

Incidence of Four Canals in Permanent Mandibular First Molar among Patients Attending Tertiary Care Hospital at Central Nepal.

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ABSTRACT

Background & Objectives: The success of root canal therapy greatly depends upon the proper cleaning, shaping and three dimensional sealing. Besides these, the locations of all the canals, is mandatory to achieve the rationale of endodontic therapy. Hence, variation in root canal anatomy has clinical significance. The aim of this study was to assess the presence of four root canals in permanent mandibular first molars in patients attending Dhulikhel Hospital. **Materials & Methods:** The clinical and radiographic examination of one hundred and nine permanent mandibular first molars, undergoing root canal treatment was conducted. Mandibular first molar teeth of both male and female patients of all age groups were included. **Results:** Out of 109 samples (46.8% male and 53.2% female), three and four canals were found in 44.1% and 55.9% respectively in root treated permanent mandibular first molars. **Conclusion:** This study concluded that 55.9% of permanent mandibular first molars have four root canals, indicating higher incidence than that of three canals, in patients attending Dhulikhel hospital.

Key words: Endodontics Incidence; Mandibular first Molar; Root canal

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INTRODUCTION

The failure of endodontic treatment is due to the presence of persistent microorganisms within the root canal space and in the periradicular area causing apical periodontitis.¹ These microorganisms persists in root filled teeth due to inadequate cleaning, shaping and irrigation which results in incomplete debridement of root canal irregularities such as fins, anastomosis and isthmuses. Moreover, apical and coronal leakage and missed canals are also a major cause of endodontic failure.² Undetected extra canal will not allow the clinician to remove all the pulp tissue debris from the canal space during treatment, thus making missed canal as one of the main cause of endodontic treatment failure.³

The mandibular first molar is the first permanent tooth to erupt in the oral cavity. It is the more frequently endodontically treated teeth with a wide variety of root canal configuration.² In regards to the morphology of mandibular first molar, presence of three canals with two roots is a common finding. However, presence of four canals is also not an

unusual finding.⁴ It has usually two canals in mesial root and one, two or three canals in the distal root.⁵ The distal canal (s) is elliptical or oval or flattened in cross section and somewhat straight till the apex with distal curvature at apical 1 to 2 mm.⁶ Hence, for a successful endodontic treatment a clinician should have a through insight of the internal morphology of teeth with its possible variations which may be encountered during treatment.⁷ This can be achieved by accurate preoperative radiographs taken at different angulations and proper interpretation of the radiographs.⁸

Although there are various studies on root canal morphology of mandibular first molar, literature is short of data of Nepalese population. Hence, the objective of this study is to evaluate the incidence of four canals in mandibular first permanent molar in patients attending Dhulikhel Hospital.

MATERIALS AND METHODS

This is a cross sectional prospective study conducted on total of 109 permanent mandibular first molar teeth, in Department of Conservative Dentistry and

Endodontics, Kathmandu University Dhulikhel Hospital, from March 2017 till May 2017. Patients with age group ranging from 14 to 55 years with adequate mouth opening were only included in this study. Exclusion Criteria were patients with severe medical conditions, trismus, macroglossia, geriatric patients, teeth with resorption, calcification, open apex, retreatment and pregnant females. After the informed consent, data were collected on a Performa sheet.

Preoperative intra oral periapical radiograph (IOPA) of each tooth undergoing treatment was taken using Radiovisogram (RVG), from 20 degree mesial and distal angulation by parallel technique and assessed by two qualified endodontists. After adequate local anesthesia, the tooth was isolated under rubber dam and access cavity was prepared using Endo Access bur (EndoZ bur, Dentsply, Maillefer). During pulpectomy procedure, the canal orifices were located under magnifying loupes at 3X magnification. Number of canals were determined both clinically and radiographically, using same lingual opposite buccal (SLOB) rule during working length determination radiographs.

The data were collected to process and analyze, using Statistical Package for Social Sciences (SPSS) version 20.0 licenced to Kathmandu University School of Medical Sciences. Chi square test was performed to compare the number of canals among different variables. The P value was set at <0.05 to see the statistical significance.

RESULTS

In this study, out of 109 subjects undergoing endodontic therapy, 46.8 % were male and 53.2%

Table 1: Descriptive Statistics

Total number of cases	109	%
Male	51	46.8%
Female	58	53.2%
Left molar(36)	61	56%
Right Molar (46)	48	44%
2 roots	99	90.8%
3 roots	7	6.4%
Inconclusive	3	2.8%
Numbers of canals		
3 Canals	48	44.1%
4 Canals	61	55.9%

were female, with 56% left and 44% right mandibular first molar teeth. Radiographically, most of the subjects (90.8%) had 2 roots, whereas only 6.4% of the subjects had 3 roots. On studying the number of canals in our sample population, the prevalence of three canals were found in 44.1% and four canals were found in 55.9% of the cases (Table 1).

Table 2 shows the comparison of the number of canals between gender and right and left mandibular first molar teeth, undergoing root canal treatment. Although female population of our study seems to have slightly higher tendency of 4 root canals in mandibular first molar teeth, there was no statistically significant difference between the prevalence of 3 and 4 canals among male and female population ($p=0.211$). Moreover, mandibular left molars showed higher tendency of having 4 canals compared to right but no statistically significant difference was noted on occurrence of 3 and 4 canals among mandibular right and left first molars ($p=0.699$).

DISCUSSION

The use of two dimensional radiographic techniques to study the morphology of the root canal system provides inadequate information leading to missed extra roots/ canals. Hence, in this study along with the intra oral periapical radiographs from different angulations, careful clinical examination of the pulp chamber was done under magnification using dental loupes (3X magnification) to overcome the disadvantage of radiographs alone.

In this study 55.9% of the population had four canals which is higher than the incidence of three canals (44.1%), although the difference is not so great. This is in accordance with the study done by Al-Nazhan on Saudi Arabian sub- population that showed 57.76% of root treated mandibular first

Table 2: Comparison of occurrence of 3 and 4 canals between sexes and Tooth

Category	3 canals	4 canals	Total	P value
Male	23	28	109	0.211
Female	25	33		
Lower Left First Molar	28	33	109	0.699
Lower Right First Molar	20	28		

molar had four canals and 42.3% had three canals.⁴ Moreover, four root canals in mandibular first molar was a common finding (59%) in Khartoum population in a study done by Ahmed et al.⁹

In the study done in an Iranian population, the prevalence of two canals in distal root was found to be relatively high, however less than that of single canal.¹⁰ Similarly, Chen G and Co-workers¹¹ also found 46% of mandibular first molar with four canals in Taiwan Chinese population with 20% of study population having extra distal roots. In this study also, we found 6.4% of the population with extra roots.

However, in a study by Joseph et al,¹² using computed tomography in an Indian population 84.48% of mandibular first molar had three canals with only 13.52% having four canals, which contrasts with our study. Similarly, in a study on Bangladeshi population, 45.92% of the mandibular first molar had four canals and 52.59% had three canals but the difference was not so high.¹³

In endodontic treatment, locating all the canals will allow the successful removal of all the pulp tissue debris, leading to successful treatment. In a study of a failed root canals done in an extracted human mandibular first molar, Skidmore and Bjorndal found approximately one third had four canals while rest had complex root canal anatomy.² Hence, the incidence of four root canals in mandibular first molar is a common finding in our population and one should always keep in mind about the higher incidence of a fourth canal in distal root. However Cone Beam Computed Tomography (CBCT) as well as endodontic microscope would have diagnosed the exact number of the canals more precisely which is the limitation of our study.

CONCLUSION

The occurrence of four canals in permanent mandibular first molar was relatively higher than that of three canals. This emphasizes that the clinicians should develop necessary skills for careful searching of fourth canals in lower first molars for successful endodontic therapy. Moreover, use of recent innovations like dental operating microscope, staining, cone beam computed tomography etc. can witness more variations in the root canal morphology of permanent mandibular first molar.

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Conflict of Interest Statement:

None Declared

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