

CASE REPORT

The Importance of CBCT as Investigation for Impacted Canine: Case Reports

Noor Ayuni Ahmad Shafiai, Siti Noor Fazliah Mohd Noor

Cluster of Craniofacial and Biomaterial Sciences, Advanced Medical and Dental Institute (AMDI), Universiti Sains Malaysia, 13200 Bertam, Kepala Batas, Pulau Pinang.

ABSTRACT

Panoramic radiograph is a routine investigation tool in orthodontic diagnosis and treatment planning however the limitation of two-dimensional image in assessing the position of impacted canine and surrounding tissues had cause unnecessary treatment options and complications during treatment. This report highlights the differences in investigation outcome and orthodontic treatment planning of two similar cases of patients with impacted upper canine, in which one only had panoramic radiograph and another case supplemented with Cone Beam Computed Tomography (CBCT). The case supported only by panoramic radiograph had changes in treatment planning during canine removal surgery as prevention from oro-antral fistula. This event could have been prevented if CBCT was taken where the canine can be assessed for proximity towards maxillary sinus. It is recommended for CBCT in orthodontic assessment for canine impaction especially for cases where canine is positioned higher than root apex of adjacent teeth and when root resorption is suspected.

Keywords: CBCT, Panoramic, Impacted canine, Treatment planning, Orthodontic

Corresponding Author:

Noor Ayuni Ahmad Shafiai, DCLinDent
Email: noorayuni@usm.my
Tel: +604-5622508

INTRODUCTION

Radiographic assessment has been an essential part of dental treatment plan for diagnostic, and also guiding dentist to diagnose potential dental issues. The standard radiograph is two-dimensional (2D) and is commonly used in routine dental screening with limitation such as inability for evaluating image depth. Hence Cone Beam Computed Tomography (CBCT), a three-dimensional (3D) radiograph, is recommended for diagnosing and planning more complicated dental procedures.

The aim of this case report is to highlight the importance of CBCT for the management of impacted tooth, and in this case, an impacted canine, as it could highly affect treatment planning and minimize complication during treatment. There were two cases of impacted canine, both for evaluation of an orthodontic treatment, where one case had only orthopantomogram (OPG) taken, while the other had both OPG and CBCT prescribed. The differences in outcome of investigation and treatment planning were discussed.

CASE REPORT

Case 1

A 15-year-old Malay girl presented with a class II

division 1 malocclusion on class II skeletal pattern with increased overjet of 5 mm and deep bite. All permanent teeth were present except upper right canine (UR3) which can be palpated in the buccal mucosa. There was retained deciduous upper right canine (URC). In the upper arch, generalised spacing of 2 mm was noted on anterior teeth while on the lower there was mild crowding. Molar relationships were class I bilaterally (Fig.1A). Only OPG was taken for this case.

Case 2

A 14-year-old Malay girl presented with class II division 1 malocclusion on class I skeletal pattern with mesiodens, impacted both upper canines (UR3,UL3), retained URC and deciduous upper left canine (ULC). Bulging of upper canines can be palpated buccally. Overjet was 4 mm with deep bite, and molar relationship was class II unit bilaterally (Fig.1B). For this case, OPG was taken and then CBCT for further evaluation.

Radiographic findings

Case 1

OPG revealed impacted UR3 which was positioned vertically at the root apex of URC (Fig. 2A). Root of the impacted UR3 was straight with closed apex. Demarcated line surrounding the crown of the impacted tooth was noted and the line was also seen to be continuous with the floor of sinus. An evidence of radiopaque mass (believed to be odontome) can be seen between the intact roots of upper right lateral incisor (UR2) and URC. Roots of adjacent teeth were found to be intact.



Figure 1: A) Pre-treatment intraoral photos for Case 1. B) Pre-treatment intraoral photos for Case 2.

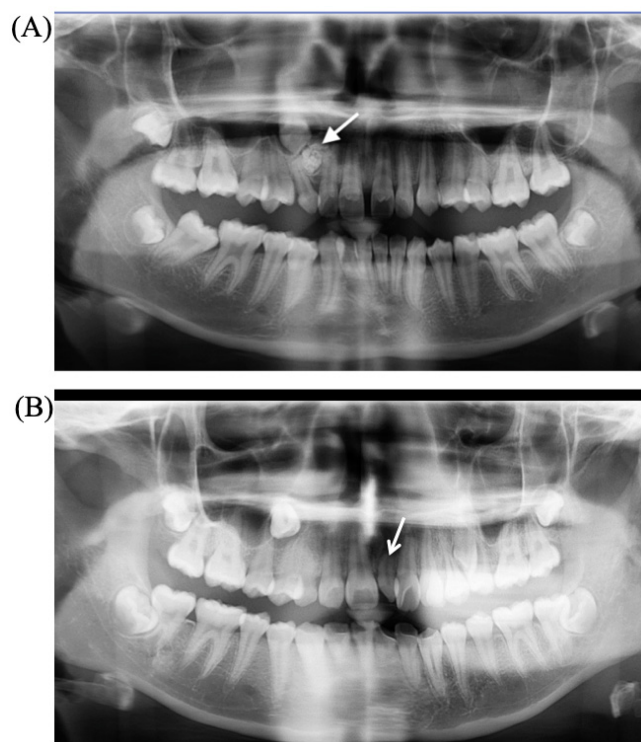


Figure 2: A) Pre-treatment panoramic radiograph for Case 1. Arrow showing odontome. B) Pre-treatment panoramic radiograph for Case 2. Arrow showing mesiodens.

Case 2

OPG revealed similar finding of impacted UR3 as in case 1, in terms of position in relation to adjacent teeth and close approximation to the sinus wall (Fig. 2B). However, no root of UR3 can be seen. UL3 was situated much lower down at the cemento-enamel junction of upper left premolars. It was difficult to assess the root condition of the premolars as they were overlapped with each other.

CBCT of impacted UR3 confirmed the findings in OPG, and much detailed information of impacted UR3 can be

achieved (Fig. 3). From axial view, it was determined that UR3 was situated horizontally with the root apex facing palatally, and sagittal/axial view provided information on thickness of the bone separating the sinus and the root, as well as the condition of adjacent roots of teeth. CBCT of impacted UL3 confirmed the absence of root resorption of adjacent premolars (Fig. 4).

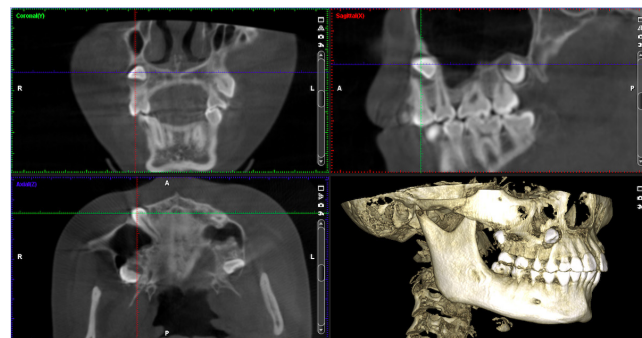


Figure 3: CBCT of impacted UR3 in Case 2

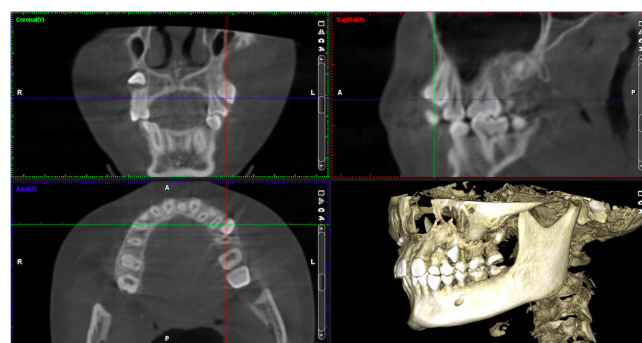


Figure 4: CBCT of impacted UL3 in Case 2

Treatment

Case 1

Patient underwent frenectomy, surgical removal of odontome, and extraction of URC, UL4 and both lower first premolars under general anaesthesia. Impacted UR3 was also planned for removal. During the surgery however, UR3 was found to be separated by thin section of bone from the sinus and its removal may create oro-nasal fistula communication. Decision was made to change the treatment plan, with the consent from the parents, instead of removing UR3, it was bonded with gold chain and planned for traction, to positioned it away from the sinus wall. UR4 was preserved for extraction later, at least until UR3 was indicated for successful traction. Patient was prescribed with upper lower fixed appliances one month post-surgery. Six months after active traction of UR3, it had erupted into buccal mucosa, and UR4 was referred for extraction.

Case 2

This girl also underwent frenectomy, surgical removal of mesiodens, UR3, UL3 and extraction of retained URC and ULC under general anaesthesia. The surgery proceeded without untoward events and fixed appliance was bonded on upper and lower teeth one month later.

DISCUSSION

These were two cases which initially had similar treatment plan (in terms of surgical removal of impacted canine) but due to lack of information on the position and surrounding tissues from CBCT, one had to amend the treatment planning impromptu during surgery.

During radiological assessment of impacted canine, several factors are considered in making decision for orthodontic treatment planning. The success of canine traction depends on its location: 1) the amount of overlap with incisor: good (no horizontal overlap), average (up to half root width of incisor, or poor (complete overlap); 2) vertical height of the canine in relation to the root of incisor: good (from cemento-enamel junction to halfway up root), average (more than half root to full length of root) or poor (more than full root length); 3) the angulation of canine from the vertical plane: good (0-15°), average (16-30°), or poor (more than 30°); 4) position of canine apex: good prognosis (above canine position), average (above first premolar position) or poor (above second premolar position) (1). Root resorption of adjacent teeth is also the main factor in determining teeth extraction. Peri-coronal follicular cysts around the crown of impacted canine may compress blood vessels against periodontal status of adjacent teeth, causing cementoblasts attaching on the root surface to die along the affected root (2). For these two cases, the roots of adjacent teeth to the impacted canine were intact, and the vertical height position of impacted canine (UR3) were more than full root length of lateral incisors, hence they were initially planned to be surgically removed. Besides, it can prevent the complication of debonding attachment and breakage of ligature wire post-surgery if canines were to be retracted by gold chain (3). UL3 in case 2 was also removed as it fastened treatment time.

The occurrence of oro-antral or naso-antral fistula due to displacement of impacted canine into the maxillary sinus or nasal cavity following surgical removal is very low (0.5%) (3). It is more commonly associated with extraction of upper molar and premolar teeth. However for the first case, UR3 was found to be in close approximation to the maxillary sinus during surgical procedure. Instead of its removal, the operator decided for canine traction, to prevent oro-antral fistula. Defect of less than 2mm can heal spontaneously by blood clot formation and secondary healing however, large defects can lead to acute sinus diseases.

CBCT would have been an advantage for case 1, for the accurate assessment of quantifying the bone surrounding impacted canine in relation to the sinus floor. CBCT has superior advantage over 2D conventional radiograph largely for its ability to assess patient's in three orthogonal

planes (sagittal, coronal and axial). This provides higher level of confidence among clinicians during pre-operative radiographic evaluation of treatment planning and the exact position of impacted canine was found to be significantly different when it was based on 2D than 3D information (4,5). Haney et al. (2010) reported different diagnoses and treatment plan for the same patient when use 2D and 3D images of impacted maxillary canines. It is a dilemma for clinicians sometimes, for the justification of further investigation using higher dose and cost of CBCT, as OPG seems adequate for some cases. However, these additional information could avoid unnecessary treatment options given to patient, and increase the confidence of patient towards the clinician.

Based from these two cases, it is recommended for OPG to be supplemented with CBCT, when there is query on the status of root resorption of adjacent teeth and when the position of impacted canine is higher than the root apex of lateral incisors, as it may displaced close into maxillary sinus.

CONCLUSION

CBCT is highly advisable as the gold standard for cases of impacted canine positioned vertically high at more than full root length of adjacent teeth for accurate canine proximity towards maxillary sinus. It is also required when impacted canine is suspected to cause damage in root resorption of adjacent teeth.

REFERENCES

1. Clinical Practise Guideline. Oral Health Division, Ministry of Health Malaysia. Management of the palatally ectopic canine (2nd edition). 2016.
2. Ricardo Machado Cruz. Orthodontic traction of impacted canines: Concepts and clinical application. *Dental Press J Orthod* 2019 Jan-Feb; 24(1):74-87.
3. Sajnani A.K., King N. M. Complications associated with the occurrence and treatment of impacted maxillary canines. *Singapore Dent J* 2014; 35:53-57
4. Alqerban A, Hedesiu M, Baciut M, Nackaerts O, Jacobs R, Fieuws S. Pre-surgical treatment planning of maxillary canine impactions using panoramic vs cone beam CT imaging. *Dentomaxillofac Radiol* 2013; 42: 20130157.
5. Haney E, Gansky S.A., Lee J.S., Johnson E., Maki K., Miller J. Huang J.C. Comparative analysis of traditional radiographs and cone-beam computed tomography volumetric images in the diagnosis and treatment planning of maxillary impacted canines. *Am J Orthod Dentofacial Orthop* 2010;137:590-7.