

# Gender Distribution and Clinical Significance of Pneumatization in Sphenoid Sinus

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## ABSTRACT

**Introduction:** Pneumatization of the sphenoid sinus is highly variable and it depends on the position of the sinus in relation to the sella turcica. The pattern of pneumatization of sphenoid sinus significantly affects safe access to the sella. Pneumatized sphenoid sinus may distort the anatomical configuration so if unaware, accidental injury can occur during invasive surgical technique.

**Material and methods:** This cross sectional observational was conducted by Postgraduate Department of Anatomy in collaboration with Department of Radiodiagnosis and Imaging, Government Medical College, Srinagar. This study was done on CT scan of 200 cases (120 males and 80 females). Since the aim of our study was to evaluate normal variation in pneumatization of sphenoid sinus, cases found to harbor pathology or disease enough to distort the regional anatomy were excluded from the study. Extent of sphenoid pneumatization in relation to pituitary fossa was studied in sagittal plane and categorized as sellar, presellar and conchal. Results were categorized for males and females separately.

**RESULTS:** In our study of 200 cases, sellar type of sphenoid sinus pneumatization was majority accounting 180 (90%) while 18 (9%) were presellar and 2 (1%) were of conchal type. Both cases of conchal type were males.

**Conclusion:** The study was performed to demonstrate surgically dangerous variations of sphenoid sinus pneumatization for the safe removal of the intrasphenoid and pituitary lesions, with the goal of preventing complications and achieving the best possible results.

**Keywords:** Pneumatization, Sphenoid Sinus, CT Scan, Gender.

## INTRODUCTION

Pneumatization of the sphenoid sinus is highly variable and can extend as far as the clivus inferiorly, the sphenoid wings laterally, and the foramen magnum inferiorly. Type of sphenoid sinus pneumatization depends on the position of the sinus in relation to the sella turcica. The sella turcica is seen as a prominence in the roof of a well pneumatized sphenoid sinus and is known as the sellar bulge.<sup>1</sup> Three major pneumatization patterns for sphenoid sinus have been noted: sellar, presellar and conchal.<sup>2</sup> In sellar type, pneumatization is present in entire sphenoid body below and behind the sella turcica, so that the pituitary forms a distinct bulge in its posterosuperior wall. A presellar sphenoid sinus has pneumatization only anterior to the sella. A conchal sphenoid sinus has minimal to no pneumatization. A highly pneumatized sphenoid sinus may distort the anatomic configuration and may attenuate the bone over the lateral

wall, placing the optic nerve and carotid artery at greater risk.<sup>3</sup> A conchal configuration poses the greatest anatomic challenge to the endoscopic management of sphenoid, pituitary or anterior skull base pathology. It usually makes trans sphenoid approach less favorable.<sup>4</sup> Trans-sphenoid surgery has now a days become the standard approach for the surgical removal of pituitary tumors.<sup>5</sup> The trans-sphenoid approach is preferred as it is the least traumatic route to the sella turcica, avoids brain retraction, and it provides excellent visualization of the pituitary gland and related lesions. This approach is associated with reduced intra- and post operative complications.<sup>6</sup> The different routes to the sella like transthemoid, transnasal or trans-septal ultimately pass through the sphenoid sinus to reach the sella. Therefore the anatomical variations in pneumatization of sphenoid sinus have major impact on the surgical access and the possibility of complications.

## MATERIAL AND METHODS

This cross sectional observational study was conducted by Postgraduate Department of Anatomy in collaboration with Department of Radiodiagnosis and Imaging, Government Medical College, Srinagar after obtaining ethical clearance from institutional ethical committee. This study was done on CT scan of 200 cases (120 males and 80 females). Cases of age  $\geq 20$  years irrespective of their sex were taken up for the study. Since the aim of our study was to evaluate normal variation in pneumatization of sphenoid sinus, cases found to harbor pathology or disease enough to distort the regional anatomy were excluded from the study. Non-contrast CT scan Nose and Paranasal sinuses (NCCT Nose and PNS) was done using Siemens Somatom Emotion 16 slice Multidetector Spiral CT scan and data was acquired in axial plane. Reconstruction was done in coronal and sagittal planes using 3mm slice thickness. CT scans of patients were evaluated with radiologist's opinion in all the cases. Data was entered in Microsoft Excel and statistically analysed using SPSS software, version 20.0. Results were summarized as frequency and percentages. Photographs

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generated were photographed at appropriate window widths and window level to depict the anatomical variant. Results were categorized in general as well as gender wise.

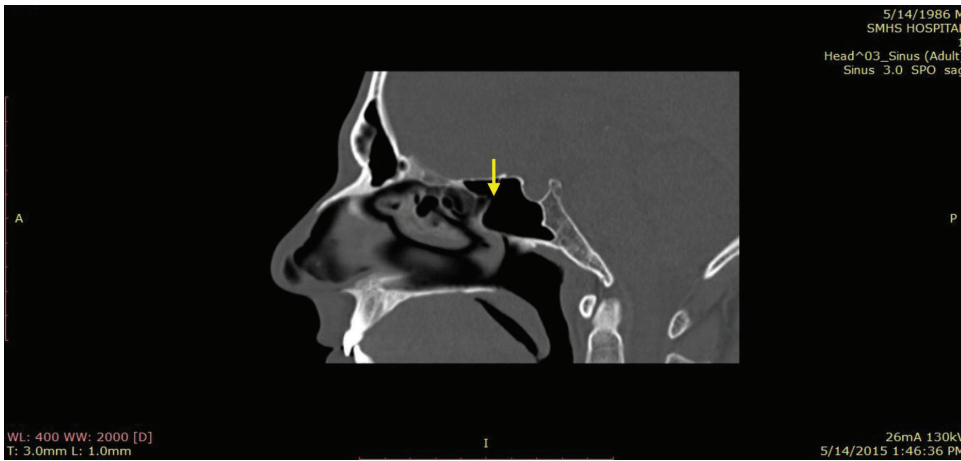
## RESULTS

In our study of 200 cases, majority pattern of sphenoid pneumatization was of sellar type in 180 (90.00%) cases, presellar type in 18 (9.00%) cases and chonchal type in only 2 (1.00%) cases as shown in table No.I. Among 80 female cases, 74 cases were sellar type while 6 cases were presellar. Total of 120 cases of males were studied; 106 cases were

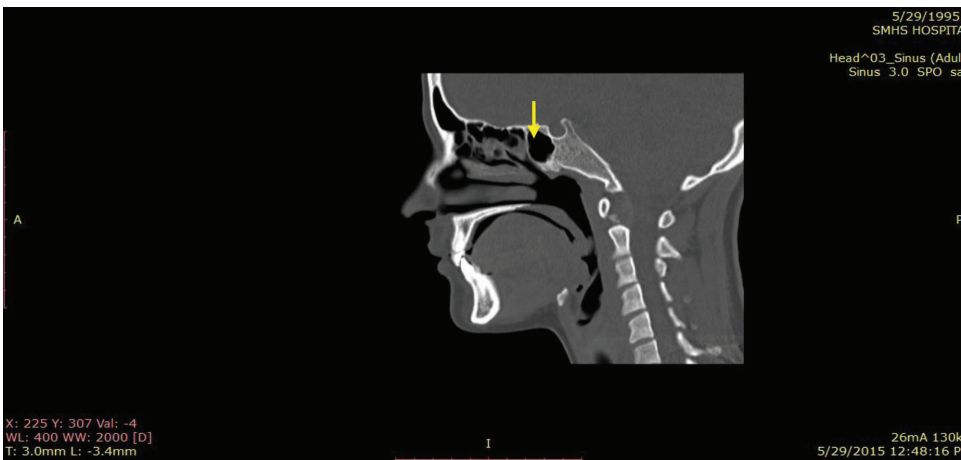
sellar type, 12 were presellar while 2 were chonchal type as can be read from table-2 (figure 1,2).

Sphenoid Pneumatization	No. of cases	Percent(%)
Sellar	180	90.00
Presellar	18	9.00
Chonchal	2	1.00
Total	200	100.00

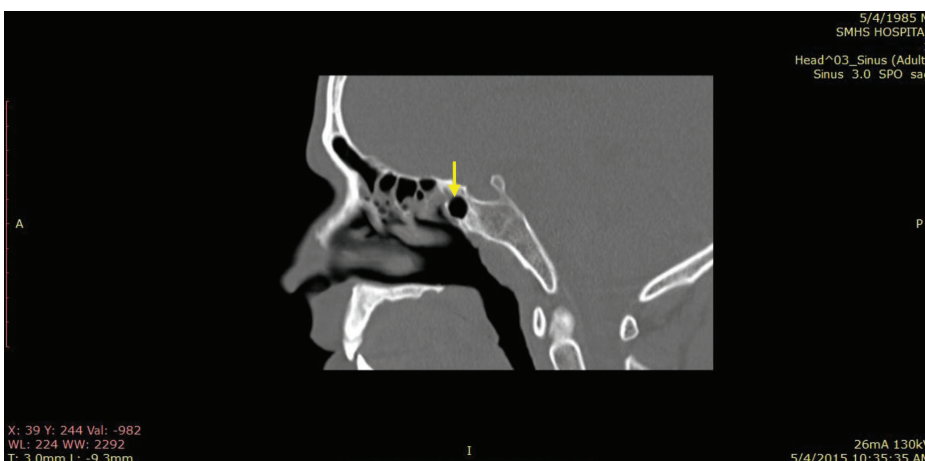
**Table-1:** Sphenoid pneumatization pattern on NCCT nose and PNS (N=200)



**Figure-1:** The sagittal computed tomography (CT) scan showing sellar type of sphenoid pneumatization (arrow)



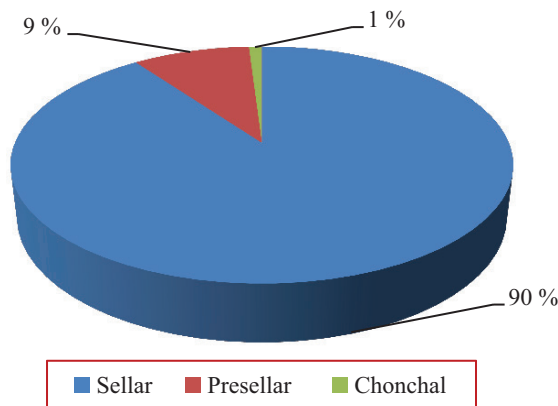
**Figure-2:** The sagittal computed tomography (CT) scan showing presellar type of sphenoid pneumatization (arrow)



**Figure-3:** The sagittal computed tomography (CT) scan showing chonchal type of sphenoid pneumatization (arrow)

Sphenoid Pneumatization	Female	Male	Total No. of Cases
	No. of Cases	No. of Cases	
Chonchal	0	2	2
Presellar	6	12	18
Sellar	74	106	180
Total	80	120	200

**Table-2:** Gender wise distribution of sphenoid pneumatization pattern(N=200)



**Figure-4:** Sphenoid pneumatization pattern on ncct NOSE and PNS

## DISCUSSION

Present study was performed to demonstrate surgically dangerous variations of sphenoid sinus pneumatization for the safe removal of the intrasphenoid and pituitary lesions in the light of the radio-anatomical concepts with the goal of preventing complications and achieving the best possible outcome. The Hyperpneumatization of sphenoid sinus not only allows extended approaches of transsphenoidal surgeries but also increases the chances of collision between operative instruments and hence iatrogenic injuries can occur. In our study of 200 cases, sellar type of sphenoid sinus pneumatization was majority accounting 180 (90%) while 18 (9%) were presellar and 2 (1%) were of chonchal type. Both cases of chonchal type were males while none of female CT scans were found to have chonchal variety. Trend of sellar being most common followed by presellar was observed in both sexes. Samih AK et al<sup>7</sup> studied pneumatization pattern of sphenoid sinus in 100 sudanese subjects and found pneumatization was of the sellar type in 85%, presellar was 15%, and no subject was chonchal. Vidya CS and Keshav Raichurkar<sup>8</sup> from India studied 80 macerated skulls of age group 40-60 yrs which were cleaned and subjected to 3D axial multislider CT scan. They observed sellar type of pneumatization in 68 skulls (85%), presellar type in 8 (10%) and post sellar type in 4 skulls (5%). Our observations concerning the pneumatization pattern of sphenoid sinus is quite comparable to that observed by above mentioned authors. Trans sphenoidal surgical approach appear to be less traumatic than the traditional microsurgical approach and is characterized by a reduced number of complications. But serious complications still can occur and must be reduced as much as possible.<sup>9-15</sup> CT is a valuable tool in the imaging of sphenoid sinus. Preoperative CT evaluation of the sphenoid

sinus is very helpful in planning the safest and most direct route to the sella. CT scans also detect the anatomic variations that may place the patient at an increased risk for intraoperative complications. A great prudence during surgical procedure is emphasized and perfect knowledge of radiological anatomy of sphenoid sinus is required to avoid the inflation of related complications.

## CONCLUSION

In order to avoid morbid consequences during surgery, it is imperative that clinicians determine the variations in pneumatization patterns of the sphenoid sinus especially when whenever transsphenoidal pituitary surgery is contemplated as pneumatized sphenoid sinus may distort the anatomical configuration so if unaware, accidental injury to the related structures can occur.

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