Original Article

# Anatomical Variations Of Nasal Cavities In Relation With Multidetector Computed Tomography

**Deva Sooria N[1]*, Mohana Karthikeyan S[2]**

*[1,2]Department of ENT, Karpaga Vinayaga Institute of Medical Sciences and Research Centre, Maduranthagam, Chengalpattu, Tamil Nadu, India. [1]Email: n.deva20@gmail.com

***Corresponding Author:** Deva Sooria N

*Department of ENT, Karpaga Vinayaga Institute of Medical Sciences and Research Centre, Maduranthagam, Chengalpattu, Tamil Nadu, India. Email: n.deva20@gmail.com
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## Abstract

Aim: To evaluate the frequency of anatomical variations in multidetector computed tomography of nasal cavities.

Methods: This is a retrospective study of eighty-three computed tomography scans of patients presented to the outpatient department with sinonasal symptoms. The scans were reviewed for deviated nasal septum, nasal septal pneumatization, septal spur, paradoxical turbinate and concha bullosa.

Results: The mean age is 33±16.9 years. The female and male ratio is 1:1.4. The most frequent variant is deviated nasal septum and the second common is the septal spur. The least common is the pneumatized nasal septum.

Conclusion: Considering the variations in the anatomical structures, each and every nasal case should be proposed individually to computed tomography and studied carefully to avoid complications and increase the benefits of the patients.

**Keywords:** nose, anatomical variation, computed tomography

## INTRODUCTION:

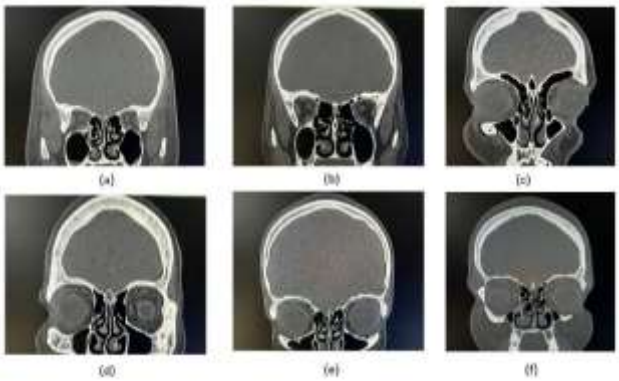
Computed tomography (CT) of the nose and para nasal sinuses has grown into be the investigation of choice for the diagnosis of the sinonasal diseases. In comparison with the conventional radiography, computed tomography has gained its superiority in interpreting the anatomical structure and pathology [(1)]. In regard to evaluation of the nose and paranasal diseases, both the otorhinolaryngologist and the radiologist depends on the CT scans now a days. Even though the nasal cavities have anatomically complex structures CT scan have the capability to detect the precise bony structures of nose and para nasal sinuses [(1)]. In using multiplanar imaging, we have axial and coronal views which will help us in eliminating the artefacts and spot the anatomical variations.

Most significant of CT is before planning for endoscopic sinus surgery because of not to end up in unrecognized anatomical landmarks or variations [(9)]. Nasal cavities are complex structures with various functions like humification, filtration, ventilation and olfaction [(6)]. The nose anatomy has a broad spectrum of variation. Even though the anatomy of nose and paranasal sinuses vary notably, some of the distinct variations are found most routinely among the public [(2)]. The goal of this present study is to determine the anatomical variations and its frequencies of the nasal cavity.

## MATERIALS AND METHODS:

This study is a retrospective study of CT scans of nasal cavity and paranasal sinuses in adult population in patient presented in Department of Otorhinolaryngology, Karpaga Vinayaga Institute of Medical Sciences. All the patients were taken CT in Siemens 32 slice CT system. About 83 CT scans of nasal cavity and paranasal sinuses were analysed out of which 11 CT scans were patients of either invasive disease or had previous surgery.

Excluding these scans we include 71 CT scans in this study who presented with sinonasal symptoms. Each and every scan was completely reviewed for the following anatomical variations such as deviation of nasal septum, septal spur, concha bullosa, pneumatized septum and paradoxical turbinate [(5)].



**Figures:** images from the coronal view of CT scans (a) Septal spur; (b) Septal pneumatization; (c) Concha bullosa; (d) deviated nasal septum; (e) paradoxical turbinate; (f)Conchabullosa.

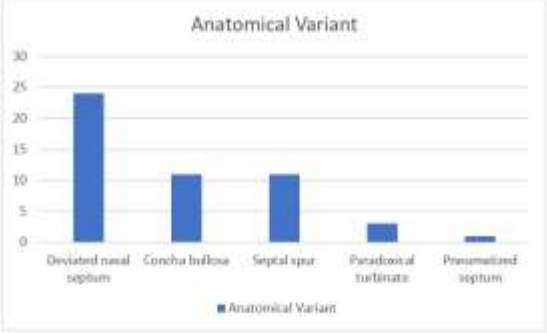
## RESULTS:

Out of the reviewed 83 CT scans of nasal cavity and paranasal sinuses, 12 were excluded for not coming under the inclusion criteria. The number included in this were 71 CT scans. Of 71, 33±16.9 years was the mean age of all the patients. About 42 59.15%) scans were of males and 29 40.84 %) were of females. 33 (46.47%) out of the 71 scans had no anatomical variations. The anatomical variations seen in the nasal cavities are nasal septal deviation, pneumatized septum, paradoxical turbinate, septal spur and concha bullosa. Some of the patients have more than one variations. Scans with one variation are 24 (63.15%) and with two variation are 14 (36.84%). Most common variations among the above is deviated nasal septum, 24 (46.15%); second common is septal spur, 13 (25%); concha bullosa, 11 (21.15%); paradoxical turbinate, 3 (5.76%) and septal pneumatization, 1 (1.92%). Most common anatomical variant with two variation is deviated nasal septum with spur.


**Graph 1.** Gender distribution

| Variable | Number | Percent |
|---|---|---|
| Deviated nasal septum | 24 | 46.15 |
| Concha bullosa | 11 | 21.15 |
| Septal spur | 13 | 25 |
| Paradoxical turbinate | 3 | 5.76 |
| Nasal septal pneumatisation | 1 | 1.92 |

**Table 1.** Nasal cavity anatomical variant found.




**Graph 2.** Anatomical variations in the nasal cavities

## DISCUSSION:

In our study the most common anatomic variation of the nasal cavity is nasal septal deviation and the least common is the septal pneumatization. Deviation of the nasal septum comprises of any deviation of the contour of the septum which can be described as anterior deviation, C shaped and S shaped deviation. Deviation can be congenital or acquired because of any trauma. If the deviation is mild, the patient is asymptomatic and when it is gross, patient presents with nasal obstruction. Gross deviation causes hypoplasia of the ipsilateral turbinate and hypertrophy of contralateral turbinate [(8)]. In our study 24 scans had deviated nasal septum. Septal spur is mostly associated with deviated septum. Sometimes spur impinges on the ipsilateral inferior turbinate and sometimes spur may cause intense pain and headache [(11)]. Septal spur was found in 13 of the scans. Concha bullosa is pneumatized turbinate or air cell in the turbinate. This may be related with the compensatory mechanism with changes in the airflow because of other anatomical variations [(10)]. Concha bullosa was noticed in 11 scans. Paradoxical turbinate is reversal of the convexity of the middle turbinate and faces laterally [(3, 4).] Anatomical variant is not pathological until it causes narrowing the ostium and resulting in rhinosinusitis. Nasal septal pneumatization is rare, if present in narrows the spheno ethmoidal recess ending up in sphenoid sinusitis. There are various anatomical variations that are common in the general public. Paradoxical turbinate and pneumatized nasal septum was found in 3 and 1 of the scans respectively.

## CONCLUSION:

Various anatomical variations may be found routinely in the CT nasal cavity and paranasal sinuses. Since each one of the variants have both surgical and anatomical importance, every single CT should be studied in depth previous to every surgery to prevent from complications [(6, 7)]. Variations differ for various populations, hence every individual is advised CT to have safe and uneventful surgery. There is broad range of obvious prevalence in all anatomic variations [(1)].

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## REFERENCES:

1. Nada Alshaikha , Amirah Aldhuraisb. Anatomic variations of the nose and paranasal sinuses in saudi population: computed tomography scan analysis. The Egyptian Journal of Otolaryngology 2018, 34:234–241.
2. Lakshmipathi Raju Penmetsa1. Anatomical Variations in Nose and Paranasal Sinuses in Patients Presenting with Chronic Rhinosinusitis. International Journal of Contemporary Medical Research 2019;6(9):I1-I4.
3. Katya A. Shpilberg1 Simon C. Daniel1 Amish H. Doshi1 William Lawson2 Peter M. Som1. CT of Anatomic Variants of the Paranasal Sinuses and Nasal Cavity: Poor Correlation With Radiologically Significant Rhinosinusitis but Importance in Surgical Planning. AJR:204, June 2015.
4. Nitin V Deosthale, Sonali P Khadakkar, Bhanupratap Singh, Vivek V Harkare, Priti R Dhoke, Kanchan S Dhote. Anatomical variations of Nose and Paranasal Sinuses in Chronic Rhinosinusitis. People's Journal of Scientific Research July 2014; Vol. 7, Issue 2.
5. Filiz Namdar Pekiner. Anatomic Variations of Paranasal Sinus on Multidetector Computed Tomography Examinations for Functional Endoscopic Sinus Surgery. / Journal of Marmara University Institute of Health Sciences Volume: 3, Number: 2, 2013.
6. Abbas Shokri 1 , Mohammad Javad Faradmal 2 , Bahareh Hekmat 3. Correlations between anatomical variations of the nasal cavity and ethmoidal sinuses on cone-beam computed tomography scans. Imaging Science in Dentistry 2019; 49: 103-13.
7. Wenrol Espinosa, Rolen Genito, Rachel Zita Ramos . Anatomic variations of the nasal cavity and paranasal sinus and their correlation with chronic rhinosinusitis using Harvard staging system. J Otolaryngol ENT Res. 2018;10(4):190–193.
8. Michaela Cellina1 , Daniele Gibelli2 , Annalisa Cappella2 , Carlo Martinenghi3 , Elena Belloni4 and Giancarlo Oliva1. Nasal cavities and the nasal septum: Anatomical variants and assessment of features with computed tomography. The Neuroradiology Journal 0(0) 1–8.
9. Bhattacharyya N. Ambulatory sinus and nasal surgery in the United States: demographics and perioperative outcomes. Laryngoscope 2010; 120: 635–638.
10. Basic N, Basic V, Jelic M, et al. Pneumatization of the middle nasal turbinate: a CT study. Lijec Vjesn 1998; 120: 200–201.
11. Beale TJ, Madani G and Morley SJ. Imaging of the paranasal sinuses and nasal cavity: normal anatomy and clinically relevant anatomical variants. Semin Ultrasound CT MR 2009; 30: 2–16.