

OCCURENCE OF NUMBER OF CANALS IN MANDIBULAR SECOND PREMOLARS IN SOUTH INDIAN POPULATION - A RETROSPECTIVE STUDY

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ABSTRACT

Mandibular second premolars are one of the most complex among dentition in humans. They often present with several patterns of complexities. It also varies based on age, sex, race etc. In the present study by a retrospective manner, we have assessed the occurrence of number of canals in mandibular second premolars in South Indian Population. Case records of 86,000 patients availing treatment at Saveetha Dental College between June 2019 and March 2020 were analysed, and the required data was extracted. 550 teeth were chosen for the study. Statistical analysis of the extracted data was done using SPSS software (SPSS Version 23.0, SPSS, Chicago, IL, USA) Graphs were derived. Correlations were made based on gender of the patients and type of tooth. Within the limits of the study the occurrence of more than one canal was more prevalent in females(11%) as compared to males(9%) in the south indian population.(P<0.05). Also the occurrence of a single canal was more prevalent in 45(44%) as compared to 35(40%)(P>0.05). More correlations can be studied by doing similar studies in larger populations and studies can be done based on geographical location and races.

KEYWORDS: Aberrant Anatomy; Bicuspid; Canal Configuration; Premolars; Root Canal; South Indian Population.

INTRODUCTION

Knowledge of internal anatomy of the tooth before undertaking endodontic therapy is important. This is because the basic knowledge of the root canal anatomy as well as all possible variations in anatomy have proved to be a crucial factor in achieving successful root canal treatment(Kumar and Antony, 2018). Careful evaluation of two or more periapical radiographs(IOPAR's) is mandatory. These multiple angled radiographs provide much needed information about root canal morphology and variations present. In the case of mandibular second premolars only the 40 degree horizontal angulation is capable of identifying the correct morphology. However, there is always a possibility of radiographic discrepancies and error and the failure to identify such complex or uncommon anatomy, especially in the mandibular second premolar.

It is reported by Ingle(Ingle, 1986) that the most significant cause for endodontic failure was incomplete canal instrumentation followed by incomplete obturation(Ramamoorthi, Nivedhitha and Divyanand, 2015). This is perhaps due to poor canal negotiation (Rajendran *et al.*, 2019), shaping and obturation of the

entire canal system in 3 dimensions (Patel, 2016). These challenges may all arise due to the clinicians difficulty in identifying complex root canal morphologies. Slowey (Slowey, 1979; Ingle, 1986) has indicated that probably because of variations in canal anatomy, the mandibular premolars are the most difficult teeth to treat endodontically. The main objective of root canal therapy is the thorough cleaning and shaping of all the pulp spaces and subsequently the complete obturation of the space with an inert filling material. The presence of an untreated canal may be a reason for failure of the root canal treatment. A canal may be left untreated if the dentist fails to recognize its presence. It is extremely important that clinicians use all the armamentaria available at their disposal to locate and treat the entire root canal system. It is also responsible for high frequency of endodontic flare ups and failures (Ramanathan and Solete, 2015) (Siddique et al., 2019). The mandibular premolars are typically described as single rooted teeth with a root canal system. The ovoid shaped root canal in the cross section has normal development grooves on mesial and distal surfaces (Oshima and Tsuji, 2017; Rajakeerthi and Ms, 2019).

Diagnostic measures such as multiple pre-operative radiographs, careful examination of the pulp chamber floor with a sharp explorer under magnification, troughing of any grooves present with ultrasonic tips, staining of the chamber floor with 1% methylene blue dye, performing the sodium hypochlorite 'champagne bubble' test and visualizing canal bleeding points are important aids in locating root canal orifices. An important aid for locating root canals is the dental-operating microscope which was introduced into endodontics to provide enhanced lighting and visibility. It brings minute details into clear view. It enhances the dentists ability to selectively remove dentine with great precision thereby minimizing procedural errors.

The incidence of number of roots and various configurations of canals reported in anatomic studies varies greatly as per literature. The root morphology and canal morphology of mandibular premolars can be extremely complex and highly variable. The factors that contribute have been studied in previous anatomic studies. These factors include ethnicity, gender as well as study designs (Verma and Love, 2011).

The purpose of this study was to retrospectively analyse the incidence of number of root canals present in the mandibular second premolars in the South Indian population.

METHODS AND METHODOLOGY

Study Design:

The type of research was a cross sectional analytical study. All dependent variables were mainly assessed. The data collection was retrospective in nature.

Data collection:

Case records of 86,000 patients availing treatment at Saveetha Dental College between June 2019 and March 2020 were analysed, and the required data was extracted. A total of 550 teeth were chosen for the study. The inclusion criteria was patients aged 18 years of age and above, having single or multi visit Root canal treatment for mandibular second premolars. All cases treated in the Outpatient departments were considered irrespective of periodontal status or any other complications.

Statistical Analysis:

The data was transferred to an MicroSoft Excel Sheet and further sorted and tabulated. Statistical analysis of the extracted data was done using SPSS software (SPSS Version 23.0, SPSS, Chicago, IL, USA). Chi-square test (Shih and Fay, 2017) was done along with necessary tests to determine the correlations between the dependent and independent variables, since most variables were of parametric nature (Vidović, 2019). Graphs and charts were obtained for all data analysed. Results were displayed in terms of percentages.

The ethical clearance for the study was obtained from the Institutional research board in prior.[SDC/SIHEC/2020/DIASDATA/0619-0320].Patient personal information was kept confidential in exception to the examiners.

RESULTS AND DISCUSSION

In the given study, the population chosen for study and analysis was South Indian Population, treated at Saveetha Dental College, Chennai on an outpatient basis. A total of 550 teeth were included and studied.

All cases chosen had patients aged 18 years of age and above. Within the limits of the study the occurrence of more than one canal was found to be more prevalent in females(11%) as compared to males(9%).The association between gender and occurrence of root canals in mandibular second premolars was statistically significant; p value 0.011 ($p < 0.05$)[Figure-1].Also the occurrence of a single canal was more prevalent in 45(44%) as compared to 35(40%).A statistically non significant association was found between tooth number and occurrence of root canals in the mandibular second premolars.p value 0.546 ($p > 0.05$)[Figure-2].Additionally a 0.54% occurrence of three canals was seen to be prevalent in females.

A great deal of variations can be found in the literature with respect to the root and root canal morphology of teeth ('*The accurate determination of variations in tooth morphology', 2009; Hussainy et al., 2018; Ravinthar and Jayalakshmi, 2018). The human mandibular premolars are no exceptions. The presence of extra roots or canals in the mandibular premolars is undoubtedly a major challenge. The clinician must be familiar with the various pathways that root canals may take to the apex(Nandakumar and Nasim, 2018). The pulp canal system is complex(Gambarini et al., 2018) and canals may branch, divide and rejoin. According to Ingle(Ingle, 1986), the percentage of two canal and one foramen in mandibular first premolar is 6.5% and second is 9.5%

The anatomies of Mandibular premolars have been examined extensively in the past by Kutlec 1972(Rowe, 1972)(Teja, Ramesh and Priya, 2018), Vertha 1984(Reeh, 1998), Fleshes 1991 etc(Gupta et al., 2016). The incidence of 2nd canals in second premolars determined to be 3%. 48% of second premolars were seen to have lateral canals and apical delta occurrence was 84% for second premolars.

Two studies compared gender differences for the number of canals in a known population. The study of Seeman(Noor, 2016) and Hasselgeon(Manohar and Sharma, 2018) reported that such an incidence was approximately equivalent and has no significance. The study of Seet(Felippini and de Carvalho Felippini, 2019) and Bayieli(Berutti and Castellucci, 2017) assessed the canal morphology in 100 Turkish males and 100 Turkish females. Males 43% exhibited more number of canals than females 15% (Teja, Ramesh and Priya, 2018; Teja and Ramesh, 2019)(Janani, Palanivelu and Sandhya, 2020). A similar variation has also been reported by several authors in various ethnic groups.

The use of 3D imaging methods(Fayad and Johnson, 2016)(Jose and Subbaiyan, 2020) can be used for precise studies of such anatomic features/ However, in the present study based on retrospective data in already treated teeth, we have assessed the various co-relations in the South Indian population. Within the limits of the study we found males to have significantly higher incidence of aberrant anatomys than females. It was also seen that anatomy of 35 was more complex than 45.The limitation of the Study was that the study was confined to a certain subset of population and the data cannot be generalized to a larger population.The study can further be done on larger populations involving more geographical location and races.

CONCLUSION

Within the limits of the study the occurrence of more than one canal was more prevalent in females as compared to males in the south indian population. Also the occurrence of a single canal was more prevalent in 45 as compared to 35. More correlations can be studied by doing similar studies in larger populations and studies can be done based on geographical location and races.

FUNDING

-NIL-

AUTHORS CONTRIBUTIONS

All authors have equal contribution in bringing out this research article.

CONFLICT OF INTEREST

There is no conflicts of interest

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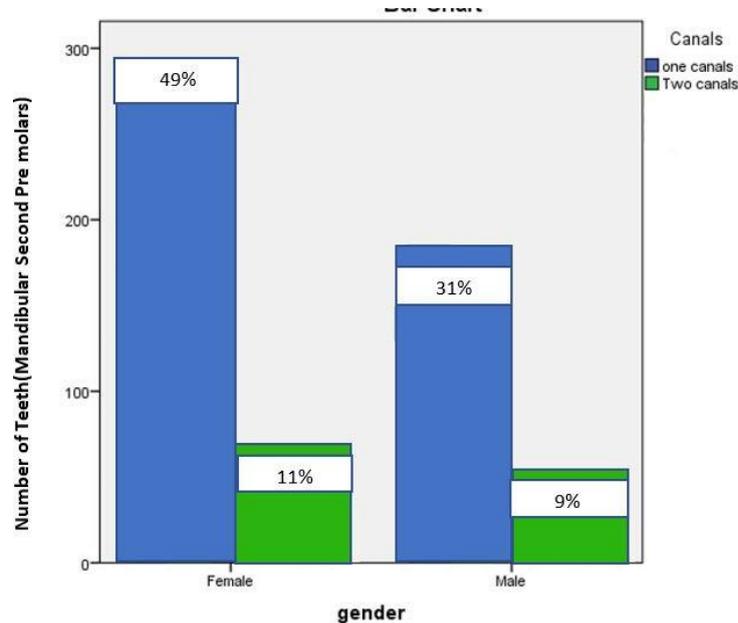


Figure 1 Bar chart shows the association between gender and occurrence of root canals in mandibular second premolars(X axis represents the gender of the patient and Y axis represents the number of mandibular second premolar teeth). Where blue represents a single canal and green represents two canals .The occurrence of more than one canal was more prevalent in females(11%) as compared to males(9%). Chi square test was done and the association between gender and occurrence of root canals in mandibular second premolars was found to be statistically significant. p value 0.011 ($p < 0.05$).The occurrence of canal variations in mandibular second premolars is more common in females than in males in the south indian population.

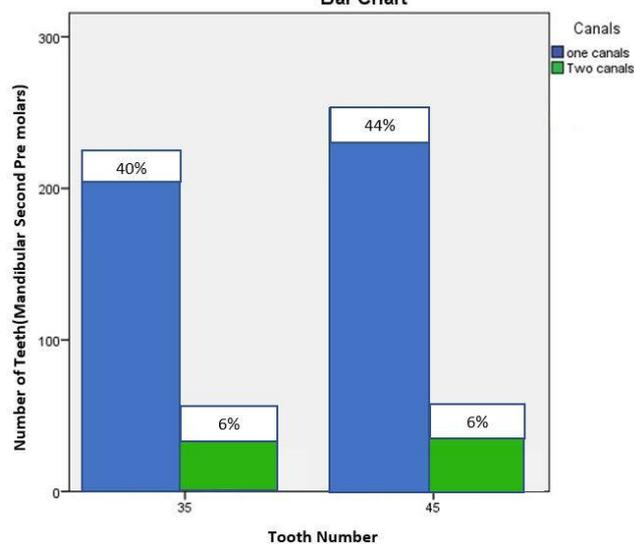


Figure 2 Bar chart shows association between tooth 35 and 45 , with the occurrence of root canals in mandibular second premolars.(X axis represents the tooth number and Y axis represents the number of patients).where blue represents a single canal and green represents two canals.The occurrence of a single canal was more prevalent in 45(44%) as compared to 35(40%). Chi square test was done and a statistically not significant association found between tooth number and occurrence of root canals in the mandibular second premolars.p value 0.546 ($p > 0.05$) .The occurrence of canal variations in mandibular second premolars is more common in tooth number 45 as compared to 35 in the south indian population.