

Middle turbinate variants and deviated nasal septum association with frontal and maxillary sinusitis

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Abstract

Background and objective: Middle turbinate variants and Deviated nasal septum (DNS) are common in population. The middle turbinate variants and DNS are implicated as possible etiological factors in sinusitis. These are usually surgical corrected simultaneously at the time of FESS. The main objective of study is to determine the association between middle turbinate

variants or DNS to frontal sinusitis and maxillary sinusitis.

Materials and methods: This is cross sectional study done for duration of 4 months in department of Radiodiagnosis. A total number of 100 patients were referred for CT PNS study during study period. Of which 70 cases were included and 30 were excluded and were imaged. Inclusion criteria - All CT PNS studies in

the study period referred to department of radiodiagnosis.

Exclusion criteria - Patients who underwent any nasal surgery or trauma involving the faciomaxillary region before taking. Results were calculated in terms of the number and percentage for the prevalence of nasal septal deviation, middle turbinate variants and frontal and maxillary sinusitis. Chi square test was implied to determination of association between middle turbinate variants and deviated nasal septum with frontal and maxillary sinusitis.

Results: The mean age of patients in the study is 43.75 years with age of the patients ranged from 13 – 75 years with maximum patients in the range of 41-60 years. Majority of patients in the study were males 38(54.2%) and females were 32(45.7%).

Out of 100 cases, 30 were excluded from study. In the present study, the middle turbinate variants and DNS are 31 and 31, left middle turbinate variants are 33 and 26. Frontal and maxillary sinusitis present in 38 and 65 patients respectively.

There is no statistically significant association between middle turbinate variants and deviated nasal septum with frontal sinusitis.

There is no statistically significant association between middle turbinate variants and deviated nasal septum with maxillary sinusitis.

Conclusion: In our study, showed that the middle turbinate variants (concha bullosa and paradoxical rotation of middle turbinate) and Deviated nasal septum does not appear to give rise to sinusitis. So, during FESS simultaneous bullectomy for prevention of sinusitis may not be indicated.

Keywords: Concha bullosa variants, Deviated Nasal Septum, Middle turbinate variants, Sinusitis.

Introduction

The middle turbinate is a part of ethmoid bone. Concha Bullosa (CB) and Paradoxical rotation of middle turbinate are main anatomical variants of middle turbinate. Concha Bullosa represents the ethmoid air cell in middle turbinate or pneumatization of middle turbinate. Pneumatization of the middle turbinate happens due to variations in the ethmoidal air cell development. Concha bullosa is generally asymptomatic and diagnosed incidentally by computed tomography. Concha bullosa can be unilateral or bilateral and can be classified into 3 types according to the site of pneumatization. They are i. Lamellar type (vertical lamella of MT pneumatization) ii. Bulbous-type (inferior portion of MT pneumatization) and iii. Extensive/large type (vertical and inferior portion of MT pneumatization)¹.

A Paradoxical Middle turbinate (PMT) refers to an inferomedially curved MT edge with the concave surface facing the nasal septum. PMT alone can lead to narrowing of the middle meatus may be causing obstruction of the osteomeatal complex and interference with the physiological drainage of paranasal sinuses².

A Deviated Nasal Septum (DNS) is the most common cause of nasal obstruction. CT scan is the technique of choice for the study of nasal septum deviation. Deviation of the nasal septum was measured by drawing a line from crista galli to maxillary crest and another line to the maximum deviation of nasal septum. Deviation angles were calculated according to the angle between crista galli and the most prominent point of the deviation. The angle formed is calculated and if nasoseptal angle is $\geq 5^\circ$ it is termed as Deviated Nasal Septum (DNS)³.

Sinusitis is an inflammatory process involving the lining of the paranasal sinuses. This is an extremely common

condition that is usually treated medically. The lining of the nasal cavity is continuous with that of the paranasal sinuses, any mechanism producing rhinitis will have the potential to cause a sinusitis. The maxillary, frontal and sphenoid sinuses drain into the nasal fossae via the ethmoid sinuses. This is important as conditions in the ethmoids and particularly in the middle nasal meatus will dictate what occurs in the remaining dependent larger sinuses.

The etiology of the rhinitis must be treated if sinus disease is to be managed. When medical treatment has failed, surgery (FESS) is aimed at widening the mucociliary pathways with procedures such as an uncinectomy(±bullectomy) to widen the ostium of the maxillary antrum. Middle turbinate variants and DNS can cause middle meatus and nasal cavity mechanical obstruction respectively, affecting the drainage pathway and leading to sinusitis. Understanding the anatomical variants of middle turbinate and DNS make it possible to plan for appropriate management. The role of MT variants and DNS in predisposition to sinusitis is in question. Very few research works have investigated the pneumatization, anatomical variants of middle turbinate and DNS and its possible association to sinusitis.

Aims & Objectives

The objectives of this study were to investigate anatomical variation of the middle turbinate (i.e., Concha bullosa and PMT) and DNS.

To determine association between MT variants and DNS with frontal and maxillary sinusitis.

Material & methods

This is cross sectional study done between 1st July 2021 to 31st October 2021 (4 months duration) done in department of Radiodiagnosis, ASRAMS, Eluru, Andhra Pradesh. A total number of 100 patients were referred

for CT PNS study during study period. Of which 70 cases were included and 30 were excluded and were imaged. Inclusion criteria - All CT PNS studies in the study period referred to department of radiodiagnosis. Exclusion criteria - Patients who underwent any nasal surgery or trauma involving the faciomaxillary region before taking the CT scan. GE Revolution Act 50 slice Computed Tomography machine (kVp [kilo voltage peak] =100, mAs [milli-ampere seconds] = 200, rotation time=0.5 second, FOV [field of view] = 240 mm, slice thickness = 1.5 mm, reconstruction interval = 0.5 mm, pitch = 1.375). The results were entered into MS excel sheet. SPSS version 26 software were used for data analysis. Results were calculated in terms of the number and percentage for the prevalence of nasal septal deviation, middle turbinate variants and frontal and maxillary sinusitis. Chi square test was implied to determination of association between middle turbinate variants and deviated nasal septum with frontal and maxillary sinusitis.

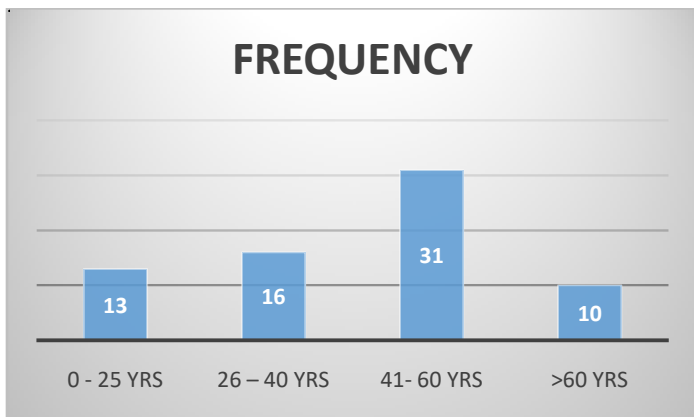
Results

Age of the patients ranged from 13 – 75 years with maximum patients in the range of 41-60 years with mean age of 43.75 years

Table 1: Distribution of Patients according to age.

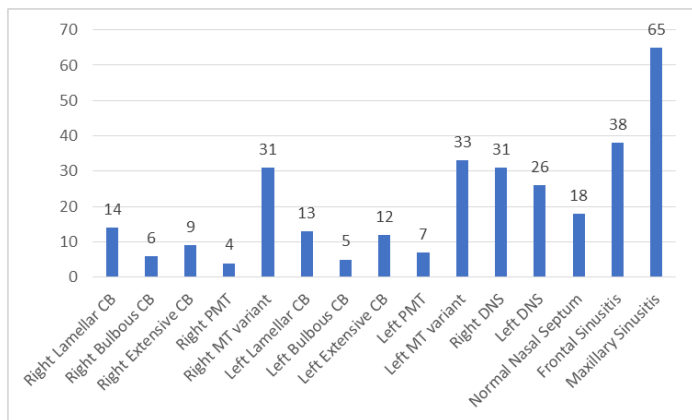
| Age Category | Frequency | % |
|--------------|-----------|-------|
| 0 - 25 yrs | 13 | 18.6% |
| 26 – 40 yrs | 16 | 22.9% |
| 41- 60 yrs | 31 | 44.3% |
| >60 yrs | 10 | 14.3% |

Graph 1: Distribution of Patients according to age.



In the present study 38(54.2%) are males and 32(45.7%) females are present.

Graph 2: Prevalence of MT variants, DNS and frontal and maxillary sinusitis.



In the present study, the middle turbinate variants and DNS are 31 and 31, left middle turbinate variants are 33 and 26. Frontal and maxillary sinusitis present in 38 and 65 patients respectively.

Table 2: Association of middle turbinate variants and DNS with frontal sinusitis

| | | Frontal sinusitis | | | |
|---------------------------|---------|-------------------|-----------|----------|---------------|
| | | Normal | Sinusitis | Total | |
| Middle turbinate Variants | Absent | 12(40%) | 18(60%) | 30(100%) | p-value – 0.4 |
| | Present | 20(50%) | 20(50%) | 40(100%) | |
| Deviated Nasal Septum | | 32(45.7%) | 38(54.7%) | 70(100%) | p-value – 0.6 |
| | Absent | 9(50%) | 9(50%) | 18(100%) | |
| | Present | 23(44.2%) | 29(55.8%) | 52(100%) | |

There is no statistically significant association between

middle turbinate variants and deviated nasal septum with frontal sinus.

Table 3: Association of middle turbinate variants and DNS with frontal sinusitis

| | | Maxillary sinusitis | | | |
|---------------------------|---------|---------------------|-----------|----------|---------------|
| | | Normal | Sinusitis | Total | |
| Middle turbinate Variants | Absent | 1(3.3%) | 29(96.7%) | 30(100%) | p-value – 0.2 |
| | Present | 4(10%) | 36(90%) | 40(100%) | |
| Deviated Nasal Septum | | 5(7.1%) | 65(92.9%) | 70(100%) | p-value – 0.6 |
| | Absent | 1(5.6%) | 17(94.4%) | 18(100%) | |
| | Present | 4(7.7%) | 48(92.3%) | 52(100%) | |

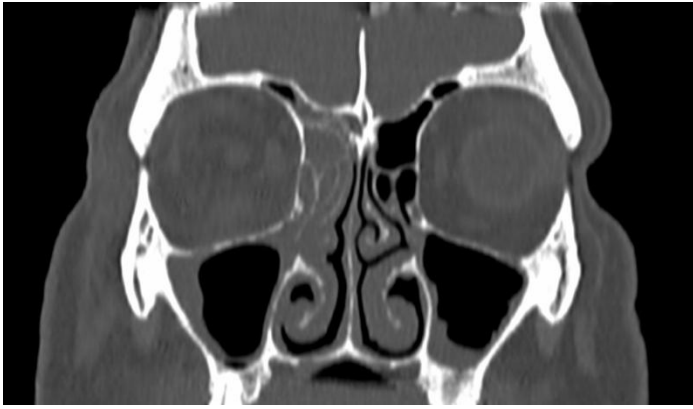
There is no statistically significant association between middle turbinate variants and deviated nasal septum with maxillary sinusitis.

In our study we have applied chi square test on a) Right concha bullosa and right maxillary sinusitis b) Left concha bullosa and Left maxillary sinusitis c) Right DNS and Right maxillary sinusitis or frontal sinusitis d) Left DNS and left maxillary sinusitis or frontal sinusitis e) Each of the concha bullosa variants with either maxillary sinusitis or frontal sinusitis. None of the above showed statistically significant p value, representing no association between them.

Figure 1: Coronal section Plain CT PNS showing bilateral extensive type concha bullosa



Figure2: Coronal section Plain CT PNS showing bilateral par adoxical middle turbinate.



Discussion

CT helps the otolaryngologists and dentists for better and easy distinguishing the anatomical variations and pathological conditions of the nasal cavity and adjacent paranasal sinuses.

In the present study, the prevalence rate of middle turbinate variants was 57.1%. Concerning sinusitis in our present study, the most frequently affected sinus was maxillary sinuses than frontal sinus. In another study performed by Mamatha et al. in India, the most common involved sinus was maxillary sinus (67.5%)⁴.

In the current study, the incidence of sinusitis was not linked to the presence of CB or its individual variants. In a study carried out by Stallman et al., 72.0% of patients with a CB had sinusitis, however; 78.0% of patients had sinusitis without CB, they confirmed that there is no statistical association between the rhinosinusitis on either side and presence of unilateral or dominant CB⁵.

Conclusion

Surgeons and radiologists should be aware of anatomical variants of the concha bullosa present in the paranasal sinus imaging. Our study show that the middle turbinate variants (concha bullosa and paradoxical rotation of middle turbinate) and Deviated nasal septum does not appear to give rise to sinusitis. So, during FESS simultaneous bullectomy for prevention of sinusitis may not be indicated.

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