

Assessment of Root Anatomy and Variations of Third Mandibular Molars in the Population of Peshawar using Cone Beam Computed Tomography

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ABSTRACT

Background: Third molars have root canal structure that is frequently incredibly complicated and highly varied. Greater heterogeneity in root patterns and canal shape has been linked to mandibular third molars.

Aim: To assess the root and canal anatomy of mandibular third molar in the people of Peshawar using cone beam computed tomography.

Study Design: Retrospective study.

Place and Duration of Study: Khyber College of Dentistry and Rehman College of Dentistry, from 1st December 2020 to 31st January 2022.

Methodology: One hundred and ninety five CBCT scans of third mandibular molars were examined and the data in regards to their root number, canal number, Vertucci's classification, gender and age relation of morphology in mandibular third molars was statistically assessed.

Results: Greater number of 3rd mandibular molars had two roots (89.7%) and two canals (67.7%). Most mesial roots had Vertucci Type I (61%), distal root had type I canals as well (92.8%)

Conclusion: The current study concluded that mandibular third molars showed great variation in Root canal configuration. Majority had two roots and two canals per root.

Keywords: Canal configuration, Vertucci's classification, Mandibular third molars, Cone beam computed tomography (CBCT)

INTRODUCTION

Genetic variables affect the root morphology and anatomy of different species' root designs, so it's important to evaluate the root variances among populations.¹ The morphology of the tooth's outer layer is lost during the clearing technique, which is an in vitro approach to examine the 3-D anatomy of the pulpal morphology. In 1990s, Italian and Japanese groups created CBCT. This method aids in the three-dimensional visualization of root canal architecture.²

Third molar is a common tooth undergoing extraction due to reasons like caries, pericoronitis as well as gingival and periodontal disease.³ Recently third molars have been used in auto-transplantation process to replace first and second molar teeth that cannot be restored.⁴ Information in regards to anatomy and root number may be crucial for extractions and subsequent endodontic treatments in auto transplantation.⁵ Hence knowing the canal anatomy of 3rd molar is very beneficial for a good endodontic treatment as variations in root canal system are major challenge faced by dentist.¹ Commonly 3rd mandibular molar may have 1-4 roots, with numbers of encased root canals varying from 1-6, still the number can vary according to different studies.^{6,7} According to a thorough assessment of the literature, no local studies employing the CBCT technique is carried on the root number, root canal number, or canal morphology in 3rd mandibular molar teeth in the population of Peshawar.

MATERIALS AND METHODS

This retrospective research was done using, CBCT scans of patients visiting Khyber College of Dentistry and Rehman College of Dentistry, Peshawar from 1st December 2020 to 31st January 2022. Consent was obtained from the teaching hospitals. The CBCT scans of 195 patients (field of view of 40mm x 40mm or 60mm x 60mm and lowest dose radiation. 10mA, 32 s scan time, 10.8 s exposure time, 5cm diameter-5 cm height scan volume, France) were then assessed with CS3D imaging software (NNT) in a HP laptop (HP Probook 450 G5) with a resolution of 1280 x 1024 pixels. The scans were amplified by adjusting brightness, grey scale and contrast by using image processing tool for good visualizing. The images were interpreted and evaluated for radiographic findings. Canal configuration types, root number and canal number were assessed by the use of NNT toolbar, rolling downward carefully through the scans from the chamber to the tip

of root at the axial slices. The scans were then rotated in full axis, their slices were taken in coronal, axial and sagittal planes. Good quality CBCT scans of completely formed root apices of 3rd mandibular molars with no periapical disease, no endodontic treatment and no calcification/resorption were selected.

The data of the examined scans were recorded and evaluated to determine the frequencies and percentages root numbers, root canal number and root canal morphology of mandibular third molars. The results were presented in the form of tables. The statistical analysis was performed using SPSS-26 and data was assessed by applying Pearson Chi-square test and Fisher's exact test. P <0.02 was considered significant.

RESULTS

There were 63.6% scans were of males and 36.4% scans were of females. Majority of the patient's age were between 25-32 years (57.94%). More than half of the mandibular third molar scans evaluated showed 2 canals (67.6%). 26.2% encased 3 canals; 1 and 4 canals were observed in 3.1% of scans respectively (Table 1).

Table 1: Frequency of number of root canals in third molars (n=195)

No. of Root Canals	No.	%
1	6	3.1
2	132	67.6
3	51	26.2
4	6	3.1

It was observed that only 9 were single rooted molars; 186 had two roots (mesial root and distal 186 each) and only 11 had distoangular root configuration. Only 5(2.6%) MnTM showed Type I (1-1) configuration in single rooted third molars; 119(61%) showed Type I (1-1) configuration in mesial roots. A majority 181 (92.8%) showed Type I (1-1) configuration Distal root and 11(5.6%) showed Type I (1-1) configuration in distolingual root. Moreover only 1(0.5%) Type II (2-1) configuration was observed among single rooted third molars whereas a minority 4(2.1%) showed Type II (2-1) configuration in mesial root; 1(0.5%) reported Type III (1-2-1) configuration in single rooted third molars as well as nearly a quarter 19(9.7%) showed Type III (1-2-1) configuration in mesial root; only 1(0.5%) showed Type IV (2-2) configuration in single rooted third molars, 12(6.2%) in mesial root and 1(0.5%) in distal root; Type V (1-2) configuration were found in

only 1(0.5%) single rooted third molars, 31(15.9%) mesial root and 4(2.1%) distal root . Moreover type VII (1-2-1-2) configurations were observed in only 1(0.5%) mesial root (Table 2).

It was found statistically a significant (p=0.035) difference observed between distal root of mandibular third molars and

different categories of genders (Table 3). It was also found that there is no statistically significant (>0.243) difference observed between different categories of age and anatomical parameters of mandibular third molars (Table 4).

Table 2: Distribution of mandibular third molar teeth on the basis of root canal configuration (Vertucci's classification)

Root morphology	Vertucci's canal configuration								Total
	Type I (1-1)	Type II (2-1)	Type III (1-2-1)	Type IV (2-2)	Type V (1-2)	Type VI (2-1-2)	Type VII (1-2-1-2)	Type VIII (3-3)	
Single Root	5(2.6%)	1(0.5%)	1(0.5%)	1(0.5%)	1(0.5%)	-	-	-	9(4.6%)
Mesial Root	119(61%)	4(2.1%)	19(9.7%)	12(6.2%)	31(15.9%)	-	1(0.5%)	-	186(95.4%)
Distal Root	181(92.8%)	-	-	1(0.5%)	4(2.1%)	-	-	-	186(95.4%)
Distolingual Root	11(5.6%)	-	-	-	-	-	-	-	11(5.6%)

Table 3: Association of gender with anatomical parameters of mandibular third molars (n=195)

Parameter	No.	Mean±SD	P value
Number of roots			
Male	124	2.04±0.26	0.084
Female	71	1.96±0.39	
Number of root canals			
Male	124	2.32±0.51	0.333
Female	71	2.24±0.66	
Single root			
Male	2	1.50±0.70	0.560
Female	7	2.29±1.70	
Mesial root			
Male	122	2.12±1.59	0.957
Female	64	2.11±1.69	
Distal root			
Male	122	1.03±0.36	0.035*
Female	64	1.23±0.92	
Distolingual root			
Male	7	1.00±0.00	-
Female	4	1.00±0.00	

*Significance value ≤ 0.05

DISCUSSION

Greater heterogeneity in root patterns and canal shape has been linked to mandibular third molars.⁸ Differences in teeth anatomy among various ethnicity should be examined. Researches that are conducted among various ethnicity shows a trend in root number and canal number.⁹

Current study found that mean age of the study subjects was 30.05±8.49; furthermore a majority 113 (57.9%) belong to 25 to 32 years age category and among them 124 (63.6%) were males. This study also reported that total 195 CBCT of 3rd mandibular molars were evaluated and it was observed that a vast number 175(89.7%) had two roots; 11(5.6%) had three and 9(4.6%) of MnTM had one root, this was consistent with the study done by Ahmed H. and abbot reviewed the literature from 1972 to 2012 and they also concluded that the majority MnTM were two rooted.¹⁰ Another study by Razumova¹¹ showed similar findings as they reported that MnTM is found mostly along with two roots. In similarity with our results Maryum et al¹² reported that the majority of teeth had two roots on average (73%), one root on average (21%), and three roots on average (5.5%) of the sample. According to Gulabivala et al¹³, 68% of 3rdmandibular molars had two roots, and 11% had just one root.

In the present study, more than half 132 (67.7%) of the CBCT of third molars evaluated showed two root canals followed by 51 (26.2%) showed 3 root canals. Distal root revealed type I Vertucci classification in more than 90% of cases. Mesial root showed Vertucci type I in 61% of the cases followed by type V (15.9%), type III (9.7%), type IV (6.2%) and type II (2.1%). Majority of distal roots 181 (92.8%) showed type I configuration.¹¹

This research showed that statistically no significant difference was observed in different categories of age and anatomical parameters of mandibular third molars whereas statistically a significant (p=0.035) difference was observed between distal root of mandibular third molars and different

categories of gender. The impact of gender on the exterior and internal root anatomy of mandibular third molars has already been examined by several studies.¹⁴⁻¹⁷

Table 4: Association of age with anatomical parameters of mandibular third molar

Parameter	No.	Mean±SD	P value
Number of roots			
17-24 years	30	1.97±0.41	0.67
25-32 years	113	2.04±0.29	
33-40 years	34	2.00±0.34	
41-49 years	7	2.00±0.00	
50 and above	11	1.91±0.30	
Number of root canals			
17-24 years	30	2.23±0.67	0.903
25-32 years	113	2.31±0.55	
33-40 years	34	2.29±0.62	
41-49 years	7	2.14±0.37	
50 and above	11	2.36±0.50	
Single root			
17-24 years	3	2.33±2.30	0.537
25-32 years	3	2.00±1.00	
33-40 years	2	1.00±0.00	
41-49 years	-	-	
50 and above	1	4.0	
Mesial root			
17-24 years	27	2.15±1.72	0.997
25-32 years	110	2.15±1.64	
33-40 years	32	2.06±1.66	
41-49 years	7	2.00±1.29	
50 and above	10	2.00±1.49	
Distal root			
17-24 years	27	1.15±0.77	0.193
25-32 years	110	1.03±0.28	
33-40 years	32	1.25±0.98	
41-49 years	7	1.00±0.00	
50 and above	10	1.40±1.26	
Distolingual root			
17-24 years	2	1.00±0.00	-
25-32 years	7	1.00±0.00	
33-40 years	2	1.00±0.000	
41-49 years	0	-	
50 and above	0	-	

*Significance value ≤ 0.05

CONCLUSION

The current study concluded that mandibular third molars showed great variation in root canal configuration. Majority had 2 roots and 2 canals per root. Vertucci's type I was commonly seen in mesial root and distal roots of 3rdmandibular molars. More researches should be conducted to confirm the results in the people of Peshawar.

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