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Variations in appearance of para-nasal sinus and sino-nasal region: A CT study

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Abstract
Background: 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. The present study was conducted to assess variations in sinuses using CT scans.
Materials & Methods: The present study was conducted in the department of radiodiagnosis in year 2014. It included 120 patients visited for sinonasal symptoms. All patients were subjected to CT scan using Kodak machine. Each scan was studied for the presence of haller cell, pneumatisation in the nasal septum, onodi cell, paradoxical middle turbinate, superior and middle turbinate, uncinate process and deviated nasal septum (DNS).
Results: Out of 120 patients, males were 50 and females were 70. The difference was non- significant (P- 0.2). Age group 20-30 years had 65 patients, 30-40 years had 40 patients and 40-50 years had 15 patients. The difference was significant (P- 0.05). Special cells such as agger nasi cells were seen in 72 patients, haller's cells in 24 and onodi cells in 20 patients. The difference was significant ($P < 0.05$). Frontal sinus shows septation in 30%, maxillary sinus in 22%, sphenoid sinus in 44% and ethmoid sinus in 4%. 50% showed type I cribiform plates, 38% showed type II and 12% showed type III. Frontal sinus hypoplasia was seen in 5%, maxillary sinus in 4%, ethmoid sinus in 1% and sphenoid sinus in 1%. Horizontal uncinate process was seen in 56% and vertical uncinate process was seen in 44% of cases. Common variation such as deviated nasal septum (59%) and concha bullosa (27%) were seen.
Conclusion: Variations in sinuses are not uncommon. Careful analysis of sinuses before undergoing sinus surgery is required for achieving best results and preventing further complications. CT scan is useful in this direction.

Keywords: computed tomography, paranasal sinus, uncinate process

1. Introduction
Paranasal sinuses are a group of four paired air-filled spaces that surround the nasal cavity. The maxillary sinuses are located under the eyes; the frontal sinuses are above the eyes; the ethmoidal sinuses are between the eyes and the sphenoidal sinuses are behind the eyes. The sinuses are named for the facial bones in which they are located [1].
The function of 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 [2].
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 [3]. 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. 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. The prevalence of these variations will vary ethnic groups [4]. The present study was conducted to assess variations in sinuses using CT scans.

2. Materials & Methods
The present study was conducted in the department of radiodiagnosis in year 2014. It included 120 patients visited for sinonasal symptoms. They were informed regarding the study and consent was obtained. Ethical clearance was taken before starting the study.
All patients were subjected to CT scan using Kodak machine. Each scan was studied for the presence of haller cell, pneumatisation in the nasal septum, onodi cell, paradoxical middle turbinate, superior and middle turbinate, uncinate process and deviated nasal septum (DNS). Results were tabulated using chi- square test. P value < 0.05 was considered significant.

3. Results
Table 1 shows that out of 120 patients, males were 50 and females were 70. The difference was non- significant (P- 0.2). Table 2 shows that age group 20-30 years had 65 patients, 30-40 years had 40 patients and 40-50 years had 15 patients. The difference was significant (P- 0.05).

Fig 1 shows that special cells such as agger nasi cells were seen in 72 patients, haller's cells in 24 and onodi cells in 20 patients. The difference was significant (P < 0.05). Fig 2 shows that frontal sinus shows septation in 30%, maxillary sinus in 22%, sphenoid sinus in 44% and ethmoid sinus in 4%. Fig 3 shows that 50% showed type I cribiform plates, 38% showed type 2 and 12% showed type 3. Fig 4 shows that frontal sinus hypoplasia was seen in 5%, maxillary sinus in 4%, ethmoid sinus in 1% and sphenoid sinus in 1%. Graph 5 shows that horizontal uncinate process was seen in 56% and vertical uncinate process was seen in 44% of cases. Graph 6 shows common variation such as deviated nasal septum (59%) and concha bullosa (27%).

Table 1: Distribution of patients

Male	Female	P value
50	70	0.2

Table 2: Distribution of patients according to age

Age group	Number	P value
20-30	65	0.05
30-40	40	
40-50	15	

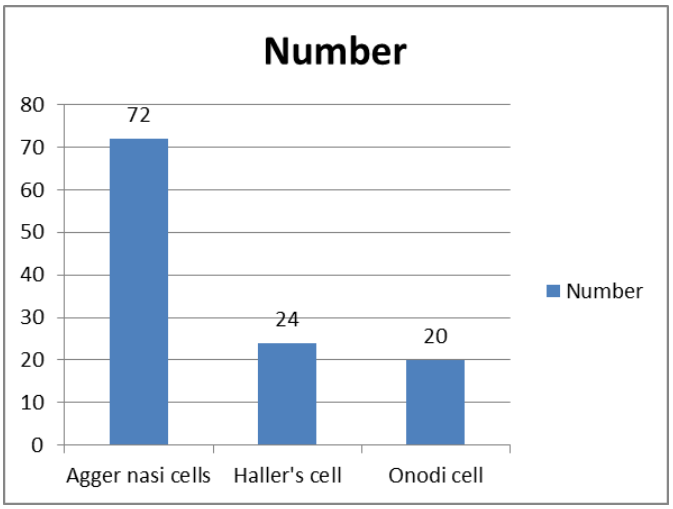

Fig 1: Occurence of special cells

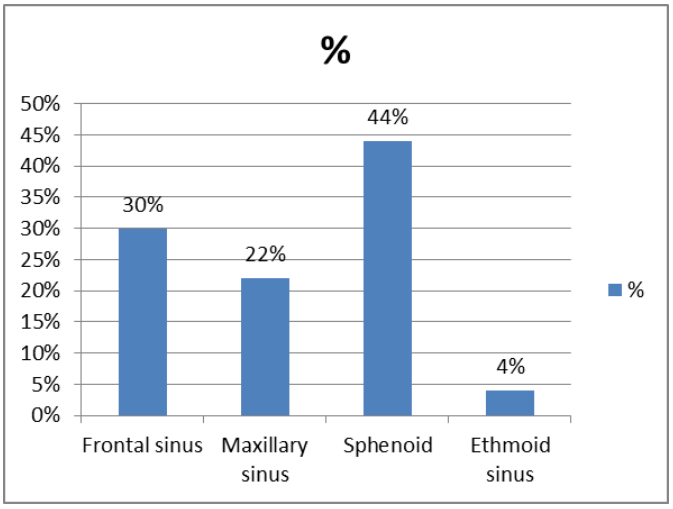

Fig 2: Septations in sinuses

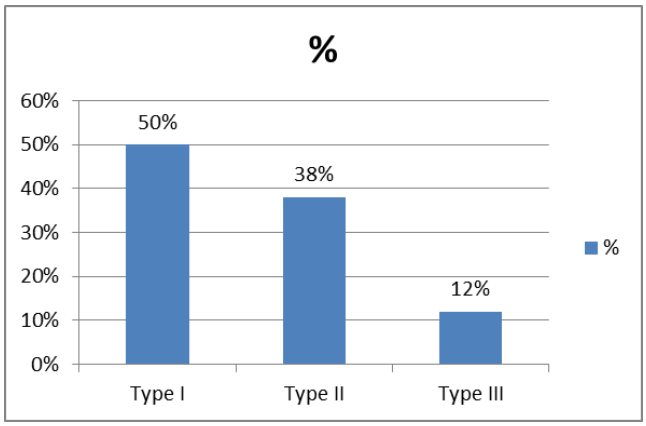

Fig 3: Occurrence of cribiform plates

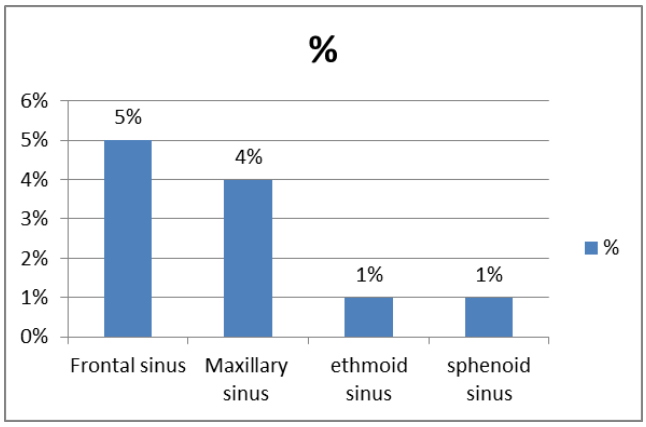

Fig 4: Hypoplasia of sinus

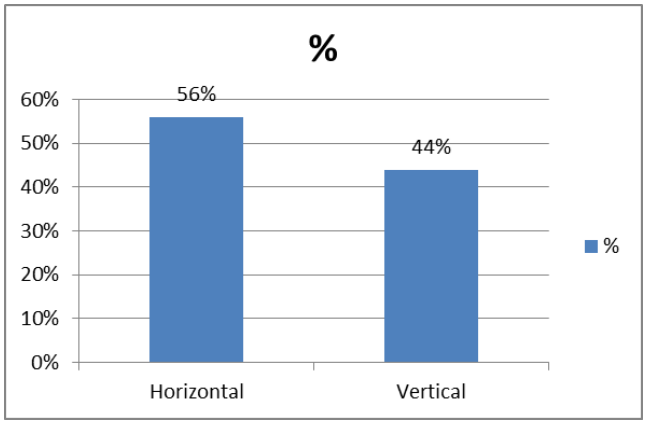

Fig 5: Variation in uncinate process

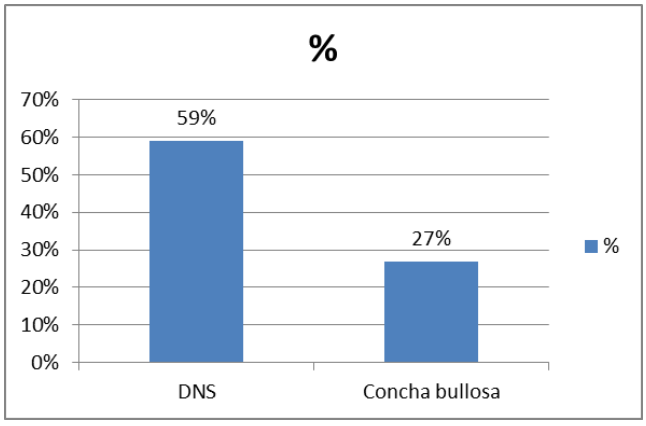

Fig 6: Common variations

4. Discussion

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. The present study was conducted to assess variations in sinuses using CT scans.

In our study, out of 120 patients, males were 50 and females were 70. Maximum patients were from age group 20-30 years which showed 65 patients, 30-40 years had 40 patients and 40-50 years had 15 patients. Results are similar to Perez *et al* [5].

We found that in our patients special cells such as agger nasi cells were seen in 72 patients followed by haller's cells in 24 and onodi cells in 20 patients. This is in accordance to Oyar *et al* [6]. We also looked for septation in sinuses and observed that maximum septations were seen in sphenoid sinus (44%) followed by frontal sinus (30%), maxillary sinus (22%) and ethmoid sinus (4%). This is in agreement to Basic *et al* [7].

Hypoplasia of sinus refers to small size of sinus than actual size. It is mainly seen in syndromes such as down syndrome etc. In our study, frontal sinus hypoplasia was seen in 5%, maxillary sinus in 4%, ethmoid sinus in 1% and sphenoid sinus in 1%. This is similar to Arslan *et al* [8] A study conducted by Bolger reported hypoplasia of maxillary sinus in 10.4% of cases [9].

We found that 60 patients showed type I cribiform plates, 46 patients showed type II and 14 showed type III. This is similar to results shown by Kantarcti M *et al* [10]. In this study we found that that horizontal uncinate process was seen in 56% and vertical uncinate process was seen in 44% of cases. We found that deviated nasal septum was seen in 59% and concha bullosa in 27% of cases.

Ludwick J [11] 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 [12].

5. Conclusion

Variations in sinuses are not uncommon. Careful analysis of sinuses before undergoing sinus surgery is required for achieving best results and preventing further complications. CT scan is useful in this direction.

6. References

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