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Review Article

Comparison of CT Findings with Histopathological of Chronic Maxillary Sinusitis

Dr. Taheer Khan Tadakod[1], Dr. N. Anwar Hussain[2*]

[1]Assistant Professor, Department of Radiodiagnosis, Deccan Institute of Medical Science, Hyderabad India
[2]Associate Professor, Department of Radiodiagnosis, Kurnool Medical College, Kurnool Andhra Pradesh India.

***Corresponding author**
Dr N. Anwar Hussain

Abstract: ***Introduction:*** The maxillary sinuses are most commonly affected with acute and chronic sinusitis. Most of these cases can be managed with medications alone. When medical management fails, surgery may be needed to treat chronic maxillary sinusitis. ***Material and Methods:*** This prospective study was done in the Department of Radiology at a tertiary care teaching Hospital over a period of six months. A total of 60 patients who were referred to our department with clinical suspicion of sinusitis disease underwent computed tomography (CT) evaluation of sinusitis using 64 Multi slice CT scanner. Study protocol A detailed history of the patient including signs and symptoms, detailed physical examination, histopathological examination and radiological investigations which included. ***Results:*** In the present study, a total of 60 subjects were included out of which 71 (59.2%) were males and 49 (40.8%) were females. In our study, most of the subjects were 21-40 years i.e., 27 out of 60 (45%) followed by 41-60 years, i.e., 21 out of 60 (35%). Predominant symptoms in study group were headache in 19 patients (31.6%) followed in decreasing order by facial pain in 17 patients (28.3%), swelling in 19 patients (38%) and nasal obstruction in 8 patients (16%). Twenty-one patients had fungal sinusitis on pathologic examinations of surgical specimens. Intrasinus calcification was found in 13 (61.9%) of 21 patients with fungal sinusitis. The infecting organism was Aspergillus in the 13 patients who had fungal sinusitis and intrasinus calcification on CT scans. The intrasinus location of the calcification was central within the maxillary sinus in 11 (84.6%) and peripheral near the sinus wall in 2 (15.3%) of the 13 patients who had aspergillosis of the maxillary sinus. The shape of the intrasinus calcification was fine punctate (38.4%), linear (38.4%), and nodular (15.3%) in the patients with fungal sinusitis. ***Conclusion:*** CT findings of intrasinus calcification in patients with fungal or nonfungal chronic maxillary sinusitis and evaluate the usefulness of these findings in differentiating fungal from nonfungal sinusitis.

Keywords: Histopathological investigation, chronic maxillary Sinusitis, Computed tomography.

INTRODUCTION

The maxillary sinuses are most commonly affected with acute and chronic sinusitis. Most of these cases can be managed with medications alone. When medical management fails, surgery may be needed to treat chronic maxillary sinusitis [1]. Open approaches to the maxillary sinus were first described in the early 1700s. The well-known Caldwell-Luc operation was first described in the United States by George Walter Caldwell in 1893 and then by Henri Luc of France in 1897 [2]. Subsequent advances in the understanding of the physiologic drainage pattern of the maxillary sinus led to intranasal middle meatus antrostomy in the late 1960s and the early 1970s [3]. Functional endoscopic sinus surgery (FESS) is based on the surgical approach performed by Messerklinger and Wigand in Europe via the ostiomeatal complex [4]. FESS has become the standard surgical treatment for chronic maxillary sinusitis, with external approaches being used as an adjunct in more complicated cases or in tumor management [5].

The maxillary sinus is housed in the body of the maxilla, with the inferior orbital wall as the superior border, the lateral nasal wall as the medial boundary, the alveolar process of the maxilla as its inferior border, and the canine fossa as the anterior border. [6] The main functional component of the maxillary sinus outflow tract is the ostiomeatal complex, which is collectively constituted by the uncinate process, the maxillary ostium, the infundibulum, and the ethmoid bulla. These structures form a functional complex through which the maxillary sinus contents egress. Obstruction of the ostiomeatal complex and its relief with surgery form the basis for FESS [7]. The uncinate process is a sickle- or L-shaped bone that starts anterosuperiorly and then slopes posteroinferiorly, running horizontally from anterior to posterior. It has a free edge along its superior surface, which is taken

down during uncinectomy. Superiorly, the uncinate process may attach to the lamina papyracea (most common configuration), the middle turbinate, or the skull base. At its most posterior point, it attaches to the inferior turbinate at the ethmoidal process [8]. Once the uncinate process is taken down, the natural maxillary sinus ostium can be visualized. The cilia of the maxillary sinus beat uphill toward the natural maxillary sinus ostium. Therefore, the natural ostium of the maxillary sinus must be included with maxillary antrostomy for maximal functional benefit [9].

CT plays an important diagnostic role to determine the distribution and extent of maxillary sinusitis and detect those anatomic variations (such as sepal deviation, spur formation, concha bullosa, and paradoxical curve of middle turbinate) that may place the patients at increased risk for intra- and post-operative FESS complications and thereby reduces the morbidity and mortality of patients [7]. Coronal imaging plane offers the best visualization of the drainage pathways of the sinuses, whereas some drainage pathways (such as sphenoid sinus ostia) and sinus walls, oriented close to the coronal plane, are better seen on axial images [10].

Contrast enhanced CT scans is obtained only in patients who are acutely ill and suspected of having a complication of maxillary sinusitis. The present study was aimed to evaluate the spectrum of maxillary sinusitis on CT and correlate their clinical and histopathological findings.

MATERIAL AND METHODS

This prospective study was done in the Department of Radiology at a tertiary care teaching Hospital over a period of six months. A total of 60 patients who were referred to our department with clinical suspicion of sinusitis disease underwent CT evaluation of sinusitis using 64 Multi slice CT scanner. Study protocol A detailed history of the patient including signs and symptoms, detailed physical examination, histopathological investigations and radiological investigations which included sinus X-ray were recorded and tabulated. A written consent was taken. The patient was then placed on the gantry table in prone position. The coronal scan is taken from posterior margin of sphenoid sinus to anterior margin of frontal sinus.

Inclusion criteria

Patients of any age and either gender who attended a medical consultation due to sinus pathology and who required at least a confirmatory biopsy or surgical treatment of the lesion.

Exclusion criteria

Patients who had not given informed consent, patients with lesions localised in a region other than the maxillary sinus (see ethmoid sinus, sphenoidal or nostril), relapses of previously diagnosed and/or treated lesions, new lesions in the same patient, lesions which affect the maxillary sinus due to loco-regional spreading but which originate in another location, and infectious lesions with odontogenic origin.

Histopathological study

This was conducted in a routine manner with paraffin inclusion and hematoxylin and eosin stain. Where necessary, multiple sections of each of the blocks were made and PAS and Grocott stains were used in those patients whose clinical suspicion included a micosis. When necessary, an immunohistochemical study was performed in order to classify the neoplasms.

RESULTS

In the present study, a total of 60 subjects were included out of which 71 (59.2%) were males and 49 (40.8%) were females (table-1).

Table-1: Distribution of gender

Gender	No. of patients	Percentage %
Male	43	71.6
Female	17	28.4
Total	60	100

Table-2: Distribution of different age groups of patients

Age	No. of patients	Percentage %
<20 years	9	15
21-40 years	27	45
41-60 years	21	35
>61 years	3	5
Total	60	100

In table 2, in our study, most of the subjects were 21-40 years i.e., 27 out of 60 (45%) followed by 41-60 years, i.e., 21 out of 60 (35%).

Table 3: Distribution of Symptoms among patients

Symptoms	No. of patients	Percentage %
Headache	19	31.66
Facial pain	17	28.3
Swelling	11	18.3
Nasal obstruction	13	21.6
Total	60	100

In table 3, predominant symptoms in study group were headache in 19 patients (31.6%) followed in decreasing order by facial pain in 17 patients (28.3%), swelling in 19 patients (38%) and nasal obstruction in 8 patients (16%).

Table-4: Distribution of Sinus among patients

Sinus	No. of patients	Percentage %
Maxillary	47	78.3
Anterior Ethmoid	4	6.6
Posterior Ethmoid	2	3.3
Frontal	4	6.6
Sphenoid	3	5.0

Total	60	100

Table-5: CT Findings in Deviated nasal septum (DNS)

	No. of patients	Percentage %
Towards Right	13	21.6
Towards Left	11	18.3
Total	24	40

In table 5, DNS was seen in 24 patients (40%) with more common towards right side. DNS towards right side seen in 13 patients (21.6%), DNS towards left side seen in 11 patients (18.3%)

Table-6: CT findings of calcification in patients with fungal sinusitis

Calcification	Fungal Sinusitis (n=13/21)	
	No. of patients	Percentage %
Location		
Central	11	84.6
Peripheral	2	15.3
Shape		
Fine punctate	5	38.4
Linear	5	38.4
Nodular	2	15.3
Round or eggshell	1	7.6

In table 6, twenty-one patients had fungal sinusitis on pathologic examinations of surgical specimens. Intrasinus calcification was found in 13 (61.9%) of 21 patients with fungal sinusitis. The infecting organism was Aspergillus in the 13 patients who had fungal sinusitis and intrasinus calcification on CT scans. The intrasinus location of the calcification was central within the maxillary sinus in 11 (84.6%) and peripheral near the sinus wall in 2 (15.3%) of the 13 patients who had aspergillosis of the maxillary sinus.

The shape of the intrasinus calcification was fine punctate (38.4%), linear (38.4%), and nodular (15.3%) in the patients with fungal sinusitis. In the patients with fungal sinusitis, all calcifications seen had irregular margins.

Table-7: CT findings of calcification in patients with non-fungal sinusitis

Calcification	Fungal Sinusitis (n=9/39)	
	No. of patients	Percentage %
Location		
Central	1	11.1
Peripheral	7	77.7
Mixed	1	11.1
Shape		
Fine punctate	0	0
Linear	2	22.2
Nodular	6	66.6
Round or eggshell	1	7.6

In table 7, in contrast to those with fungal sinus disease, the intrasinus calcification was located at the periphery near the sinus wall in 7 (77.7%) of the 9 patients with non-fungal sinusitis. The shape of the intrasinus calcification was linear (22.2%), nodular (66.6%) and round or eggshell (7.6%) in the patients with non-fungal sinusitis.

DISCUSSION

The prevalence of intrasinus calcification on CT scans in patients with aspergillosis has been reported to be between 69% and 77% [11]. Intrasinus calcification is known to be a characteristic feature of fungal sinusitis. Other CT findings of fungal sinusitis include bony change of a sinus wall, a focal mass with increased density within the sinus, and infiltration of adjacent soft tissue or bony destruction in the case of invasive fungal sinusitis [12]. It is important to differentiate fungal from non-fungal sinusitis, as treatment is different for the two forms [13]. In patients with altered host defenses, such as those undergoing transplantation, a diabetic, or a patient with immunodeficiency or leukemia, fungal sinusitis can become invasive and cause a fatal complication. Therefore, early diagnosis of fungal sinusitis may help prevent life-threatening complications in immunocompromised patients.

In our study intrasinus calcification with less frequency (23%) in patients with non-fungal chronic maxillary sinusitis than in those with fungal sinusitis (61.9%). The shape and intrasinus location of the calcification in non-fungal sinusitis were different from those of fungal sinusitis. Most of the calcifications in fungal sinusitis were centrally located within the maxillary sinus, while the calcifications in non-fungal sinusitis were usually found at the periphery, near the wall of the maxillary sinus. Calcification with a nodular or linear shape was found with both fungal and non-fungal sinusitis; however, fine punctate calcification was found only in fungal sinusitis, while smooth-margined, round, or eggshell type calcification was found exclusively with the non-fungal variety.

The different CT features of intrasinus calcification may be the result of the different pathogeneses of calcification. The calcification in fungal sinusitis develops from metabolic deposits of calcium within the mycelial mass. Kopp *et al*. [2] and Stammberger *et al*. [14] reported that the focal hyperdense area seen on plain radiographs represents calcium phosphate and calcium deposits within the necrotic area of mycelium. The CT appearance of fungal calcification may be fine punctate at an early stage and dense after progression of calcium deposits within the fungal concretion. The intrasinus central location of the calcification can be explained by the fact that the calcification develops within the mycelial mass, which is usually located in the center of the maxillary

sinus. Dystrophic calcification or ossification can develop in many inflammatory conditions as well as in other pathologic conditions, including neoplastic disease, trauma, and injury [15].

Dystrophic calcification caused by a chronic inflammatory process or ossification may also occur in nonfungal sinusitis. The calcification seems to occur near the thickened mucosal layer of the sinus that has been repeatedly affected by a chronic inflammatory process. The mechanism of intrasinus calcification is supported by the results of our study, which showed intrasinus calcification or ossification in nonfungal sinusitis embedded within the thickened fibrotic submucosal layer of the maxillary sinus on histologic examination. This characteristic of dystrophic calcification in nonfungal sinusitis may explain the common occurrence of intrasinus calcification at the peripheral location of the maxillary sinus on CT scans.

Histologic examination of the intrasinus round or eggshell calcific densities found on CT scans showed them to be ossifications rather than calcifications. The uncommon sinus ‘‘lith’’ also may be dystrophic calcification or ossification caused by chronic inflammation of the paranasal sinus [16].

CONCLUSION

The CT findings of intrasinus calcification showed differences in shape and location between fungal and non-fungal maxillary sinusitis. Although intrasinus calcification occurs uncommonly in non-fungal sinusitis, the CT finding of intrasinus calcification may be helpful for differentiating fungal from non-fungal maxillary sinusitis.

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