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Evaluation of Maxillary Sinus Pathologies – A Computed Tomographic Study

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Abstract

Aim: To evaluate maxillary sinus pathologies seen in computed tomography.

Material and Method: This is a cross-sectional radiographic study. Randomly selected 128 computed tomography (CT) scans has been collected of patients who are clinically & radiographically diagnosed with maxillary sinus pathologies. However 42 scans were excluded due to various reasons like presence of trauma, poor quality images etc and so 86 scans were assessed in all axial, coronal and sagittal planes.

Result: Maximum number of maxillary sinus pathologies was found to be in the age group of 46-60 years and affecting males more than females. The most common maxillary sinus pathology was reported to be mucormycosis (fungal sinusitis). Moreover the pathologies were found to be present more bilaterally.

Conclusion: Maxillary sinus pathologies may mimic orofacial pain, may remain undiagnosed & may be inadvertently treated. In the present era CT has become one of the choice of investigation for paranasal sinus diseases. So a sound knowledge of CT findings in maxillary sinus pathologies is essential for the proper diagnosis and early treatment planning for the same.

Keywords: Maxillary sinus, Maxillary sinus pathologies, Computed tomography

Introduction

The maxillary sinuses are the largest of all paranasal sinuses and are located bilaterally within the maxillary bone, assuming a pyramidal shape. The maxillary sinus disease is common and numerous disorders can affect this anatomical area[1]. Diseases of maxillary sinus ranges from inflammation to neoplasms, both benign and malignant are a major health problem [2,3]. The maxillary sinuses are of particular importance to the dentist because of their proximity to the teeth and their associated structures [4]. Moreover maxillary sinus impacts most on the work of the dentist as they will often be required to make a diagnosis in relation to orofacial pain that may be sinogenic in origin[5]. Consequently, abnormalities arising from within the maxillary sinuses can cause symptoms that may mimic diseases of odontogenic origin, and conversely, abnormalities that arise in and around the teeth may affect the sinuses or mimic the

symptoms of sinus disease [4]. Most of the times physical examination is nonspecific to rule out sinus pathologies. And thus radiological evaluation has been relied on as an aid in confirming the clinical diagnosis. In recent years due to technological advancement, Computed tomography (CT) has supplanted conventional radiography as the primary diagnostic modality and has also contributed in the change in therapeutic approach [2]. CT has become the investigation of choice for radiological diagnosis of nasal and sinus diseases as CT images clearly show air spaces, opacified sinuses and fine structural architecture of bony anatomy [6]. So a good knowledge of the variety of CT findings in maxillary sinus pathologies is important. Thus the aim of this study was to evaluate maxillary sinus pathologies seen in computed tomography.

Material & Method

This is a cross-sectional radiographic study. Data has been collected of patients with maxillary sinus pathologies who came to the department of Oral Medicine and Radiology with some orofacial complain during the period of October 2019 to December 2021. Randomly selected 128 CT scans were obtained with required demographic data. Siemens 128 slice multidetector helical CT machine was used. The scans were assessed in all axial, coronal and sagittal planes. All the radiographs in which there is presence of any pathology that encroaches or arising from the maxillary sinus were included. Whereas the exclusion criteria was patients whose demographic data was not available, non-established diagnosis, patients presenting with trauma to face and improper or poor quality images. Thus 42 scans were excluded and 86 scans were further evaluated. All patients information obtained were treated with high level of confidentiality.

The following radiographic criteria were used:

Mucositis: Mucosal thickening of >2mm, paralleling the bony wall of the sinus [4,7,8].

Chronic Sinusitis: Presence of air fluid level, mucosal thickening and sclerosis of sinus wall [9].

Mucormycosis (Fungal sinusitis): Presenting as hyperdense polypoidal mass with expansion, remodeling, erosion and thinning of bony walls of sinus [2,4].

Polyp: Seen as focal thickening of sinus mucosa >5 mm [10]. Also it usually occurs with a thickened mucous membrane lining.

Retention pseudocyst: Appearing as well-defined, noncorticated, smooth, dome-shaped mass arising from floor or lateral wall of sinus. The internal aspect is homogeneous and more radiopaque than the surrounding air of the sinus cavity [4].

Odontogenic cyst: Homogenous mass of odontogenic origin which is curved or oval shaped of >2cm in diameter with corticated border. It is radiopaque relative to the air filled sinus cavity [4,11].

Mucocele: Presenting as circular or hydraulic shape of sinus which is opacified along with expansion and thinning of the bony walls [4,10].

Osteomyelitis: Occurrence of moth eaten appearance of bone destruction, sequestra and periosteal new bone formation [12].

Fibrous dysplasia: Appearing as an ill-defined heterogenous lesion with abnormal trabeculae which usually are numerous, shorter, thinner and irregularly shaped. Extension into the sinuses appears as a parallel thickening of the outer cortical border, resulting in a residual antral air space that still has approximately the normal anatomic shape of an antrum.

Cherubism: Seen as well defined, bilateral enlargement of maxilla and mandible with fine granular bone and wispy trabeculae. Since its epicenter is in the posterior

aspect of the jaws, the teeth are displaced in an anterior direction[13].

Malignancy: The presence of an ill-defined lesion causing bony destruction and invasion into the soft tissue facial planes beyond the sinus walls is the hallmark of malignancy[4,10,14].

Hypoplasia: It was considered when the dimension of maxillary sinus was smaller than the average i.e., 3.5cm (anteroposteriorly)*3.2cm (height)*2.5cm (width)[15].

Results

Table 1 & Graph 1 shows distribution of patients with maxillary sinus pathology according to age and gender. Maximum number of patients were in age group of 46-60 years (32.55%) followed by 31-45 years (25.58%), 61 years and above (22.12%), 16-30 years (11.62%) and 0-15 years (8.13%) respectively. Maxillary sinus pathology was found to be more in males (72.09%) than females (27.91%)

Table 2 and Graph 2 shows distribution of patients with maxillary sinus pathology according to side of involvement in which maximum patients were having bilateral involvement (61.64%) followed by right (22.09%) and left (16.27%) side respectively.

After evaluation of 172 maxillary sinus (of 86 patients), 135 maxillary sinus showed pathology while 37 maxillary sinus were without any pathology.

Table 3 and Graph 3 shows involvement of number of maxillary sinus according to pathologies. Mucormycosis (Fungal sinusitis) was found to be highest (42.96%) followed by mucositis (22.96%), chronic sinusitis (14.81%), polyp (3.70%) and odontogenic cyst (3.70%), malignancy(2.99%), osteomyelitis (2.22%) and fibrous dysplasia (2.22%), cherubism (1.48%), retension pseudocyst (0.74%), mucocele (0.74%), hypoplasia (0.74%) and others (0.74%) respectively.

Table 1: Distribution of patients with maxillary sinus pathology according to age and gender

Age Groups	Gender		Pathology Present (%)
	Male	Female	Total
0-15 years	4	3	7 (8.13%)
16-30 years	8	2	10 (11.62%)
31-45 years	15	7	22 (25.58%)
46-60 years	21	7	28 (32.55%)
61years and above	14	5	19 (22.12%)
Total	62 (72.09%)	24 (27.91%)	86 (100%)

Graph 1: Distribution of patients with maxillary sinus pathology according to age and gender

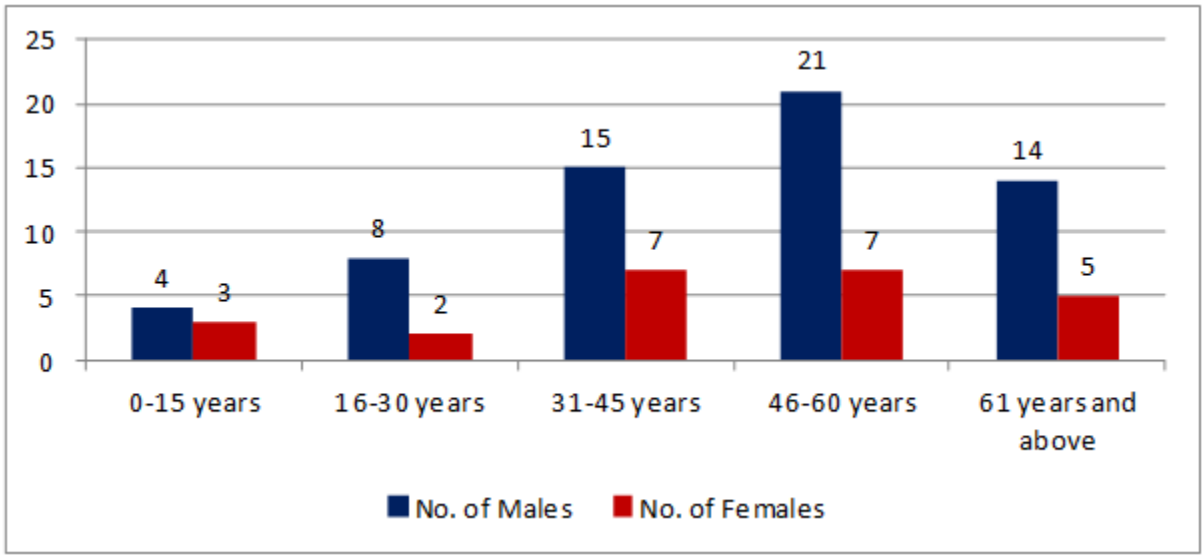


Table 2: Distribution of patients with maxillary sinus pathology according to side of involvement

Side	Pathology Present (%)
Left	14 (16.27%)
Right	19 (22.09%)
Bilateral	53 (61.64%)
Total	86 (100%)

Graph 2: Distribution of patients with maxillary sinus pathology according to side of involvement (%)

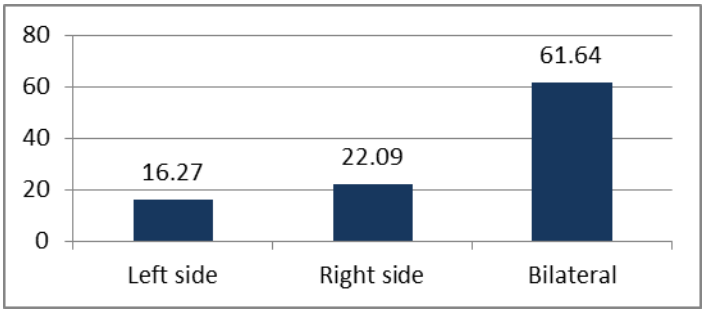
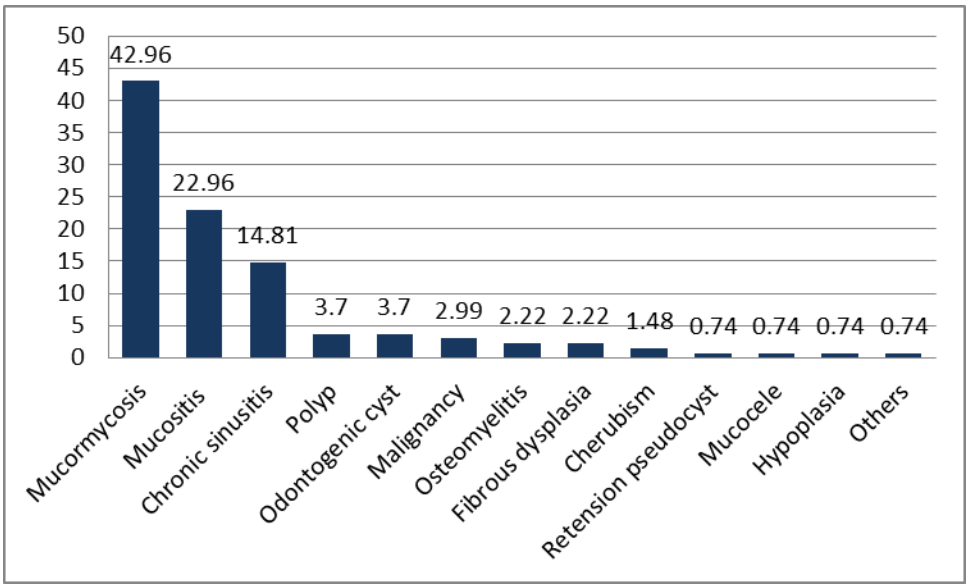


Table 3: Involvement of number of maxillary sinus according to pathologies

Pathology	No. of Maxillary Sinus (%)
Mucormycosis (Fungal sinusitis)	58 (42.96%)
Mucositis	31 (22.96%)
Chronic sinusitis	20 (14.81%)
Polyp	5 (3.70%)
Odontogenic cyst	5 (3.70%)
Malignancy	4 (2.99%)
Osteomyelitis	3 (2.22%)

Fibrous dysplasia	3 (2.22%)
Cherubism	2 (1.48%)
Retension pseudocyst	1 (0.74%)
Mucocele	1 (0.74%)
Hypoplasia	1 (0.74%)
Others	1 (0.74%)
Total	135 (100%)

Graph 3: Involvement of number of maxillary sinus according to pathologies (%)



Discussion

Maxillary sinus is at crossroads of dentistry and otorhinolaryngology as it occupies a strategic position connected directly to nasal cavity and related indirectly to the oral cavity and maxillary alveolus. Patients with maxillary sinus pathologies often visit dental clinic with some orofacial complains. It is therefore imperative that the maxillofacial radiologist has to be well versed with the pathologies of maxillary sinus[16]. Moreover Computerized tomography is considered as a gold standard for sinus diagnosis[17]. Thus the aim of this study was to evaluate maxillary sinus pathologies seen in computed tomography.

In present study, maximum number of patients with maxillary sinus pathologies was found to be in the age group of 46-60 years (Table 1). This is consistent with studies done by Sayans MP et al (2020)[18] and CC Ani et al (2016)[19]. However according to study done by Verma J. et al (2016)[3] higher incidence of maxillary sinus pathologies were among younger adults (16-30 years). Subjects between the ages of 0-15 years having the least percent of maxillary sinus pathologies which is consistent with the study done by Hussein AO et al (2014) and this could be due to the fact that in children their ostia are usually very wide and also their sinuses are not fully formed[20,21].

Maxillary sinus pathologies was found to be more in males than females (Table 1). This is in favour of studies done by Ogolodom MP et al (2018)[21], Drumond JPN et al (2016)[1] and Manjit B (2016)[2]. The increasing number of males being commonly prone to paranasal sinuses pathologies could be attributed to the fact that

males are more exposed to dusty and polluted environment especially due to the nature of their occupation such as carpentering and driving[21]. However according to study conducted by Hussein AO et al (2014)[20] higher incidence of paranasal sinus pathologies were found among females than males. Such high incidence among female could be attributed to the fact that; women exposure to dust and smoke from home cleaning and cooking more than men which result to allergic rhinitis which is one factor that causes sinusitis.

Maxillary sinus pathologies were predominantly found to be bilateral in present study (Table 2). This finding is in agreement with the studies done by Sakthivel et al (2021)[22], Graco et al (2012)[23] and Smith KD et al (2010)[24]. However according to study done by Ogolodom MP et al (2018)[21], right side had the highest percentage of involvement followed by the left side and the least was bilateral sides.

Moreover in present study, the most common maxillary sinus pathology was found to be fungal sinusitis (mucormycosis), followed by mucositis, chronic sinusitis, polyp, malignancy while the least was found to be hypotrophy, retension pseudocyst and mucocele (Table 3). This is in favour of studies done by Ogolodom MP et al (2018)[21] and Verma J et al (2016)[3] in which sinusitis had highest percentage of occurrence followed by polyp and malignancy. Sinusitis is often associated with allergic rhinitis, asthma, cystic fibrosis and dental infections [4]. The higher incidence of sinusitis could be attributed to the low socio-economic factors and overcrowding [12]. According to study done by Kanvar SS et al (2017)[25] chronic sinusitis was found to be highest followed by polyp, fungal sinusitis and least was malignancy. The maximum occurence of mucormycosis (fungal sinusitis) in this study could be attributed to the fact that during the time of present study there was POST COVID MUCOR outbreak in various states of India.

There are some limitations of the present study. Data regarding the occupation and habits of the subjects were not available which may be a cause for sinus changes in males and females. Differentiation amongst various fibro-osseous lesions and cysts could not be done as histological confirmation was not available.

Conclusion

Maxillary sinus pathologies may mimic orofacial pain, may remain undiagnosed & may be inadvertently treated. The present study highlights incidence of maxillary sinus pathologies in CT. As an oral physician sound knowledge of CT findings in maxillary sinus pathologies is essential for the proper diagnosis and early treatment planning for the same.

Figure 1: Shows Mucositis of right maxillary sinus as mucosal thickening of >2mm paralleling the bony wall of the sinus.

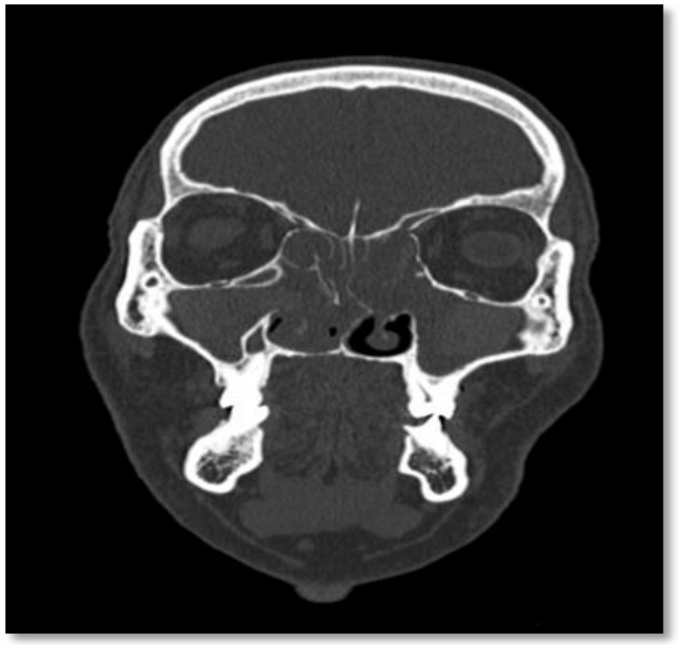


Figure 2: Shows Chronic sinusitis as complete radiopacification of maxillary and ethmoid sinus bilaterally.

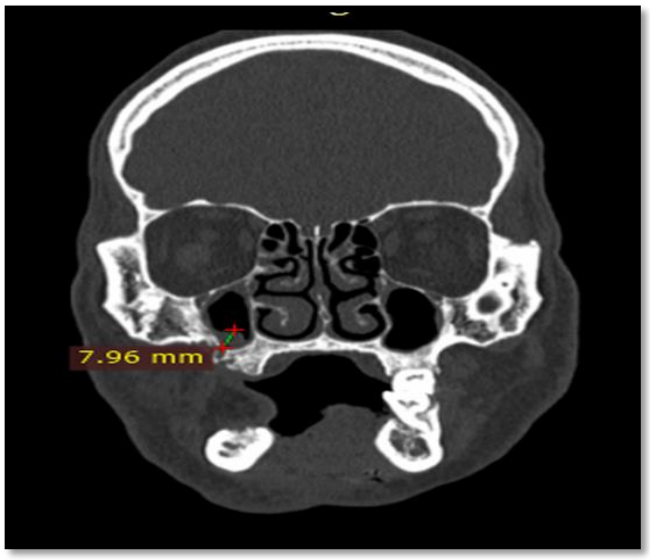


Figure 3: Shows Polyp in right maxillary sinus with focal thickening of sinus mucosa >5 mm. Adjacent mucosal thickening noted.

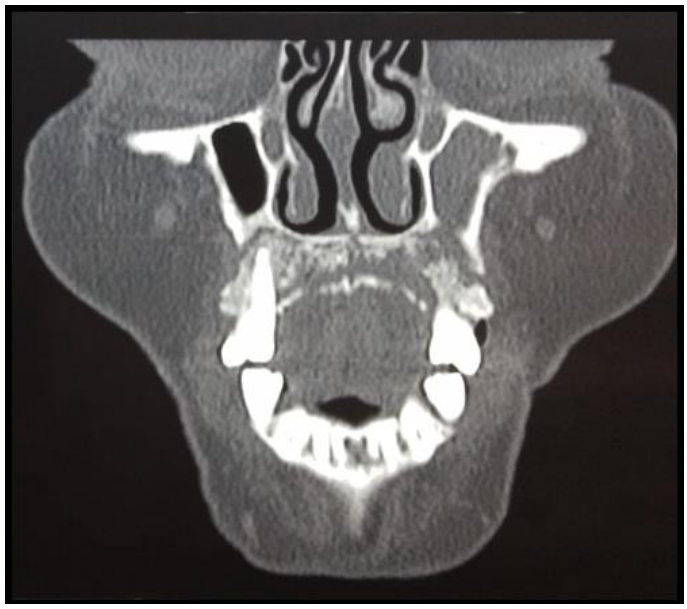


Figure 4: Shows Osteomyelitis involving maxillary alveolus and left maxillary sinus. Break in continuity of floor of left maxillary sinus noted.

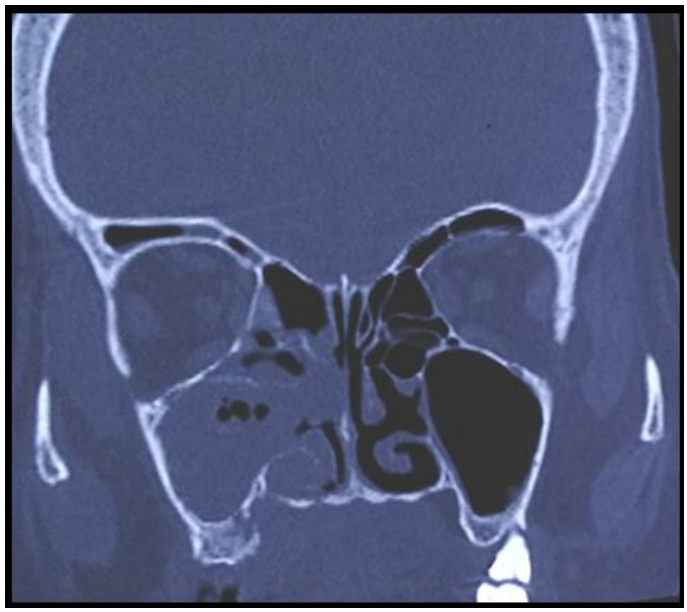


Figure 5: Shows Mucormycosis affecting right maxillary and ethmoid sinus. Thinning and erosion of walls of maxillary sinus present.

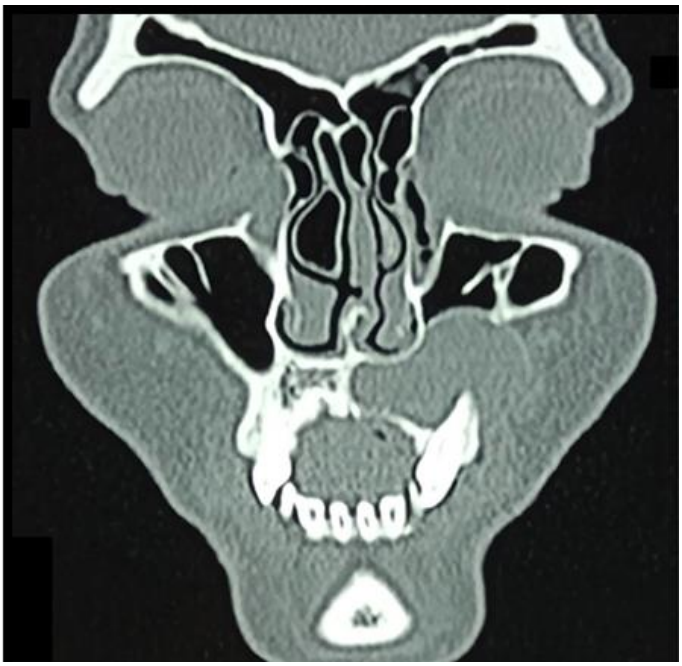


Figure 6: Shows Odontogenic cyst involving left maxillary sinus.

Figure 7: Shows Retention pseudocyst as dome shape hyperdense homogenous mass arising from floor of right maxillary sinus along with sinusitis of left maxillary sinus.

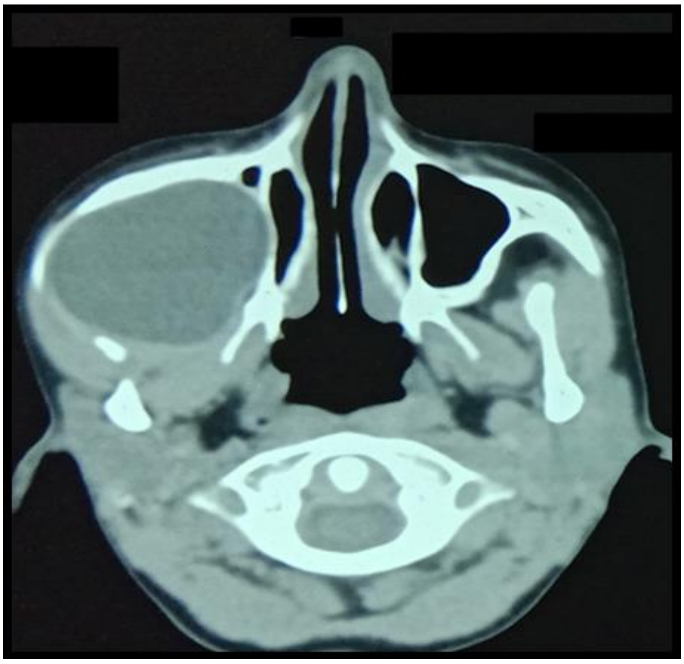


Figure 8: Shows Mucocele as hypodense lesion involving right maxillary sinus with well-defined peripheral enhancing thin wall. Expansion and erosion of walls is noted.

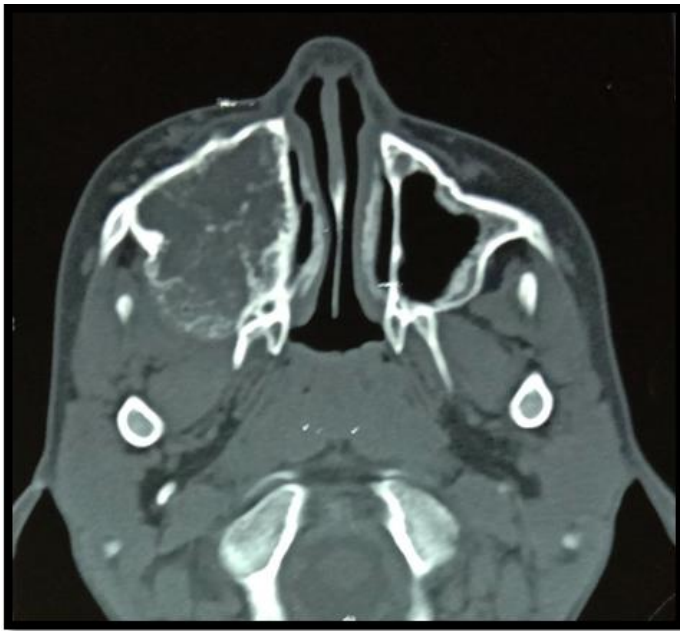


Figure 9: Shows Fibrous dysplasia as well defined hyperdense heterogenous expansile lesion involving right maxillary sinus.

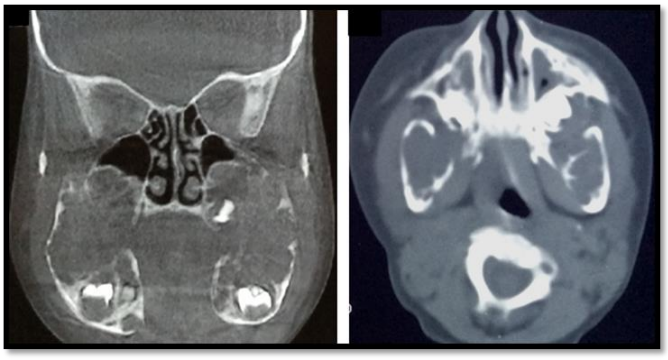


Figure 10: Shows Cherubism as hypodense expansile lesion present bilaterally in maxilla and mandible; also involving maxillary sinus bilaterally.

Figure 11: Shows Malignancy with large heterogeneous lesion causing destruction and expansion of walls of right maxillary sinus.

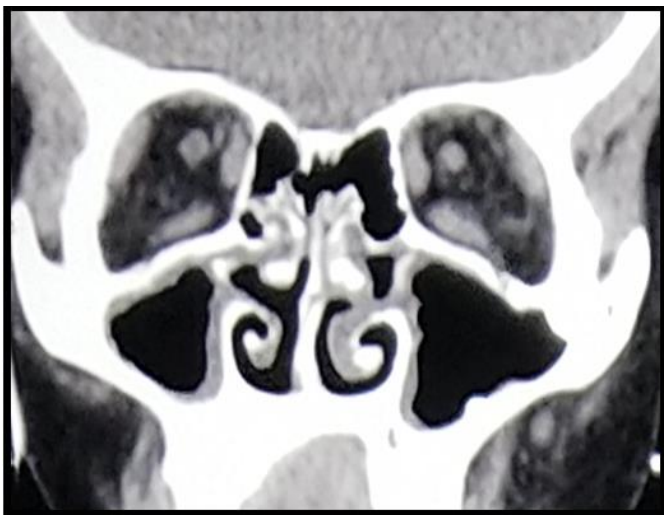


Figure 12: Shows Hypoplasia of right maxillary sinus

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