

Cone beam computed tomographic analysis of furcation groove of maxillary first premolar – an invitro study

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Abstract

Aim: To assess the presence of furcation groove on maxillary first premolar using cbct.

Materials and methods: 125 extracted maxillary first premolars were selected and scanned using cbct. Presence of a furcation groove/developmental depression on the palatal aspect of the buccal root in two-rooted teeth was recorded.

Results: A furcation groove/developmental depression on the palatal aspect of the buccal root was observed in 25 teeth among the 81 teeth that had two separate roots.

Conclusion: Complex root anatomy makes the treatment procedures difficult. Presence of groove must be taken into account during endodontic and periodontal procedures.

Keywords: Furcation groove, CBCT, Maxillary First Premolar

Introduction

Cone beam computed tomographic analysis of furcation groove maxillary first premolar – an invitro study

Complexities of root canal systems frequently present serious complication. Lack of knowledge of these anatomies will lead to procedural errors. Many studies show developmental variations, the presence of a groove or invagination on the furcation aspect of the buccal root of maxillary premolars. This groove is termed as developmental depression [1] or buccal furcation groove [2] or furcal concavity [3]. Deeper and larger the furcation groove more will be internal anatomic variation. Groove starts apical to furcation extend upto 5.38 mm and ends towards apex. [3] This groove often leads to plaque accumulation. Variations in dentin width should be considered in the treatment of maxillary first premolar. Studies shows that palatal wall in unprepared roots is on average less than 1mm, so it is important in root canal instrumentation and post space preparation.

Cbct was used to study the furcation groove as it provide a three dimensional image. According to Kim et al - CBCT scans can enhance the understanding of root canal anatomy, with the potential of improving the outcome of endodontic treatment. Thus, the present study was

conceived to evaluate by CBCT, the presence of furcation groove of maxillary first premolar in a Kerala population.

Materials and methods

125 extracted maxillary first premolars were selected using criteria as described by Wheeler. Teeth's were arranged in a template [Fig. 1]. CBCT scans of the teeth were taken using Kodak Carestream CS 9300 machine and the scans were assessed by a single investigator. [Fig 2]

Presence of a furcation groove/developmental depression on the palatal aspect of the buccal root in two-rooted teeth was recorded.

Results

Of the 125 first premolar teeth studied, 110 teeth had two roots and 15 teeth had single root. Of the two rooted premolars, 81 teeth had two separate roots while 29 teeth had fused roots. A furcation groove/developmental depression on the palatal aspect of the buccal root was observed in 25 teeth among the 81 teeth that had two separate roots. [Fig 3a, 3b]

Discussion

Few anatomical studies shows the presence of furcation grooves. Presence of furcation groove is seen in about 62-100% of cases according to different authors.[4-6]

Lammertyn et al (2009) described it as a developmental depression or furcal concavity that starts at a point just apical to the bifurcation and disappears toward the apex. Concavity on the furcal aspect of furcation groove provides a kidney shape cross section. This groove has major clinical challenge in endodontic, prosthetic, and periodontal procedures. According to Tamse et al the furcal groove is a morphologic and not a development entity. In the present study among the 81 teeth's 30.8% of tooth showed furcation groove on palatal aspect of buccal root which could pose a risk during root canal treatment [7] The presence of groove could be due to the partial formation of two buccal roots during

development of the tooth.[8] Tamse et al found that the concavities reach a maximum value of 0.40 mm at a mean distance of 1.18 mm from the furcation, 5.3 mm from the apex, and a mean distance of 0.81 ± 0.24 mm from the invagination to the canal wall.[12] This distance of 0.81 ± 0.24 mm and the shape of the canal contradict any circular-shaped post space preparation at that level.[9] Post must not extend more than 6.5 mm from the CEJ, as the groove begins with a mean of 5.5 ± 1.05 mm from the CEJ . Highly significant correlation between the length of the tooth and the end of the groove: as tooth length increases, the groove lengthens and ends further from the CEJ. The length, depth, location, and width of the lingual dentin thickness of the groove vary in relation to tooth length, bifurcation, and CEJ. Reducing the width during root canal instrumentation can lead to perforation or vertical root fracture.[10] The maxillary premolars are also a "key risk" teeth among periodontists.[11] Presence of groove and concavities lead to more retention of plaque and calculus. These grooves may lead to periodontal attachment loss thus leading to periodontal disease.

Conclusion

Outcome of endodontic treatment depends on highly variable root canal anatomy. Therefore clinician should be aware about the complex anatomy to reduce the procedural errors.

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Legends Figures



Fig 1 : samples arranged in template



Fig 2: CBCT scan



Fig 3 a



Fig 3 b