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Case Report

Maxillary first molar with a single canal in a patient with bilateral cleft lip and palate repair

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Conventional two-dimensional (2-D) imaging is an indispensable diagnostic adjunct in endodontic treatment. However, due to its inherent shortcomings, sufficient visualization of the root canal system is not always possible.^{3,5} Cone Beam Computed Tomography (CBCT) provides the definite advantage of viewing 3-D reconstructions of the morphologic features and helps to confirm anomalies, when present.⁶

This report presents a patient with history of bilateral cleft lip and palate repair in whom bilateral maxillary first molars having single roots and canals were detected. CBCT provided for an invaluable diagnostic tool towards the initial endodontic management and the subsequent inter-disciplinary treatment plan.

Case report

Introduction

A comprehensive understanding of the intricate three dimensional (3-D) configuration of a root canal system and the anticipation of possible morphologic variations are essential prerequisites towards successful endodontic therapy.¹ Maxillary first molar exhibits a wide range of variations with respect to its root and canal anatomy. While the most common form has three roots and four canals, presence of extra canals have been extensively documented in literature.^{1–3} However, the clinician should also be aware of the possibility of existence of a fewer roots or canals than normally encountered.⁴

A 22 year old female patient reported with pain in the left upper posterior tooth region for the past one week and a history of intermittent pain for the past one month. Clinical examination revealed that the patient had maxillary retrusion and narrow maxilla with palatal defect and crowding in the maxillary arch (Fig. 1A and B). Dental history revealed that a bilateral cleft lip and palate repair procedure was undertaken in childhood. Further, Class II carious lesions with pulpal exposure were detected in the left maxillary second premolar (Tooth No 25) and first molar (Tooth No 26) and was diagnosed to be the cause of the patient's chief complaint. The preoperative radiograph showed occluso-proximal radiolucencies encroaching upon the pulpal space and widening of the

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Fig. 1 – (A) Collapsed upper arch with severe malalignment of teeth. Also seen are carious left maxillary second premolar (Tooth No 25) and first molar (Tooth No 26). (B) Lingually placed maxillary dentition. (C) Preoperative radiograph of Tooth No 26. (D) Transverse CBCT image showing single orifice at coronal section in maxillary first molars. (E) & (F) Midroot and apical slice showing single canal. (G) Longitudinal CBCT image showing single canal and single root corono-apically in 26. (H) Post-obturation radiograph of Tooth No 26. (I) Initiation of orthodontic intervention.

periodontal ligament space in both the teeth. Radiograph also revealed an unusual anatomy of the involved first molar with a single root and a single canal (Fig. 1C). After interdisciplinary consultations, root canal treatment (RCT) was planned in 25 and 26 to alleviate the pain with subsequent multi-disciplinary management. Definitive post endodontic coronal restoration (metal/metal ceramic crown) was planned to be carried out after completion of orthodontic-surgical treatment.

An informed consent of the patient was taken and access opening was carried out in both the teeth. While the root canal system of 25 conformed to an expected clinical pattern, a single wide canal orifice was found in the 26 and all the exploratory files converged into a single canal. To validate the clinical findings, various horizontal angulations of conventional Intra Oral Periapical radiographs were taken. However, to confirm the above with a 3-D image of the tooth and to plan for the subsequent multi-disciplinary procedures, CBCT imaging was decided upon. CBCT scan was performed using iCAT vision software (Imaging Sciences International, USA) and 3-D images of the tooth with transverse and longitudinal sections were obtained. Imaging confirmed presence of a

single canal corono-apically in 26 (Fig. 1D–G). Further examination revealed bilateral occurrence in the contra-lateral tooth.

RCT of 25 and 26 was done using crown-down technique with ProTaper rotary system (Dentsply Maillefer, Ballaigues, Switzerland). Following cleaning and shaping of the canals, obturation was done using cold lateral compaction of gutta-percha and AH Plus resin sealer (Dentsply DeTrey, Konstanz, Switzerland). The teeth were then coronally restored with resin modified glass Ionomer cement (Fig. 1H). The patient was clinically asymptomatic on subsequent follow-up. RCT was followed by initiation of orthodontic intervention (Fig. 1I).

Discussion

Documentation of cases with unusual morphology has an important didactic value as they facilitate the recognition and successful management of similar cases.⁷ Only five cases of maxillary first molars with a single canal could be found on literature search.^{1,2,4,7,8} However, none reported a history of cleft lip and palate.

The presence of anomalous internal root canal morphology in patients with cleft lip and/or palate has not been adequately assessed. Considering that the function of embryonic processes occurs simultaneously with odontogenesis, the tooth germ may be fully or partially affected by a cleft resulting in anomalies in different phases of dental development, i.e., numerical anomalies during the initial formation of the tooth germs, shape anomalies during morphodifferentiation, and position anomalies during tooth eruption.⁹

The morphology and internal canal anatomy of teeth is determined by the pattern of cell proliferation in the Hertwig's epithelial root sheath and is genetically determined.¹⁰ In addition, the morphology of a tooth changes as it develops. Deposition of secondary dentin with age forms partitions which results in the development of separate canals and transverse connecting systems. Variations in eruption times and environmental influences would have some bearing on the morphology of the root canal in individual teeth at various ages.¹¹ A multitude of genetic and environmental factors may similarly result in the etio-pathogenesis of oro-facial clefting. According to one author, the etiological factors for dental anomalies may be same as that of the cleft and therefore dental abnormalities could represent an incomplete manifestation of the clefting process.¹² Another group of authors concluded that the existence of morphologic anomalies throughout the permanent dentition argues for attenuation of the overall growth potential (e.g., reduced canalization, decreased developmental homeostasis) rather than the cleft being an isolated, unassociated defect.¹³ The higher incidence of abnormalities of number, size, shape, development, eruption, and enamel of teeth in individuals with cleft lip, palate or both in comparison to the general population has been widely reported.¹⁴ However, extensive studies on the co-relation of cleft and the internal root canal system have not been carried out so far.

The need of contemporary 3-D imaging techniques is amplified here. CBCT can be used as an objective analytical tool to ascertain the root canal system. Retrospective studies can also be carried out with the help of the records available in large multi-specialty hospitals. Moreover, smaller radiation dose is administered to the patient compared to conventional computed tomography. Patient's radiation exposure to conventional CT is approximately 100–300 μ Sv for maxilla and 200–500 μ Sv for the mandible. In comparison, the radiation exposure to CBCT scanning is 34–102 μ Sv.³ In addition, the radiation dose can be further reduced by the use of lower settings and available collimation options; choosing the smallest Field of View (FOV); patient positioning modifications and the use of the additional personal protection.^{3,5}

Conclusion

Presence of anomalous internal root canal morphology in the presence of various disorders has not been adequately

assessed. Further studies need to be carried out in this regard. CBCT scanning can be used as an objective analytical tool to ascertain the rcs morphology. However, its judicious use is recommended.

Conflicts of interest

All authors have none to declare.

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