To Study the Pattern of sinusitis on Cross sectional Imaging in a rural population visiting a rural medical Hospital.

*Dr. D.P. Kotnis, **Dr. Pooja Shinde

*Associate Professor, Department of ENT, **Resident, Department of Radiology

Corresponding Address : Department of ENT, Vikhe Patil Institute of Medical Sciences, Ahmednagar.

Mail id - dpkotnis@gmail.com

Mobile No. - 07798427673

Abstract :

Background : Sinonasal inflammatory disease with sinus ostial obstruction is a very common cause of headache in rural population. It manifests as an opacified paranasal sinus on plain radiography. Cross sectional imaging modalities like Computed Tomography can demonstrate the actual pattern of sinusitis. **Aims :** To study patterns of sinusitis as seen on cross sectional imaging using CT scan. **Method :** Using CT high-resolution bony algorithm and intermediate window widths, 2000 HU, and window level (WL) 200 HU, the bony anatomy, the extent and anatomic localization of inflammatory lesions and complications such as sclerotic thickening of the bone and cortical destruction were studied and they were classified in different patterns of sinusitis. 100 patients who were clinically diagnosed to suffer from sinusitis were imaged using CT scan. **Results :** The infundibular pattern of sinusitis was seen in 28 (28%) of the scans. The ostiomeatal unit pattern was identified in 27 (27%), with 8 (8%) scans demonstrating the spheno-ethmoidal recess pattern. Sinonasal polyposis was present in 12 (12 %) of the scans and in 25 (25%) the sporadic or unclassifiable pattern was designated. **Conclusion :** Of the five different patterns of sinusitis, in this rural area infundibular pattern was the commonest. Sporadic or unclassifiable pattern was also significant.

Key Words : CT scan, Sinusitis, Imaging features.

Introduction:

Sinonasal inflammatory disease with sinus ostial obstruction is a very common cause of an opacified paranasal sinus. Sinusitis is an inflammation of the mucosal lining of the paranasal sinuses. Rhino sinusitis is a more suitable term, as the mucosa of the sinuses is continuous with that of the nose.[1,2,3]

Sinusitis can be subdivided into acute(< 1 month), sub acute (1-3 months), and chronic disease (> 3 months) . Acute and sub acute sinusitis are usually treated medically, whereas chronic sinusitis may require surgical intervention.

Functional endoscopic sinus surgery (FESS) has the therapeutic benefits. FESS have helped a large number of patients with chronic sinus disease.[4,5] Imaging has also progressed with FESS, and computed tomography (CT) scanning can now demonstrate the sinus anatomy and patterns of sinusitis in exquisite detail before surgery.[6,7]

Thickening of the mucosal lining of the nasal cavity and sinuses may be due to inflammation or represent mucosal oedema or hyperplasia. Mucosal thickening of the maxillary sinus is common in asymptomatic patients , therefore the mucosal lining is considered to

be normal when < 4 mm . In the frontal and sphenoid sinuses, the mucosal lining should not be seen at CT in normal healthy persons.[8,9] The ethmoid sinuses mucosal thickening up to 2 mm is considered as a normal finding in the ethmoid sinuses.[10,11]

There are certain recurring patterns of inflammatory sinus disease that may be seen on sinus computed tomography (CT).

Materials and Method : It is an observational study , which is conducted on the 100 patients diagnosed for sinusitis on clinical grounds and confirmed on Imaging studies. All age groups and genders are included, Patients operated earlier for sinusitis or any PNS surgery were excluded.

Permission of institutional ethical and research cell, and informed written consent from patients were obtained prior to study.

CT is regarded as the “gold standard” in the primary imaging of inflammatory sinonasal lesions .

Using a high-resolution bony algorithm, the radiation dose may be as low as 16 mAs per scan for diagnosing sinusitis.

An intermediate window width (WW), 2000 HU, and level (WL), 200 HU, are commonly used for both the bony anatomy and soft tissue masses. A better distinction of watery Sinonasal secretions from more viscous or desiccated secretions or neoplasm may require a more narrow window setting. The prone position is preferred to drain fluid away from the ostiomeatal complex (OMC) in order not to obliterate the OMC falsely and for better delineation of the bony anatomy.

However, a supine position with coronal reconstruction is preferred to reduce artifacts. In the patients operated on, axial images may offer a better visualization of the anterior and posterior ethmoid complex as well as the

sphenoid sinuses.

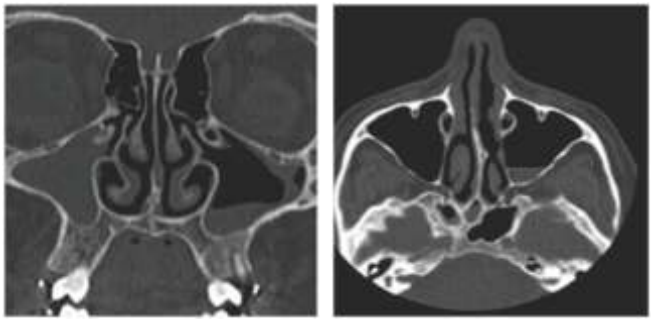
Patient preparation with nose blowing and topical nasal decongestion offers only a small reduction in mucosal thickening and therefore has a limited effect on the diagnostic accuracy of CT imaging in CRS patients.

Results : Inflammatory changes within the paranasal sinuses could be grouped into the five recurring patterns of inflammatory sinonasal disease that had been defined. Three of these patterns correlated with occlusion of known mucociliary drainage routes of the paranasal sinuses. These three distinctive obstructive patterns were designated the infundibular (I), osteomeatal unit (II), and sphenoethmoidal recess (III) patterns. The two additional recurring patterns were designated included the sinonasal polyposis pattern (IV) and the sporadic or unclassifiable pattern (V).

The study shows following results :

	Patterns of sinusitis	No of cases	Total no of cases
1	Infundibular	28	100
2	Osteomeatal unit	27	100
3	Sphenoethmoidal recess	08	100
4	Sinonasal polyposis	12	100
5	Sporadic or Unclassifiable	25	100

PATTERN I(INFUNDIBULAR)



PATTERN II (OSTEOMEATAL)

PATTERN III (SPENOETHMOIDAL)

PATTERN IV (SINONASAL POLYPOSIS)

PATTERN V (SPORADIC/ UNCLASSIFIABLE)

There is simultaneous occurrence of more than one pattern in some patients. Additional incidental sinonasal CT abnormalities were noted like septal deviation, septal spurs in synechiae, or intranasal adhesions.

Discussion : Coronal CT imaging helps in studying the sinonasal anatomy and pathology. It is non-invasive imaging helps in a detailed presurgical map of the sinonasal region.

Use of these patterns of sinusitis in the radiologic interpretation of CT scans results in grouping of patients into nonsurgical (normal CT), routine surgical or medical treatment (patterns I and II), and complex surgical (patterns III and IV) groups.

Pattern 1: Infundibular Pattern : The infundibular pattern limited to the maxillary sinus with obstruction within the ipsilateral ostium and infundibulum. As the anterior ethmoid and frontal sinuses may also drain via the infundibulum, it is presumed that in this pattern only the posteroinferior aspect of the infundibulum, that component into which the maxillary sinus ostia drains, is occluded. The infundibular pattern include polyps, mucosal swelling, and anatomic variants, such as Haller cells that encroach and narrow the infundibulum. Hypoplastic maxillary sinuses are common and are associated with a long, infundibulum and consequently, responsible for an isolated infundibular pattern. When an isolated infundibular pattern is diagnosed on CT, endoscopic surgery can be limited to correction of the infundibular obstruction. This pattern requires the least amount of surgical intervention, and the surgical result is excellent. Often infundiulotomy alone will correct the problem.Surgical complications and disease recurrence are rare.

Pattern II : Ostiomeatal Unit

The ostiomeatal unit pattern of sinusities is also commonly seen. When complete, it leads to

inflammatory involvement within the ipsilateral maxillary, frontal, and anterior and middle ethmoid sinuses. Occlusion of the middle meatus, the common area of drainage for each of these sinuses, is responsible for this pattern of inflammatory sinus disease. The pattern may be incomplete due to a variable amount of disease involvement within the middle meatus and OMU components, and due to variable placement of the draining ostia. It had been specifically noted for the nasofrontal duct that drains the frontal sinus

The nasofrontal duct can end at variable locations within the middle meatus. If the duct is more anteriorly located, the frontal sinus may be spared from inflammatory disease in the ostiomeatal pattern. When an OMU pattern of sinus opacification is observed on CT, then specific attention should be directed to the components of the OMU/middle meatus region. An attempt should be made to define possible causes of opacification within the OMU. Common causes of OMU obstruction include mucosal swelling, hypertrophied turbinates, polyps, adhesions, nasal tumors, and anatomic variants such as concha bullosa, paradoxical middle turbinates, and septal deviation with or without spur . The surgical approach to the OMU pattern is more extensive than with the infundibular pattern due to the involvement of multiple ostia within the middle meatus .The identification of this pattern on CT allows a tailored surgical plan that usually includes infundibulotomy in combination with ethmoid bullectomy and, at times, more extensive ethmoidectomy. Any identified causal lesions are also surgically corrected. Due to the more extensive surgical therapy required the complication and failure rates are greater than with intervention for the infundibular pattern.

Pattern III : Sphenoethmoidal Recess Pattern

When pathology leads to obstruction of sinus ostia posteriorly, in the area of the SER, the ipsilateral posterior ethmoid and sphenoid sinuses are variably involved with inflammatory changes. This is the sphenoethmoidal recess pattern and is readily apparent on CT due to the typical inflammatory disease within the sphenoid sinus and, to a lesser extent, within the posterior ethmoid sinuses. When this pattern is identified, associated opacification of the SER can usually be visualized. Isolated sphenoid disease, without posterior ethmoid sinus disease, can be seen in the SER pattern since the sphenoid sinus drains directly into the SER, whereas the posterior ethmoid initially drains more anteriorly into the superior meatus. The posteriorly located SER is understandably more difficult to reach at endoscopy, and surgery to correct pathologic processes causing this pattern is more challenging. There is also an expected increased surgical complication rate compared to the other obstructive patterns [4,6,7].

Pattern IV : Sinonasal Polyposis

Pattern Distinct, characteristic, radiologic findings are present on CT in patients with sinonasal polyposis. In this disease process, polyps are diffusely present within the nasal cavity and paranasal sinuses. Characteristic CT findings that are variably present include polypoidal masses filling the nasal vault and sinuses, bilateral infundibular enlargement, convex (bulging) ethmoid sinus walls, and attenuation of the bony nasal septum and ethmoid trabeculae. Because the polyps may occlude the mucociliary drainage routes, a mixture of inflammatory patterns may be present. Air-fluid levels are frequent but do not always indicate acute sinusitis, as normal secretions may accumulate without infection. Correlation for clinical evidence of acute sinusitis is necessary in these circumstances. The label sinonasal polyposis is reserved for diffuse polyposis. Isolated polyps are not included but categorized by the pattern of sinusitis that results from the obstructing polyp .Sinonasal polyposis is frequently treated medically with chronic adrenocortical steroids and with antibiotic therapy for acute bouts of sinusitis .Surgical intervention is utilized for medical therapy failure . The required endoscopic surgery is much more involved and difficult than in patterns due to the extensive pansinus polypoid disease and tendency for the recurring formation of polyps. Consequently, the surgical complication rate is increased and vigorous bleeding may be encountered. Reactive mucosa that is present in patients with sinonasal polyposis may lead to poorer long-term surgical results and the need for possible repeated surgeries.

Pattern V: Sporadic (Unclassifiable) Pattern

The sporadic pattern is diagnosed when inflammatory sinonasal disease is not attributable to obstruction of known mucous drainage routes or polyposis, but rather, there is randomly placed disease noted anywhere within the sinuses. This group includes individual inflammatory lesions such as retention cysts and mucoceles. Also included in this group are CT scans demonstrating postsurgical changes. CT findings are varied due to the variety of processes included in the sporadic pattern. The specific process that is present will dictate the actual CT findings. These range from isolated inflammatory changes within the

sinuses in the absence of mucous drainage route obstruction, to the more specific entities of retention cysts and mucoceles, as well as randomly located postsurgical changes. Endoscopic surgical intervention in this group is tailored to the specific findings. Surgical outcomes vary, but is usually good. The degree of surgical difficulty and the chances of complications vary greatly in this group, depending on the lesion type and accessibility of the affected sinus.

Conclusion : The present study classifies five different pattern of sinusitis, each with a different therapeutic course and surgical options. When a specific obstructive pattern is identified, detailed attention can be directed to the likely site of obstruction with possible definition of a specific etiology. A detailed road map of relevant surgical anatomy and pathology is then available for the endoscopic surgeon. It is anticipated that this will result in more directed and specific functional endoscopic sinonasal surgery with improved patient care and surgical result.

References :

1. Chadha NK, Chadha R. 10-minute consultation: sinusitis. BMJ. 2007 Jun 2. 334(7604):1165.
2. McQuillan L, Crane LA, Kempe A. Diagnosis and management of acute sinusitis by pediatricians.Pediatrics. 2009 Feb. 123(2):e1938.
3. Rosenfeld RM, Piccirillo JF, Chandrasekhar SS, Brook I, Ashok Kumar K, Kramper M, et al. Clinical practice guideline (update): adult sinusitis.Otolaryngol Head Neck Surg. 2015 Apr. 152 (2 Suppl):S1-S39.
4. Platt MP, Cunnane ME, Curtin HD, Metson R. Anatomical changes of the ethmoid cavity after endoscopic sinus surgery.Laryngoscope. 2008 Dec. 118(12):2240-4.
5. Huang BY, Lloyd KM, DelGaudio JM, Jablonowski E, Hudgins PA. Failed endoscopic sinus surgery: spectrum of CT findings in the frontal recess. Radiographics. 2009 Jan-Feb. 29(1):177-95.
6. Mafee MF. Imaging of paranasal sinuses and rhinosinusitis. Clin Allergy Immunol. 2007. 20:185-226.
7. Zinreich SJ. Progress in sinonasal imaging.Ann Otol Rhinol Laryngol Suppl. 2006 Sep. 196:61-5.
8. Eggesbo HB, Ringertz S, Haanaes OC, Dolvik S, Erichsen A, Stiris M, Kolmannskog F (1999) CT and MR imaging of the paranasal sinuses in cystic fibrosis. Correlation with microbiological and histopathological results. Acta Radiol 40:154–162
9. Rao VM, el-Noueam KI (1998) Sinonasal imaging. Anatomy and pathology. Radiol Clin North Am 36:921–939, vi
10. Rak KM, Newell JDd, Yakes WF, Damiano MA, Luethke JM (1991) Paranasal sinuses on MR images of the brain: significance of mucosal thickening. Am J Roentgenol 156:381–384
11. Zinreich SJ, Kennedy DW, Kumar AJ, Rosenbaum AE, Arrington JA, Johns ME (1988) MR imaging of normal nasal cycle: comparison with sinus pathology. J Comput Assist Tomogr 12:1014–1019