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EVALUATION OF PARANASAL SINUS DISEASES BY COMPUTED TOMOGRAPHY-A CROSS SECTIONAL STUDY

Radiodiagnosis

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ABSTRACT

Introduction: Diseases of the Para nasal sinuses include wide spectrum ranging from inflammatory conditions to neoplasms.Computed tomography(CT) has replaced conventional radiographs as imaging modality of choice for assessment of Para-nasal sinus diseases.
Objectives: To evaluate the pathologies affecting the Paranasal sinuses and the anatomical variants by Computed Tomography.
Methods: A Cross sectional study was conducted at RIMS from June 2018 to June 2019 among 130 patients of varied age group presenting with symptoms and signs of paranasal sinus diseasesreferred for CT of paranasal sinuses.
Results: The CT diagnosis shows sinusitis (73.0%) to be the most common sinus lesion found in patients followed by polyposis (23.8%), fungal sinusitis (1.6%), neoplasm (6.2%) and inverted papilloma (0.8). The most common anatomical variant was found to be deviated nasal septum (55.4%) followed by agger nasi (49.2%) and concha bullosa (29.2%).
Conclusion: Most common sinonasal pathology in patients with PNS disease was inflammatoryand maxillary sinus is most commonly affected. Deviated nasal septum accounts for more than half of the anatomical variant followed by agger nasi and concha bullosa.

KEYWORDS

Computed tomography, Paranasal sinus, Deviated nasal septum

INTRODUCTION

The nasal passage and paranasal sinuses plays host to a wide spectrum of diseases and conditions which can be collectively termed as sinonasal disease. The sinonasal pathologies include broad spectrum of conditions ranging from inflammatory to neoplasms, both benign and malignant. It commonly affects the varied range of population.[1,2]Their clinical assessment is hampered by the surrounding bony structures, hence for confirmation of their diagnosis, the role of radiology is of paramount importance.So,the radiological evaluation of sinonasal diseases is very essential as the clinical findings in these cases may be non-specific.[2,3]

Sinonasal imaging has progressed in an orderly fashion as each generation of imaging modality has advanced gradually on the domain of the former generation. New generation of imaging modalities have completely changed the picture of sinonasal imaging.[4] Previously plain radiography was most commonly done, as it is economical, simple, and widely available. However, it only provides a basic overview of the anatomy and underlying pathology. Plain radiography could not display the three-dimensional structures in a two dimensional plane. It can provide limited views of the anterior ethmoid cells along with the upper two thirds of the nasal cavity.[5]

Available imaging techniques include plain radiography, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), and Positron Emission Tomography (PET).CT is the investigation of choice for pre-operative evaluation of the nasal cavity and paranasal sinuses and is the gold standard for description of inflammatory sinus disease resulting from obstruction.[6] Coronal CT images closely correlates with the surgical approach.[7] Therefore, CT is the preferred study for Functional Endoscopic Sinus Surgery (FESS) because coronal images mimic the appearance of the sinonasal cavity from the perspective of the endoscope.[8] CT helps in the diagnosis of the anatomic variations (such as septal deviation, spur formation, concha bullosa, and paradoxical curve of middle turbinate) that may lead to intra-operative and post-operative FESS complications and reduces the mortality and morbidity of patients. A combination of CT and diagnostic endoscopy has become the mainstay in evaluation of the sinonasal diseases. Hence, CT has immense value and offers standard imaging of sinonasal diseases.[9]So, this study was conducted to evaluate the pathologies affecting paranasal sinuses and the anatomical variants by Computed Tomography.

MATERIALS AND METHODS

This Cross-sectional study was conducted at RIMS from June 2018 to June 2019 after the approval of the Ethical Committee of the Institution. In this study we included atotal of 130 patients of varied age group presenting with symptoms and signs of paranasal sinus diseasesreferred for CT of paranasal sinuses. All postoperative cases, patients with any traumatic conditions involving PNS and patients with contrast allergy were excluded from the study.The data of their clinical presentationswere recorded and their informed consent was obtained before subjecting them for the imaging modality.Both axial and coronal images were acquired using multi-detector CT unit.

The sinuses were evaluated for the following parameters: mucosal thickening, wall of sinus, fluid level, soft tissue extension, hyperdensities and masses, blockage of osteomeatal complex, and pattern of bony involvement.

The results were recorded and expressed as sinus distribution, frequency of different anatomical variants viz.deviated nasal septum (DNS), concha bullosa,Agger nasi,Haller cells,Onodi cells, Enlarged ethmoid bulla etc. and provisional CT diagnosis.

Equipment used and technique

Philips 64 slice CT scanner was used in this study. CT scan of paranasal sinuses (PNS) requires imaging of the anatomy into coronal and axial planes. A lateral 256 mm scout scan was first obtained at 120 kVp and 100 mA. Routinely axial scanning was done in supine position. Reformatting in coronal and sagittal planes was done using software provided. Direct coronal imaging was done whenever deemed necessary either by referring physician or by the radiologist. For direct coronal imaging, the patient was kept in prone position or in supine position with the head of the patient free leading edge of the table of the scanner. The gantry angle used in case of coronal imaging was

perpendicular to the plane of hard palate. 3 mm sections from anterior margin of nose to the posterior margin of sphenoid sinus were taken.

RESULTS:

A total of 130 patients fulfilling the inclusion criteria were included in the present study. The majority of the cases were in the age group of 21–30 years (31.5%) and 6% of patients were above 60 years. There was a female predominance of 67.7% as compared to male 32.3% with a female to male ratio of 2.09:1. (Table 1 &2)

Most of the patients had headache (69.2%) followed in decreasing order by nasal discharge (60.8%), nasal obstruction (49.2%), facial pain (36.9%) and swelling in the facial region (3.8%). (Table 3)

The most common anatomical variant was found to be deviated nasal septum (55.4%) followed by agger nasi (49.2%) and concha bullosa (29.2%) . Haller cells (20.8%), onodi cells (16.9%), enlarged ethmoid bulla (10%), paradoxical middle turbinate (13.1%), deviated uncinate process (6.2%) and pneumatized uncinate process (1.5%) were other variants that are observed in this study. Maxillary sinus (84.6%) was the most commonly involved sinus followed by anterior ethmoidal sinus (74.6%), posterior ethmoidal sinus (67.7%), frontal sinus (47.7%), and sphenoid sinus (41.5%). In this study, the CT diagnosis shows sinusitis (73.0%) to be the most common sinus lesion found in patients followed by polyposis (23.8%), fungal sinusitis (1.6%), inverted papilloma (0.8%) and neoplasm (0.8 %) (Table 4-Table6)

DISCUSSION

The present study shows that diseases of PNS are more common in the age group of 21–30 years (31.5%) and there is a female predominance with a female to male ratio of 2.09:1. The age distribution of the present study was in concordance with other studies done byKandukuri R[10], Venkatachalam VP[11], Prabhakar et al.,[12] and Chakraborty et al.[13]but the gender distribution shows a different direction as in a study conducted by GliklichRE et al.[14]

The most common presenting complaint among patients with PNSdisease was of headache (69.2%) followed in decreasing order by nasal discharge (60.8%), nasal obstruction (49.2%), facial pain (36.9%) and swelling in the facial region (3.8%). Studies conducted by Kanwar SS et al[15].and Kushwah et al.[16]also noted similar findings and concluded that headache was the predominant presenting complain whereas Nasal discharge and Nasal blockage were the most common presenting symptoms in the study done by Asruddin et al.[17]

In this study, we came across almost all types of anatomical variants viz- deviated nasal septum (55.4%)agger nasi (49.2%) and concha bullosa (29.2%). Haller cells (20.8%), onodi cells (16.9%), enlarged ethmoid bulla (10%), paradoxical middle turbinate (13.1%), deviated uncinate process (6.2%) and pneumatized uncinate process (1.5%).DNS causes decrease in the critical area of osteomeatal complex predisposing it to obstruction and related complications. It was found to be the one of the common anatomical variants in our study (55.4%). It was more than that of 40% reported by Bagul M[18],36% reported by Kushwah APS et al.[16] and 38% reported by Asruddin et al.[17] Study conducted by Bagul M[18] shows agger nasi to be the most common variant in his studies accounting to 59.1% of cases. These cells lie anterior to the anterosuperior attachment of middle turbinate and frontal recess. Presence of Concha bullosa as an anatomical variant varies between 16-53%.[17,19,20]

In the present study, maxillary sinus (84.6%) was the most commonly involved sinus followed by anterior ethmoidal sinus (74.6%), posterior ethmoidal sinus (67.7%), frontal sinus (47.7%), and sphenoid sinus (41.5%).Kanwar SS etal.[15]Kushwah et al.,[16]Chaitanya et al.,[9] Zinreich,[5]and Maru and Gupta[20] shows similar results in their studies. Studies done by Kelkar AA et al.[21] and Dua k et al.[22]observed ethmoidal sinus to be the most common sinus involved but in all the studies mentioned Sphenoid sinus is the least affected.The various sinonasal pathologies diagnosed on CT are classified based on their imaging features. Most common sinonasal pathology in the present study was inflammatory- sinusitis (73.0%) and polyposis (23.8%) followed by fungal sinusitis (1.6%), inverted papilloma (0.8%) and neoplasm (0.8%).Similar findings were also found in studies done byKanwar SS et al.,[15] Khan N et al.[23], DhillonV et al.[24]So Sinusitis and polyposis accounts for majority of cases of PNS disease.

LIMITATION

This study evaluated only symptomatic patients referred for CT and hence anatomical CT abnormalities like concha bullosa and DNS in causation of PNS disease could not be stressed upon without the control group.

CONCLUSION

Most common sinonasal pathology in patients with PNS disease was inflammatory(sinusitis and polyposis) andMaxillary sinus is most commonly affected . DNS accounts for more than half of the anatomical variant followed by agger nasi and concha bullosa**.** Females aretwice prone to PNSdiseases as compared to males.

Table 1: Age distribution of patients

Age in years	Number	Percentage
11-20	18	13.9
21-30	41	31.5
31-40	28	21.5
41-50	23	17.7
51-60	12	9.2
>60	8	6.2
Total	130	100

Table 2: Gender distribution of patients

Sex	Number	Percentage
Male	42	32.3
Female	88	67.7
Total	130	100

Table 3: Chief complaint of the patients (n=130)

Complaints	Number	Percentage
Headache	90	69.2
Nasal discharge	79	60.8
Nasal obstruction	64	49.2
Facial pain	48	36.9
Facial swelling	5	3.8

Table 4: Anatomical Variants of patients (n=130)

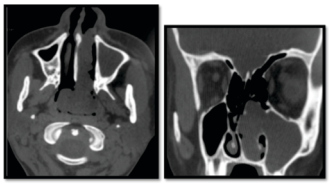
Anatomical variants	Number	Percentage
Deviated nasal septum	72	55.4
Concha bullosa	38	29.2
Agger nasi	64	49.2
Haller cells	27	20.8
Onodi cells	22	16.9
Enlarged ethmoid bulla	13	10.0
Paradoxical middle turbinate	17	13.1
Deviated uncinate process	8	6.2
Pneumatized uncinate process	2	1.5

Table 5:Sinuses involved

Sinus involved	Number	Percentage
Maxillary	110	84.6
Anterior ethmoid	97	74.6
Posterior ethmoid	88	67.7
Frontal	62	47.7
Sphenoid	54	41.5

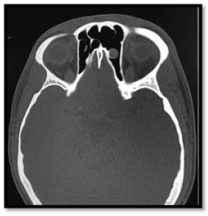
Table 6: Distribution of patients of sinus lesions according to computed tomography diagnosis

Diagnosis	Number	Percentage
Sinusitis	95	73.0
Polyposis	31	23.8
Fungal sinusitis	2	1.6
Neoplasm	1	0.8
Inverted papilloma	1	0.8

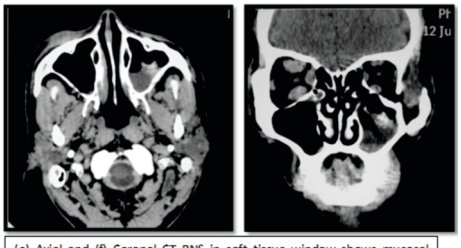


Axial (a) and coronal (b) CT PNS shows soft tissue attenuating mucosal antrochoanal polyp from left maxillary sinus extending posteriorly and nearly obliterating the posterior choana.

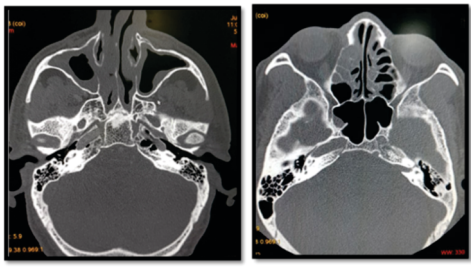
(c) CT PNS axial image showing Right maxillary sinus polyp and mild mucosal thickening in left maxillary sinus suggestive of sinusitis.



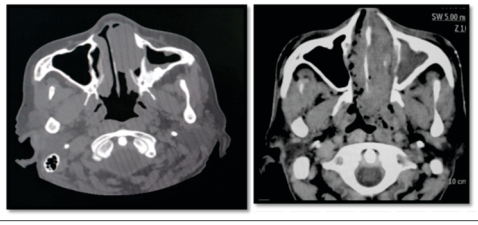
(d) Axial CT PNS showing small well defined rounded fluid attenuating lesion in left ethmoidal sinus consistent with mucous retention cyst.



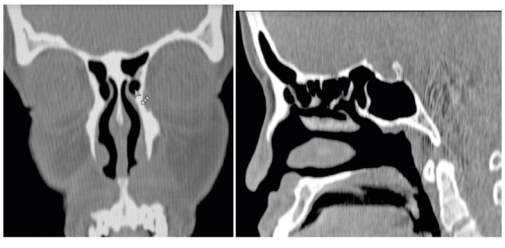
(e) Axial and (f) Coronal CT PNS in soft tissue window shows mucosal thickening in left maxillary sinus within which foci of hyperdensities are seen consistent with fungal sinusitis.



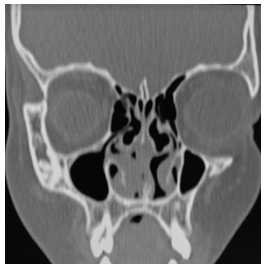
(g)and (h) Axial CT PNS images shows pansinusitis showing mucosal thickening in all the sinuses.



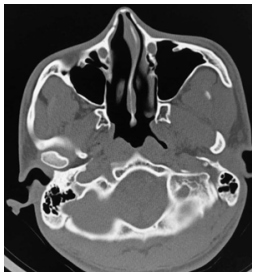
(i) and (j) CT Axial image in two different patients showing soft tissue attenuating lesions in left side of nasal cavity abutting lateral nasal wall mildly expanding the left nasal cavity with associated left maxillary sinusitis, probable inverted papilloma.



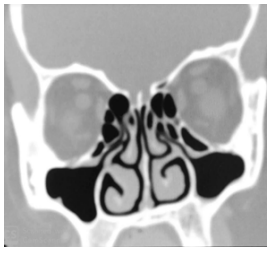
(k)coronal and (l) sagittal CT PNS images shows anterior ethmoid air cells- agger nasi.



(m) Coronal CT PNS shows bilateral concha bullosae with right inferior turbinate hypertrophy.



(n) CT axial PNS image shows left sided DNS.



(o) CT coronal PNS image shows bilateral infraorbital ethmoidal air cells- Haller cells

REFERENCES

1. Parsons C, Hodson N. Computed tomography of paranasal sinus tumors. Radiology.1979;132:641
2. Fagnan LJ. Acute sinusitis: A cost-effective approach to diagnosis and treatment. Am Fam Physician.1998;58:1795-802.
3. Bhattacharyya N. Clinical and symptom criteria for the accurate diagnosis of chronic rhinosinusitis. Laryngoscope. 2006;116:1-22.
4. Yousem DM. Imaging of sinonasal inflammatory disease. Radiology. 1993;188(2):303-14.
5. Zinreich SJ. Paranasal sinus imaging. Otolaryngol Head Neck Surg 1990;103:863-8.
6. Duvoisin B, Landry M, Chapuis L, Krayenbuhl M, Schnyder P. Low-dose CT and inflammatory disease of the paranasal sinuses. Neuroradiology. 1991;33:403–06.
7. Spector SL, Berstein IL, Li JT, Berger WE, Kaliner MA, Schuller DE,et al. Parameters for the diagnosis and management of sinusitis. J Allergy Clin Immunology. 1998 Dec;102(6 part 2):s107–44.
8. Gotwald TF, Zinreich SJ, Corl F, Fishman EK. Three-dimensional volumetric display of the nasal ostiomeatal channels and paranasal sinuses. AJR Am J roentgenol. 2001 Jan;176(1):241-5.
9. Chaitanya CS, Raviteja A. Computed tomographic evaluation of diseases of paranasal sinuses. International Journal of Recent Scientific Research. 2015;6(7):5081–86.
10. R Kandukuri, S Pathak. Evaluation of Sinonasal Diseases by Computed Tomography. JCDR. 2016 Nov;10(11):TC09-TC12
11. Venkatachalam VP, Bhat A. Functional endoscopic sinus surgery . A newer surgical concept in the management of chronic sinusitis. Indian J Otolaryngol Head Neck Surg 1999;52:13-6.
12. Prabhakar S, Mehra YN, Talwar P, Mann SB, Mehta SK. Fungal infections in maxillary sinusitis. Indian J Otolaryngol Head Neck 1992;1:54-8.
13. Chakraborty P, Jain Ragni. Radiologic variations of nose and paranasal sinuses: A CT based study. J Med Sci Clin Res 2016;4:10536-41.
14. GliklichRE,MetsonR.TechniquesforOutcomesResearchinChronicSinusitis. Laryngoscope Apr 1995;105:387-390.
15. Kanwar SS, Mital M, Gupta PK, Saran S, Parashar N, Singh A. Evaluation of paranasal sinus diseases by computed tomography and its histopathological correlation. J Oral MaxillofacRadiol2017;5:46-52.
16. Kushwah APS, Bhalser R, Pande S. CT evaluation of diseases of paranasal sinuses and histopathological. Int J Med Res Rev 2015;3:1306-10.
17. Asruddin, Yadav SP, Yadav RK, Singh J. Low dose CT in chronic sinusitis. Indian J Otolaryngol Head Neck Surg 1999;52:17-22.
18. Bagul M. Computed Tomography Study of Paranasal Sinuses Pathologies. Int J Sci Stud 2016;4(4):12-16.
19. Lund VJ, Lloyd DS, Lloyd G. Imaging for endoscopic sinus surgery in adults JLO 2000; 114:395-397.
20. Maru YK, Gupta Y. Concha bullosa: Frequency and appearances on sinonasal CT. Indian Journal of Otolaryngology and Head and Neck surgery Dec 1999Mar 2000;52(1):40-44
21. Kelkar AA, Shetty DD, Rahalkar MD, Pande SA. Space occupying lesions of paranasal sinuses- A CT study. IJRI1991Nov;1:47-50
22. Dua K, Chopra H, Khurana AS, Munjal M. CT scan variations in chronic sinusitis. IJRI 2005;3:315-20.
23. Khan N, Zafar U, AfrozN, Ahmad SS, Hasan SA. Masses of nasal cavity, paranasal [24] sinuses and nasopharynx: A clinicopathological study. Indian J Otolaryngol Head Neck

Surg. 2006;58(3):259-63.
24. Dhillon V, Dhingra R, Davessar JL, Chaudhary A, Monga S, Kaur M, Arora H. Correlation of clinical, radiological and histopathological diagnosis among patients with sinonasal masses. International Journal of Contemporary Medical Research. 2016;3(6):1612-15.