

## EVALUATION OF NUMBER OF ROOTS AND ROOT CANALS IN MANDIBULAR SECOND MOLAR BY CLEARING TECHNIQUE: AN INVITRO STUDY

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### ABSTRACT

Any attempt to perform endodontic therapy must be preceded with a thorough understanding the anatomy of both pulp chamber and the root canal system after by using clearing technique. A thorough knowledge of root canal morphology is essential for successful endodontic therapy. This study is conducted on extracted mandibular second molars from north Indian population of Himachal Pradesh.

**AIM of this study is :** To investigate number of roots and root canals.

**Methodology:** A total of 100 mandibular second molar extracted over a period of two years were selected for study. Endodontic access cavities were prepared, patency of canals were checked and the pulp tissue was removed by immersing teeth in sodium hypochlorite for 2 days. Teeth were decalcified, then dehydrated and were then made transparent by immersing samples in methyl salicylate solution. Cleared specimens were observed using magnifying lens at 5X magnification. They were looked for number of roots and root canals.

**Results:** The majority of mandibular molars Majority of second permanent mandibular molars had two separate roots (88%). The order of occurrence of number of canals was 3 canals (55%) > 2 canals 24 % > 4 canals (18%) > 5 canals (2%) > 1 canal (1%).

**Conclusion:** Staining and clearing technique is an effective measure for the evaluation of root canal configuration without altering the canal configuration.

**KEYWORDS :** Mandibular Molar, Decalcification, Clearing, Root Number, Root Canals.

### INTRODUCTION:

The root canal anatomy of human teeth has puzzled the dentist to no end and has been a source of immense research interest. Starting from way back in 1925 when Hess<sup>1</sup> studied the root canal anatomy by injecting Vulcanite resin into the root canals, it was Okumura<sup>2</sup> who stressed the advantage of dye injection and clearing of the teeth for studying the morphology and anatomy of root canals and gave a simple root canal classification. Root canal treatment can be highly guaranteed when all the root canals are identified, thoroughly cleaned, shaped, and obturated with an inert filling material<sup>3</sup>. The methods most commonly used in analyzing the root canal morphology are canal staining and tooth clearing<sup>4-6</sup>, conventional radiographs<sup>7-13</sup>, digital and contrast medium-enhanced radiographic techniques, and more recently computed tomographic techniques<sup>10-12</sup>. In the present study clearing technique will be used. This technique allows a three dimensional view of the root canal morphology without altering the internal shape of pulp cavity or direction of the canals<sup>13</sup>. In this study no. of roots and root canals are studied by clearing tooth followed by viewing it under microscope.

### MATERIALS AND METHODS:

The sample teeth comprised 100 mandibular second permanent molars extracted from population of Himachal Pradesh attending various dental clinics fig no. 1. The age and reason for extraction were recorded. Teeth were collected from the patients with in age range of 15 - 50 years who attended the hospital for extraction in last one and a half year as a result of caries, periodontal diseases or before going for prosthodontic treatment. Only teeth that could be verified as mandibular permanent second molar by crown and root morphology were included.

The teeth were immersed in a 5% sodium hypochlorite (NaOCl) solution (Prime Dental Pvt. Ltd. Pune) for 2 hours and stored in distilled water until required Fig. no. 2. The external root surfaces of experimental teeth were cleaned of

adherent remnants and debris with periodontal curette (Hu-Friedy Manufacturing Co, Chicago) and were stored in physiological saline solution. Endodontic access cavity was prepared with Round Bur No. 6 (Mani Inc. Japan) in Airotor Hand-Piece (NSK, Nakanishi Inc. Japan). The patency of canals was checked with K-files no.10 (Mani, Japan). The pulp tissue was removed by immersing teeth in sodium hypochlorite for 2 days followed by rinsing in running water for 2 hours.



Fig No. 1



Fig No.2

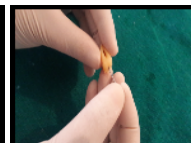


Fig No. 3

The study of root canal was done by canal staining and clearing technique adopted from the **Shahriar Shahi et al.** Samples were decalcified by immersing in 5% nitric acid for 5-6 days which was renewed daily. Then end point decalcification was confirmed by using paper pin (penetrating the crown portion easily) Fig. no. 3. The decalcified teeth were then washed in running water for 4 hours to remove the traces of nitric acid.

The dehydration of teeth was done by successive rinse of ethyl alcohol starting with 70% for 24 hours, 80% with 12 hours, 90% for 1 hour and 100% for 1 hour Fig. no. 4. The dehydrated teeth were then placed into methyl salicylate for 2 days to make them transparent, i.e., easy to visualize and dried by blowing air with the help of three way syringe fig no. 5.



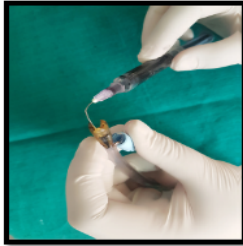
Fig no. 4



Fig no. 5

**(Specimen in Ethyl alcohol conc. 90% and 100%)  
(Clearing of Tooth in Methyl Salicylate)**

India ink was then injected into the canals with the help of 10 ml syringe Fig no. 6.



**Fig No. 6**

**Dye (India Ink) Placement In A Representative Cleared Specimen**

The internal anatomy details were examined in all directions using 5 X magnifying glass. After evaluation the teeth were placed immediately in a separate container of methyl salicylate to avoid loss of transparency. Number of roots and root canals were observed fig no. 7.



**Fig No. 7**

**RESULTS:**

**Number Of Roots:**

Majority of second permanent mandibular molars had two separate roots (88%) followed by single (1%) and three roots (1%). Out of all, 10 % of teeth showed fused roots. (Table 1)

**Table No:1 Analysis Of No. Of Roots In Mandibular Second Molar.**

Description Mandibular second molar(N=100)	Secondmolar N=100	
	No.	%
Twoseparateroots	88	88%
Twofusedroots	10	10%
Threeseparateroots	1	1%
Singleconical	1	1%

**Number Of Root Canals:**

The order of occurrence of number of canals was 3 canals (55%)> 2 canals 24 %>4 canals (18%) >5 canals (2%)> 1 canal (1%).(Table 2)

**Table No. 2: Analysis Of Root Canals In Mandibular Second Molar.**

Type of molar	No.of tooth	No.of canalsper tooth				
		1	2	3	4	5
Mandibular second molar	N=100	1	24	55	18	2
	%	1%	24%	55%	18%	2%

**DISCUSSION:**

This study adds to the database about the root canal anatomy of second permanent molar in Himachali population. Teeth were collected from patients aged between 16 - 40 years because the apices of all permanent teeth close by the age of 16 years while at 40 years, root canals show increased evidence of canal calcifications, pulp stones and root canal fillings. The teeth were placed in 5% solution of sodium hypochlorite for 48 hours to dissolve

the organic matter. The effectiveness of sodium hypochlorite in the cleaning and disinfection processes depends on the concentration of available chlorine and the pH of the solution. Then, they were washed in running water, and were placed in 5% nitric acid, for 5-6 days, the acid was changed every day and was stirred thrice daily with a glass rod. The dehydration process includes series of rinses in 70% alcohol for 12 hours, 80% for 12 hours, 90% alcohol and 100% alcohol for 1 hour each. There occurs loss of water via the process of dehydration. After dehydration the teeth were placed in a container containing methyl salicylate for 2 days to make them translucent. Methyl salicylate (oil of wintergreen or wintergreen oil) is an organic ester naturally produced by many species of plants. Some authors used the same technique but with some modifications, such as using different type of acids, dyes for different periods of times. For example, there was the modified clearing technique developed by **Vertucci, Seelig A**, in which a 5% potassium hydroxide solution was used for 24 hours instead of the use of sodium hypochlorite, and heamatotoxylin dye instead of India ink dye. In the present study, majority of the second permanent mandibular molars studied were found to have two roots which were not fused. These findings are similar to those of other studies of **Gulabivala And Sahrari Shahi**<sup>14</sup>. Of the 220 mandibular second permanent molars studied, 83.1% were found to have two separate roots while 9.0% had fused roots, 2.2% had three separate roots. In another study, by **Rocha et al.**<sup>15</sup> where the anatomy of 628 extracted mandibular first and second permanent molars was studied, it was found that 84.1% had two separate roots, 15.9% had fused roots and 1.5% had three roots.

**CONCLUSION:**

Within the limitations of this study, it can be concluded that:

1. Majority of second permanent mandibular molars had two separate roots (88%) followed by single (1%) and three roots (1%). Out of all, 10 % of teeth showed fused roots.
2. The order of occurrence of number of canals was
3. canals (55%)> 2 canals 24 %> 4 canals (18%)>5 canals (2%)> 1 canal (1%).

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