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A Discernment of Sphenoid Sinus Pneumatization - An Inquisitive CBCT Study

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ABSTRACT

Purpose: Variations in sphenoid sinus pneumatization are quite diversified and can impact surgeries involving suprasellar, para-sellar, and lesions near the floor of the middle cranial fossa. The details of this can be acquired by cone beam computed tomography (CBCT), a 3-D imaging modality that provides the ability to examine anatomical structures in multiple planes by overcoming superimpositions and magnification. The purpose of this study was to conduct an epidemiological assessment inspired by the classifications provided by Gibelli et al. and Bilgir et al. on the morphological variants of the sphenoid sinus pneumatization using CBCT in a South Indian population.

Material and Methods: In this retrospective study, one hundred and sixty CBCT scans of sphenoid sinuses devoid of any pathology were evaluated. Descriptive analysis and the Pearson Chi-square test were used to analyze any statistically significant difference between the sexes of patients and were evaluated using SPSS 22.0 software for Windows.

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Results: The posteroanterior pneumatization in these 160 scans was evaluated, where 5.6% was presellar, 26.8% sellar, 53.1% postsellar, and 14.3 % anterior. No conchal type of pneumatization was demonstrated. Aberrant pneumatization of 13.7% involving the pterygoid process, anterior clinoid process, and dorsum sellae was observed. No statistically significant difference between the sexes was found.

Conclusion:
To perform surgery with the least amount of risk of morbidity and human error, it is essential to have a good understanding of surgical anatomy and its variations. Hence, it is necessary to have a thorough grasp of sphenoid sinus pneumatization and its classification as there are discrepancies between the numerous study results that have been reported in the literature. Given that it produces images with higher spatial resolution than traditional computed tomography (CT), CBCT—the modern and most sophisticated imaging technique for the head and neck—aids in better visualization and evaluation of anatomical variation of sphenoid sinus pneumatization. This adds to the accuracy of the results of the study. Therefore, in order to assess pertinent anatomic features in the maxillofacial region and prevent unintentional injury, CBCT should be the gold standard imaging modality.

KEY WORDS

Cone beam computed tomography, Paranasal sinus, Pneumatization, Sella turcica

Introduction

Sinus pneumatization is a continuous physiological process, that results in the expansion of the paranasal sinuses. The sphenoid sinuses are pneumatic pockets within the sphenoid bone's body lined with mucous membranes. Due to their size, relationship to the nearby neurovascular networks, the number of septa present, and the degree of pneumatization, they are known to have a variety of morphologies. Thus, it has proven difficult to identify a single variation that would be regarded as a typical form [1].

The sphenoid bone is non-pneumatised at birth and commences around 4 months of age and progresses till 12 to 14yrs of age. During pneumatization the sphenoid sinus frequently spreads beyond the body of the sphenoid to the nearby structures such as the clinoid process, pterygoid processes, vomer, and palatine bones, resulting in the formation of recesses [2]. The variances in the pneumatization of sphenoid bone may pose a risk for iatrogenic injury. Comprehensive detailed mastery is vital while accessing aneurysms of the paraclinoid and supraclinoid sections of the internal carotid artery or central nervous system tumors in that location. The presence of the anterior clinoid process pneumatization (the posterolateral recess) may inadvertently cause pneumocephalus or rhinorrhoea. Therefore, the outright knowledge of the complex anatomy and an insight into the avenues of pneumatization is decisive so that equitable surgical planning could be accomplished before performing invasive procedures [3,4].

The degree of pneumatization is related to the likelihood of important structures, such as the internal carotid artery, maxillary nerve, and optic nerve, becoming exposed in the sinuses [5]. Pneumatised structures may represent a risk for chronic sinusitis and possible involvement of maxillary and optic nerves exposed into the sphenoid sinuses, with trigeminal neuralgia and visual deficit [6,7].

The epidemiological assessment of different variants in the general population is crucial. Although Congdon in 1920 was the first to describe pneumatization of the sphenoid sinus, it was Hamberger (1961) who classified sphenoidal sinus in the sagittal plane into three types: conchal, presellar, and seller [8]. For more than 30 years, this classification served as the foundation for transsphenoidal surgeries, but it had some shortfalls, as they didn't elaborate on the full extent of the anatomy of the sphenoid sinus. Gibelli et al (2017) suggested a classification that included aberrant forms of sphenoid sinus pneumatization in the Northern Italian popula-

Table 1: Prevalence of various Posteroanterior Pneumatization

Sr No	Posteroanterior Pneumatization	Male	Female	Total
1.	Conchal Count (n)	0	0	0
	% within posteroanterior	0.0%	0.0%	0.0%
	% within gender	0.0%	0.0%	0.0%
	% of total	0.0%	0.0%	0.0%
2.	Presellar Count (n)	7	2	9
	% within posteroanterior	77.7%	22.2%	100.0%
	% within gender	9.3%	2.3%	5.6%
	% of total	4.3%	1.2%	5.6%
3.	Sellar Count (n)	12	31	43
	% within posteroanterior	27.9%	72%	100%
	% within gender	16%	36.4%	26.8%
	% of total	7.5%	19.3%	26.8%
4.	Postsellar Count (n)	37	48	85
	% within posteroanterior	43.5%	56.4%	100.0%
	% within gender	49.3%	56.4%	53.1%
	% of total	23.1%	30%	53.1%
5.	Anterior Count (n)	19	4	23
	% within posteroanterior	82.6%	17.3%	100%
	% within gender	25.3%	4.7%	14.3%
	% of total	11.8%	2.5%	14.3%
	TOTAL Count (n)	75	85	160
	% within posteroanterior	46.8%	53.1%	100.0%
	% within gender	100.0%	100.0%	100.0%
	% of total	46.8%	53.1%	100.0%

tion but didn't elaborate on posteroanterior pneumatization, which has been thoroughly classified by Bilgir et al (2020) [5,9]. However, the latter's classification, which included lateral body type pneumatization to classify aberrant forms of pneumatization, has given a slightly complicated outlook. Thereby, increasing the complexity of the classification, necessitating a high level of expertise to comprehend.

Thus, inspired by classifications proposed by Gibelli et al. and Bilgir et al., the study aimed to comprehensively analyze various sphenoid sinus pneumatizations and their aberrant forms in a South Indian population using CBCT. CBCT, the most recent and advanced 3-D imaging modality, plays an important role in the assessment of paranasal sinuses and is widely used in maxillofacial radio-diagnostics and sinus pathologies treatment. It aids in determining all relevant anatomic structures in the maxillofacial region with utmost accuracy. It has been proven to assist surgeons with suprasellar, parasellar, and lesions near the floor of the middle cranial fossa surgical planning. Owing to the sub-millimeter isotropic voxels that are equal in all three dimensions, CBCT provides superior images with higher resolution when compared to CT, making it an ideal choice for evaluating anatomic structures in the maxillofacial region, including an anatomical variation of the sphenoid sinus pneumatization.

Material And Methods:

This study was conducted on CBCT images of 160 patients aged 20 to 60 years range using the purposive sampling method, and the sample size was calculated using the formula n= (z2) P(1-P)/d2, where n = sample size, z = statistics for the level of confidence, P = expected prevalence, and d = allowable error. This formula assumes P and d are decimal values, but it is also acceptable if they are percentages, with the exception that the expression (1-P) in the numerator becomes (100-P).

The Ethical Committee of the Institution approved the study [IEC PROTOCOL NUMBER: 95/2020]. The study includes CBCT images of the sphenoid sinus with perfect diagnostic quality across all horizons.

Inclusion criteria

1. Subjects aged 20 to 60 years old who are willing to participate in the study
2. Superior diagnostic quality CBCT images of the entire face from the orbit to the skull base (full face scan and 90mm maxilla scan).
3. Images collected for orthodontic operations, dental implants, and other maxillofacial purposes without a history of maxillary trauma or evident clinical anomalies.
4. CBCT images showing all of the sphenoid sinus borders

Exclusion Criteria

1. Patients with sphenoid sinus diseases, cleft lip or palate, craniofacial osseous anomalies, or a history of or evidence of orthognathic surgery.
2. Subjects and photos of subjects under the age of 20 because the sphenoid was not completely pneumatized.
3. Subjects with midfacial abnormalities, prior trauma, or midface surgery
4. Low-quality images.

CBCT images were obtained with a Planmeca Promax 3D Mid-CBCT machine, and the outcomes were evaluated using Romexis 5.3.5.80 viewer software with exposure parameters of 94kVp, 14 mA tube current, 27 s scan time, and 0.4-0.6 m voxel sizes. Two oral radiologists performed a radiographic examination of the study individuals under optimal viewing conditions twice with a two-week interval to rule out any disparity or bias in the interpretation of results.

The occurrence and forms of sphenoid sinus pneumatization were examined bilaterally using established reference points such as the sella turcica, vidian canal, foramen rotundum, optic canal, anterior clinoid process, and sphenoid crest. Sphenoid sinus pneumatization was examined using CBCT images that integrated the classifications established by Gibelli et al. and Bilgir et al. to include aberrant forms of pneumatization as well as evaluate posteroanterior pneumatization in depth.

Sphenoid sinus pneumatization was broadly classified into Posteroanterior pneumatization [Bilgir et. al] and aberrant pneumatization [Gibelli et al.]:

I] **Posteroanterior pneumatization:** This type was analyzed in two sections Sagittal and Axial, where anterior and posterior margins of the Sella Turcica were considered to classify pneumatization into conchal, presellar, sellar, and postsellar. (Figure 1A, 1B, 1C)

Table 2:- Prevalence of anterior pneumatization in combination with Presellar, Sellar and Post Sellar						
Anterior Pneumatization	**R**		**L**		**BL**	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**
Combined with Presellar (n)	0	0	0	0	0	0
% Within posteroanterior	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% within gender	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% of total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Combined with Sellar (n)	3	0	3	0	0	0
% within posteroanterior	50.0%	0.0%	50.0%	0.0%	0.0%	0.0%
% within gender	4%	0.0%	4%	0.0%	0.0%	0.0%
% of total	1.8%	0.0%	1.8%	0.0%	0.0%	0.0%
Combined with Post sellar (n)	6	4	6	0	1	0
% within posteroanterior	35.2%	23.5%	35.2%	0.0%	5.8%	0.0%
% within gender	8%	4.7%	8%	0.0%	1.3%	0.0%
% of total	3.7%	2.5%	3.7%	0.0%	0.6%	0.0%
Total Count (n)	9	4	9	0	1	0
% within posteroanterior	64.2%	28.5%	64.2%	0.0%	7.1%	0.0%
% within gender	12%	4.7%	12%	0.0%	1.3%	0.0%
% of total	5.6%	2.5%	5.6%	0.0%	0.6%	0.0%

Sphenoid crest was used as a reference to identify anterior pneumatization. (Figure 1D)

Posteroanterior pneumatization was classified into five types:

A) The sella turcica was completely enveloped in bone in **conchal type** one, and the sinus was obscured.

B) The anterior portion of the sella was exposed to air in the **presellar type**, but the sinus terminates on the anterior wall of the sella turcica. (Figure 1 A)

C) Sinus extended to the posterior wall of the sella turcica in the **sellar type** pneumatization. (Figure 1B)

D) In the **postsellar type**, pneumatization spreads beyond a vertical line along Sella's posterior end (Figure 1C).

The postsellar type was further divided into four subgroups dorsum, subdorsum, occipital, and full clival type pneumatization. As previously described in the literature, by directing the two horizontal planes passing through the pituitary fossa floor and the anterior opening walls of the vidian canal.

Pneumatizations that were limited to the interplanar area are classified as subdorsum type (Figure 2A); pneumatizations that extend above the upper plane are classified as dorsum type (Figure 2B); pneumatizations that extend below the lower plane are classified as occipital type (Figure 2C), and pneumatizations that extend beyond both planes were classified as full clival type (Figure 2D).

E) The anterior sinus wall extends anterolaterally beyond the vertical coronal plane of the sinus side of

Table 3:- Prevalence of various types of Post sellar pneumatization				
Sr. No.	**Post Sellar Pneumatization**	**Male**	**Female**	**Total**
1	**Sub dorsum** Count (n)	16	31	47
	% within posteroanterior	34%	65.9%	100%
	% within gender	21.3%	36.4%	29.3%
	% of total	10%	19.3%	29.3%
2	**Dorsum** Count (n)	12	11	23
	% within posteroanterior	52.1%	47.8%	100.0%
	% within gender	16%	12.9%	14.3%
	% of total	7.5%	6.8%	14.3%
3	**Occipital** Count (n)	5	2	7
	% within posteroanterior	71.4%	28.5%	100.0%
	% within gender	6.6%	2.3%	4.3%
	% of total	3.1%	1.2%	4.3%
4	**Full Clival** Count (n)	4	4	8
	% within posteroanterior	50%	50%	100.0%
	% within gender	5.3%	4.7%	5%
	% of total	2.5%	2.5%	5%
	TOTAL Count (n)	37	48	85
	% within posteroanterior	43.5%	56.4%	100.0%
	% within gender	49.3%	56.4%	53.1%
	% of total	23.1%	30%	53.1%

the sphenoid crest in the **anterior type**. The anterior type is often observed in conjunction with the pre-sellar, sellar or post-sellar type. (Figure 1D)

II] **Aberrant Pneumatization:** In axial sections, they are identified based on the anatomical component which is associated with the pneumatization. (Figure 3A, 3B, 3C)

A] Pneumatization of the Pterygoid process

B] Pneumatization of Dorsum Sellae

C] Pneumatization of Anterior Clinoid Process

Statistical analysis:

The data obtained were tabulated and analyzed using SPSS 22.0 software for Windows. A mean and standard deviation were employed for the evaluation of continuous data and a percentage proportion for categorical data. Statistical evaluation was considered by using the Chi-square test for categorical data and the student test

Table 4: Prevalence of Posteroanterior type of pneumatization in various populations.

S. No	AUTHORS	YEAR	POPULATION	SAMPLE SIZE	PREVALENCE (%)			
					PRE-SELLAR	SELLAR	POST SELLAR	CONCHAL
1	Kayalioglu G et al	2005	Turkey	257	9	52.9	36.2	1.9
1	Wiebracht ND	2007	United States	90	9	37	54	0
2	Yuntao lu	2011	China	200	28.5	65.5	0	6
3	Guldner C et al	2012	Germany	580	6.6	57.2	17.9	0.3
4	Sevinc o et al	2014	Turkey	616	16.6	83.0	0	0.5
5	Nikola Stokovic et al	2016	Italy	51	24	41	33	2
6	Rahmati et al	2017	Iran	103	1.9	14.6	83.5	8
7	Ozer et al	2018	Turkey	239	8.3	23.6	66.7	1.4
8	Hiremath SB	2018	India	500	1.2	22.2	76.6	0
9	Present Study	2022	India	154	5.6	26.8	53.1	0

for continuous data at a 95% confidence interval. P values of less than 0.05 were considered significant. Pearson Chi-Square test was used in this study to assess the statistical significance of variation among the sexes of the subjects.

Results:

The present study assessed the diagnostic CBCT images of 160 patients to determine the prevalence of posteroanterior pneumatization. The results showed that conchal pneumatization was not observed (0.0%), while presellar, sellar, postsellar, and anterior pneumatization was detected in percentages of 5.6%, 26.8%, 53.1%, and 14.3%, respectively. (Figure 1a, 1b, 1c, 1d) (Table 1).

Anterior pneumatization is observed in conjunction with pre-sellar, sellar, and post-sellar types of pneumatization. The present study assessed anterior pneumatization through axial sections, as opposed to its combination with posteroanterior pneumatization, which can solely be visualized in the sagittal section. The findings of the study indicate that a percentage of 5.6% of males and 2.5% of females exhibited anterior pneumatization on the right side. Moreover, the study revealed that 5.6% of males exhibited left-side anterior pneumatization, while no instances of this were detected in females. The prevalence of anterior pneumatization concomitant with sellar in the male population was found to be 1.8%, whereas no instances of this were observed in the female population. The prevalence of anterior pneumatization in conjunction with postsellar in the male and female populations was 3.7% and 2.5%, respectively. The present study did not observe the co-occurrence of anterior pneumatization and pre-sellar pneumatization (Table 2).

After analysis of the incidence of posteroanterior pneumatization with respect to sex, it was observed that the postsellar type was the predominant form of pneumatization in both males and females. The preva-

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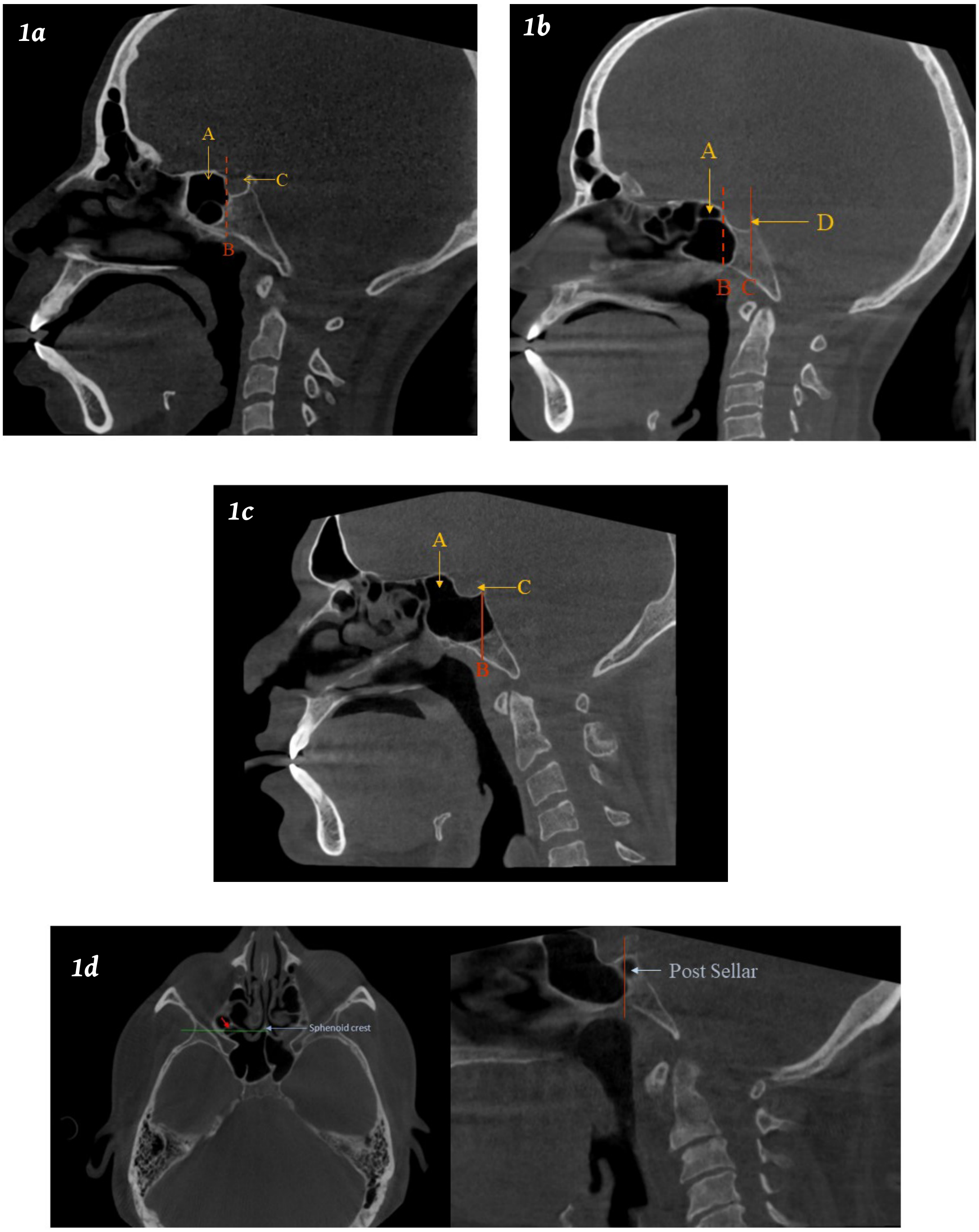

***Figure 1 a** : Represents Pre sellar type of posteroanterior pneumatization. A- Sphenoid Sinus, B-Anterior wall of Sella turcica, C- Sella turcica*
***Figure 1 b** : Represents Sellar type of posteroanterior pneumatization. A- Sphenoid Sinus, B-Anterior wall of Sella turcica, C- Posterior wall of Sella turcica, D- Sella Turcica*
***Figure 1 c:** Represents Post sellar type of posteroanterior pneumatization. A- Sphenoid Sinus, B-Anterior wall of Sella turcica, C- Posterior wall of Sella turcica, D- Sella Turcica*
***Figure 1 d:** Represents Anterior type of posteroanterior pneumatization (Axial Section) in combination with Post Sellar type of pneumatization (Sagittal section). Green line indicates coronal plane beyond which the pneumatization has exceeded. In the same patient in sagittal section Post Sellar type of pneumatization can be seen (Red line indicating posterior wall of Sella turcica).*

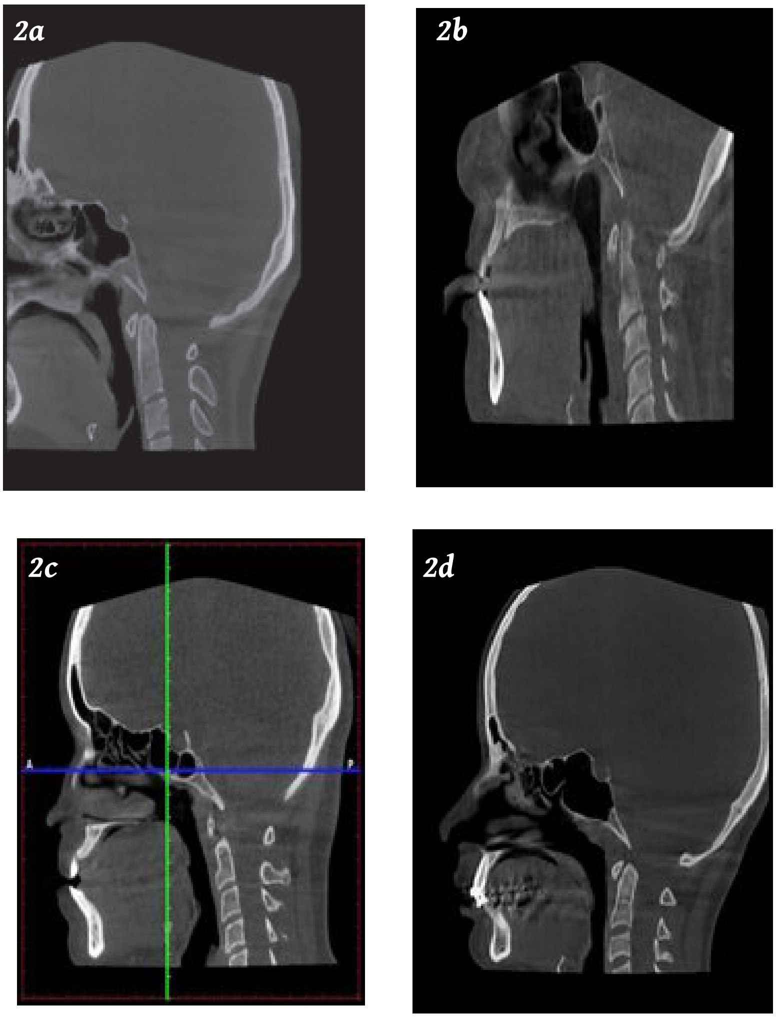

Figure 2 a *: Represents Sub dorsum type of post sellar pneumatization*
Figure 2 b*: Represents Dorsum type of post sellar pneumatization*
Figure 2 c *: Represents Occipital type of post sellar pneumatization*
Figure 2 d *: Represents Full clival type of post sellar pneumatization*

lence of presellar type was observed to be 4.3% among males and 1.2% among females. The prevalence of Sellar-type pneumatization was observed to be higher in the female population as compared to males. The sub-dorsum type of pneumatization among postsellar types was observed to be the most prevalent, accounting for 29.3% of the total population (Table 3) (Figure 2a, 2b, 2c, and 2d). The prevalence of posteroanterior pneumatization did not exhibit a statistically significant difference between the two sexes, with a p-value greater than 0.05. Within the entirety of the sample population, a total of 13.7% exhibited the aberrant form of pneumatization upon assessment through axial sections. The highest percentage of encountered forms of this aberrant pneumatization were found as pneumatization of the pterygoid process (63.6%) (Figure 3a), dorsum sellae (22.7%) (Figure 3b, Figure 4b), and anterior clinoid process (13.6%) (Figure 3c). The prevalence of pneumatized pterygoid processes was higher on the right side, with an incidence of 22.7% in males and 13.6% in females, as depicted in Figure 4a. No significant differences were observed in both males and females in this regard. The study revealed that males exhibited pneumatized anterior clinoid processes of 9% and 4.5% on the right and left sides, respectively. Conversely, no instances of such processes were observed in females. Moreover, the

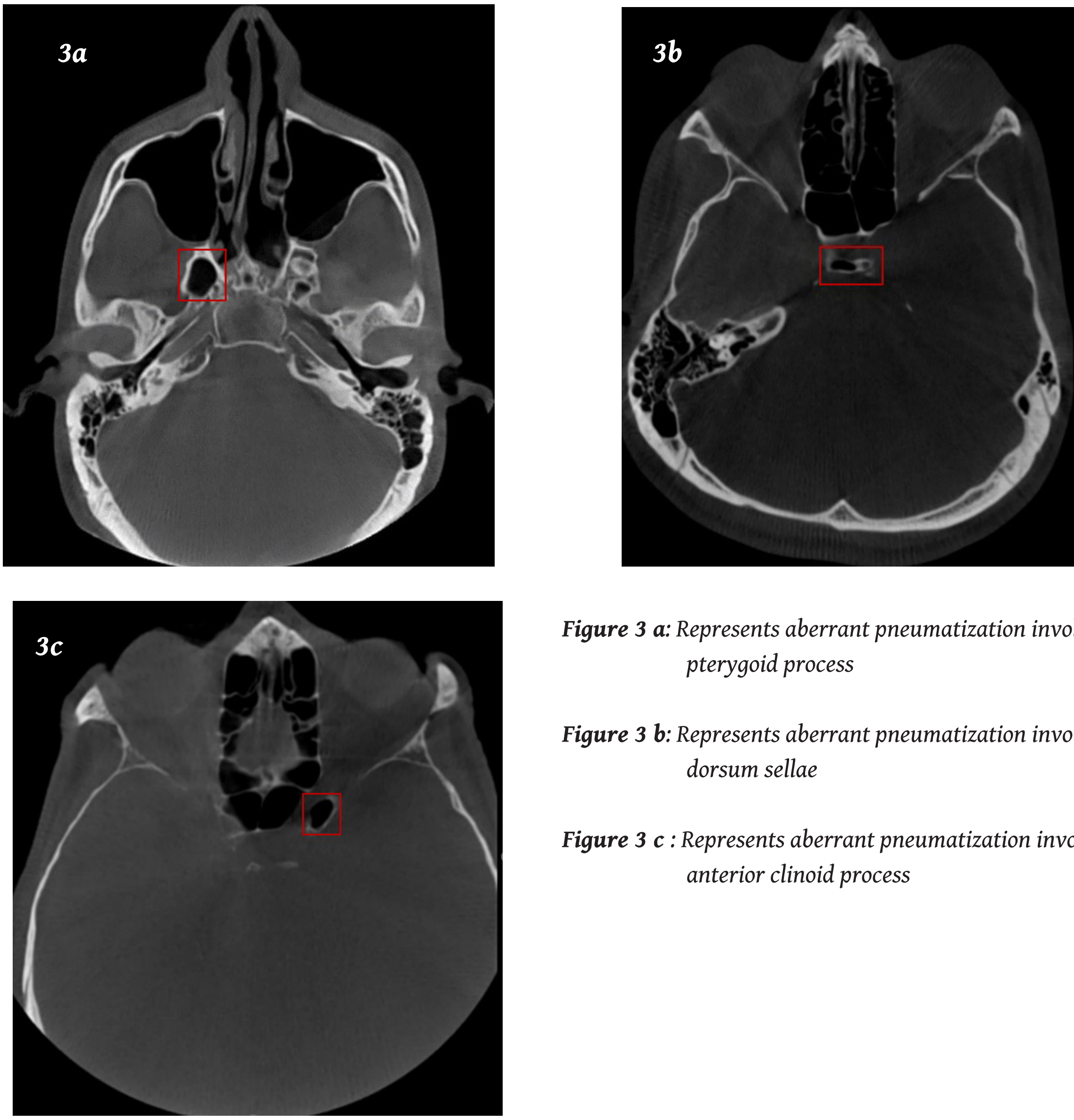

Figure 3 a: *Represents aberrant pneumatization involving pterygoid process*

Figure 3 b: *Represents aberrant pneumatization involving dorsum sellae*

Figure 3 c : *Represents aberrant pneumatization involving anterior clinoid process*

study did not observe any significant variations in the occurrence of various forms of pneumatization between male and female subjects, with a p-value greater than 0.05. Aberrant pneumatization was observed in association with different posteroanterior pneumatization. As previously stated, 13.7% of the sampled population exhibited an aberrant form of pneumatization. Specifically, 15% of the aberrant pneumatization was observed in the postsellar pneumatization, while 18.6% and 44.4% of the cases were found in the sellar and pre-sellar pneumatization, respectively. Despite the fact that the incidence of pre-sellar was lowest in individuals with posteroanterior pneumatization, 44.4% of them exhibited aberrant pneumatizationn.

Discussion:

The form of the face, the resonance of the voice, and the humidification of the inhaled air are all influenced by the paranasal sinuses [10]. In recent years there has been significant emphasis on research into the anatomical variances I the paranasal sinus. The sphenoid sinus is commonly referred to as a «neglected sinus» due to its physical isolation, relative obscurity, and complexity of access [11]. It develops because of bilateral intussusception of the nasal mucosa in the direction of the sphenoid bone. These are unique to primates, originating

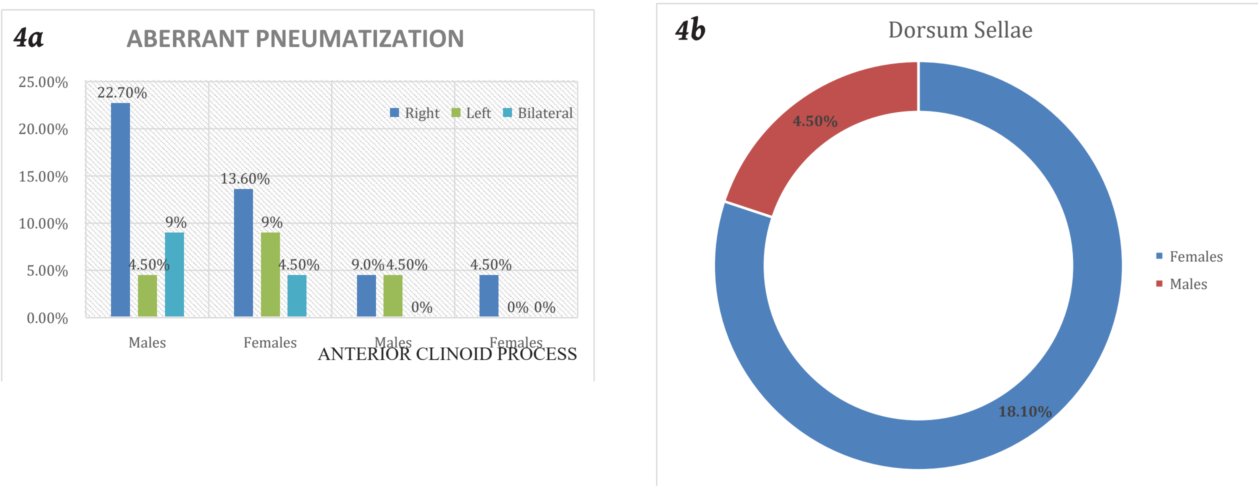

Figure 4: *- Graphical representation of the prevalence and distribution among sexes in various types of Aberrant Pneumatization.*
[a] Shows the prevalence of aberrant pneumatization involving Pterygoid process and Anterior Clinoid process
[b] Shows prevalence of aberrant pneumatization involving Dorsum Sellae

from the posterior divisions of the nasal cavity around the third or fourth month of gestation [12]. Although the specific age at which the sphenoid sinuses are fully pneumatized is uncertain, the process often culminates with a fully aerated sinus by the third decade of life [13].

Transseptal, transantral, transpterygoid, transethmoidal, and transpalatal procedures are all used to get access to the sphenoid sinus. It is at the discretion of the surgeon to select the most appropriate strategy based on their skill and the extent of the disease [11]. As a result, explicit data on diverse morphological variances in sinus pneumatization in the respective population is required to provide exact knowledge for effective procedures with minimal complications.

The epidemiologic study of variation in sphenoid bone pneumatization is important for establishing any ethnic differences. A characteristic of sphenoid sinuses which seems to be strongly related to ethnic variability is the type of sinus: from this point of view, several classifications have been proposed in the past; for example, Hammer and Radberg described three anatomic types of sphenoid sinus, conchal, presellar, and sellar, with the sellar being the most common (86 per cent) [14,15]. The Hammer and Radberg classification is widely accepted and is still the most commonly used in practice [11]. Also, Kayaloglu et al. (2005), and Guldner et al. (2012) identified results similar to Hammer and Radberg [16,17]. However, in this study, the Post sellar type was the most common (53.1%) [Table 1], which is consistent with the findings of Wiebracht et al. (2014), in the detailed analysis it was found that among 90 subjects, the most common occurrence was post sellar 49 (54%) followed by sellar 33 (37%) and presellar 8 (9%). In an independent study by Rahmati et al. (2016), there was no occurrence of a conchal type of sphenoid sinus, a finding similar to the present study. The most common incidence was post sellar (83.5%), followed by sellar (14.6%) and presellar (14.6%). It was observed in an analysis by Ozer et al (2018) that post sellar (66.7%) was most common followed by sellar(23.6%), presellar(18.3%) and conchal (1.4%).

Amongst the post sellar type, the subdorsum type (29.3%) was the most common in the present study population [Table 3] which is in accordance with the study by Bilgir et al (60.8%). One reason, for this disparity, could be the parameters used by each author to describe the various type of pneumatization. Another reason for the differences in results could be that the studies were conducted on a variety of indigenous races (Table 4).

When a literature review of the incidence of four posteroanterior types (conchal, presellar, sellar, and postsellar) was conducted, it was discovered that the conchal type had the lowest incidence. In our study, conchal type of pneumatization was not detected. This could be due to the rarity of this type in our population which needs to be cross verified with further research with a larger sample size (Table 4).

In addition, the current study raises other issues that justify further investigation through population analyses, such as the coexistence of different forms of pneumatization in the same individual: the statistical analysis revealed that subjects with one form of pneumatization are more likely to show other forms. This study observed that anterior pneumatization was present in combination with Sellar (1.8%) present only in males on both right and left sides) and Post sellar (3.7 %) on both right and left sides in males and 2.5% in females only on the right side, one bilateral incidence in males. (Table 2) Similar finding was observed in the study by Bilgir et al. where anterior pneumatization combined with presellar was detected in only one patient and bilaterally. The incidence of anterior pneumatization combined with sellar on the right and left sides was 12.5% and 10.9%, respectively, whereas the combination of anterior pneumatization with post sellar type was 15.6% and 11.7% respectively. This finding could point to a common origin for various types of pneumatization, which is most likely linked to the development of sphenoid sinuses.

Furthermore, surgeons must anticipate that patients will most likely be affected by various forms of pneumatization [5]. If neglected, a vital structure such as the internal carotid artery lies close to the lateral wall of the sinus and could be injured, thereby increasing the risk of a life-threatening haemorrhage [19].

The study conducted by Sinha et al. (2020) suggests that there may be a correlation between the skeletal pattern and the size of the Sella turcica, as revealed by the results of lateral cephalometric radiography examination in the context of Orthodontic treatment planning. The potential influence of sphenoid sinus recesses on the morphology and dimensions of the Sella requires additional studies, thereby highlighting the need for future research endeavours in this domain. Furthermore, several authors' research has shown that Sphenoid sinus pneumatization occurs at varied rates in different populations. In our investigation, aberrant pneumatization was found to be 13.7% (Figure 4a, 4b), which is significantly lower than the 57% identified by Gibelli et al [5]. Several studies conducted by Hewaidi et al., Sirikci et al., Arslan et al., Rereddy et al., Lu et al., and Rahmati et al. have investigated the prevalence of pneumatization of the pterygoid process in different ethnic groups. Their findings indicate that the prevalence ranges from 16% to 44%. However, the present study reports a much higher prevalence of 63.6%. The significant fluctuation observed in the outcomes suggests two potential explanations. Firstly, it could be attributed to the diversity in the populations studied. Secondly, lacunae in standardization in classifying variances in Sphenoid Sinus pneumatization. As a result, a standard protocol must be developed to provide precise information and universally accepted classification without major disparities in sinus pneumatization variations, which can be accomplished through additional research in other ethnicities with a larger sample size population. **R**

Conclusion:

Sphenoid sinus is a highly variable anatomical structure. The postsellar and sellar pneumatization types predominate compared to the rarely found presellar or conchal types. The present study assessed the 6anatomical variation and classification of the sphenoid sinus pneumatization by using CBCT which is indispensable in surgical planning in order to avoid the risk of iatrogenic damage to the surrounding structures in extensive endoscopic and skull base procedures.

Authors Contribution:

All authors were included in all steps of preparation of this report. All authors gave final approval for the version to be published and agree to be accountable for all aspects of the work. **R**

Conflict Of Interest:

There are no conflicts of interest.

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