



MORPHOMETRIC STUDY OF THE ROOT ANATOMY IN FURCATION AREA OF EXTRACTED FIRST MANDIBULAR MOLARS

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ABSTRACT

Mandibular molar with furcation involvement exhibit a poorer prognosis. Furcation involvement in periodontal disease has been a challenge for the dentist.

Objective: The aim of this study was to investigate and find out the correlation between different root trunk length and Inter-radicular angle.

Results: In Buccal & lingual Furcation angle signification difference was observed, Mid-root trunk length of Lingual surface was more than Buccal surface in all the samples.

Conclusions: In conclusion, the lingual furcation of mandibular first molars presented narrower entrance and longer root trunk than the buccal furcation, suggesting more limitation for instrumentation and worse prognosis to lingual furcation involvements in comparison to buccal lesions.

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INTRODUCTION

The Glossary of Periodontal Terms defines furcation as “the anatomic area of a multirrooted tooth where the roots diverge” and furcation invasion refers to the “pathologic resorption of bone within a furcation”.¹ As the destruction of the periodontium progresses apically, the furcation of multi rooted teeth is exposed, leading to irreversible bone loss instrumentation during periodontal therapy. Furcation involvement in periodontal disease has been a challenge considerable influence on the accessibility for both home care maintenance and for the dentist². Sometimes it is difficult to make decision regarding furcation management. In this study, an attempt has been made to find out a clinical formula to make appropriate judgement regarding treatment procedure.

To check the feasibility of this concept, an in-vitro study was designed on extracted molar teeth. Non root carious molars were collected from the department of oral surgery. All extracted teeth were disinfected and cleaned with ultrasonic scaler. The entire specimens were dried. Photographs were taken and using Computer software a relationship has been established between root trunk length and furcation angle.

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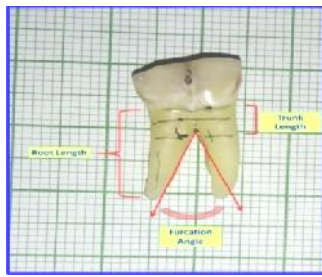
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Aims & Objectives

To find out the relationship between clinically visible root trunk morphology and the architect of the hidden furcation complexity

MATERIALS AND METHODS

The experimental sample consisted of 30 freshly extracted, mandibular molars teeth. Teeth with caries, fused roots, calculus or restorative treatment that could interfere in the area of interest were excluded. The reasons for tooth extraction and any information about possible periodontal treatment before extraction could not be identified. All freshly extracted teeth were disinfected in Conc. Sodium Hypochlorite solution. All the samples were dried, numbered and placed over a grid paper to take pictures for computer analysis. With the help of ruler, divider & Protractor, dimensions of the roots were measured and recorded in a sheet. Statistical analysis were done to find out the correlation between different root trunk (RT)length and Inter-radicular angle(IA). For the measurement of root trunk a line was drawn on the cemento enamel junction (CEJ), and a point mark indicated the fornix of the furcation entrance ie RT (root trunk)= distance between the fornix and the highest point of the CEJ; For the IA measurement, two lines were drawn along the inner wall of the mesial and distal root.



The angle formed between the intersection of these two lines was recorded as the IA. IA (interadicular angle)= angle of separation formed by the buccal and lingual roots of the furcation. Root length (RL) is measured from CEJ to apex of the root.

RESULTS

Result was obtained by entering data in Microsoft excel and student paired t-Test and Pearson correlation was analyzed by using statistical analysis software Graphpad Prism (Version5) and SPSS (version16). ‘p’ value of less than 0.05was accepted as indicating significance.

1. When Buccal & lingual Furcation angle is compared, signification difference is observed; whereas Root trunk length is almost comparable.(Table 2 & 3; Figure 1)
2. Mid-root trunk length of Lingual surface is more than Buccal surface in almost all cases; that means lingual fornix is more apical than buccal & its periodontitis involvement is latter than Buccal furcation.(Table 1, Figure 3)
3. Significant difference is observed between Buccal & Lingual furcation angle. Although buccal furcation is more prone to periodontitis but its accesibility and visibility for instrumentation is better than Lingual surface.(Figure 3)
4. Correlation between Buccal root trunk length and Buccal furcation angle results in negative correlation. In case of deeper trunk length furcation angle is narrower.(Figure 4)
5. Correlation between Lingual root trunk length and Lingual furcation angle results in no correlation. That means Furcation angle in lingual surface is not related to Lingual root trunk length.(Figure 5)
6. The average furcation angle of buccal region which is dependent on root trunk length is 23.12±4.71 whereas the average furcation angle of lingual surface is 19.07±4.44 which is irrespective of the length of root trunk length or the level of lingual fornix. (Table 1 & Figure 3)

Table 1 Morphometric analysis of root anatomy

Morphometric Analysis of Root Anatomy

SAMPLE No.	MEDIAL ROOT LENGTH		BIFURCATION LENGTH		AVERAGE ROOT LENGTH		MID-BUCCAL ROOT TRUNK LENGTH		BUCCAL FURCATION ANGLE		MID-LINGUAL ROOT TRUNK LENGTH		LINGUAL FURCATION ANGLE	
	mm	mm	mm	mm	mm	mm	mm	mm	degree	degree	mm	mm	degree	degree
1	13.50	14.00	13.75	2.00	30.00	3.50	10.00							
2	11.50	12.00	11.75	3.00	25.00	5.00	23.00							
3	11.00	12.00	11.50	3.50	24.00	4.00	18.00							
4	14.50	14.00	14.25	2.00	19.00	3.50	16.00							
5	12.00	13.00	12.50	3.50	21.00	2.00	19.00							
6	13.50	13.00	13.25	3.50	25.00	4.00	15.00							
7	11.50	12.50	12.00	2.50	30.00	3.00	22.00							
8	13.00	15.00	14.00	4.00	22.00	4.50	20.00							
9	12.00	13.50	12.75	4.50	28.00	5.00	27.00							
10	18.50	14.00	16.25	4.00	32.00	3.50	25.00							
11	13.00	12.00	12.50	4.00	22.00	3.50	20.00							
12	11.00	10.00	10.50	4.00	25.00	3.50	22.00							
13	12.00	11.00	11.50	4.00	28.00	6.00	20.00							
14	12.00	11.50	11.75	3.00	16.50	4.00	13.00							
15	11.00	10.00	10.50	5.00	27.00	4.00	25.00							
16	18.00	17.00	17.50	4.00	15.00	4.50	12.00							
17	13.00	11.00	12.00	4.50	18.00	5.00	15.00							
18	12.00	11.00	11.50	5.00	20.00	3.00	18.00							
19	14.00	13.50	13.75	4.50	22.00	3.50	17.00							
20	15.00	13.00	14.00	5.00	25.00	3.00	23.00							
21	13.00	12.50	12.75	4.00	20.00	3.50	19.00							
22	12.00	11.50	11.75	5.00	12.00	4.50	10.00							
23	13.00	12.50	12.75	4.00	21.00	3.50	18.00							
24	11.50	10.00	10.75	3.50	20.00	4.00	18.00							
25	14.00	13.00	13.50	5.00	21.00	4.50	17.00							
26	14.50	12.00	13.25	3.50	25.00	5.00	22.00							
27	14.00	13.00	13.50	3.00	28.00	4.00	25.00							
28	13.00	12.00	12.50	5.00	26.00	3.50	24.00							
29	15.50	14.50	15.00	3.50	19.00	5.00	17.00							
30	14.00	13.50	13.75	4.00	27.00	5.50	22.00							
	13.22	12.58	12.90	3.87	23.12	4.03	19.07							

Table 2 Comparison between Mid-Buccal Root Trunk Length and Mid Lingual Root Trunk Length

	MID FACIAL	MID LINGUAL	P value
ROOT TRUNK (mm)	3.87±0.85	4.03±0.86	0.1356

Significant difference

Table 3 Comparison between facial and lingual measurement of furcation angle.

	FACIAL	LINGUAL	P value
FURCATION ANGLE (degree)	23.12±1.71	19.07±1.11	<0.001

Significant difference

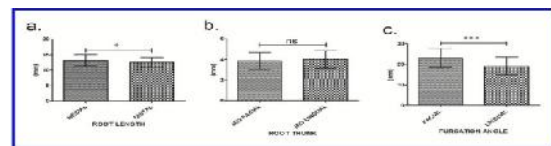


Figure 1 Comparison between Buccal & Lingual Surface in terms of Root Length, Trunk Length and Furcation Angle.

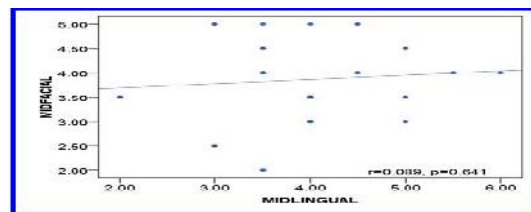


Figure 2 Correlation between Mid-Buccal Root Trunk Length and Mid Lingual Root Trunk Length.

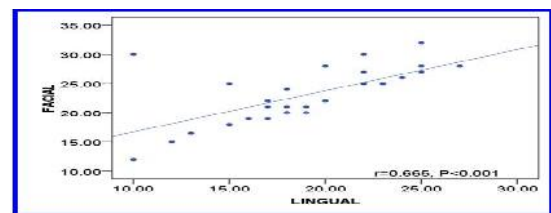


Figure 3 Correlation between facial and lingual measurement of furcation angle.

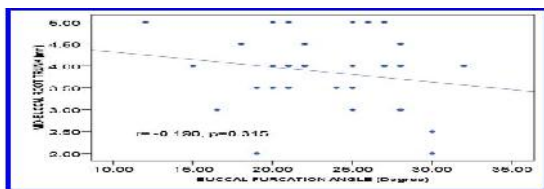


Figure 4 Correlation between Mid-buccal root trunk length and Buccal furcation angle

Non-significant and negative correlation was observed between Mid buccal root trunk and buccal furcation angle ($r = -0.190, p = 0.315$)

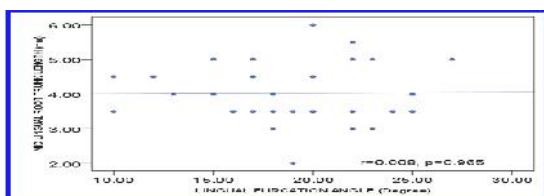


Figure 5 Correlation between Mid-lingual root trunk length and Lingual furcation angle

Non-significant correlation was observed between Mid lingual root trunk length and lingual furcation angle ($r = 0.008, p = 0.965$).

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DISCUSSION

There has been a significant increase in the knowledge and understanding of the etiology, pathogenesis, and treatment of inflammatory periodontal diseases over the past few decades. However, arriving at a diagnosis and determining the course of treatment are still based largely on basic clinical and radiographic techniques, such as conventional assessment of attachment and bone loss, which both have limitations.³ Therefore, knowledge of the anatomical and morphological features of roots is necessary to achieve better clinical practice in the field of periodontology. The severity of furcation is directly associated with the relationship between the amount of attachment loss and the RT length.⁴ In the present study, morphometric analysis of mandibular first molar furcation area revealed longer lingual root trunk in comparison with buccal root trunk as shown in figure 3.

The length and type of the root trunk is one of the key anatomical factors that make molars particularly susceptible to periodontal disease.⁵ McClain and Schallhorn reported that short root trunks surely influence the pathogenesis of furca involvement, a molar with a short root trunk is more vulnerable to furcal involvement, but has a better prognosis after treatment since less periodontal destruction has presumably occurred.⁶

In the present study mandibular first molar have anatomically narrower interradicular distance and greater root trunk height in the lingual surface than the in the buccal surface. Narrower furcation implies an increased difficulty of access through furcation entrances for complete root debridement leading to a poor periodontal outcome.⁷

CONCLUSION

Shorter root trunks also make it easier for the clinician to diagnosed and treat furcation defects and more convenient for the patient to maintain such furcations after treatment.

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