THE STUDY OF THE MORPHOLOGIC VARIATIONS IN THE ROOT CANAL OF HUMAN PERMANENT MANDIBULAR SECOND MOLAR

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Knowledge of Morphological variations in root canal system improves the operator ability to locate and trace root canal and increases the degree of successful treatment. The study of morphological variations in the root canal of human mandibular second molar has been carried out on a sample of 100 extracted human permanent mandibular second molar of age range of 15 to 45 years was carried out.

It is observed that medial roots have more complex root canal system than distal roots. Anatomically mandibular second molar has many similarities with that of mandibular first molar, although the possibility of one medial canal cannot be ruled out.

If endodontic treatment is carried out satisfactorily, it has good prognosis and success rate is as that of mandibular first molar. However, the presence of lateral canals, transverse anastomoses and apical deltas have to be taken into onsideration before deciding the prognosis of the Case.

Morphologic knowledge of root canal system is indispensable and improves the operator's ability to locate and trace root canal to its termination and this increases the degree of successful treatment.

Number of techniques have been reported to study the root canal morphology by various investigators 2 such as -

(i) Replication technique,

(ii) Clearing technique,[6,8,9,10]

(iii) Ground sections,

(iv) Sectioning of teeth,[4]

(v) Use of radio-opaque dyes and radiographs,

Although all these techniques have their merits and demerits, it is observe that one of the disadvantages of all these techniques is that the tooth is altered irreversible. As the radiographic techniques does not revels the complexity of the root canal anatomy it is decided to adopt clearing technique in this study. A general trend towards the retention of teeth rather than extraction, is evident today & consequently mandibular second molars are frequently involved in root canal treatment. Considering the importance of the root canal morphology in the success of endodontics, it is proposed to carry out a study in vitro, the morphologic variations in the root canal of permanent mandibular second molars in Indian population by employing modified clearing technique and the transparent specimens were photographed to provide a permanent visual demonstration of their root canal form.

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Materials & Methods

Sample of one hundred extracted human permanent mandibular second molars from the patients blip an age range of fifteen to forty-five years were selected. Recommended trapezoidal access cavity preparations were made in occlusal surfaces of all teeth using ultraspeed rotary instruments and the pulp contents were dissolved in 5 percent solution of sodium hypochlorite for a period of 24 hours. Decalcification procedures were carried out with 8 percent nitric acid for 48 hours at room temperature. Subsequently the teeth were rinsed and dehydrated in an ascending order of ethyl alcohol rinses starting with 70 percent for 12 hours, followed by 90 percent for an hour and 3 rinses of 1 hour each

for 100 followed by 90 percent and preserved in methyl salicylate for about 2 hours to make the teeth transparent. Hematoxylin dye was infected into the pulp chamber by creating negative pressure at the apex and clean teeth were preserved in methyl salicylate solution to avoid loss of transparency and the specimens were cleared in cedar wood oil for 2 days Drior to examination.

Under the dissecting microscope variations in the root canal were observed and charted the findings. The photographs of the specimens were taken ibid the help of close up lenses to provide a permanent visual demonstration of their root canal form.

Results & Discussion

Of all the teeth employed in present study were having two roots i.e. one medial and one distal. These findings are correlating India that of Vespucci, F.J. (1984) 9 and Weine, F.S. et al (1988).[11] However, there was a deviation from the findings of Walker R.T. (1988)10 and Manning, S.A. (1990).[6]

Of the one hundred teeth studied, 84 percent of teeth showed three root canal viz. mesiobuccal, mesiolingual and distal, 10 percent of teeth showed two root canals viz. one medial and one distal and 6 percent of teeth showed four root canals viz. mesiobuccal, mesiolingual and to distal.

From the observations of present study, it can be seen that majority of permanent mandibular second molars showed three root canals, thus X correlating the observations of maxwell and Bellizzi (1982),[5] Vertucci. F.J. and Manning, S.A. However a radiographic study of Pineda and Kuttler (1972),[8] and Weer. R.T. from Mongoloid population demonstrated higher percentage of-twos root canals.

Out of one hundred medial roots studied, the root canal showed 10 percent, 50 percent, 38 percent and 2 percent of Type 1, Type 11, Type 111 and Type IV configuration respectively Weine's classification). In case of one hundred distal roots 94 percent, 3 percent, 2 percent and 1 percept showed Type 1, Type 11 Type 111 and Type IV canal configuration respectively.

From the above observations, it can be seen that Type II and Type III configuration were commonly found in the medial roots and predominance of Type I configuration in case of distal roots.

The percentage of canal configuration in this study are in agreement with the observations of Green D and Brooklyn. N.Y. (1973),[3] and Weine. et al. However there is a slight deviation from the endings of Manning. S.A.,[7] and Vertucci. F.J. Although radiographic study of Pineda and Kuttler from Mongoloid population is identical India that of the present study in the distal root, but medial roots reported higher percentage (58 percent) of Type I canals and lower percentage of Type III canals.

Out of one hundred and ninety medial canals studied, fifty-nine showed lateral canals and their percentage of distribution were 45.6 percent, 30.4 percent and 24 percent is the apical, middle and cervical thirds of the root respectively. In case of one hundred and six distal canals studied, thirty-five showed lateral canals which were positioned 59.1 percent, 27.3 percent and 13.6 percent in the apical middle and serials thirds of the root. However frication canals were noticed in three specimens.

From the findings of the present study, it can be seen that lateral canals were commonly observed in the medial as well as distal root canals and frequently in the apical thirds of the root. Thus correlating with that of Vertucci, F.J. and Pineda, et al. Although there is deviation from the findings of Manning, S.A.; where higher percentage of lateral canals were reported, however the percentage of distribution of lateral canals correlate with the findings of present study.

Of the one hundred teeth studied, transverse anastomoses were present in 42 medial roots and their distribution of occurrence were 41.6 percent, 39.6 percent and 18.8 percent in the middle, apical and cervical thirds respectively Whereas it was 50.0 percent, 37.5 percent and 12.5 percent in the mid-

dle apical and cervical thirds of the 4 distal roots studied respectively.

From the findings of the present study, it was observed that transverse anastomoses were found frequently in the middle than in the apical third of the roots with higher percentage in the medial roots rather than distal one. Thus correlating with that of Vertucci F.J. and Manning, S.A.

Out of the one hundred teeth studied, the apical foramina situated laterally in majority of the cases (85 percent) and few cases (15 percent) had at the apex in mesial roots. Similar fadings were observed in the distal roots i.e. 72 percent, 28 percent.

The finding of the current study correlates with that of Manning, S.A., Pineda and Kuttler, Burch, J.G.[1] and Green D.[4] Of all the specimen studied, 4 showed (4 percent) apical deltas at the apex in the mesial and 2 showed (2 percent) of the distal roots.

The findings of the present study correlating with that of Vertucci, F.J., Pineda and Kuttler. However Manning S.A. showed higher percentage of apical deltas. Variations of the results reported in this study might be due to i) the collection of the data from different type of population with regards to age, sex and side of the mouth from which the tooth originated ii) the type of method adopted to study the root canal anatomy is different iii) mixed studies were reported on mandibular first and second molars or iv) those who employed radiographic methods which is having inherent limitations in eliciting the complexity of root canal system.

Conclusion

A pictorial view of the possible variations found in root canal anatomy of permanent mandibular second molar teeth were discussed extensively. It is observed that medial roots have more complex root canal system than distal roots. Anatomically mandibular second molar has many similarities with that of mandibular first molar, although the possibility of one medial canal cannot be ruled out.

If endodontic treatment is carried out satisfactorily, it has good prognosis and success rate is as that of mandibular first molar. However, the presence of lateral canals, transverse anastomoses and apical deltas have to be taken into onsideration before deciding the prognosis of the Case.

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