>3</sup>, SARFRAZ LATIF<sup>4</sup>, ZIA US SALAM QAZI<sup>5</sup>, SADIA MAQSOOD AWAN<sup>6</sup><sup>1</sup>Assistant Professor ENT, BMC Hospital Quetta<sup>2</sup>Associate Professor ENT, Sheikh Zayed Medical College Rahim Yar Khan, Pakistan.<sup>3</sup>Professor of Radiology, Federal Postgraduate Medical Institute & Shaikh Zayed Hospital Lahore<sup>4</sup>Associate Professor of ENT, Federal Postgraduate Medical Institute & Shaikh Zayed Hospital Lahore<sup>5</sup>Assistant Professor, Department of ENT, Shaikh Zayed Hospital Lahore<sup>6</sup>Assistant Professor, Department of Pharmacology, Federal Postgraduate Medical Institute & Shaikh Zayed Hospital LahoreCorrespondence to Dr Ikram Ullah, Email. [ikrambmc92@gmail.com](mailto:ikrambmc92@gmail.com), Cell: +92-333-3036587

## ABSTRACT

**Background:** Anatomical position of sphenoid sinus, sellar and parasellar regions are located in the skull base having difficulty to approach due to presence of vital structures in its proximity. The presence of carotid artery and optic nerve in its lateral wall make the situation difficult due to lack of illumination and visual limitation. In the past traditional techniques to approach this region like external ethmoidectomy, transseptal transsphenoidal routes were used causing significant trauma, bleeding and risk of possible complication in skull base region.

**Aim:** to access the efficacy and safety of the endonasal endoscopic approach to the sphenoid sinus

**Method:** This study was done in the department of ENT Shaikh Zayed hospital Lahore, 33 patients who were diagnosed to have lesions involving sphenoid sinus. Detailed history, thorough ENT examination, relative investigations were done and all were managed naso-endoscopically.

**Results:** The review of these cases showed that the endoscopic technique was found to have the advantages of being minimally invasive with no external incisions. There is less trauma to the patient, no need for operating microscope or intraoperative image intensifier.

**Conclusion:** The conclusion of our study showed that naso-endoscopes are excellent tools for better visualization due to availability of different angled scopes and good illumination. The disease is better assessed and cleared identifying landmarks with quicker postoperative recovery and lesser overall morbidity. Over the last few years, endoscopic approach to these regions has gained much popularity because of advances in optics, endoscopes and illumination.

**Keywords:** Endoscopic sinus surgery, sphenoid sinus

## INTRODUCTION

Isolated sphenoid sinus pathologies are relatively rare entity in ENT practice. The literature mentions that isolated involvement of the sphenoid sinus is only 2.7% while another study shows its incidence to be less than 1% among all other sinuses. [1]. In the literature it is mentioned that endoscopic technique has been used to operate in the sphenoid sinus region. This orientation has been reported as the standard approach for the surgical treatment of most of the sellar and intrasellar tumors since few decades<sup>2-4</sup>. However, endoscopic transsphenoidal surgery was recognized only after developing an understanding of the skull base anatomy and sphenoid sinus<sup>5,6</sup>. The sphenoid sinus is deepest sinus located in the skull base. Its ostium is covered by the superior turbinate.

Endoscopically sphenoid sinus ostium lies 1.5 cm superior to the posterior choana on the anterior sphenoid sinus wall. Anatomically sphenoid sinus ostium is elliptical in appearance and is located near the superior turbinate in the sphenoidal recess. In majority of. The cases ostium lies medial to superior turbinate and becomes prominent with gentle lateralization of superior turbinate<sup>7</sup>. Another reliable anatomical landmark to locate the sphenoid sinus ostium involves dividing the superior turbinate into three parts. It is found at the junction of the inferior and middle third of the superior turbinate.

The sphenoidal recess is a narrow vertically oriented slit bounded medially by the nasal septum and laterally by

the superior turbinate superiorly lies the cribriform plate and inferiorly the floor of the nasal cavity.

Due to deep anatomical location and presence of small number of mucous glands, primary infection of the sphenoid sinus is rare. Whenever some virulent organism involves the sinus secondary infection may develop<sup>8</sup>. The cardinal symptoms of sphenoid sinus involvement are severe headache, visual disturbances, diplopia ptosis and other cranial nerves involvement. Once the sphenoid sinus is involved, signs and symptoms may be very subtle causing delay in diagnosis and the lesion may extend to affect adjacent structures giving rise to variety of clinical manifestations<sup>9</sup>. Headaches, visual disturbances and cranial nerve involvement are the common presentations. Diagnosis is mostly on radiological evidence like CT and MRI.

Mycetoma of paranasal sinuses are more frequently diagnosed now with widespread use of nasal endoscopy and CT scan and sphenoid sinus involvement is seen more commonly now than reported in the past<sup>10</sup>. There has been a change in the way that these lesions are approached for the purposes of diagnosis and treatment. Endoscopic surgery has now been widely used because it allows excellent visualization with minimal invasion<sup>11</sup>.

This study presents 33 cases of lesions of sphenoid sinus and pituitary area. Their presentation, assessment with CT and MRI scans and management with endonasal, endoscopic technique is discussed here. The efficacy of this technique and its advantages over traditional methods are described here.

## MATERIAL AND METHODS:

This is a review of 33 patients who were diagnosed to have lesions involving sphenoid sinus. Detailed history, thorough ENT examination, relative investigations were done and all were managed naso-endoscopically. This study was done in the department of ENT Shaikh Zayed hospital Lahore. The age ranged from 18 -55 years (Table 1) Male: female ratio was 9:5. The common presenting complaints were headaches, nasal blockade and visual disturbances. Less common symptoms were cranial nerve palsies and neuralgias. One patient presented with progressive quadriparesis due to brainstem involvement with sphenoid aspergilloma and meningeal involvement.

The pattern of clinical presentation of these patients are given in Table 2. Patients were initially assessed with complete ENT examination followed by neurological and ophthalmological examination where such involvement was suspected or present.

Table 1: Age distribution of patients

Age group (years)	Numbers	%age
10-20	7	21%
21-30	8	24%
31-40	10	30.5%
41-50	5	15.5%
51-60	3	9%

Table 2 Presenting Symptoms

Symptoms	Numbers	%age
Headache	13	39.9%
Visual disturbances	7	21%
Nasal obstruction	7	21%
Cranial nerve palsy	2	6%
Neurological involvement	1	3%

All the patients had CT scans for assessment of extent of involvement of sphenoid sinus, any bony erosion or intracranial extension associated with it. More than half of them (9/33) underwent MRI scan because there was considerable expansion and thinning of bony walls of the sphenoid sinus with extension beyond its anatomical boundaries and intracranial extension was needed to be ruled out (Table 3). One patient who presented with neurological involvement had involvement of brainstem with small multiple brainstem infarcts.

Table 3: Radiological Assessment Method Used

Scan	No.	%age
CT Scan face/brain	66	100%
MRI Scan Face/brain	9	27%

All those cases with neurological and visual involvement were managed in collaboration with neurosurgeon and ophthalmologist. The surgical intervention was individually decided in each patient depending on the provisional diagnosis. Nine patients had endoscopic assessment and biopsy of the lesions. Due to intracranial involvement, poor general health of these patients and suspicion of malignancy, single stage clearance was not advisable or possible. In these patients, a definitive diagnosis was made after endoscopic biopsy and definitive therapy was started according to the histological report.

The rest of the patients (24) were suspected to have sphenoid aspergillomas. They were assessed endoscopically and after confirmation of clinical suspicion, total clearance of the disease was achieved by endonasal, endoscopic approach (Table 4)

Table 4: Surgical Procedure Performed

Procedure	No.	%age
Endoscopic assessment and Biopsy	9	27%
Total endoscopic clearance of the disease (Bilateral ethmoidectomy & sphenoid clearance)	24	72%

The surgical technique applied was the same with some modification according to the pathology. It was done under general anesthesia with controlled hypotension. The nose was prepared with topical application of pack soaked with 1: 4000 adrenaline for 10 minutes. 0 and 30 rigid fiberoptically illuminated endoscopes were used with instruments commonly used for functional endoscopic sinus surgery (FESS). No septal surgery was required. Sphenoid sinus was approached directly by identifying its opening and performing sphenoidotomy. The rest of them (24) required bilateral total ethmoidectomy and clearance of disease from sphenoid sinus as they were found to have ethmoid polyps along with fungal balls (Table 5). The nose was packed for 24 hours. Patients were discharged home after 24-48 hours except one patient with neurological involvement who needed intravenous antifungal therapy and other supportive care.

Table 5: Surgical Approach Used

Approach	No.	%age
Direct endoscopic sphenoidotomy	7	21%
Endoscopic trans-ethmoid approach	26	78.7%

## RESULTS

All patients recovered well without any intra-or post-operative complication. One had sphenoid adenocarcinoma (Fig 3), and was referred for radiotherapy, and the other two patients had disseminated aspergillosis with brainstem involvement arising from sphenoid aspergilloma. She was treated with systemic antifungal and other supportive therapy by physicians and was not considered suitable for any further surgical intervention. Out of the 27 patients, who underwent total clearance of disease with ethmoidectomy and sphenoid clearance (Fig 2), all had aspergilloma except 03 patients who were reported to have Wegener's Granulomatosis, later confirmed by a positive ANCA test. He was referred to physician for further long term therapy.

Table 6.

Diagnosis	No.	%age
Aspergilloma with nasal polypi	27	81.8%
Wegener's granulomatosis	3	9%
Mucocele	2	6%
Pituitary adenocarcinoma	1	3%

All other patients were treated with oral steroids and remained well on follow up without any recurrence of the disease. There was no early or late post-operative

complication of the procedure. The histopathological distribution of the lesions is given in table 6.

Fig 1 Coronal CT section shows soft tissue mass eroding sphenoid sinus walls extending into nasopharynx. Biopsy confirmed adenocarcinoma.



Fig 2. Axial T2W (a) and axial T1W (b) images show fluid signal expanding the sphenoid sinus. Post contrast sagittal and coronal T1W images (c&d) show smoothly enhancing thickened mucosal lining. These findings suggest sphenoid sinus mucocoele.



Fig 3. Coronal section of CT paranasal sinuses shows soft tissue opacification in sphenoid sinus causing erosion of floor and right lateral wall of sinus. High density foci within disease process suggest fungal etiology. Biopsy confirmed aspergilloma

**DISCUSSION**

Isolated sphenoid sinus pathology is not always straight forward and simple to diagnose and treat. The complex anatomical position always remained surgical challenge. In all pathologies initial symptoms are frequently vague and rhinological examination remains unremarkable. Unexplained headache, numbness, visual symptoms give high suspicion of sphenoid sinus involvement. On ENT examination positive findings are rare so treating doctor has to advice radiological investigations. The only sphenoid

sinus involvement by inflammatory lesions and tumors is rare<sup>12</sup>. Wyllie et al<sup>13</sup>. Who reviewed 45 cases of sphenoid lesions from Mayo Clinic over a period of 37 years, emphasized that the confirmation of diagnosis must be done vigilantly rather than of an exclusion. Delay in the diagnose and treatment can lead to serious sequelae<sup>14</sup>. The possible complications may be optic nerve compression, blindness, cavernous sinus thrombosis, internal carotid artery spasm, and intracranial abscesses and meningitis<sup>15</sup>.

The most common presenting symptoms are headache non-responding to medical management, visual problems and cranial nerves involvement. In this study 13 patients (39.9%) presented with headache. Its site can be nonspecific, for example retro-orbital, bitemporal or frontal. We observed this non-localizing nature of such headaches (95% of patients with headache) may result in difficulties in establishing early diagnosis. Visual disturbances are the second most common presenting complaints in our study which were 21 percent. This symptom is comparable to literature which vary from mild blurring of vision to total blindness and their incidence varies from 24% to 60% in various studies. The commonly involved cranial nerve is abducent nerve due to its long course and medial intracavernous position. In various studies incidence has been mentioned from 6% to 50%<sup>16</sup>. The gold standard investigation to diagnose sphenoid sinus pathology is CT scan of face and paranasal sinuses as per FESS protocol, which is quick, cheap and easily available. MRI is also essential when we suspect that the lesion is involving surrounding structures or has an intracranial extension. In our case series bone expansion, thinning and bone remodelling is commonly found in mucocoeles, aspergillosis and benign pathologies. Bone destruction and intracranial extension is a feature of malignant disease. MRI scanning is done to find out extent of disease and its intracranial extension.

Lesions involving sphenoid sinus, inflammatory or neoplastic, primary or infiltration from pituitary neoplasms, need proper radiological assessment and surgical planning. In near past ENT surgeons use to approach the sphenoid sinus through external ethmoidectomy approach using operating microscope. Due to complex anatomy of this deepest sinus ENT surgeons are always scared due to vital structures in its proximity.

Apart from traditional indication of FESS, this technique also has some advance applications like endoscopic CSF leak repair, DCR and pituitary tumor removal. The endoscopic technique is gaining popularity due to excellent visualization and minimally invasive approach to sphenoid, sellar and parasellar region<sup>17</sup>. The advantages are improved visualization, magnification and panoramic view of the surrounding relationship to other structures. The endoscopic sinus surgery technique is preferable technique to restore the normal mucocilliary function of the sinuses and is the treatment of choice for benign and inflammatory lesions. It is indicated when the medical treatment fails. The aim of this type of surgery is to open the blocked sinus through the ostium and to establish the aeration and restoration of mucocilliary system<sup>18</sup>. On the other hand, endoscopic sinus surgery may cause severe complications even when performed by a skilled

surgeon. This is easily explained by the close vicinity of many functionally important structures to the operative site<sup>19</sup>. In this study we observed advantages of endonasal approach there is better illumination, visualization, option of angled vision, minimal invasiveness, incisionless surgery, quick postoperative recovery and minimal morbidity in experienced hands. On the other hand disadvantages of this approach is lack of binocular vision, lack of depth field and need of endoscopic equipments and training.

## CONCLUSION

Endonasal, endoscopic management of lesions of sphenoid sinus and pituitary gland has definite advantages over traditional approaches, even those using operating microscope. The combined use of imaging techniques like CT and MRI scan and diagnostic nasal endoscopy allows for accurate diagnosis and enables minimally invasive techniques to be tailored to the patient's disease. The technique described is minimally invasive, incisionless, allowing unsurpassed, unobstructed and panoramic view of the region of interest to the surgeon and the operative team. It can be performed safely and effectively with quick postoperative recovery and minimal morbidity.

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