ORIGINAL RESEARCH PAPER
Volume - 10 | Issue - 05 | May - 2021 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ROLE OF CT SCAN OF PARANASAL AIR SINUSES FOR DIAGNOSTIC EVALUATION OF SINONASAL PATHOLOGY IN A TERTIARY CARE HOSPITAL IN EASTERN INDIA.

Radio-diagnosis

Dr. Sk. Jishan Shine Alam Junior resident, Department of Radio-diagnosis, Nilratan Sircar Medical College and Hospital, Kolkata.

Dr. Swadha Priya Basu* Professor and Head, Department of Radio-diagnosis, Nilratan Sircar Medical College and Hospital, Kolkata. *Corresponding Author

Dr. Sayantan Roy Junior resident, Department of Radio-diagnosis, Nilratan Sircar Medical College and Hospital, Kolkata.

Dr. Md. Sajid Junior resident, Department of Radio-diagnosis, Nilratan Sircar Medical College and Hospital, Kolkata.

ABSTRACT

This study aims to evaluate the sensitivity and specificity of CT in diagnosis of sinonasal diseases along with the spectrum of Paranasal sinus diseases oncomputerized tomography (CT) and correlate their clinical and histopathological findings.
40patients who have undergone endoscopic sinus surgery, their relevant histopathological and surgical reports are included in Radiodiagnosis department of Nil Ratan Sircar Medical College.
Chronic sinusitis has 100% sensitivity,94% specificity, 96% positive predictive value (PPV) and 100% negative predictive value (NPV). For fungal sinusitis the sensitivity was 66%,specificity was 97.4%, PPV 66% and NPV 97.4%. Polyps have sensitivity of 90.9%, specificity of 94%, PPV 90% and NPV 100% Benign neoplasms have sensitivity of 100%, specificity of 100%, PPV 100% and NPV 100%.
CT may be used as gold standardimaging modality for evaluating the PNS diseases.

KEYWORDS

INTRODUCTION

A wide spectrum of diseases and conditions involve the nasal passage and paranasal sinuses which can be collectively termed as sinonasal diseases. This includes conditions ranging from inflammations, neoplasms both benign and malignant, infections etc. Their clinical assessment is hampered by bony structures and for that reason radiological investigations are of paramount importance [1]. CT has become the investigation of choice for radiological diagnosis of nasal and sinus diseases [2] as CT of paranasal sinuses (PNS) clearly show air opacified areas like sinuses and details of bony anatomy. CT allows evaluation of the patency of sinonasal passages, diseases or both. CT can show anatomywhich are not visualised by physical examination or even in diagnostic nasal endoscopy.Hence, CT PNS is the study of choice for the surgeonsbefore considering functional endoscopic sinus surgery [6].CT scan plays an important role in excluding presence of aggressive infections, malignancy, bony destructions and local invasion [6]. CT is the investigation of choice for pre-operative evaluation of the nasal cavity and paranasal sinuses and is the gold standard for inflammatory sinus disease resulting from obstruction [8].Coronal CT images closely correlates with the surgical approach[9]. As CT helps in the diagnosis of the anatomic variations which if unknown can cause intra-operative and post-operative FESS complications. Hence CT is the preferred study for Functional Endoscopic Sinus Surgery (FESS)[10].

AIMS: This study aims to evaluate the sensitivity and specificity of CT in diagnosis of sinonasal diseases along with the spectrum of Paranasal sinus diseases oncomputerized tomography (CT) and correlate their clinical and histopathological findings.

MATERIALAND METHODS:

Study area: Radiodiagnosis department of Nil Ratan Sircar Medical College

Study population: 40

Inclusion criteria:

1. Patient referred to Radiodiagnosis department for CT scan of PNS for any complaints.
2. Patients above the age of 10 years.
3. Patients who have undergone endoscopic sinus surgery, their relevant histopathological and surgical reports are included.

Exclusion criteria:

1. Patients with previous history of sinus surgery.
2. Patients with any traumatic conditions involving PNS were excluded from the study

Statistical analysis

For statistical analysis data were entered into a Microsoft excel spreadsheet and then analysed by SPSS (version 27.0; SPSS inc., Chicago, II, USA) and GraphPad Prism version 5. Data had been summarised as mean and standard deviation for numerical variables and count and percentages for categorical variables. Unpaired proportions were compared by Chi-square test or Fischer's exact test, as appropriate.

RESULT AND ANALYSIS

In our study, 39(97.5%) patients had fibro optic endoscopic sinus surgery (FESS) and 1(2.5%) patient had surgery and the biopsy specimen were taken and sent for histopathological evaluation. The clinical examinations, CT findings and histopathological diagnosis were recorded for correlation and data analysis. Findings were analysed, tabulated and results were obtained.

A total no of 40 patients who fulfilled the criteria were included in this study.In our study, 8(20.0%) patients were 11-20 years of age, 6(15.0%) patients were 21-30 years of age, 10(25.0%) patients were 31-40 years of age, 9(22.5%) patients were 41-50 years of age and 7(17.5%) patients were >50 years of age. The oldest patient was 65 years old and the youngest patient was 12 years old.

There was a male predominance of 23(57.5%) compared to female 17(42.5%). The male to female ratio was 1.35:1.In our study, 1(2.5%) patient had nose bleeding, 1(2.5%) patient had chronic nasal discharge, 19(47.5%) patients had headache, 5 (12.5%) patients had headache with nasal obstruction, 1 (2.5%) patient had nasal discharge and 13 (32.5%) patients had nasal obstruction.

Patients were categorised according to aetiology as developmental 7(17.5%), inflammatory 32(80%), neoplastic 1(2.5%). In CT finding, 12(30.0%) patients had agger nasi, 3(7.5%) patients had concha bullosa, 1(2.5%) patient had concha bullosa and agger nasi, 7(17.5%) patients had deviated nasal septum (DNS) towards left,1(2.5%) patient had DNS towards left and agger nasi anatomical, 11(27.5%) patients had DNS towards right and 5(12.5%) patients had DNS towards right and agger nasi.

In our study, the most common inflammatory pathology was sinusitis62.5% (25/40) followed by sinonasal polyp 30% (11/40).In

CT finding, 5(12.5%) patients had anterior ethmoidsinus, 2(5.0%) patients had anterior ethmoidsinus and posterior ethmoidsinus, 3(7.5%) patients had frontalsinus, 1(2.5%) patient had frontal and anterior ethmoid,1(2.5%) patient had frontalsinus,anterior ethmoidsinus, posterior ethmoidsinus, sphenoidsinus, 1(2.5%) patient had frontal and anterior ethmoidsinus, 21(52.5%) patients had maxillary sinus and 6(15.0%) patients had maxillary sinus with anterior ethmoid sinus involved. In CT finding, we found that 3(7.5%) patients had fungal sinusitis, 1(2.5%) patient had juvenile nasopharyngeal angiofibroma (JNA), 11 (27.5%) patients had polyp and 25 (62.5%) patients had inflammatory sinusitis.39(97.5%) patients had negative extra sinus and 1(2.5%) patient had positive extra sinus involvement in CT finding.Association of Chief complaint vs Histopathology findings was statistically significant (p=0.0257).

Chronic sinusitis has 100% sensitivity,94% specificity, 96% positive predictive value (PPV) and 100% negative predictive value (NPV). For fungal sinusitis the sensitivity was 66%,specificity was 97.4%, PPV 66% and NPV 97.4%. Polyps have sensitivity of 90.9%, specificity of 94%, PPV 90% and NPV 100% Benign neoplasms have sensitivity of 100%, specificity of 100%, PPV 100% and NPV 100%.

DISCUSSION

The majority of the cases were in the age group of20-40 years and least number of patients werein age group of 70–80 years. There was a malepredominance compared to females. The male to female ratio was 1.35:1.The demographic distribution of the present study is comparable with other studies, done by Venkatachalamand Bhat [10],Prabhakar *et al*. [11]Gliklich and Metson[12], Dewan *et al*. [13], Ahmed *et al*.[14]and Chakraborty *et al*.[15]

In our study the most common presenting symptom was headache (57%) followed by nasal obstruction similar to finding of Kushwah *et al*.[16].

Most commonanatomical variations seen was deviatednasal septum which correlates well with the study done by Asruddin *et al*., [17] Maru and Gupta [18], Ahmed *et al*. [14] and Chakraborty *et al*. [15]. DNS wasmore commonly on right side.Next common anatomic variant was agger nasi cells in 48% of cases followed by concha bullosa in 10% of cases.In our study, the most common PNS pathology was sinusitis. In our study most common pattern is sinonasal involvement.Most common sinus involved was maxillary sinus which is followed by anterior ethmoid, posterior ethmoid, frontal and sphenoid sinuses. Present study correlates well with studies done by Chaitanya CS et al. [11] Kushwah et al. [16], where maxillary sinus was most commonly involved.

Osteomeatal was most commonly involved pattern in inflammatory sinusitis as reported in study done by Babble et al[3] and Kushwah *et al*.[16].

Among various sinonasal pathologies diagnosed on CT, classified based on their imaging features, most common sinonasal pathology was inflammatory (80%) followed by developmental (17.5%)benign neoplastic (2.5%). Similar findings were also found in studies done by Vijay Prabhu et al., Khan N et al., Vikas Dhillon et al. [19,20,21]. The most common inflammatory pathology was sinusitis followed by polyps, which was also found in study done by Azzam MA, Salami et al.[22]

In our study 11 patients were diagnosed as sinonasal polyp which is similar to study find in Gupta et al. [4] In our study 1 case was diagnosed angiofibroma which showed involvementof thepterygopalatine fossa and bony erosion. The diagnostic accuracy in our study is 100% and is consistent with the study of Kosling et al[23]

Three patients were diagnosed as fungal sinusitis by ct reporting among them two were confirmed by histopathology making the sensitivity and specificity it similar to study of CT in diagnosing fungal sinusitis, as described in literature, by Zenreich SJ et al., which was a retrospective study [5].

In the present study, a good correlation was noted incases of chronic sinusitis, polyps,benign neoplasms, as evidenced by high sensitivity andspecificity values in cases of chronic sinusitis (100%and 94%), polyp (90.9% and 94%) and benign neoplasm (100% and 100%), respectively. However, poor correlation wasnoted in cases of fungal sinusitis which was supported bythe low sensitivity of 66%. Similar results were notedwhen the positive and negative predictive values werecalculated for all diagnosis.

LIMITATION

Our study has small number of cases as this study is relatively small. Further studies needed with larger study population to substantiate a clinical effect.

CONCLUSION

This study emphasizes the significant role of CT in diagnosis and characterisation of various sinonasal diseases. CT was able to characterize the PNS diseases and their extension. It is also useful in detecting bony involvement.It proves the better sensitivity and specificity of CT in evaluation of various sinonasal pathologies in symptomatic patients for the diagnosis, staging and thereby better planning of management.However, a potential pitfall was its inabilityto accurately differentiate in cases of fungal sinusitis andhigh-density secretions. CT may be used as gold standardimaging modality for evaluating the PNS diseases.

Table1: Distribution of Age in group, Chief complaint, type of sinus pathology, specific CT diagnosis

		Frequency	Percent
Age in group	11-20	8	20.0%
	21-30	6	15.0%
	31-40	10	25.0%
	41-50	9	22.5%
	>50	7	17.5%
	Total	40	100.0%
CHIEF COMPLAINT	BLEEDING NOSE	1	2.5%
	CHRONIC NASAL DISCHARGE	1	2.5%
	HEADACHE	19	47.5%
	HEADACHE, NASAL OBSTRUCTION	5	12.5%
	NASAL DISCHARGE	1	2.5%
	NASAL OBSTRUCTION	13	32.5%
	Total	40	100.0%
TYPE OF SINUS PATHOLOGY	DEVELOPMENTAL	7	17.5%
	INFLAMMATORY	32	80.0%
	NEOPLASTIC	1	2.5%
	Total	40	100.0%
specific CT diagnosis	FUNGAL SINUSITIS	3	7.5%
	JNA	1	2.5%
	POLYP	11	27.5%
	SINUSITIS	25	62.5%
	Total	40	100.0%

Table 2 : Comparison between CT findings with Histopathology

DIAGNOSIS	Sensitivity	Specificity	PPV	NPV
FUNGAL SINUSITIS	66.6%	97.4%	66.6%	97.4%
JNA	100%	100%	100%	100%
POLYP	100%	94%	90%	100%
SINUSITIS	100%	94%	96%	100%

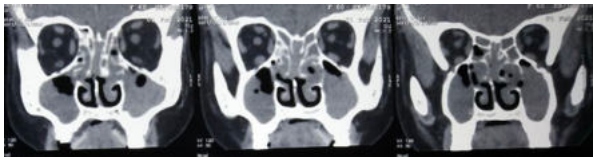
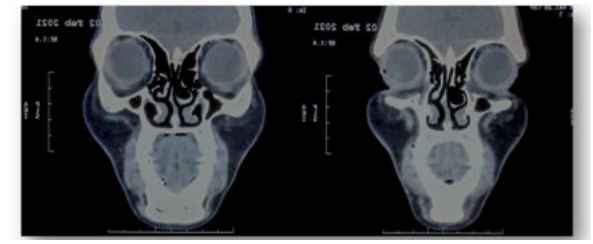


Fig 1 : Coronal non contrast computed tomography image of paranasal sinus shows sinusitis involving bilateral maxillary sinus and anterior ethmoid sinus cells. There is also mild deviated nasal septum towards right.

Fig 2:Coronal noncontrast computed tomography of paranasal air sinus shows left middle turbinate concha bullosa.



(a)

(b)

Fig 3:Coronal noncontrast computed tomography image of paranasal air sinusshows (a) Deviated nasal septum towards right with bony septal spur. (b) Left sided deviated nasal septum with septal spur and compensatory right inferior turbinate hypertrophy.

Fig 4:Coronal noncontrast computed tomography image of paranasal sinuses shows large right antral polyp.

Fig 5:Axial section of contrast enhanced computed tomography image of paranasal sinuses shows a large heterogeneously enhancing juvenile nasopharyngeal angiofibromacentred at left sphenopalatine foramen with bony erosion and intra sinus extension and expansion into surrounding area.

Fig 6: Axial section of contrast enhanced computed tomography image of paranasal sinuses shows allergic fungal sinusitis involving bilateral maxillary sinus with remodelling of left maxillary sinus medial wall.

REFERENCES

1. Babbel RW, Harnsberger HR, Sonkens J, Hunt S. Recurring patterns ofinflammatory sinonasal disease demonstrated on screening sinus CT.AJNR Am J Neuroradiol 1992;13:903-12.
2. GuptaSC, SinghM,JainA, WaliaDK.A comparative study of radiological and antroscopic findings in the lesions of maxillary sinus. Indian Journal of Otolaryngology and Head and Neck Surgery. 2004;56(1).
3. Bhattacharyya N. Clinical and symptom criteria for the accuratediagnosis of chronic rhinosinusitis. Laryngoscope 2006;116:1-22.
4. Zinreich S. Rhinosinusitis: Radiologic diagnosis. *Otolaryngology - Head and Neck Surgery*. 1997;117(3):27-34.
5. Zinreich SJ, Kennedy DV, Malat J. Fungal sinusitis: diagnosis with CT and MR imaging Radiology. 1988;169(2):439-44.
6. Miller JC. Imaging for Sinusitis. Radiology Rounds A Newsletter for Referring Physicians Massachusetts General Hospital Department of Radiology. 2009;7(8).
7. Momeni AK, Roberts CC, Chew FS. Imaging of chronic and exotic sinonasal disease**:** Review. *AJR*. 2007;189:S35-S45.
8. 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.
9. Spector SL, Berstein IL, Li JT, et al. Joint task force on practice parameters, joint council of allergy, asthma and immunology. Parameters for the diagnosis and management of sinusitis. *J Allergy Clin Immunology*. 1998;102(6, part 2):s107–44.
10. Venkatachalam VP, Bhat A. Functional endoscopic sinus surgery - Anewer surgical concept in the management of chronic sinusitis. IndianJ Otolaryngol Head Neck Surg 1999; 52:13-6.
11. Prabhakar S, Mehra YN, Talwar P, Mann SB, Mehta SK. Fungal infectionsin maxillary sinusitis. Indian J Otolaryngol Head Neck 1992; 1:54-8.
12. Gliklich RE, Metson R. The health impact of chronic sinusitis in patientsseeking otolaryngologic care. Otolaryngol Head Neck Surg 1995; 113:104-9.
13. Dewan K, Ray R, Nag D, Mullick MG, Mukhopadhyay S, Ray Choudharyet al. Clinico-pathological evaluation of sinonasal neoplasm in a tertiarycare hospital. J Dent Med Sci 2013; 6:20-6.
14. Ahmed MA, Kanmadi S. Role of computed tomography in evaluationof congenital anatomical variations in paranasal sinuses. Int J Biol MedRes 2015;6:4775-81.
15. Chakraborty P, Jain Ragni. Radiologic variations of nose and paranasalsinuses: A CT based study. J Med Sci Clin Res 2016;4:10536-41.
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. Maru YK, Gupta Y. Concha bullosa: Frequency and appearances onsinonasal CT. Indian J Otolaryngol Head Neck Surg 1999;52:40-4.
19. Prabhu VR, M. Adaikappan, S. Sethurajan. Computed Tomographic Evaluation of Paranasal Sinus and Pathologies. Journal of Evolution of Medical and Dental Sciences. 2015;4(33):5741-47.
20. Khan N, Zafar U, Afroz N, Ahmad SS, Hasan SA. Masses of nasal cavity, paranasal sinuses and nasopharynx: A clinicopathological study. Indian J Otolaryngol Head Neck Surg. 2006;58(3):259-63.
21. 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.
22. Azzam M.A. Salami Unilateral Sinonasal Disease: analysis of the clinical, radiological and pathological features. J Fac Med Baghdad. 2009;51(4):372-75.
23. Kosling S, Wanger F,Schulz HG, Heywang KS. Osseous variations in coronary CT of the PNS. Rofo Fortschr Geb Rontgenstr Neuen Bildgeb Verfahr. 1993;159(6):506-10.