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Relationship Between Root Trunk Types and Periodontal Attachment Loss in Taiwanese's Molars Affected with Class III Furcation Involvements

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Abstract

The purpose of the present study was to investigate the relationship between root trunk types (RTT) and periodontal attachment loss (PAL) on molars affected with Class III furcation involvement (FI). The extracted teeth (169) of maxillary (103) and mandibular (66) molars in individuals affected severe advanced periodontitis were diagnosed as molars with Class III FI and alveolar bone loss ≧70%. The clinical records include patient's age, gender, degree of FIs and vertical dimensions of root trunk types (RTT), molar location, furcation site, and number of extracted molars. The assessments of the PAL and RTT of the extracted molars were taken under a stereomicroscope equipped with micrometer scale. Collected data were analysed using the chi-square test and one-way ANOVA. Results showed that significant relationships between PALs and 1) prevalence of molar location ($p<0.001$); 2) RTTs ($f=4.32$, $p<0.05$); 3) molar types; and 4) furcation surfaces ($p<0.05$). It was concluded that the prevalence of the molar extraction affected with the Class III molar FI is associated with increasing length of root trunk and PAL.

Keywords: RTT; Molar FI; RTL; ECM; PAL

Abbreviations: RTT: Root Trunk Types; PAL: periodontal attachment loss; FI: furcation involvement; FED: Furcation Entrance Dimension; RDA: root divergent angle; BRT: Buccal Root Trunk; MRT: Mesial Root Trunk; DRT: Distal root trunk; LRT: lingual root trunk

Introduction

The primary challenging problems in the individuals affected severe advanced periodontitis with molar furcation involvements are due in part to the complexity of furcation entrance dimension (FED), root divergent angle (RDA), degree of root separation, and molar root fusion. Former studies have documented that the variations in molar root morphology may be regarded as a beneficial factor favor the development of localized periodontal problems by providing an environment favorable to plaque retention [1-5]. In addition, Furcation anatomy and classification system with therapeutic considerations are also considered as relative important in the periodontal treatment plan [6,7]. The shape, length, number, proximity of molar roots, and vertical component of furcation involvement are generally capable of affecting the anchorage and stability of molars to a significant degree [4-7]. Molars with long root trunk are not easily to develop FI when compared to those molars with short root trunk. The problems related to periodontal bony defects, such as more and more attachment loss and resultant molar loss which may occur when such molars with Type B as Type C root trunk developed in Class III FI. The earlier study on the types, dimension, distribution, and prevalence of root trunks together with a molar FI classification included assessment and correlating the relationship of varying degrees of root trunk with horizontal and vertical attachment loss [8,9]. These data of RTT and dimension and respective periodontal attachment level may be developed as an aid in diagnosing the Class III FI and respective PALs. Our earlier report also showed that different dimension of buccal root trunk (BRT), mesial root trunk (MRT), and distal root trunk (DRT) of maxillary molars as well as in BRT and lingual root trunk (LRT) of mandibular molars may be useful in assessing the diagnosis of through and through

FI [10]. Little or limited study regarding the types and dimensions of root trunk correlated with the RTT, periodontal attachment loss (PAL) with Class II and III FIs, is available. The purpose of the present study was to investigate the correlation of PAL and the types and dimensions of root trunk with Class II FI.

Methods and Materials

Samples

The study samples consisted of a total 169 maxillary (103) and mandibular (66) first and second molars were extracted due to the final diagnosis of hopeless teeth with severe advanced periodontal destruction and with Class III molar furcation involved and alveolar bone loss ≧70% in a group of individuals. The subjects included males and females, 24 to 84 years of age, with a mean age of 47.8±7.2 years. The subjects were collected among individuals treated in the Kaohsiung Medical University, Department of Periodontics for periodontal therapy. The molars collected had not restored with crown or bridge or otherwise damaged so as to prevent an exact assessment of vertical dimensions of root trunk and root length. The extracted molars were washed in a tap water, and tooth type determined subsequently, the collected examples were fixed in formalin solution after hard root deposits are also removed with curettage and ultrasonic scaling.

Measurement of samples (Vertical dimension of molar root trunk) (Figure 1)

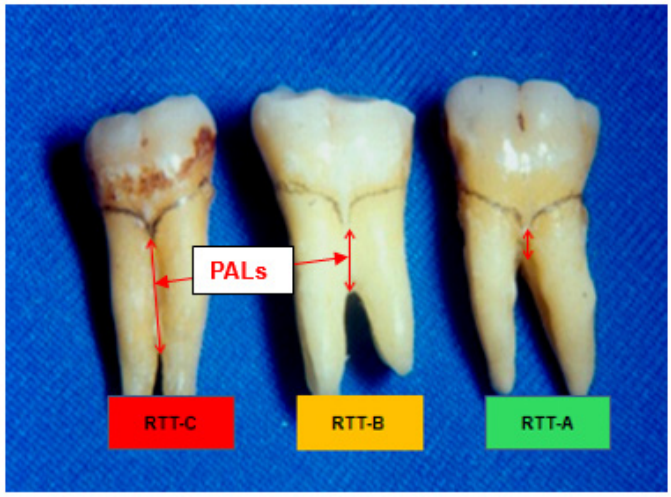

Figure 1: The root trunk types (RTT) A, B, and C are associated with periodontal attachment levels (PALs) and root trunk length on molars.

The vertical dimensions of the root trunk and root length were measured with an ECM (NSK, Max-Caliper, Japan Micrometer, MFG Co. Ltd.) and the means and standard deviations calculated. Measurements of the maxillary molars included the vertical height of the BRT, MRT, and DRT, as well as the molars included the BRT and LRT, respectively. The type of root trunk classified according to the ratio of root trunk height to root length in Types A, B, and C, which was reported earlier [8-10]. Samples consisted of 169 hopeless permanent molars (103 maxillary and 66 mandibular molars) which were diagnosed as having severe advanced periodontitis, with a Class III molar FI and alveolar bone loss ≧70% and with a failure of repeated periodontal therapy following radiographic examination.

The measurements of PAL (Figure 1)

Clinical records including patient's age, gender, grades of FI, FED (defined three groups 1,2, and 3 as FED < 0.55 mm, 0.55-0.75mm, and > 0.75mm), the PAL for the intra-furcations on the maxillary molar roots, as well as buccal, and lingual intra-furcations on the mandibular molar roots, were made after extraction. Routine periapical radiographic examinations were taken on molars to ensure the degree of FIs. The PAL of 168 isolated molars with Class III accounted for 70% as more by using the stereomicroscopic examination equipped with micrometer scale. Measurements of true attachment loss were taken by methylene blue staining after molar extraction. The classification of Root trunk types A, B, and C was employed as the three grading system which was published earlier [8-10].

Statistical Analysis

The relationship between the RTTs and molar location, furcation sites among maxillary and mandibular molars were analyzed using chi-square test. The mean values and standard deviations between type, dimensions of molar root trunk among maxillary and mandibular molars were also calculated. The correlation of the root trunk types with respect to the molar location, furcation site, and PAL was analyzed by one-way ANOVA.

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Results

Table 1 displays the mean values, standard deviations and ranges of % of PAL in the root trunk length from a total 169 extracted hopeless molars (441 molar furcations) with Class III FI and ABL≧ 70%. Results revealed that there is a slight change between the PAL and RTL, but with a non-significant relationship between PAL and root trunk length (RTL) by using the one-way ANOVA(X^2 =0.02). Table 2 indicates the mean values and standard error of % of PAL in the root trunk types A, B, and C in a total 441 molar furcations with Class III FI and ABL≧70%. The statistical analysis revealed a significant relationship between the % of PAL (PAL/RTL x 100%) and root trunk type (f = 4.32, p=0.0139, p<0.05). The statistical analysis also revealed a significant relationship between the root trunk type and furcation sites by chi-square test (X^2 =14.25, p<0.05). Table 3 indicates that the mean values and standard errors of the % of PAL in 441 maxillary and mandibular molar furcations with Class III FI and ABL≧70%. Result shows that a significant relationship between the % of PAL and molar location by using the one-way ANOVA (f = 6.05, p<0.001). Table 4 shows that the mean values and standard errors of the % of PAL in 441 furcation sites (buccal, mesial, and distal furcations in maxillary molars and buccal and lingual furcations in mandibular molars). There was a statistically significant relationship between % of PAL and different furcation sites by using the one-way ANOVA (F=3.018, p<0.05).

Table 1: comparison of the means and standard deviations of the periodontal attachment loss (PAL) in the root trunk types A, B, and C in 169 extracted hopeless molars affected class III FI.

Molar location(n)	N	Type A PAL M±SD	Type B PAL M±SD	Type C PAL M±SD
16 & 26(45)	135	9.5(1.89)	8.58(1.84)	9.12(2.26)
17 & 27(58)	174	9.04(2.25)	8.82(1.69)	9.00(2.00)
36 & 46(13)	26	8.52(2.08)	8.74(1.66)	10.02*(-)
37 & 47(53)	106	9.53(1.70)	9.31(1.20)	9.10(1.59)
Total (169)	441	66	174	201

n: Teeth numbers; N: Root numbers; RTL: Root trunk length; M: Mean; SD: Standard deviations.

Table 2: The comparison of the Means and standard deviations of periodontal attachment loss among the root trunk types A, B, and C.

RTT	n	PAL/RTL (%) M(SD)	One-way ANOVA
A	66	81.41(1.79)	F = 4.317
B	174	78.38(1.10)	p<0.05
C	201	82.76(1.02)	

PAL: Periodontal attachment levels; RTL: Root trunk lengths; M: Mean; SD: Standard deviation.

Table 3: The comparison of means and standard errors of % in the molar surfaces.

Molar Location	n	PAL/RTL (%) M(SE)	One-way ANOVA
16 & 26	135	81.41(1.79)	
17 & 27	174	78.38(1.10)	f = 6.052
36 & 46	26	82.76(1.02)	p<0.001
37 & 47	106	84.92(1.40)	
Total	441		

Table 4: The comparison of means and standard errors of PAL (%) among furcation surfaces of buccal, mesial, lingual, and distal furcations.

Furcation Surface	n	PAL / RTL(%) M(SE)	One-way ANOVA
Buccal Furcation	169	81.15(1.12)	
Lingual Furcation	103	82.81(1.43)	F = 3.018
Mesial Furcation	66	83.87(1.79)	p<0.05
Distal Furcation	103	78.02(1.43)	

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Discussion

Little or no report regarding the relationship between the length of molar root trunk and associated PAL is reported. Most former reports do not address the extent and degree of molar FI associated with the dimensions and types of root trunk, especially molars with the presence of Class III. The present data for the % of the PAL associated RTL could contribute to understanding the relationship between the PAL and the RTL. It suggests that the higher length of root trunk probably correlate with more PALs when molars affected with Class III FI. To our knowledge, limited data has been addressed the information regarding the % of the PAL related to the associated molar root trunk types. Based on the analysis of the mean values of root trunk types A, B, and C, lengths of root trunk in different molar location indicated that the mean vertical PAL from CEJ to the point at which the separate on the different furcation sites may be useful in the diagnosis, prognosis, and treatment of various degrees of molar FI. Our result displays the mean values, standard deviations and ranges of % of PAL in the root trunk length from a total 169 extracted hopeless molars (41 molar furcations) with Class III FI and ABL≧ 70%. Results revealed that there is a slight change between the PAL and RTL, but with a non-significant relationship between PAL and root trunk length (RTL) by using the one-way ANOVA. Results demonstrated that the mean values and standard error of % of PAL were measured in the root trunk types A, B, and C in a total 441 molar furcations with Class III FI and ABL≧70%. The statistical analysis revealed a significant relationship between the % of PAL (PAL/RTL x 100%) and root trunk type.

Only little or no published data are available to correlate the relationship between the PAL (%) and associated molar and molar location. The % of the mean PAL, as analyzed by one-way ANOVA, appears to be higher significant association with the molar location at the 2nd molar as compared to the 1st molar. This result also reemphasized the second molars with longer root trunk Type C have a greater risk to develop in both greater PAL and poor prognosis than molars with short root trunk (Type A) when molars affected with Class III FI. The present report indicated that the mean values and standard errors of the % of PAL in 441 maxillary and mandibular molar furcations with Class III FI and ABL≧70%. Statistically analysis showed that a significant relationship between the % of PAL and molar location by using the one-way ANOVA. Table 4 shows that the mean values and standard errors of the PAL/RTL% in 441 furcation sites (buccal, mesial, and distal furcations in maxillary molars and buccal and lingual furcations in mandibular molars). There was a statistically significant relationship between the PAL/RTL (%) and different furcation sites by using the one-way ANOVA. The % values of PAL/RTL at the mesial furcation are the highest, followed by the lingual, buccal, and distal furcations, irrespective of maxillary and mandibular furcations.

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