

## PREVALENCE OF INCIDENTAL FINDINGS IN MAXILLARY SINUS USING CONE BEAM COMPUTED TOMOGRAPHY – A RETROSPECTIVE STUDY

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### ABSTRACT

Maxillary sinus pathologies and normal variations in the sinus anatomy can result in complications during surgical interventions. Hence, maxillofacial radiologists should be knowledgeable regarding these radiographic findings pointing to pathologies/variations.

To study the prevalence of various incidental findings in the maxillary sinus region using cone beam computed tomography (CBCT). This was a retrospective- cross sectional study. CBCT scans of sixty patients who have been advised radiographs exclusively for dental complaints were retrospectively collected and examined for maxillary sinus pathologies. Their frequencies as well as unilateral/ bilateral involvement were recorded and analyzed. The most prevalent incidental finding of the maxillary sinus was mucosal thickening followed by septations. Few cases presented with infrequent findings like sinus floor discontinuity and root canal sealant inside the sinus. Significant maxillary sinus pathologies may present without any associated symptoms. Hence, oral radiologists examining CBCT scans should mandatorily evaluate the entire volume of the scan and any abnormal finding must be identified and reported to the clinician.

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### Introduction

Maxillary sinus pathologies are frequently encountered by dentists during the radiographic assessment of patients with teeth-related complaints. Also, maxillary sinus pathologies are observed as incidental radiographic findings in asymptomatic patients who are evaluated for implant assessment, endodontic therapy, impacted/ supernumerary teeth and orthodontic correction [1]. A variety of imaging modalities including plain films as well as advanced radiographs provide visualization of maxillary sinus. Computed tomography, although is the gold standard out of these, has limitations of high radiation exposure and cost [2, 3]. Cone beam computed tomography (CBCT) which is being widely used now by the dentists for an array of indications, also is a good option for studying maxillary sinus. Despite of its poor soft tissue contrast, CBCT images can aid in viewing inflammatory pathologies and sinus opacification [4].

The prevalence of maxillary sinus pathologies in asymptomatic patients ranged widely between 10.9 % and 69.1 % across studies in literature [5-9]. Maxillary sinus abnormalities can be classified as developmental, inflammatory, cystic, calcifications or neoplasms [10]. The most commonly encountered being the lesions of inflammatory origin. Radiographically, these may appear as mucosal thickening (MT) or as sinus opacification (SO) [11]. The presence of an air-fluid level can also be a sign of inflammation implying acute sinus disease [12]. The cystic lesions of maxillary sinus can be retention cysts or mucocoeles. Blockage of secretory ducts of seromucinous glands causing submucosal accumulation of secretions result in a pseudocyst called the mucous retention cyst. This is viewed in radiographs well defined non corticated, smooth, dome shaped, mostly sessile radiopaque mass [13]. Mucocoeles on the other hand are expansile destructive masses due to a blocked sinus ostium and can appear as completely opacified maxillary sinus [14]. Maxillary sinus polyps are formed by thickened mucous membrane of chronically inflamed sinus which form polypoid folds which may be isolated or multiple [15]. Deposition of mineral salts such as calcium phosphate and calcium carbonate around the nidus results in a maxillary antrolith. Smaller antroliths are asymptomatic and are discovered as incidental findings [16, 17]. Radiographically, these appear as

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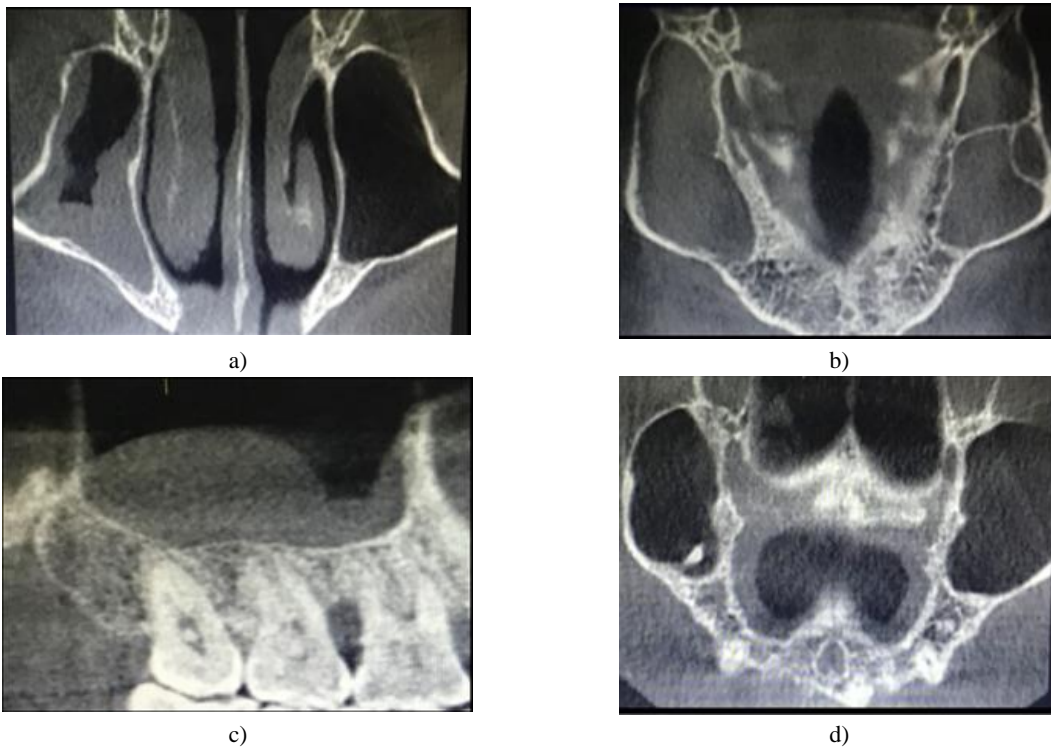
radiopaque structures of varying densities, with a well-defined periphery. They can have smooth or irregular borders and at times an internal structure resembling laminations [18].

Hence, it is evident that numerous pathologies can develop asymptotically in the maxillary sinus region. Because we dentists evaluate CBCT scans of patients that involve the maxillary sinus region in our day-to-day practice, we must be knowledgeable to identify such lesions and advise proper management when necessary. This study aimed to assess the prevalence of various incidental findings in the maxillary sinus region using CBCT.

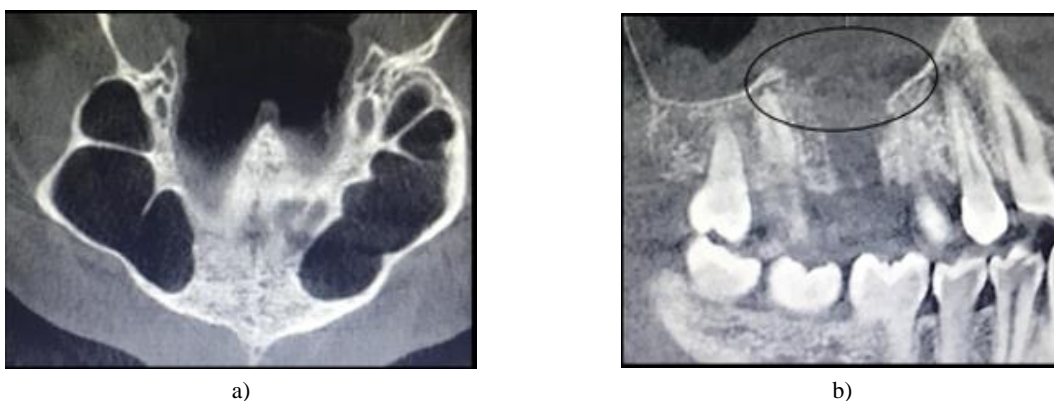
### Materials and Methods

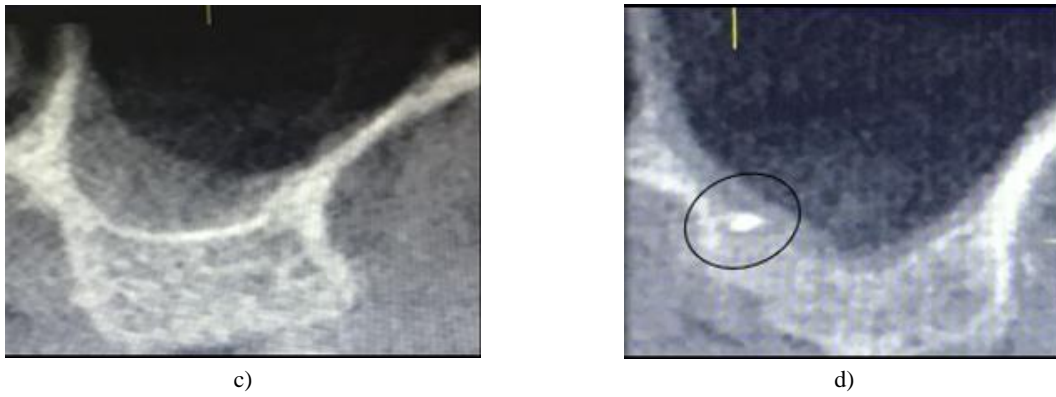
CBCT scans of sixty patients who were referred to the oral radiology department of a dental college were collected retrospectively. CBCT scans covering either the upper arch alone or both upper and lower arches, allowing adequate visualization of bilateral maxillary sinus regions, were included. Patients who were advised to radiograph exclusively for dental complaints were included and those suspected of having sinus-related pathologies clinically were excluded. Patients below the age of 18 years and those above 50 years were excluded from the study.

A thickening of mucosal membrane measuring  $> 3\text{mm}$  was considered pathological (**Figure 1**). Also, homogeneously radiopaque mass with a convex/ polypoid shape, of any etiology, was radiographically recorded as a polypoidal thickening (PT). In addition to the frequency of various pathologies (**Figure 2**), the involvement of the sinus by the lesion was also noted and recorded as unilateral or bilateral.



**Figure 1.** a) Mucosal thickening  $> 3\text{mm}$  seen on right maxillary sinus, b) CBCT axial section shows complete sinus opacification with bilateral involvement, c) CBCT sagittal section shows a polypoidal thickening, d) CBCT axial section reveals a small antrolith in relation to the right maxillary sinus





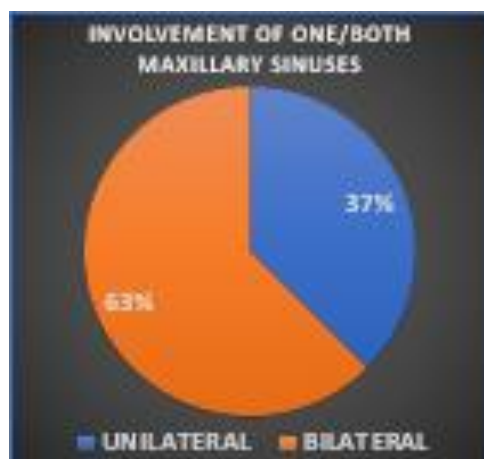
**Figure 2.** a) Bilateral septations, b) CBCT sagittal section shows discontinuation of the sinus floor irt site of extraction. CBCT cross-sectional view shows, c) an air-fluid level and, d) root canal sealant

**Results and Discussion**

The most prevalent incidental finding was MT followed by separations, OPA, air-fluid level, PT, antrolith, and sinus floor discontinuity. Root canal sealant was observed in one case which was the least prevalent abnormal finding. Also most of the pathologies had a bilateral presentation whereas less than half of the cases showed a unilateral involvement (**Figures 3 and 4**).



**Figure 3.** Prevalence of incidental findings in the maxillary sinus



**Figure 4.** Percentage of pathologies with unilateral/ bilateral involvement

In our study out of the 60 patients, CBCT scans of 80% had incident findings in relation to the maxillary sinus and 20% had none. In a similar study done by Mamta Raghav et. al., 59.7 % of the study sample had incidental findings in the maxillary sinus [4].

In our study, the most prevalent incidental finding was MT (31.66%) followed by septations (18.33%) in the maxillary sinus. The normal thickness of the maxillary sinus mucosa is 0.8–1 mm, and with no consensus about how thick the mucosa should

be for mucosal thickening literature. The maxillary sinus mucosa thickness value varies between 2-6 mm for the diagnosis of 'mucosal thickening'. In a study by Pazera *et al.* 1 mm was taken as the cut-off value [19]. Following Lana *et al.*, the current study accepted a value of 3 mm [20]. Variability in the rate of mucosal thickness may be because the researchers accepted different threshold values and the patient criteria included in the study were different. Ritter *et al.*, reported MT followed by OPA and PT to be the most frequent findings [21]. These studies have not mentioned the prevalence of septations as individual findings and have rather grouped them along with other findings. This could be probably due to more focus on lesions. But we highlight the high prevalence of maxillary sinus septations in our study especially since it is significant for surgical planning in certain cases of implant and sinus lift procedures [22]. Also, the frequency of OPA (11.66 %) and PT (6.66 %) was lower compared to that reported in these studies. But these prevalence rates were consistent with another study conducted by Lim CG *et al.* in using CT scans [23]. The mucous retention cyst and antrochoanal polyp represent polypoid lesions of the maxillary sinus. The first lesion is a common asymptomatic incidental finding that can be viewed at 2%–5% rate on radiographic examinations. It is characterized by a dome-shaped radiopacity, extending from the sinus wall. The second lesion is a benign polypoid lesion that originates from the maxillary sinus mucosa and extends through its ostium to the choana. As both polypoid lesions show fluid density in the sinus on CT, they cannot be differentiated only with CT findings. For that reason, both have been grouped under the same heading in the current study, following Lana *et al.* [20].

#### *Air Fluid Level CC Ani et al.*

Eleven patients (9.3%) were found with maxillary mucosal thickening associated with a fluid level. The presence of an air-fluid level implied acute sinus disease and mucosal thickening in a normal-sized maxillary sinus suggested chronic sinusitis. Opacified maxillary sinus (partial or complete) had been described in other studies and might have either fluid or solid material as its content. Maxillary mucosal thickening with air-fluid level indicated an acute on the chronic process.

#### *Antrolith*

Antroliths are pathologic calcifications formed as a result of mineral salt deposition in the paranasal sinuses and show up as radiopaque masses with different sizes and shapes in the radiographic examination. Antrolith incidence was between 0.15%–4.54% in the literature. This incidence was 1.3% in the current study and our results were in accordance with other studies.

#### *Foreign Body*

Foreign bodies may access the maxillary sinus via an oroantral fistula. This can also occur through tooth extraction or root canal treatment (RCT) or because of surgical procedures in the maxillary sinus. While the current study found foreign bodies in the maxillary sinus at a rate of 0.3%, Lana *et al.* found this rate to be 1.6% [20].

#### *OAF*

Oroantral fistula is a common complication of dental surgery. Surgical treatment should be done so that normal sinus function can resume and inflamed sinus mucosa can heal. While Rege *et al.* found the incidence of the oroantral fistula rate to be 2.2%, Price *et al.* found it to be 2.7% in their study, and nine of these cases involved implant patients [24, 25]. The current study examined patients who underwent CBCT imaging for implant treatment and we found the oroantral fistula percentage as 0.3%. This result is quite lower than in the aforementioned research.

## **Conclusion**

This study reported a very high incidence of incidental findings on CBCT evaluation of maxillary sinus. Hence, radiologists should mandatorily evaluate the entire CBCT section and report the pathological as well as incidental findings, if any, so as to avoid complications during surgical procedures.

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