**ORIGINAL ARTICLE**

# Root canal morphology of mandibular premolars in a Saudi population using cone beam computed tomography

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## ABSTRACT

**Aim:** To evaluate the root canal morphology (RCM) of mandibular premolars and to identify the difference between the males and females in Aljouf population.

**Methods:** The CBCT scans belonging to 376 patients (166 women and 210 men) aged between 15 and 60 years, were evaluated. The CBCT scans were evaluated from the cementoenamel junction to the apical portion of the root. The number of roots and canals of the selected teeth were documented. The obtained data was entered in excel sheet and was analyzed by SPSS 21 software using Chi-square test.

**Results:** In lower first premolar, out of total 752 teeth examined, overall, the presence of mandibular first premolars with single root was more than two roots and this difference between the men and women was statistically significant (P = 0.056). Similarly, the occurrence of mandibular first premolars with single canal was considerably more than two canals, and the difference between males and females did not display any significant difference (P = 0.129). In mandibular second premolars, the presence of single root was more than two roots and the presence of the roots among genders did not display any significant difference (P = 0.312). Similarly, the presence of mandibular second premolars with single canal was more than two canals, and presence of canals among the genders did not display any significant difference (P = 0.385).

**Conclusion:** The incidence of mandibular first premolars and mandibular second premolars with two roots and canals was more common in the males than females.

**Keywords:** mandibular first premolars, mandibular second premolars, root canal morphology

## INTRODUCTION

The primary aim of root canal therapy largely relies on the knowledge of the complex anatomy of the root canal system[1,2,3]. Thus, an extensive knowledge of the RCM and their alterations are significant. The complexity of the spaces that must be accessed, cleaned, shaped, and filled may lead to failure of identification and minimize the success of endodontic therapy. Complete knowledge of normal RCM and its routine variations is a preliminary step for success of root canal therapy[45].

Mandibular bicuspids, due to their increased variability in their RCM are of the most complex teeth to treat endodontically and have a increased chances of failure of root canal therapy[6.7,8] .Numerous factors like, gender, ethnicity, age, sex, study design, and the method of evaluating the root canal morphology can contribute to disparity seen in the previous studies reported in the literature[9,10,11]. During the last three decades, multiple techniques such as clearing, modeling, histological methods, imaging techniques, etc., have been adapted to assess the RCM[12,13].

As mentioned in the literature, the genes, which codify the RCM, are situated on the X-chromosome. Comparatively, a few studies have evaluated the impact of gender difference in the various ethnic populations[14]. .The objective of the present study was to assess the RCM of mandibular premolars and to identify the difference between the males and females in Aljouf population.

## METHODS

In this study the retrospective analysis of CBCT scans, which contained the lower first and second biscuspids of both sides were evaluated. The CBCT images were obtained from the department of Radiology data base March 2017 and August 2019. This study was approved by Jouf University Local Ethics Committee. The CBCT scans of 376 patients (166 women and 210 men) were included in the study. The age of the patients was ranged between fifteen and sixty years. Scanora 3D equipment (Soredex, Finland) was used to obtain the CBCT scans. Then, the scans were evaluated using accompanying software. The exclusion criteria was determined as follows: Existence of periapical pathologies, resorbed roots, incomplete apex, severe apical curvature, calcified root canals, presence of wasting disease of tooth, root canal treated tooth, tooth with post and core placement and tooth with very large restoration. The CBCT scans were evaluated from the cementoenamel junction up to the root apex, and the number of roots and canals of the selected teeth were noted. The data obtained was entered in excel sheet and were analyzed with Statistical Package for the Social Sciences 21 Software (SPSS Inc., Chicago, IL, USA) by applying Chi-square test. The statistical significance was set at $P < 0.05$.

## RESULTS

The results are summarized in Tables I and II.

**Lower first biscuspid**

**Number of roots:** Out of total 752 teeth, 80.85% had singe root and 19.14% were having two roots. In the females, out of 332 lower first premolars, 296 teeth (89.15%) were observed with single, and 36 teeth (10.84%) were having two roots. In the males, out of 420 lower first premolars, 312 teeth (74.28%) were single rooted, and 108 teeth (25.71%) were having two roots. Overall, the presence of lower first premolars with single root was more than two roots and this difference between the males and females was statistically significant (P = 0.056) (Table-I).

**Number of canals:** Out of 752 teeth examined, 71.27% had single canal and 28.72% were having two root canals. In the females, out of 332 lower first premolars, 244 teeth (73.49%) were having single canal, and 88 teeth (26.50%) were noted with two canals. In the males, out of 420 lower first premolars, 279 teeth (66.36%) were note with single canal, and 141 teeth (33.63%) were having two canals. Overall, the occurrence of lower first premolars with single canal was considerable more than two canals, and the difference between males and females did not display any significant difference (P = 0.129) (Table-I).

Table-I: Number and percentage of roots and canals in the mandibular first premolars

| Gender | Root | | Canal |
|---|---|---|---|
| | N (%) | | N (%) |
| Males | 1 | 312 (74.28) | 279 (66.36) |
| | 2 | 108 (25.71) | 141 (33.63) |
| Females | 1 | 296 (89.15) | 244 (73.49) |
| | 2 | 36 (10.84) | 88 (26.50) |
| p | 0.056 | | 0.129 |

**Mandibular second premolar**

**Number of roots:** In total, of 752 teeth, 88.29% had one root and 11.70% had two roots. In the females, of 332 lower second premolars, 302 teeth (90.96%) were one rooted, and 30 teeth (9.03%) were two rooted. In the males, of 420 MSPs, 362 teeth (86.19%) were one rooted, and 58 teeth (13.80%) were two rooted. Overall, the presence of lower second premolars with one root was more than that of two roots, and the presence of the roots among the genders did not display any significant difference (P = 0.312) (Table-II).

**Number of canals:** In total, of 752 teeth, 71.80% had one canal and 28.19% had two canals. In the females, of 332 lower second premolars, 246 teeth (74.09%) had single canal, and 86 teeth (25.90%) had two canals. In males, of 420 lower second premolars, 294 teeth (70%) had single canal, and 126 teeth (30%) had two canals. Overall, the presence of lower second premolars with single canal was more than that of two canals, and the occurrence of the canals between the two genders did not display any significant difference (P = 0.385) (Table-II).

Table-II: Number and percentage of roots and canals in the mandibular second premolars

| Gender | Root | | Canal |
|---|---|---|---|
| | N (%) | | N (%) |
| Males | 1 | 362 (86.19) | 294 (70) |
| | 2 | 58 (13.80) | 126 (30) |
| Females | 1 | 302 (90.96) | 246 (74.09) |
| | 2 | 30 (9.03) | 86 (25.90) |
| p | 0.312 | | 0.385 |

## DISCUSSION

Data in the literature confirms that mandibular premolars have majority of variations with regard to root canal anatomy[13, 14] .Very less number of studies are available in literature which evaluates the morphology of the root canal of mandibular bicuspids and the difference among gender in Saudi population. Hence this survey was designed to assess and compare RCM of lower bicuspids and the difference among the two genders.

According to the observations of our study in present population, most of the lower first and second biscuspids were having one root and one canal. In comparison between lower first bicuspids and lower second bicuspids, the prevalence of two roots and canals in lower first bicuspids was more than lower second biscuspids. Vertucci[15] Kazemipoor et al[16], observed higher incidence of a second canal in lower first biscuspids compared to lower second bicuspids, which was in accordance with the observation of our study.

Increasing age and deposition of secondary dentin may contribute to alterations in the structure of the already formed root canals, particularly in the root canals that are tapered in the center[17].This factor may be well regulated in the clinical researches and not those that are carried out in labs. In the present study, the subject' age was 15–50 years. In subjects with less than 15 years, root formation may not be formed completely. Different morphological changes can occur between the age of 15 and 50 years.

Conventional radiographic methods can provide only two dimensional image of an object and also have other shortcomings like superimposition, poor resolution, etc. Advanced imaging modality like CBCT imaging, with three-dimensional image reconstruction, may be more beneficial in providing accuracy for morphological analysis of tooth and its supporting structures.

Gender dimorphism and its affect on the RCM were previously reported by some authors. In a study by Serman and Hasselgren[18] more females had more than one root and/or canals in mandibular first biscuspids, whereas more men revealed multiple roots and/or canals in lower second biscuspids. Sert and Bayirli[19] also observed the increased incidence of lower first biscuspids having two or more canals in women and lower second bicuspids with two or more canals in men.

Park et al [20] and Aminsobhani et al [21] assessed the CBCT images of the mandibular premolars with regard to gender in Korean and Iranian population respectively. Even though the morphology of root canal was not same in both genders, but this difference was not significant statistically.

The results of this study reveals that, prevalence of two roots and canals in mandibular first premolars and mandibular second premolars was more in males, this observation was similar to Kazemipoor et al[16] and was in contrast to the results of Sert and Bayirli[19]. The disparity in the obtained results may be due to difference in sample size, ethnicity, method of evaluation. Sert and Bayirli[19] used decalcification and staining technique which is considered as destructive for root canal structure. Whereas Kazemipoor et al, assessed the root and morphology of canal using CBCT[16]. Aminsobhani et al, noted an increased prevalence of two roots and canals in mandibular first

bicuspids and mandibular second bicuspids in males, although this difference was statistically non-significant[21].

## CONCLUSION

From the observations of this study, the incidence of mandibular first premolars and mandibular second premolars with two roots and canals in the males was more common than females. Since variations in the number of roots and canals might be influenced by ethnicity, age, gender, and according to the method of assessment, future research considering these factors may help in arriving at definite conclusion.

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