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VOLUMETRIC APPROACH USING CBCT IN LOCALIZATION OF MULTIPLE IMPACTED TEETH - A CASE REPOST

Dental Science

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ABSTRACT

Since decades, 2D imaging modalities such as cephalometrics, panoramic, periapical radiography have been a standard of care for diagnosing and treatment planning in Dentistry. CBCT, compared to the conventional radiography, has a greater potential to provide complementary information because of its 3D images, reducing the amount of bone loss and failures in surgical procedures. CBCT is acclaimed for its accuracy and diverse clinical utility. CBCT imaging yields accurate 3D pictures of supernumerary teeth, local dental and bony structures, which is helpful for diagnosis and orientation of supernumerary teeth. The position of the supernumerary teeth is varied in the maxilla and often causes permanent dentition complications. CBCT is crucial for exact localization, for treatment planning, and for the surgical approach in cases of multiple supernumerary teeth. The purpose of this is to highlight the significance of CBCT in diagnosis and treatment planning in the surgical removal of multiple impacted teeth.

KEYWORDS

Cone beam computed tomography (CBCT), multiple impacted teeth, supernumerary teeth, three-dimensional (3D) imaging.

INTRODUCTION

It becomes difficult to make a diagnosis based on the clinical examination alone. Various diagnostic aids such as imaging play an essential role in diagnosis in dental practice. Among the various techniques, periapical radiography has been a benchmark resource in dental imaging.[1] This scenario has changed by introducing panoramic radiography, which is the two dimensional (2D) projection of three dimensional (3D) structures, which can lead to magnification, distortion and superimposition of structures. This led to 3D projections technology. Cone Beam Computed Tomography (CBCT) is a recent technology, which allows the 3D assessment of hard tissues of the maxillofacial region.[2] CBCT is used to make an accurate diagnosis and treatment strategies that would result in less invasive surgical intervention.[3] The purpose of this article is to discuss the role of CBCT in determining the morphological characteristics and the accurate position of the impacted supernumerary teeth.

Basics of CBCT imaging-

Imaging is accomplished by using a rotating gantry to which an x-ray source and detector are fixed. A cone-shaped source of ionizing radiation is directed through the middle of the area of interest with an x-ray detector on the opposite side. During the rotation, multiple (150 - 600) sequential planar projection images (basis image) of the field of view (FOV) are acquired in a complete or sometimes partial arc. [4] Once the rotation is complete and all basis images are made, the complete set of basis images forms "projection data." Image reconstruction software programs, manage the projection data and construct a 3D volumetric data set depending on the capability of the software used. [5]

Interpretation of CBCT images-

Competency in the interpretation of both anatomic and pathologic findings on CBCT images depends on practitioner experience and the FOV of a scan. The General imaging findings should include missing teeth, restorative status, root canal filled teeth, periapical lesions, the general status of alveolar bone and edentulous regions. Specific findings should use precise anatomic, pathologic and radiologic terminology to accurately describe the region of interest. Either a definitive or a differential diagnosis should be provided. Finally, recommendations for follow-up or additional diagnostic or clinical studies should be suggested, as appropriate, to clarify, confirm or exclude the diagnosis.[6]

Advantages are shorter examination time, reduction of image unsharpness, reduced image distortion and increased x-ray tube efficiency. Disadvantages are limited image quality related to noise and contrast resolution due to a large amount of scattered radiation.[4]

CASE REPORT-

A 12-year-old male patient reported with a chief complaint of spacing in the upper front tooth region. Extraoral examination revealed that he had a mesocephalic head, mesoprosopic facial form, convex facial profile, competent Lips. On intraoral examination, a missing left maxillary central incisor (21) and an ectopically erupting canine was noted with a normal overjet, overbite. The intraoral periapical radiograph and maxillary occlusal radiograph showed an impacted 21 and a supernumerary tooth. To confirm the 3D position of the canine, the patient was advised for a CBCT.

CBCT confirmed that the 21 at a position below the nasal floor associated with two impacted supernumerary teeth. A 3D reconstruction [Figure 1] confirmed the 3D position of 21. On frontal view, 21 appeared to be tilted mesiodistally with the crown more mesially placed than the root. Supernumerary teeth were found to be more palatal to the 21. On the lateral view, the crown appeared to be tilted buccopalatally with crown portion more buccally placed than the root portion. It was in close approximation to the palatal floor. As seen in the axial view, the total buccopalatal distance of the alveolar ridge was 13mm. 21 was located at a distance of 1.2 mm from the palatal cortical plate and 5.9 mm from the buccal cortical plate, supernumerary teeth in the 11and 22 regions were located at a distance of 2.1, 2.3 mm from the palatal cortical plate and 4.3, 4.6 mm from the buccal cortical plate, respectively. [Figure 2]. In the coronal view, it was confirmed that the impacted 21 extended from the apical third of 22 region and the nasal floor of the 23 region (distoangular impaction) with a depth of 14.9 mm from the nasal floor and 6.3 mm from the alveolar crest.[Figure 3] Supernumerary teeth in the 11and 22 region had a depth of 13.1, 13.2 mm from the nasal floor and 2.9, 1.7 mm from the alveolar crest, respectively.

FIGURE 1- 3D reconstruction

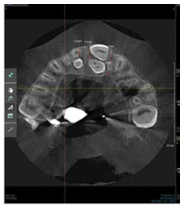

Figure 2 - Axial view

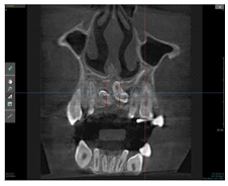

Figure 3 - Coronal view showing the depth of the impacted teeth

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With the above CBCT findings, we planned a surgical removal of multiple impacted supernumerary teeth by a palatal approach with minimal bone removal under local anesthesia and forced eruption of 21. Thus they were surgically removed as planned and sutured with 3-0 black silk.(Figure 4)

Figure 4- a) Impacted supernumerary teeth after guttering of bone, b) After surgical removal, c) After suturing.

DISCUSSION-

CBCT has been increasingly employed as a complementary method for diagnosis of maxillofacial pathologies and temporomandibular disorders as well as for placement of implants, orthognathic/ craniofacial surgeries, orthodontic planning determine the follicle size, estimate space conditions and to locate the precise position of impacted and supernumerary teeth adjacent to significant anatomical structures such as vessels, nerves, adjacent teeth roots, and paranasal sinuses. [3,7] The anatomical shape and position of the impacted supernumerary teeth should be recognized before the procedure in order to predict and overcome possible complications.[8] It also allows 3D reconstruction in different planes beside eliminating image superimposition. Furthermore, CBCT images are useful for determining the proximity of impacted tooth to the roots of adjacent teeth, as well as the degree of resorption, avoiding damages to the essential anatomical structures during surgical approach. [9]

Based on some case reports, we can understand that CBCT allows identifying different treatment strategies and surgical approaches for the removal of the impacted supernumerary teeth. *Manoj et al.,* after CBCT examination, underwent the surgical removal of multiple impacted supernumerary teeth by crevicular approach (buccally and palatally) with minimal bone removal under local anesthesia.[10]

In the case series done by *Sarabjeet Singh Sandhu et al.,* CBCT confirmed that the maxillary left canine was inverted and impacted. In the axial and coronal view, the inverted canine appears to be 0.56 mm away from the maxillary sinus and 0.76 mm away from the nasal cavity. Hence a palatal approach was done for the surgical extraction of impacted inverted canine. In another case, mesiodens was present in relation to apical one-third of the radicular portion of 21, on the palatal side causing thinning of the palatal cortical plate, 4 mm away from the nasal cavity. It was surgically extracted through a palatal approach.[11]

David Ditto S et al., planned for the surgical removal of two tuberculate supernumerary teeth and one conical supernumerary tooth.However, during the surgical procedure, only two tuberculate supernumerary teeth could be removed whereas the conical ST was left behind as it was found to be deeply impacted.[12]

Fabiano Jeremias et al., surgically removed three abnormal supernumerary teeth two from lingual and one from buccal.[3]

In the case report of *Nematolahi et al.,* CBCT revealed a closely-situated hard calcified tissue mass separate from the unerupted tooth, with exact dimensional details. In the sagittal plane, the mass was seen to be covered only by soft tissue, and the healthy impacted incisor crown with normal anatomy could be observed. A trap door window approach on the palatal side was done and forced eruption of the unerupted teeth was considered as a treatment plan.[9]

Ahmed Fathi AL-Omar et al., a palatal approach was used to access and extract the supernumerary teeth.[8]

CONCLUSION

In dentistry, the application of CBCT technique can be helpful in detecting the exact location of supernumerary and impacted teeth, in appropriate treatment planning and consequently in the clinical success. The surgeries guided by CBCT were completely safe, avoiding damage to the noble structures and with minimal bone guttering. Thus, providing a better recovery of the patients. Therefore, a reliable assessment of the 3D position, improved localization and surgical-orthodontic management of impacted teeth can be done using CBCT.

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