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Comparative analysis of impacted maxillary canine and dentigerous cyst diagnosis using panoramic and CBCT imaging

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ABSTRACT

Objectives: This report is aimed to compare diagnostic accuracy of impacted maxillary canine and dentigerous cyst in determining its dimension and position using panoramic and CBCT (cone beam computed tomography) imaging.

Case Report: A 30-year-old woman was referred to Department of Dental and Maxillofacial Radiology with the suspect of upper right impacted canine. She had chief complaint of swelling pain in the palate for ± 3 months. Panoramic showed 13 impacted superiorly to the maxillary sinus and surrounding with a radiolucent lesion attached on cementoenamel junction. However, panoramic has limitations in assessing the labio-palatal position of

impacted canine and lesion extension. CBCT revealed the tooth located closer to palate and no sign of direct contact with sinus. The radiolucent lesion has destructed anteroposterior aspect of cortical plate which explain the reason of swelling and pain.

Conclusion: Precise dimension and position are important to avoid mistakes since impacted maxillary canine accompanied with dentigerous cyst required invasive management. In our case, panoramic and CBCT contributed to guide the diagnosis and help the referrer determining the exact site of surgery.

INTRODUCTION

Permanent maxillary canines are the second most frequently impacted tooth.[1] The missing of permanent canine in the arch after normal eruption age, or the labial canine bulge is not pronounced but a palatal bulge is present, or malposition of lateral incisors are often lead dentist to suspect canine impaction.[2,3] Impacted canine not only interfere with aesthetic and stomatognathic function, but also contribute to pathological lesion such as dentigerous cysts. Dentigerous cysts formed by inflammatory exudates exerted from hydrostatic force between reduced enamel epithelium and the crown of impacted teeth. Hence, the cyst encloses the crown and attached to the cementoenamel junction. Dentigerous cyst suspected whereas radiographically the follicular space increase more than 5mm. At the maxilla, dentigerous cysts may displace the impacted canine to sinus.[4–6]

Therefore, to evaluate the occurrence probability of dentigerous cysts around the impacted canines based on the imaging data might be helpful to guide the dentist to make a clinical decision.[4] Panoramic has been used as a routine diagnose tool to identify canine impaction by locating cusp tip of canine in relation to root of lateral incisor and its angulation. However, panoramic have several disadvantages, such as

distortion, superimposition of structures, and variation in magnification leading to difficulty to assess the exact labio-palatal position of impacted canines.[7,8] On the other hand, CBCT had been known accurately determine the position of the impacted maxillary canine in multiplanar view and provide comprehensive measurement of the distance and thickness between the crown and the surrounding radiolucency better than panoramic and any conventional radiograph.[4]

Regarding appropriate justification of CBCT in addition to panoramic should consider radiation dose risk and increased expense for patient and also weighed against the information obtained.[9,10] Thus, this report aims to compare diagnostic accuracy impacted maxillary canine and dentigerous cyst in determining its position with anatomic structure such as sinus and the radiolucency dimension using panoramic and CBCT (cone beam computed tomography) imaging.

CASE REPORT

Permanent maxillary canines are the second most frequently impacted tooth.[1] The missing of

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permanent canine in the arch after normal eruption age, or the labial canine bulge is not pronounced but a palatal bulge is present, or malposition of lateral incisors are often lead dentist to suspect canine impaction.[2,3] Impacted canine not only interfere with aesthetic and stomatognathic function, but also contribute to pathological lesion such as dentigerous cysts. Dentigerous cysts formed by inflammatory exudates exerted from hydrostatic force between reduced enamel epithelium and the crown of impacted teeth. Hence, the cyst encloses the crown and attached to the cementoenamel junction. Dentigerous cyst suspected whereas radiographically the follicular space increase more than 5mm. At the maxilla, dentigerous cysts may displace the impacted canine to sinus.[4–6]

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Extraoral examination showed no abnormality, no history of familial and systemic disorder and currently not under medication. Panoramic revealed 13 impacted horizontally overlapping with

the apical of 14, 12 and 11 and superiorly with nasal floor and sinus. A radiolucent lesion surrounds the crown attached on cementoenamel junction displacing the apical tip of adjacent teeth. Due the fact of impacted canine and radiolucent lesion overlap within each other minimize the visual sensitivity to evaluate labio-palatal position and lesion extension, in addition the patient taken another exposure to CBCT.

Coronal view detected the radiolucent lesion is unilocular, oval, size around 58 mm^2 with average density 93.1 HU of CBCT. The impacted canine better evaluated in axial slices view, located closer to palate than labial and no direct contact to sinus and nasal floor as the cortical of its anatomy at this time has no sign of perforation. The radiolucent lesion has destructed anteroposterior aspect of cortical plate which might explain the reason of swelling and pain. Based on the clinical examination and imaging finding, the radiographic diagnostic leads to dentigerous cyst et causa right maxillary impacted canine. Patient was sent back to the referrer to get proper treatment.

DISCUSSION

Several studies were done to prove the reliability of panoramic to evaluate the position of canine impaction using a prediction model based on linear or angular measurement. Ericson and Kurol proposed the canine position by locating the tip in relation to lateral incisor.[11] In another study, Becker introduced canine impaction based on the transverse relationship of the canines to the dental arch and the height of the canine in relation to the occlusal plane.[12] Ackerman and Fields also reported another classification of impacted canines based on horizontal relation to the arch and vertical in relation to the apex.[13] The most current method, formulated by Yamamoto determining the degree of canine impaction according to the angle between the long axis of the tooth and the occlusal plane, divided into seven subtypes.[14]

Although in some experimental studies, these prediction models using panoramic provides quiet satisfactory two-dimensional view of the impacted teeth, but in a recent publications these method reported still inadequate to sketch a clinically

Figure 1. a. Changes on color and consistency of gingiva in related to missing 13 and b. Palatal bulge in right slightly pronounced compared to the left region
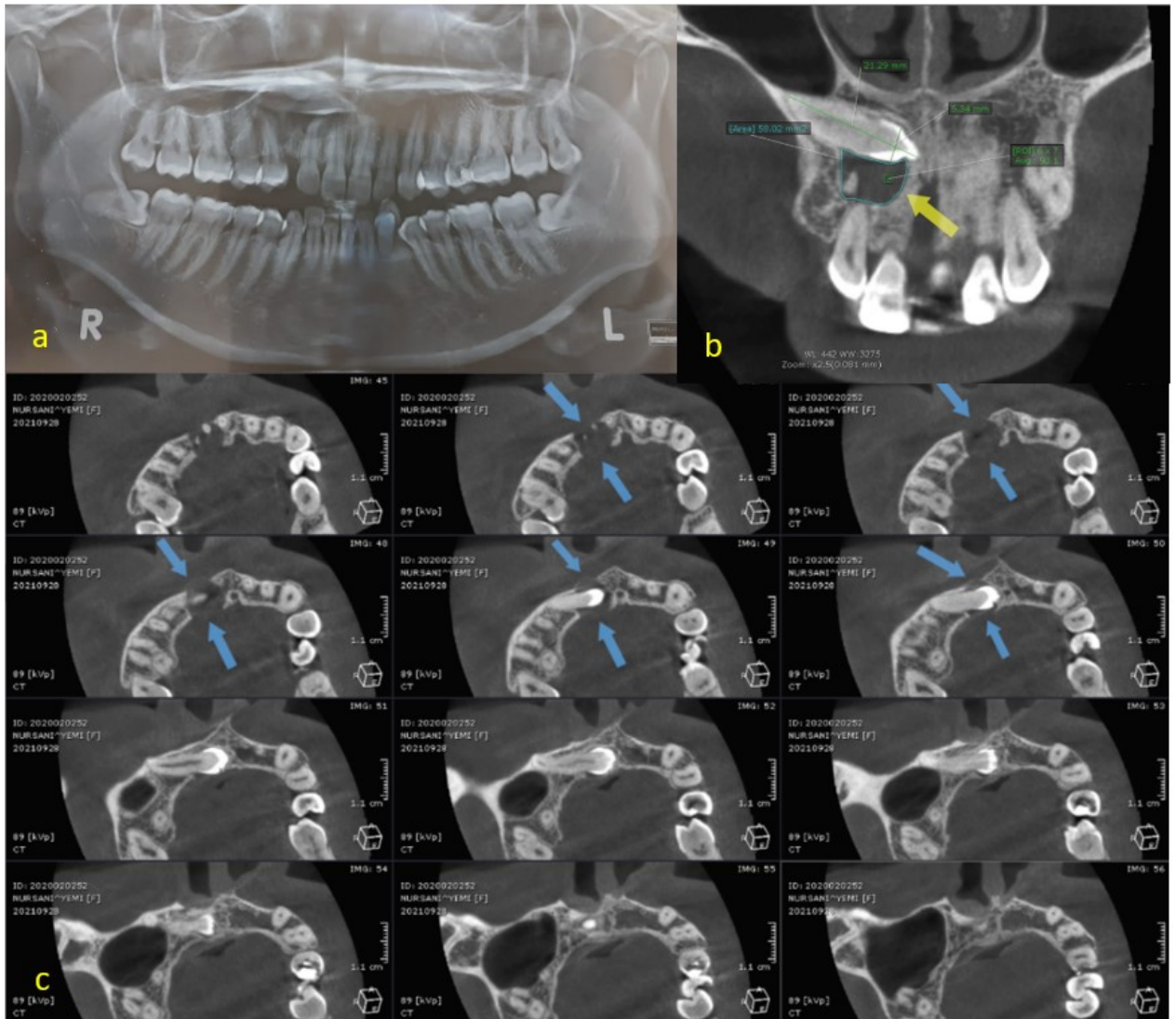
Figure 2. a. Initial panoramic showing difficulty to assess 13 labio-palatal position and the radiolucent lesion extension,
b. CBCT coronal view measured the distance and the density between cementoenamel junction to lesion border c. Axial slice view evaluated the exact position of
13 closer to palate and the lesion has destructed cortical plate (blue arrow)

realistic labio palatal position and CBCT remained a superior tool to observe. [15,16] As mentioned above, in our case panoramic cannot clearly pinpoint the canine position. In panoramic imaging, structures closer to the x-ray source appear more magnified than those closer to the detector. [17] The x ray beam enters from the lingual surface, follows the curvilinear shape of the maxilla and mandible to symphysis, reverse the arch and shifts to focal through. [18] Thus, describing the palatally impacted canine might be misjudged in this view. The important thing to note in diagnosing a dentigerous cyst is this cyst attached to the cemento-enamel junction, the radiographic appearance of a dentigerous cyst on both panoramic and CBCT was radiolucent, well-defined, unilocular, symmetrical around the crown of the impacted tooth.

In an impacted canine case where an underlying pathology is suspected and invasive surgical approach to treat lesion is planned, it is preferrable to recommend additional 3D radiographic scans to visualize the lesion's involvement to the surrounding anatomical structures better. These imaging method helps in locating the defect caused by the lesion as well as determining the pattern of its growth.[5] In our case, CBCT enabling the preoperative identification of the cause of the swelling pain and aided the referrer during the surgical procedure to avoid any surgical complications due to the closeness to the sinus maxillary and hard palate. However, surgical approach should also be considered due to secondary factors such as risk of recurrence, malignant transformation and displacement of anatomic structures. As for our patient, since the surrounding anatomy currently showing no sign of perforation and the lesion was not particularly large, surgical enucleation was the recommended treatment.

Although the risk of dentigerous cyst transformation is very low, the patient should be monitored clinically and radiographically on a regular basis. Dentigerous cyst have been reported in the literature to occasionally change into ameloblastoma and keratocystic odontogenic tumors, which can subsequently develop

aggressively. Whereas the risk of dentigerous cysts undergoing dysplastic transformation to squamous cell carcinoma is limited, it still exists and has been documented in the literature; thus, a histopathological examination of the specimen is required following surgical intervention to rule out the possibility of malignancy.

CONCLUSION

Precise dimension and position are important to avoid mistakes since impacted maxillary canine accompanied with dentigerous cyst required invasive management. In our case, panoramic and CBCT contributed to guide the diagnosis and help the referrer determining the exact site of surgery.

FOOTNOTES

All authors have no potential conflict of interest to declare for this article. Informed consent was obtained from the patient for being included in this case report.

REFERENCES

1. Bharathi AR, Santhanam A, Sivakumar M. Prevalence of impacted maxillary canines and its association with other dental anomalies. Int J Dent Oral Sci. 2021;8(2):1757–60.
2. Alassiry A. Radiographic assessment of the prevalence, pattern and position of maxillary canine impaction in Najran (Saudi Arabia) population using orthopantomograms – A cross-sectional, retrospective study. Saudi Dent J. 2020;32(3):155–9.
3. Migliorati M, Cevidanes L, Sinfonico G, Drago S, Dalessandri D, Isola G, et al. Three dimensional movement analysis of maxillary impacted canine using TADs: a pilot study. Head Face Med. 2021;17(1):1–10.
4. Chen J, Lv D, Li MX, Zhao W, He Y. The correlation between the three-dimensional radiolucency area around the crown of impacted maxillary canines and dentigerous cysts. Dentomaxillofacial Radiol. 2020;49(4):20190402.
5. Dhusia AH, Das A, Lahane A, Dalvi A, Jagdale H, Shah P. Maxillary Dentigerous Cyst: A Case Report and Brief Review of Literature. Quest Journals J Med Dent Sci Res. 2021;8 (February):15–26.
6. Berberi A, Aoun G, Hjeij B, AboulHosn M, Alassaad H, Azar E. Bilateral ectopic third molar in the maxillary sinuses associated with dentigerous cyst: a case report. Med Pharm Reports. 2021;3–6.
7. Jung YH, Liang H, Benson BW, Flint DJ, Cho BH. The assessment of impacted maxillary canine position with panoramic radiography and cone beam CT. Dentomaxillofacial Radiol. 2012;41(5):355–60.
8. Alhummayani F, Mustafa Z. A new guide using CBCT to identify the severity of maxillary canine impaction and predict the best method of intervention. J Orthod Sci. 2021;10:3.
9. Sosars P, Jakobsone G, Neimane L, Mukans M. Comparative analysis of panoramic radiography and cone-beam computed tomography in treatment planning of palatally displaced canines. Am J Orthod Dentofac Orthop. 2020;157(5):719–27.
10. Andresen AKH, Jonsson M V., Sulo G, Thelen DS, Shi X-Q. Radiographic features in 2D imaging as predictors for justified CBCT examinations of canine-induced root resorption. Dentomaxillofacial Radiol. 2021;20210165.
11. Ericson S, Kurol J. Early treatment of palatally erupting maxillary canines by extraction of the primary canines. Eur J Orthod. 1988 Nov;10(4):283–95.
12. Becker A. Radiographic Methods Related to the Diagnosis of Impacted Teeth. In book: Orthodontic Treatment of Impacted Teeth. 2012. p.10–28.
13. William R. Proffit, Henry W. Fields Jr, Brent Larson DMS. Contemporary orthodontics, sixth edition. Br Dent J. 2019 Jun;226(11):828–828.
14. Yamamoto G, Ohta Y, Tsuda Y, Tanaka A, Nishikawa M, Inoda H. A New Classification of Impacted Canines and Second Premolars Using Orthopantomography. Asian J Oral Maxillofac Surg. 2003;15(1):31–7.
15. Jiménez-Silva A, Carnevali-Arellano R, Vivanco-Coke S, Tobar-Reyes J, Araya-Díaz P, Palomino-Montenegro H. Prediction methods of maxillary canine impaction: a systematic review. Acta Odontol Scand. 2021;0(0):1–14.
16. Margot R, Maria CDL-P, Ali A, Annouschka L, Anna V, Guy W. Prediction of maxillary canine impaction based on panoramic radiographs. Clin Exp Dent Res. 2020 Feb;6(1):44–50.
17. Raghib MA, El N, Gomaa S, El MI. Localization of Impacted Maxillary Canine using Different Radiographic Methods. 2020;19(2):45–54.
18. Ridgway E. Dental panoramic radiograph position and preparation errors for mixed dentition patients. Thesis. Vancouver: The University of British Columbia; 2021.