

# ORIGINAL ARTICLE

## Assessment of variations in sinuses using CT scans

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### ABSTRACT:

**Aim:** To assess variations in sinuses using CT scans. **Methodology:** One hundred ten subjects with sinonasal symptoms were selected in this prospective, observational study. All patients were subjected to CT scan and were examined for the presence of haller cell, pneumatization in the nasal septum, onodi cell, paradoxical middle turbinate, superior and middle turbinate, uncinate process and deviated nasal septum (DNS). **Results:** Out of 110 patients, males were 62 and females were 48. Special cells such as agger nasi cells were seen in 65 patients, haller's cells in 20 and onodi cells in 25 patients. The difference was significant ( $P < 0.05$ ). Frontal sinus shows septations in 35, maxillary sinus in 24, sphenoid sinus in 12 and ethmoid sinus in 16 patients. The difference was significant ( $P < 0.05$ ). Frontal sinus hypoplasia was seen in 6 cases, maxillary sinus in 3, ethmoid sinus in 2 and sphenoid sinus in 4. The difference was significant ( $P < 0.05$ ). Horizontal uncinate process was seen in 65 and vertical uncinate process was seen in 45 cases. The difference was significant ( $P < 0.05$ ). Common variation such as deviated nasal septum was observed in 57 and concha bullosa in 21 cases. The difference was significant ( $P < 0.05$ ). **Conclusion:** Careful analysis of sinuses before undergoing sinus surgery is required for achieving best results and preventing further complications. CT scan is useful in assessment of variation in para- nasal sinuses.

**Key words:** Para- nasal sinuses, CT scan, Haller

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### INTRODUCTION

The function of paranasal sinuses are to decrease the relative weight of the front of the skull, regulation of intranasal and serum gas pressures, increasing resonance of the voice, providing a buffer against facial trauma, insulating sensitive structures like dental roots and eyes from rapid temperature fluctuations in the nasal cavity etc.<sup>1,2</sup> There is variation in appearance of paranasal sinuses (PNS). Various radiographs are available for the assessment of PNS such as water's view, panoramic radiographs etc. Among specialized radiography, computed tomography (CT) of the paranasal sinuses (PNS) has nowadays become the investigation of choice. One of the biggest advantages of CT is that it provides details about soft tissue and bony structures.<sup>3</sup>

Sound knowledge of sino- nasal apparatus is essential for the best management of diseases affecting the sinuses. Because of proximity of vital structures such as orbit and base of skull, care should be taken while operating in case of sinus surgeries. Less common anatomic variants of the paranasal sinuses include pneumatization of the uncinate process (or an uncinate bulla), large ethmoidal bullae, supraorbital cells, and pneumatized crista galli.<sup>4</sup> A supraorbital ethmoidal air cell is located posterolateral to the frontal sinus, superior and lateral to the lamina papyracea, and anterior to the anterior ethmoidal artery and can be identified by the presence of a bony septum between

the frontal and anterior ethmoidal sinuses on axial CT images.<sup>5</sup> Pneumatization of the crista galli originates from the frontal sinuses. The prevalence of these variations will vary ethnic groups.<sup>6</sup> The present study was conducted to assess variations in sinuses using CT scans.

### METHODOLOGY

A sum total of one hundred ten subjects with sinonasal symptoms were selected in this prospective, observational study. All enrolled subjects were informed regarding the study and their written consent was obtained. Ethical clearance was taken before starting the study.

Demographic profile such as name, age, gender etc. was recorded. All patients were subjected to CT scan using Toshiba machine with an FOV of 14–16 cm and a slice thickness of 0.625 mm. The axial plane was the inferior orbital meatal plane. Coronal and sagittal reconstructions were postprocessed. The CT scans were examined independently by two neuroradiologists for the presence of haller cell, pneumatization in the nasal septum, onodi cell, paradoxical middle turbinate, superior and middle turbinate, uncinate process and deviated nasal septum (DNS). Results were tabulated and analysed statistically using chi- square test. P value  $< 0.05$  was considered significant.

## RESULTS

**Table I Distribution of patients**

Total- 110		
Gender	Male	Female
Number	62	48

Out of 110 patients, males were 62 and females were 48 (Table I).

**Table II Occurrence of special cells**

Special cells	Number	P value
Agger nasi cells	65	0.04
Haller's cell	20	
Onodi cell	25	

Special cells such as agger nasi cells were seen in 65 patients, haller's cells in 20 and onodi cells in 25 patients. The difference was significant ( $P < 0.05$ ) (Table II).

**Table III Septations in sinuses**

Septations	%	P value
Frontal sinus	35	0.03
Maxillary sinus	24	
Sphenoid	12	
Ethmoid sinus	16	

Frontal sinus shows septations in 35, maxillary sinus in 24, sphenoid sinus in 12 and ethmoid sinus in 16 patients. The difference was significant ( $P < 0.05$ ) (Table III).

**Table IV Hypoplasia of sinus**

Hypoplasia	%	P value
Frontal sinus	6	0.92
Maxillary sinus	3	
ethmoid sinus	2	
sphenoid sinus	4	

Frontal sinus hypoplasia was seen in 6 cases, maxillary sinus in 3, ethmoid sinus in 2 and sphenoid sinus in 4. The difference was significant ( $P < 0.05$ ) (Table IV).

**Table V Variation in uncinate process**

Uncinate process	%	P value
Horizontal	65	0.41
Vertical	45	

Horizontal uncinate process was seen in 65 and vertical uncinate process was seen in 45 cases. The difference was significant ( $P < 0.05$ ) (Table V).

**Table VI Occurrence of common variation**

Variations	%	P value
Deviated nasal septum	57	0.01
Concha bullosa	21	

Common variation such as deviated nasal septum was observed in 57 and concha bullosa in 21 cases. The difference was significant ( $P < 0.05$ ) (Table VI).

## DISCUSSION

Pathologies of sinuses are becoming common nowadays due to various reasons. For the management of diseases affecting sinuses, their basic knowledge about anatomy is must. Sinus surgery is a common procedure which requires a radiological description of the anatomy and its anatomical variations in nose and PNS.<sup>7,8</sup> Though the importance of anatomical variations of osteo meatal complex in the etiology of nose and para nasal disease is still in debate but knowledge of these variations in each

patient is important before planning for surgery to avoid injury to surrounding important structures like the orbit and the brain.<sup>9,10</sup> The present study was conducted to assess variations in sinuses using CT scans.

Out of 110 patients, males were 62 and females were 48. Special cells such as agger nasi cells were seen in 65 patients, haller's cells in 20 and onodi cells in 25 patients. Shpiberg et al<sup>11</sup> determined the incidence of sinonasal anatomic variants and to assess their relation to sinonasal mucosal disease in 192 sinus CT

examinations of patients with a clinical history of rhinosinusitis. The most common normal variants were nasal septal deviation, Agger nasi cells, and extension of the sphenoid sinuses into the posterior nasal septum. We found no statistically significant difference in the prevalence of any of the studied anatomic variants between patients with minimal and those with clinically significant paranasal sinus or nasal cavity disease.

Our results showed that frontal sinus shows septations in 35, maxillary sinus in 24, sphenoid sinus in 12 and ethmoid sinus in 16 patients. Frontal sinus hypoplasia was seen in 6 cases, maxillary sinus in 3, ethmoid sinus in 2 and sphenoid sinus in 4. Ludwick J<sup>12</sup> found that CT is very useful in depicting sinuses. Moreover it has benefit that it is inexpensive as compared to MRI and provides hard tissue profile better than MRI. We observed that horizontal uncinate process was seen in 65 and vertical uncinate process was seen in 45 cases. Common variation such as deviated nasal septum was observed in 57 and concha bullosa in 21 cases. Qureshi MF et al<sup>13</sup> determined the incidence of anatomical variants of sinonasal region and its correlation with symptoms of sinusitis. Out of 50 subjects, 34 were males and 16 were females with mean age of 42.68±18.22 years. Most common anatomical variants observed were agger nasi cells (64%), deviated nasal septum (56%), and concha-bullosa (46%). Statistically significant correlation existed between bilateral agger nasi cells and nasal obstruction ( $p=0.017$ ,  $\rho=-0.336$ ). Dasar et al<sup>14</sup> reported that strong correlation was recognized between agger-nasi cells, DNS, turbinate variants with rhinosinusitis also, stated incidence of DNS (20.0%), CB (11.7%) and agger-nasi cells (78.3%). Suri et al<sup>15</sup> that showed there was strong association between anatomical variants and rhinosinusitis. Also, there is an impact of variants on sinus infections and hence CT is the best tool for evaluation of sinonasal region.

## CONCLUSION

Careful analysis of sinuses before undergoing sinus surgery is required for achieving best results and preventing further complications. CT scan is useful in assessment of variation in para- nasal sinuses.

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