Diagnosis and Surgical Planning of Dentigerous Cyst Involving Impacted Mandibular Third Molar: A CBCT perspective

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Abstract

In any bony pathology detected on routine radiograph, diagnosis and surgical planning is of utmost importance. However, the routine two dimensional panoramic imaging technique may not provide sufficient details regarding the extent, density, angulation, nature of borders and effect on adjacent structures making the technique inadequate for diagnosis and surgical planning. The advent of Cone Beam Computed Tomography (CBCT) into the field, has highly contributed to the ability of stomatognathic and maxillofacial imageology experts in the analysis, diagnosis and surgical planning of various types of bony pathology. This article provides an insight into the accurate analysis and surgical planning methods using various measurements and angulations obtained by CBCT technique in a case of Dentigerous cyst involving impacted mandibular third molar.

Key Words: Cone Beam Computed Tomography, Dentigerous Cyst, impacted tooth, surgical planning

INTRODUCTION

With the boon obtained by the introduction of Cone Beam Computed Tomography (CBCT) into the field, the practice of Oral and Maxillofacial Radiology has changed entirely.[1] The ability of CBCT to provide high quality 3 dimensional images makes it possible to demonstrate the exact location, extent, bone density assessment and anatomical relationships of cysts and tumors involving jaw region which further aids in the accurate diagnosis and treatment plan.[1,2] In addition, CBCT detector has the capability in recording more than 12 bit of gray scale difference, which in turn provides 212 or 4096 shades to display contrast.[2] Study by Nasim; 2018 concluded that CBCT gray scale value is superior to conventional radiographic methods in the diagnosis of lytic lesions and in turn a valuable tool in diagnosing Cysts, Tumors and other soft and hard tissue lesions.[2] This article reports a case of Dentigerous Cyst involving impacted right mandibular third molar, in which diagnosis and surgical planning have been performed using CBCT.

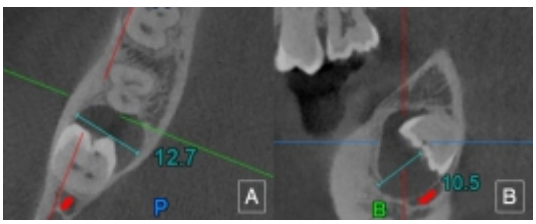

Fig. 1 A]axial section showing buccolingual measurement B]sagittal section showing anteroposterior measurement

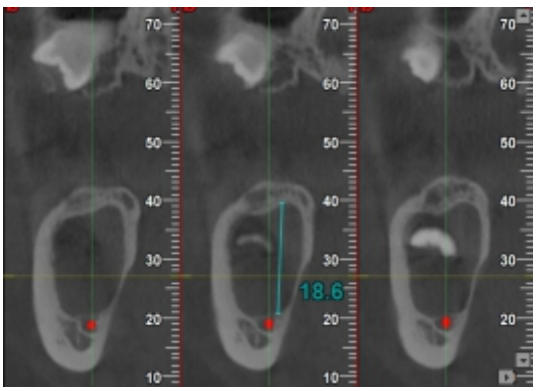

Fig. 2 Coronal sections showing supero-inferior measurement

Case Report:

A 36 year old male patient was referred to Oral Medicine and Radiology department by a general dental surgeon for evaluation of impacted right mandibular third molar. The patient provided a history of altered sensation since 6 months in the region and in conventional intraoral radiograph an impacted tooth with enlarged follicular space was detected, by the general dental surgeon. CBCT image in relation to the region was obtained using Newtomgiano machine with a Field of View of 8 × 8 and slice thickness of 0.15 mm. Axial section showed well defined uniloculare adiolucency with well-defined regular sclerotic borders of size 12.7mm (Bucco-Lingually), 10.5mm (anter-posteriorly) and 18.6mm (supero-inferiorly), at its maximum dimensions, extending from Cemento-Enamel Junction (CEJ) of impacted right mandibular third molar.(Fig 1 and 2) Radiolucency was approximating distal aspect of second

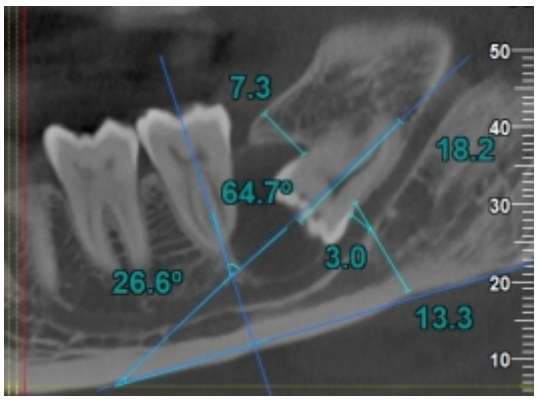

Fig. 3 Sagittal section showing various angulations and measurements

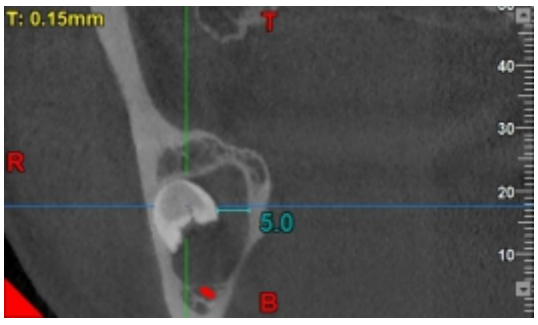

Fig. 4 Coronal section showing buccolingual relation ship of crown surface of impacted tooth

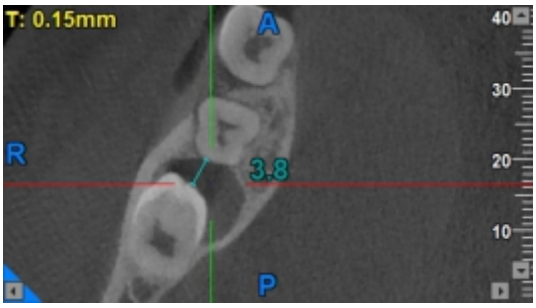

Fig. 5 Axial section showing lesion approximation to distal surface of second molar

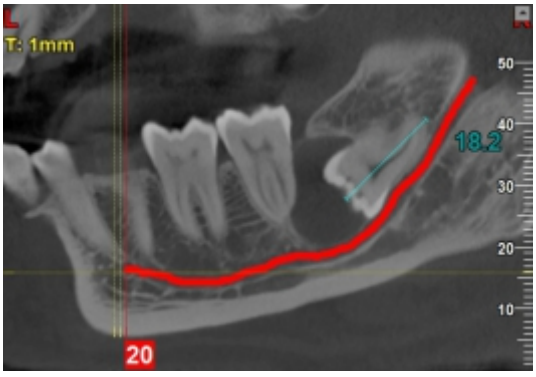

Fig. 6 Mutiplanar image after nerve tracing showing approximation of tooth to mandibular nerve

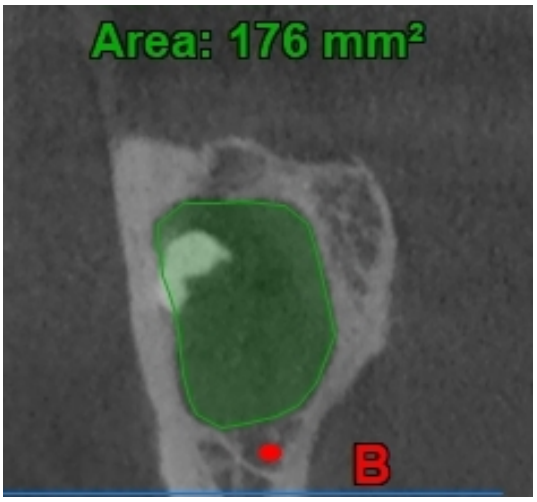

Fig. 7 Coronal section showing area of the lesion

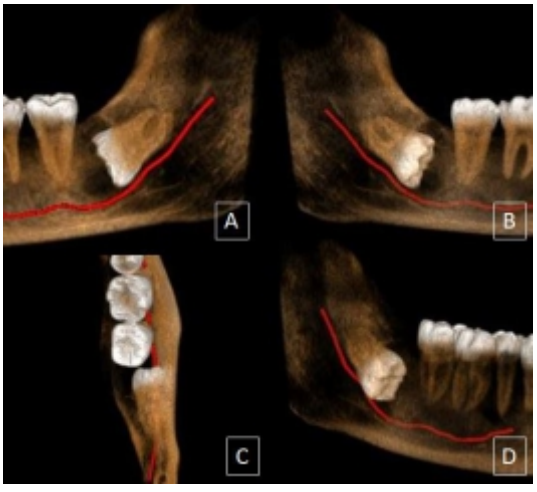

Fig. 8 Three Dimesnional reformatted images from various aspects A] Lingual B] Buccal C] Occlusal D] Bucco-Anteriora

molar anteriorly and superior border of mandibular canal inferiorly. Occlusal aspect of impacted tooth was directed in an anteroinferior direction with the root apex directed superoinferiorly. The angulation between long axis of tooth and the inferior border of mandible was measured to be 26.60. The angulation between long axis of second molar and impacted third molar was 64.70. The distance between alveolar crestal region and the cervical region of tooth was found to be 7.3mm. Distance between inferior border of mandible and cervical portion of tooth was 13.3mm. The total length of tooth was 18.2mm. The entire mesial aspect of the tooth was approximating superior border of mandibular canal. The maximum width of mandibular canal was measured to be 3mm.(Fig 3) The crown portion of impacted tooth was tilted towards buccal cortical plate closely approximating the same. Distance from crown surface to lingual cortical plate was 5.0mm.(Fig 4) The distance between occlusal surface of impacted tooth to the distal aspect of second molar was 3.8mm.(Fig 5)Mandibular nerve tracing was performed which confirmed the approximation of impacted tooth to mandibular canal.(Fig 6)The approximate Hounsefield Unit (HU) value denoting density within the cavity was ranging between -100 to +10, which suggested the possibility of fluid content within the lesion. Average area of the lesion, at its

greatest dimension, in coronal section was 176mm[2]. (Fig 7) Later based on these different sections, 3D reformatted images were also obtained.(Fig 8)

Discussion: Dentigerous Cyst (DC) or Follicular Cyst (FC)is considered as the second most common type cystic lesion affecting jaws after radicular cyst, even though asymptomatic and remain dormant, may enlarge and cause cortical bone destruction, exudation and pain.[3,4,5] A 10 year retrospective study by Kambalimath; 2014, reported DC prevalence of 17.33% in Indian population.[6] Potential complications expected in long standing cases of DC's are transformation to ameloblastoma, mucoepidermoid carcinoma and squamous cell carcinoma.[7] Complications such as injury to inferior alveolar nerve may occur during surgical removal of the impacted tooth.[7] Radiographic evaluation is essential for assessment of the extent, nature and anatomic relationships of these lesions.[7] Although conventional radiographs may be useful in establishing a provisional diagnosis, CBCT evaluation is of utmost importance in the management of these lesions.[5]

While considering the two dimensional representation of three dimensional anatomical regions by conventional periapical and panoramic radiographic images in dentistry, the information acquired for diagnosis and treatment planning is limited.[3] CBCT, in the last few decades, has offered clinicians the three dimensional images of maxillofacial structures with minimum distortion and lower radiation doses than conventional imaging.[3] Accuracy of radiographic diagnosis based merely on two dimensional imaging was also less, necessitating microscopic tissue evaluation.[2] CBCT also produces images with 40% lesser radiation dose when compared to Computed Tomography(CT).[3] But, when compared to conventional panoramic radiography, the radiation dose of CBCT is higher by 3 to 7 times.[3] However, when considering device, Field of View(FOV) and selected technique factors, the CBCT dose may vary.[3] In addition to the image of pathology of interest, with CBCT images, clinician can obtain accurate information regarding bone resorption, sclerosis of adjacent bone, cortical expansion, calcifications and proximity of the lesion to adjacent structures in axial, coronal and sagittal plane.[3] In this case, we were able to obtain the accurate measurements in all sections. In addition to linear measurements, angulation of the long axis of impacted tooth in relation to inferior border of mandible and also to long axis of second molar were obtained which will help immensely in surgical planning. In addition we were able to obtain three dimensional images which also helped in patient education. Even though gray scale values denoting density may be obtained in CBCT, these can be only considered as approximate values, thus cannot be denoted as HU, as in CT scan images.[2] In the present case approximate HU value based on CBCT software was between -100 and +10 which cannot be completely relied on to assess the nature of pathology. Clinicians should be also well informed that, CBCT even though provides accurate images for hard tissue analysis, is not indicated for soft tissue analysis.[3]

Conclusion: Oral and maxillofacial radiography is still considered as the first step of diagnosis in any type of jaw lesions.[1] The three dimensional approach which entered into the field of dentistry by the introduction of CBCT has contributed immensely by making the complex craniomaxillofacial region more accessible for imaging which further assisted the stomatognathic and maxillofacial imageology specialists for an early and precise diagnosis of all types of bony pathologies.[1] Even though analysis of density by the use of CBCT still remain controversial, various three dimensional measurements and angulations obtained by the use of CBCT, as demonstrated in the present case, has undoubtedly contributed much to the diagnosis, precise surgical planning and thereby prognosis of the same.

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