

# Is It A Misdiagnosis Or A Missed Diagnosis? - The Necessity Of Cbct Imaging In A Variety Of Clinical Scenarios

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## **ABSTRACT:**

Clinical decision-making using CBCT has become increasingly popular since it enhances the level of certainty for diagnosis and treatment. Traditional 2D imaging is not always accurate enough to diagnose and manage pathologic lesions. The Expertise and experience of the clinician may help decide the best radiographic technique when there is a doubt or abnormality. This paper presents a series of cases that demonstrate how CBCT allowed us to make a definitive diagnosis and plan treatment.

**Keywords:** CBCT; CT; 2D imaging; 3D imaging; Diagnosis

## **INTRODUCTION:**

The field of oral and maxillofacial Radiology has boomed over the past few decades as imaging techniques have advanced. The inadequacies of 2D imaging have enabled us to develop 3D cross-sectional imaging techniques that reshaped the concepts of diagnosis and treatment planning. A preoperative isotropic 3D radiographic assessment of oral and maxillofacial pathology can reduce the chance of intraoperative and postoperative complications.

Although new imaging technologies are being introduced into dentistry, conventional techniques such as periapical, panoramic, and occlusal radiographs remain the primary diagnostic and treatment planning tools. The 2D imaging techniques do have limitations, such as magnification, distortion, and superimposition.<sup>1</sup> CBCT (Cone Beam Computed Tomography) imaging provides a significant advantage over conventional 2D imaging due to the elimination

of superimposition of relevant areas with surrounding structures. A CBCT scan yields large volumes of data, which are stored, formatted, and aligned. It is possible to synthesize images for diagnostic purposes in a variety of ways based on the specific needs of the diagnostician.<sup>2,3</sup> In addition CBCT has been shown to be a more effective option than conventional CT( Computed Tomography) for diagnosing and treating oral and maxillofacial diseases. The CBCT scan enables clinicians to see maxillofacial features in three dimensions, reducing the need for CT scans. It has several advantages over conventional CTs, such as minimizing reliance on medical setup, low radiation, rapid scan time, customized display modes especially for maxillofacial imaging, capability to alter the viewing field, and reduced visual field distortion caused by metals in conventional CTs.<sup>4,5</sup>

The excellent spatial resolution of CBCT for bone and teeth allows for a precise and

reliable evaluation of the relationship between adjacent anatomic structures. Because CBCT imaging provides a volumetric data set that can be reformatted to present a digital image in any plane, it can aid in the early detection of a wide range of complex pathological conditions affecting the oral and maxillofacial region.<sup>6,7</sup>

This article aims to emphasize the value and need of CBCT imaging over traditional 2D imaging modalities through a series of clinical cases.

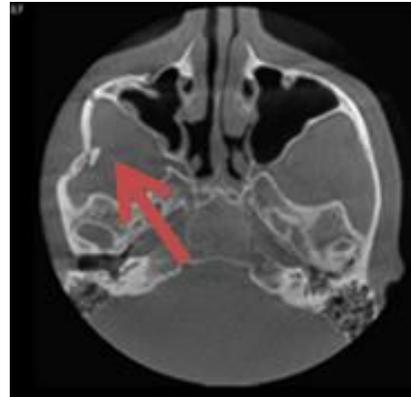
### **CASE: I**

A 40-year-old male patient with multiple facial abrasions and limited mouth opening presented to our department with an alleged history of RTA. It was evident on clinical examination that the right malar region of the face was flattened with tenderness, anterior open bite, and limited mandibular movements. An Orthopantomogram (OPG) was taken to confirm isolated right zygomatic arch fracture. But unfortunately, the OPG (Figure 1) doesn't reveal any radiographic evidence of a fracture.



**(FIGURE: 1)**

A CBCT scan was recommended for the patient and we were astonished to see so many findings after examining CBCT images, which were not apparent in the OPG. Axial CBCT image showed an isolated comminuted fracture of the right zygomatic arch with medially rotated and angulated fractured segments along with an associated fracture of the zygomatic process of the maxilla (Figure 2).



**(FIGURE: 2)**

The CBCT bone algorithm demonstrates fracture of the zygomatic process at the right side of the maxilla, relative to the normal side (Figure 3).



**(FIGURE: 3)**

The coronal CBCT image of the right maxillary sinus showed a comminuted fracture involving both the anterior and lateral walls with the displacement of the fractured segment inside the sinus cavity. An air-fluid level with mucosal thickening in the maxillary sinus suggests hemorrhage. The coronal view also revealed a fracture at the inferolateral wall of the right orbit (Figure 4).



**(FIGURE: 4)**

CBCT view of sagittal (Figure 5) and coronal (Figure 6) axes revealed an infected small periapical cystic lesion with a homogeneous radiopaque internal structure in contrast to the air-filled sinus cavity which encroaches into the left maxillary sinus and causes displacement of the floor of the sinus in relation to 27.

**(FIGURE: 5)****(FIGURE: 6)****CASE: 2**

A 30-year-old male patient presented to our department with pain and discomfort in the upper anterior region, which he claimed to have been caused by a self-fall two days prior. An IOPA (Figure 7) was recommended by a dentist to the patient prior to his visit to our department, and he presented it to us. There were no other findings on IOPA except for the widening of the periodontal ligament space. During clinical examination, we noted extrusion and mobility of upper central incisors.

**(FIGURE: 7)**

Our recommendation was to perform a CBCT scan to eliminate the possibility of alveolar fracture as a measure of removing any doubt.

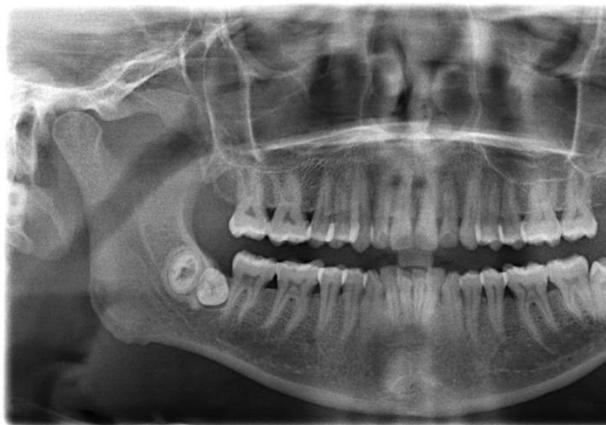


Fracture of both labial and lingual cortical plates through the teeth sockets in relation to 11 and 21 was apparent on CBCT images (Figures 8 and 9).

**(FIGURE: 8)**

**(FIGURE: 9)****CASE: 3**

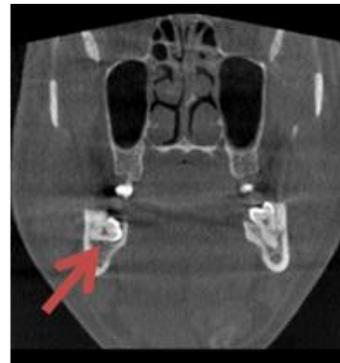
A young male patient presented with lower anterior pain and a recent self-fall two days before visiting our department. During clinical examination, there were no signs of fracture and to eliminate the possibility of fracture, an OPG was taken.

**(FIGURE: 10)**

The OPG (Figure 10) revealed the presence of an impacted third molar in the third quadrant and a dilated Odontoma distal to the unerupted impacted third molar in the fourth quadrant. There was no evidence of

**(FIGURE: 11)**

fracture in the OPG. A CBCT scan was advised for this patient in order to determine the exact position of Odontoma, impacted teeth and to confirm the absence of fracture. Horizontal



impaction (Figure 11) with buccolingually positioned tooth was evident in relation to 47. The presence and position of the dilated Odontoma was confirmed using CBCT.

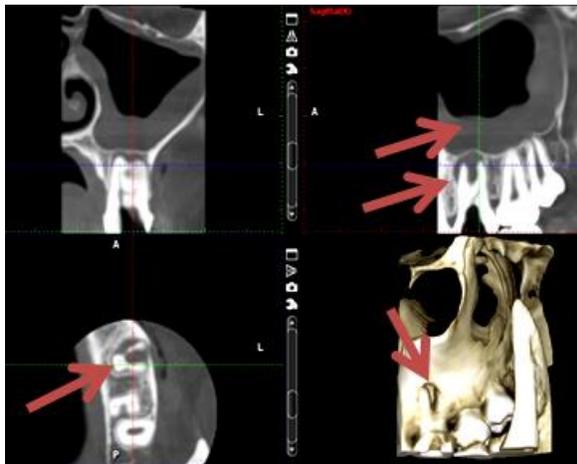
**(FIGURE: 12)**

Additionally a Mesiodens was also observed between central incisors on a CBCT view (Figure 12) of sagittal orientation, with 1/3 of its crown lying in the incisive foramen.

**CASE 4:****(FIGURE: 13)**

From viewing this intraoral periapical radiograph (Figure 13) we can give a radiographic diagnosis of Deep dental caries involving the pulpal space with a periapical ill-defined radiolucency suggestive of an abscess. Even after beginning root canal treatment and taking medication, the patient still felt constant pain, which prompted us to consider a CBCT for additional analysis to gain further insight. However, when CBCT was used to look at the three-dimensional perplex, we found the true nature of the same periapical lesion. In CBCT images (Figure 14), apart from Deep dental caries, we were able to appreciate the features of a Periapical cyst including the loss of buccal cortical plate and displacement of the left maxillary sinus floor warranting special attention to the clinician. Thus with the help of CBCT, a periapical abscess turned out to be a cyst.

**(FIGURE: 14)**



The left maxillary sinus also revealed generalized mucosal thickening (Figure 14) around the entire wall suggestive of sinusitis.

#### **CASE 5:**

In this case, the patient's chief complaint was pain in the upper front teeth region. Conventional radiographs were taken to rule out any pathosis. An intraoral periapical radiograph (Figure 15) showed a well-defined tooth-like structure between 11 and 21 just above the anterior nasal spine whereas an OPG (Figure 16) showed its

location at the periapical region of 21, 22, and 23. We had the following questions to clear up at this point.

1. What is the actual location of this tooth-like structure?
2. Is it a mesiodens?
3. Why it is causing pain?
4. Which medium is going to give us the right proof?

There was no doubt that it was CBCT (Figures 17,18,19) because of the multi-field of view and it clearly showed the actual location of a mesiodens between 11 and 21 with an associated

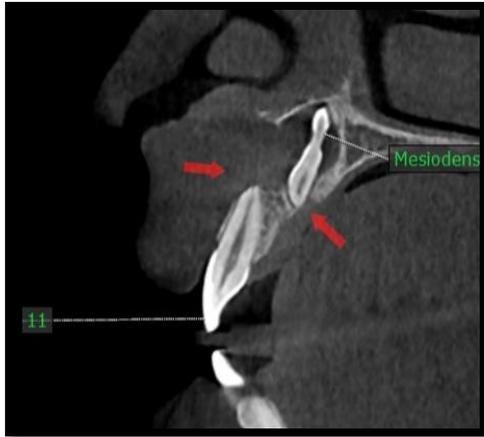


pathology that was responsible for causing the pain.

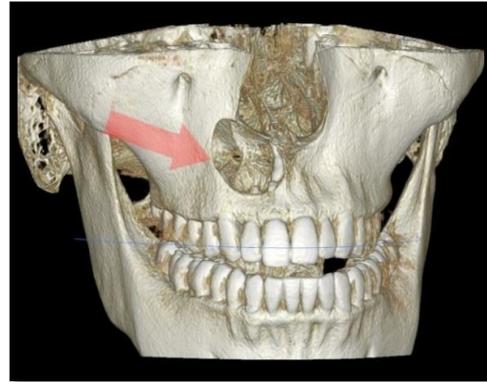
**(FIGURE: 15)**



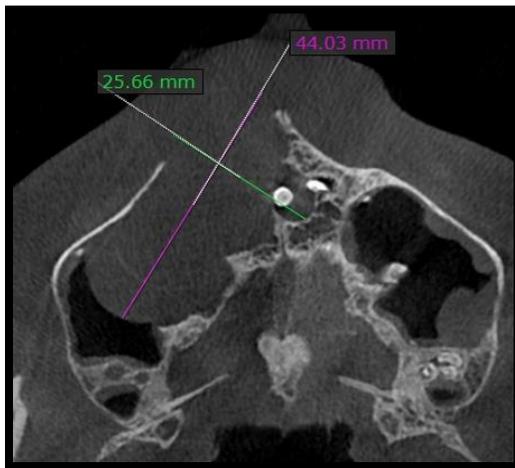
**(FIGURE: 16)**



(FIGURE:17)



(FIGURE: 19)



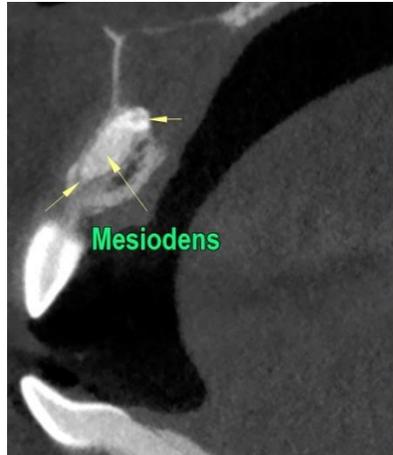
(FIGURE: 18)

**CASE 6:**

Another case of mesiodens also showed a diagnostic dilemma. Without 3D evaluation (Figure20), this case would have been diagnosed as a Radicular cyst. Following 3D evaluation (Figure 21) using CBCT, various sections and views revealed the presence of an impacted mesiodens and its associated pathology. Again it was proved that 3D visualization is a relatively reliable form of investigation giving proper treatment plan to the clinician.



(FIGURE: 20)



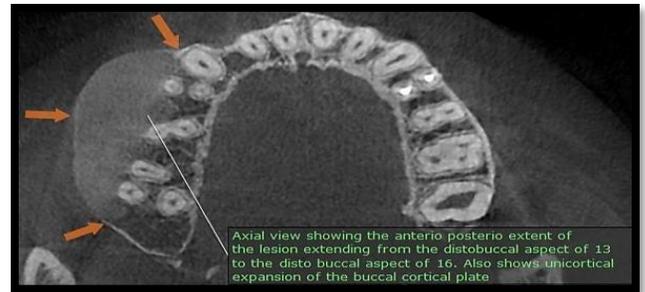
(FIGURE: 21)

**CASE 7:**

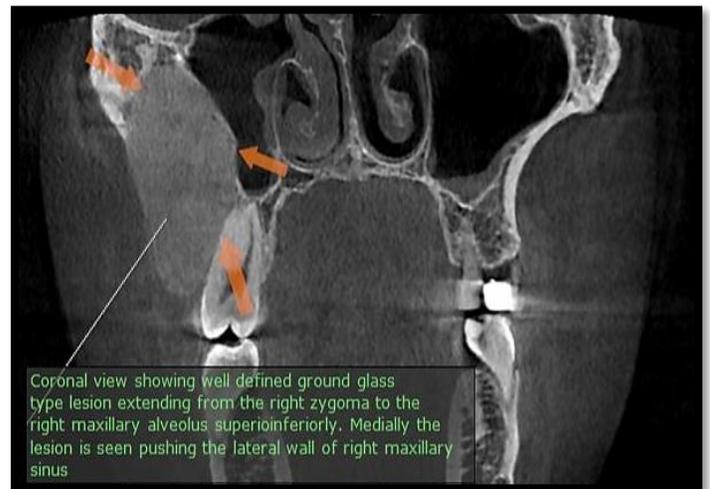
A young patient reported to our department with the chief complaint of gradually increasing swelling on the right side of face. After the patient's OPG (Figure 22) was concluded to be insignificant, CBCT was advised which revealed the hidden truth. In this case also CBCT (Figures 23, 24, 25 and 26) added valuable radiographic information regarding the antero-posterior extent of the lesion in relation to the significant anatomic structures and also showed the characteristic ground glass appearance of the lesion, thereby ensuring straightforward diagnosis of Fibrous dysplasia.



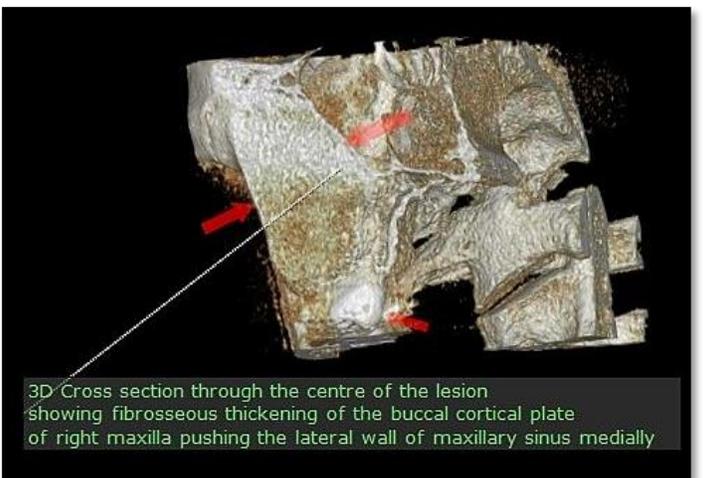
(FIGURE: 22)



(FIGURE: 23)



(FIGURE: 24)

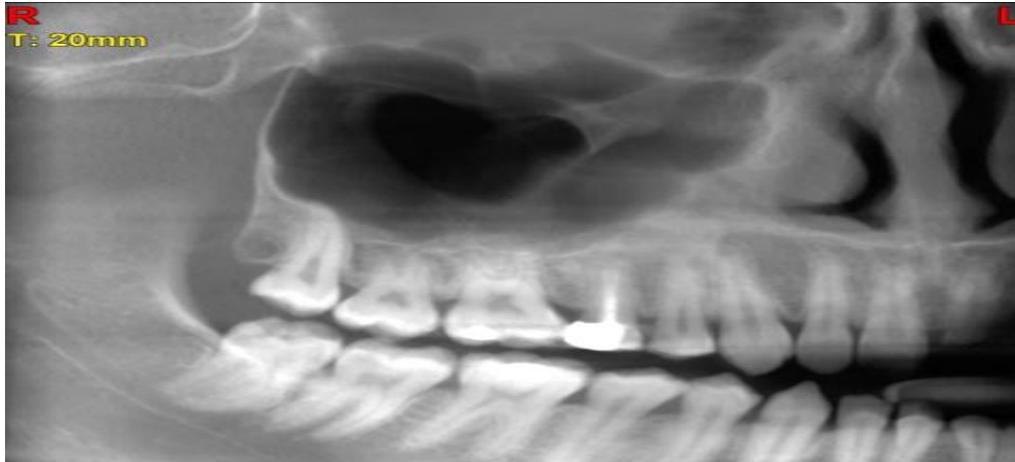


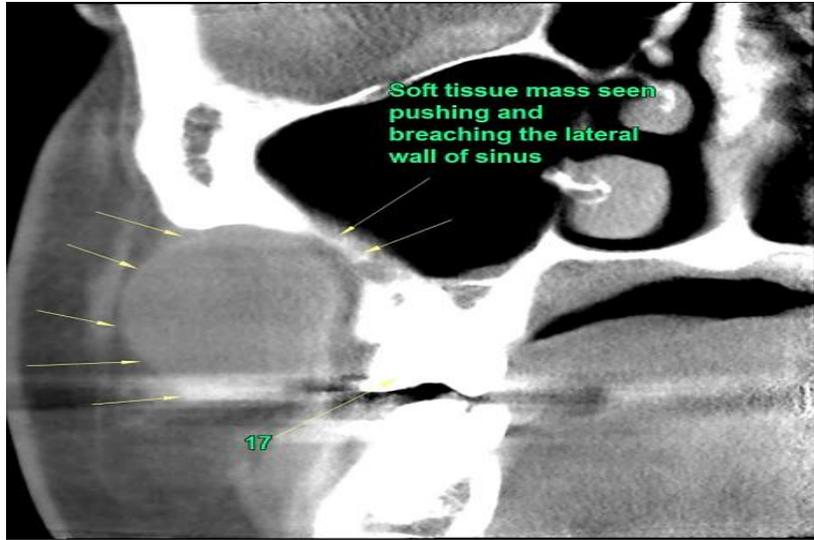
(FIGURE: 25)

**(FIGURE: 25)****(FIGURE: 26)****CASE 8:**

In this case, the patient has been experiencing a steady increase in swelling without pain since a week on the right side of the face. Similar to previous cases, in this one too 2D imaging

(Figure 27) was ineffective in assisting with diagnosis and treatment. But on 3D imaging (Figure 28 and 29), a benign soft tissue tumor was noted at the corresponding region of swelling which was pushing and breaching the lateral wall of the maxillary sinus. In this case as well, CBCT adds value to the diagnosis and treatment planning.

**(FIGURE: 27)****(FIGURE: 28)**

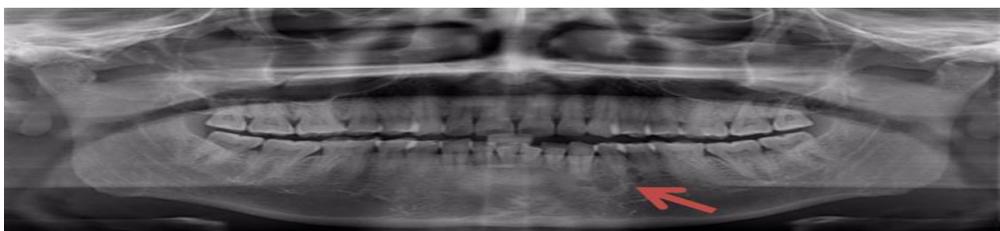


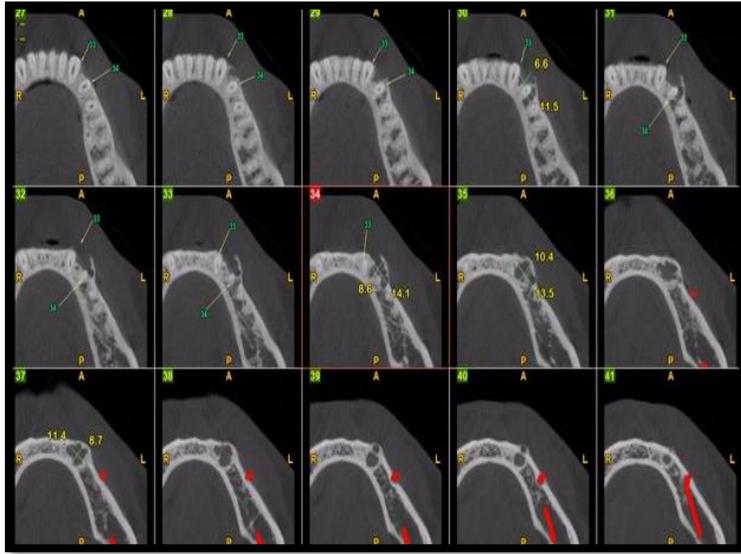
(FIGURE: 29)

**CASE: 9**

Conventional imaging cannot always detect the aggressiveness or stage of an “asymptomatic lesion”, which may be seen as unilocular or multilocular radiolucencies. To halt further progression of an aggressive lesion by prompt treatment, it is always ideal to choose CBCT as asymptomatic botryoid odontogenic cyst, which perforated the buccal cortical plate.

an investigatory tool that offers excellent diagnostic quality. The lesion was initially identified on OPG (Figure 30) as a multilocular radiolucency, but on CBCT (Figure 31), we could able to see the aggressive nature of an



**(FIGURE: 30)****(FIGURE: 31)****CONCLUSION:**

From all these case scenarios we can understand the importance of 3D CBCT images and the deceiving presentation of 2D conventional images which made us to give misdiagnosis as a result of missed diagnostic findings. Hence, it is always prudent to consider 3D evaluation during such clinical situations prior to any form of treatment in order to improve the clinician's diagnostic acumen, avoid unnecessary treatments, and patient's confidence.

CBCT imaging should be best used as a supplement to standard 2D imaging techniques for specific applications rather than as a replacement.

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Nil.

**CONFLICTS OF INTEREST :**

There are no conflicts of interest.

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