

# Role of CBCT in diagnosis and treatment plan of Impacted teeth: A Case Report

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## ABSTRACT

In recent years Cone Beam Computed Tomography (CBCT) has become a widely accepted radiographic tool for diagnosis, treatment planning and follow-up in dentistry. 3D imaging has improved diagnostic efficiency and the practice of dentistry in a variety of ways; from routine evaluation to complex analysis of unusual pathology and congenital deformities. The technology available today makes dentistry better, easier, and more accurate. The most recognized need for CBCT imaging in orthodontics is that of the impacted canine evaluation.

This article reports a patient having impacted right maxillary lateral incisor and canine; which is evaluated by 3D CBCT and was found beneficial particularly in terms of anatomical detail of root resorption and labiolingual relationships of the impacted tooth with the roots of neighboring teeth. Linear and angular measurements on CBCT images were accurate and helped in determining the exact location of the impacted teeth making it convenient for the surgical exposure of impacted teeth.

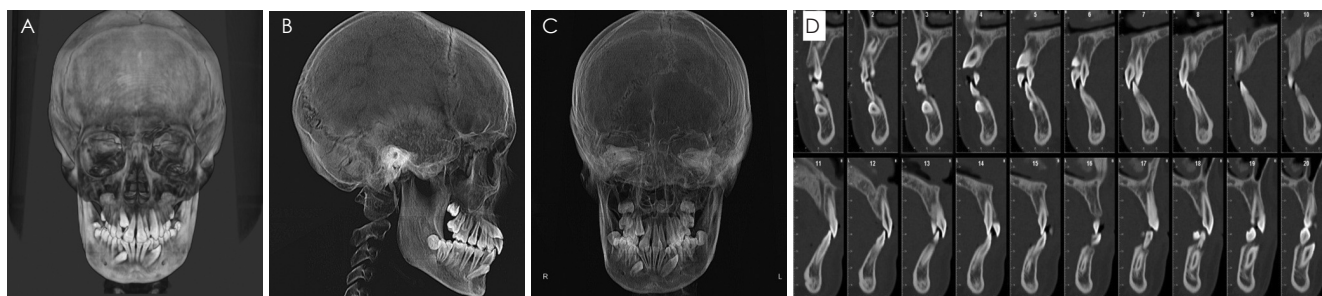
**Key words:** CBCT, Impacted canine, Orthodontics

## INTRODUCTION

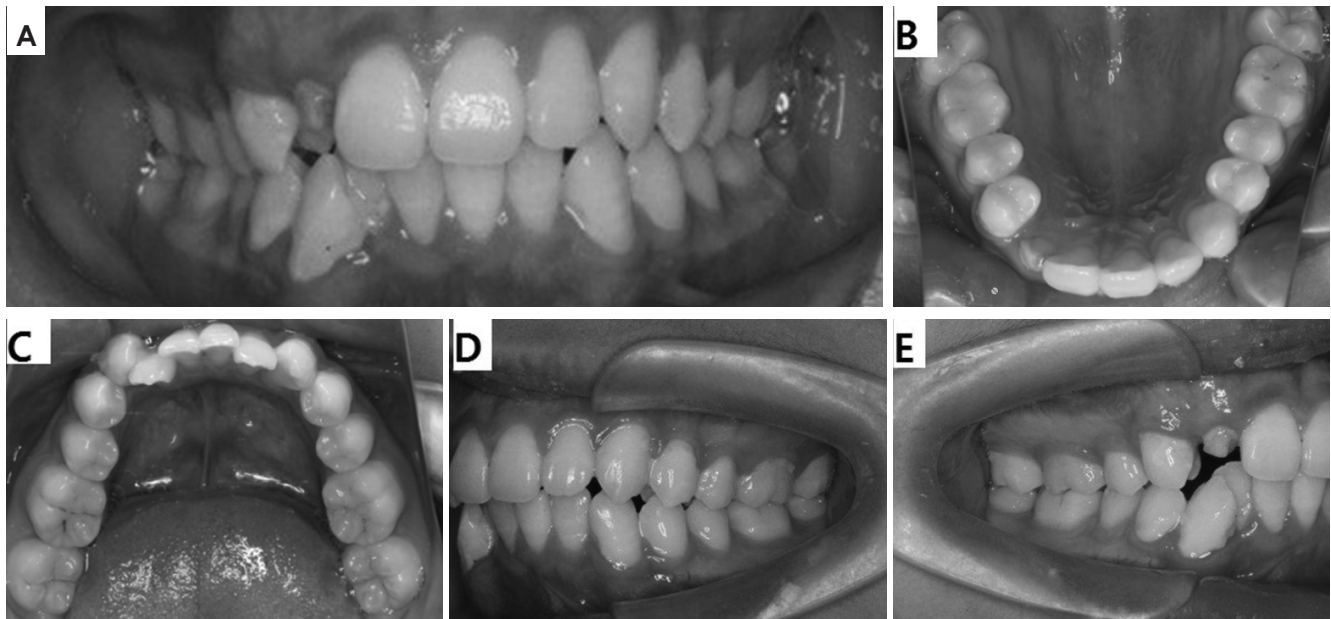
Maxillary canines are the second most frequently impacted teeth after the third molar, with the prevalence of 1-3%.<sup>1-5</sup> Mismanagement, failure to diagnose or untreated impacted canines can lead to external resorption of adjacent teeth, especially the lateral incisors, aesthetic problems, malalignment of neighboring teeth, shortened dental arches, and an increase in the occurrence of follicular cyst formation and recurrent infections resulting in irreversible damage that may eventually cause tooth loss.<sup>6-9</sup>

A CBCT scan with a single revolution of the radiation source is sufficient to scan the entire maxillofacial region (Sukovic *et al*, 2001).<sup>10</sup> CBCT technology is based on the use of a cone-shaped X-ray beam that is directed through the patient and the remnant beam is captured on a flat

two-dimensional (2D) detector (Scarfe *et al*, 2006).<sup>11</sup> The X-ray source and detector are able to revolve about a patient's head, and a sequence of two-dimensional (2D) images is generated. These 2D images are then converted into a three-dimensional (3D) image using computer software. When comparing conventional radiography and CBCT. Katheria *et al* found that CBCT provides more information regarding the location of pathology, the presence of root resorption, and treatment planning.<sup>12</sup> The rapid development of CBCT scanning combined with 3D rendering techniques produce high resolution images that have been proven to be useful for the diagnosis of impacted canines, treatment planning, and the identification of associated complications, such as root resorption, in adjacent incisors.<sup>13</sup> CBCT overcomes the limitations of conventional 2D imaging, such as image enlargement and distortions, structure overlap, limited identifiable landmarks, and positioning problems.<sup>13-15</sup>



**Figure 1:** 3D CBCT images showing the impacted 13, 33 and 43. A. Frontal view of skull. B. Lateral view of skull. C. Postero Anterior (P.A) view of skull. D. Sagittal slices that were used to identify the exact location of impacted canine and the amount of root resorption on the adjacent tooth (13-upper right permanent canine, 33- Lower left permanent canine, 43-lower right permanent canine)



**Figure 2: Showing intraoral findings. (A. Frontal view. B. Upper arch. C. lower arch. D. Left lateral view and E. Right lateral view)**

An example of impacted canine is shown in Figure 1. In this case, three canines are impacted, one on upper right side and two on each sides of the mandibular arch. The 3D data helps to determine the exact location and the amount of root resorption present. Obtaining exact location of the impacted teeth not only help the surgeon during surgical procedure but also help the orthodontist to apply the correct force vector to move the impacted canine without causing damage to the adjacent teeth.

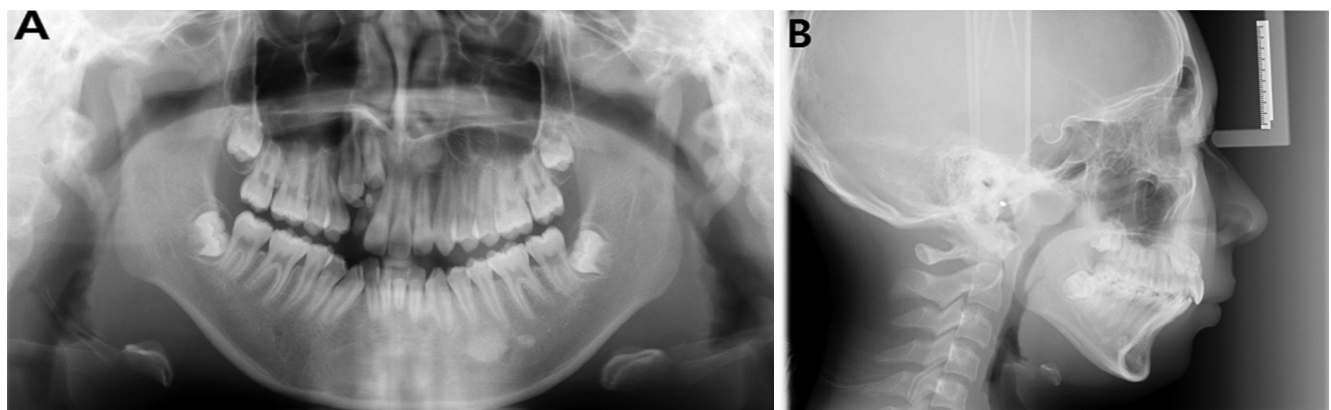
**CASE REPORT**

A 14-year-old male patient reported to Department of Orthodontics, West China Hospital of Stomatology with the chief complaint of retained deciduous tooth on upper right side. The extra-oral clinical examination demonstrated convex profile, protrusive upper lip without any history of medical illness.

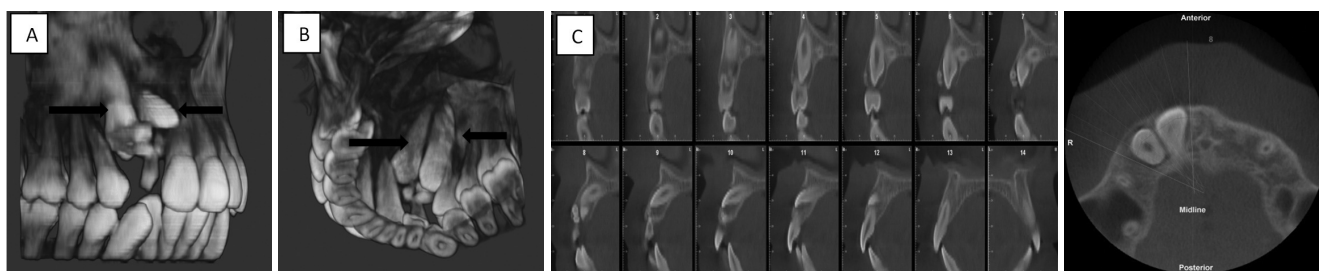
The intra-oral examination revealed Class II molar relation (Figure 2). Retained maxillary deciduous tooth was present on right side with missing permanent lateral incisor and canine. Mild crowding was present on lower anterior with buccally erupted canine on right side. Overjet and overbite was normal. Both the upper and lower arch form were ovoid in shape. Lower midline was normal while the upper midline was shifted towards right side by about 2mm.

Panoramic x-ray revealed impacted upper right lateral incisor and canine (Figure 3A). The radiograph showed erupting third molars on both sides of upper and lower arch along with impacted upper right lateral incisor and canine. The Cephalometric finding revealed skeletal Class II jaw relation, increased ANB angle, retrusive mandible with high mandibular plane angle (Figure 3B).

CBCT revealed the exact location and shape of the



**Figure 3: Radiographic findings. A. Panoramic radiograph. B. Lateral cephalogram**



**Figure 4:** 3D CBCT images showing the presence of two supernumerary teeth along with the position of impacted 12 and 13, proximity of impacted teeth with the adjacent teeth (12-upper right lateral, 13-upper right canine) (A. Right oblique view, B. Position of impacted lateral and canine when 3D image is rotated, C. Sagittal slices, D. Axial view)



**Figure 5:** After 5 months of surgical exposure of impacted lateral and canine (A. Frontal view, B. Right lateral view, C. Intraoral periapical radiograph)

impacted canine which helped the surgeon to access the impacted teeth in the best way possible with minimal damage to the neighboring structures. Furthermore, it helped to identify the amount of root resorption of the adjacent teeth and helped in treatment planning accordingly. Thus, CBCT proved to be far better than the conventional radiograph in determining the exact location of impacted teeth and amount of root resorption adjacent teeth (Figure 4).

**Diagnosis:** Patient was diagnosed with skeletal Class II pattern and Class II molar relation with bimaxillary protrusion and vertical growth.

**Treatment plan:** Extraction of retained deciduous tooth followed by initial alignment and leveling of the upper and lower arches, surgical exposure of the impacted teeth after obtaining the adequate space. Force added on the exposed teeth to pull the teeth downward for proper alignment of the arch.

In this case, CBCT was helpful in locating the exact position of the impacted teeth and their relation with the adjacent teeth which helped to access and determine the direction of orthodontic forces. Furthermore, with proper treatment planning, minimal bone structures were removed to expose the impacted teeth, which helped in rapid healing and new bone formation. Figure 5 shows surgical extrusion in progress.

## DISCUSSION

Proper diagnosis is required for successful treatment. Traditional 2D radiographs like Panoramic view is used to evaluate the vertical position, occlusal X-ray to evaluate the proximity to adjacent teeth, and periapical radiographs to determine the labiopalatal position. However volumetric images are obtained from a CBCT scan.<sup>16</sup> Haney *et al* showed enhanced precision in the localization of canine teeth and improved estimation of the space conditions in the arch obtained with CBCT. This can greatly affect diagnosis and treatment planning to facilitate a more clinically-orientated approach.<sup>17</sup>

Wriedt *et al*<sup>18</sup> stated that CBCT should be used as an adjuvant for routine panoramic radiographs in the following cases:

1. Canine inclination in the panoramic X-ray exceeding 30°
2. Root resorption of adjacent teeth is suspected, and/or
3. Canine apex is not clearly discernible in the panoramic X-ray, implying dilacerations of the canine root.

CBCT provides highly detailed 3D imaging with a single x-ray exposure of approximately 18 seconds. Imaging can be obtained at any angle, thus offering optimum viewing and eliminating superimpositions. CBCT images have provided reliable data on root angulation<sup>19</sup> and the management of impacted canines.<sup>20,21</sup> The diagnostic

ability of CBCT to detect simulated external root resorption was studied by Silveira *et al.*<sup>22</sup>

Thus CBCT in the treatment of impacted canine is more beneficial than the conventional radiographs as more accurate images are obtained with fewer imaging artifacts. The use of CBCT leads to better prognosis, reduce the treatment time and results in more successful treatment of impacted teeth as compared to the conventional radiographs.

## CONCLUSION

The qualitative assessment of external apical root resorption reveals clinically considerable amount of root resorption in stainless steel boot loop group which can be attributed to higher force delivery by stainless steel loop which accounts to the inherent property of the materials used for retraction.

**OJN**

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