

Root Morphology and Tooth Length of Maxillary First Premolar in Nepalese Population

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Abstract

Introduction: Maxillary first premolar teeth are commonly extracted teeth for orthodontic purpose and commonly root treated tooth because of dental caries. There are different variations on root form, number as well length of the root and tooth.

Objective: To find out the root morphology and average tooth and root length of maxillary first premolars in Nepalese population samples.

Materials and methods: Total 100 maxillary first premolar teeth were collected for the study and carefully stored in chambers separated for male and female. Root form was identified and recorded. Similarly tooth length and root length was measured by digital caliper (MC, China) and compared by independent t-test.

Result: 58% of the samples had single rooted roots. Whereas double root, fused root and triple root form were 20%, 21% and 1% respectively. There was not any significant difference on male and female tooth and root length.

Conclusion: Majority of Nepalese premolars have a tendency to be single rooted. Overall tooth length is shorter than the established tooth length.

Keywords: Maxillary first premolar; Root form; Root length; Tooth length

Introduction

Orthodontic treatment is usually associated with dental extraction and maxillary first premolar teeth are most commonly extracted teeth for this purpose [1-5]. Maxillary premolars are also commonly affected by dental caries which necessitates the need of root canal treatment. These teeth are found to have numerous variations in root form as well as root canal system which is of importance for general dentists as well as endodontists. First premolars being located in between anterior and posterior segment, they resemble with canine and molars in form as well as function [6]. On labial view, maxillary first premolars resemble more closely with maxillary canines where as they resemble the function of molar mostly i.e., grinding and chewing food. In absence of molars, premolars do the function of chewing food particles. However they are also used for tearing the food which is primarily the function of canines. Maxillary first premolars are usually thought to have two roots. However there are numerous racial differences on the root form, number of root and root canal system [7-10]. Extraction of maxillary first premolar might be difficult, especially when it has two separate roots. In orthodontic practice, therapeutic extraction of these teeth should be performed cautiously. When there is fracture of roots, extreme precaution should be taken to preserve the buccal cortical plate. If prior information about the number and curvature of root is known then necessary precautions can be taken while performing any clinical procedures. The established normal value of maxillary first premolar crown and root length are 8.5 mm and 14 mm respectively [11]. But these values might not be applicable in all the populations [12]. There are very scanty publications regarding the root forms of the south Asian populations and there are not any researches in Nepalese samples so far. So this study was designed to find out the facts about root form, tooth and root length in Nepalese population samples.

Materials and Methods

Total 100 maxillary first premolar teeth that are extracted for

routine orthodontic procedure in Dhulikhel Hospital, Kathmandu University School of Medical Sciences are collected for the study. The tooth immediately after extraction is rinsed with water to clean the blood debris then dipped into 5.2% Sodium Hypochlorite solution for two minutes and stored in 10% formalin until measurements are done. While collecting the teeth, male and female teeth are collected in a separate collection bottles with clearly written labels. Verbal consent is obtained from patient to keep their extracted teeth in hospital. In case the patients who wanted to take their extracted teeth with them, the teeth were given. Teeth with fractured and incompletely formed roots, with open apex and gross malformation are excluded from the study. The root forms were identified as single root, double root, triple root and fused root; described originally by Turner [13] later by Loh [9]. The root and tooth length are measured from mid buccal cemento-enamel junction and tip of buccal cusp to the root apex respectively with the help of a digital caliper (MC 01010157, 150 mm, China). In case of double and triple rooted teeth, the measurement is taken up to the apex of the longest root. Descriptive analysis was done for the root form, tooth and root length. Root length and tooth length were compared between male and female samples by independent t-test. The p-value was kept 0.05 for the level of significance.

Results

The frequency distribution of the root form, tooth and root length

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is shown in Table 1. Out of 100 specimens, majority of the teeth had single root form (58%, n= 58) whereas double root (n= 20), fused (n= 21) and triple root (n=1) forms were 20%, 21% and 1% respectively.

The tooth length, root length as well as comparison of these measurements between two genders are shown in Table 2. The average tooth length was 21 mm with minimum and maximum tooth length 17.52 mm and 24.69 mm respectively. The mean tooth length in male and female were 21.09± 2.09 mm and 20.99 ± 1.65 mm and mean root length were 13.08 ± 2.00 mm and 12.63 ± 1.50 mm respectively. The independent t-test did not show any significant difference on tooth and root length between male and female samples.

Discussion

The study was designed to obtain some idea about the root form, tooth length as well as root length of maxillary first premolar in Nepalese samples. So far there are no publications on root form and tooth length in Nepalese population. We have carefully stored the maxillary first premolar teeth immediately after extraction so that there is no confusion regarding the identifying characteristics of the tooth and to avoid possible biases.

In our study, 58% of the samples are found to have single root. There are varying reports from similar Asian studies. Walker and Loh in separate studies done in south-Chinese populations have found that 60% and 50% of their sample had single root [9,10]. Similarly a CBCT (Cone-Beam Computed Tomography) study done by Tian et al. in Chinese population has found that 66% of the maxillary first premolars had single root [14-16]. So Chinese population has more tendency towards having single root maxillary first premolar. However in contrast to our study and the Chinese studies, the studies done in Saudi and Jordanian population has shown the predominance of double rooted maxillary first premolars [17,18].

Other non-Asian studies have however shown the predominance of double rooted maxillary first premolars [6,7,12,15,19]. Some authors have clearly divided root forms into single, double, fused and triple roots as shown in Table 3 [6,9,18]. The difference on prevalence of root form on different studies might be because of the different criteria followed. If we assume fused root are the variant of double root then our findings will also be different. Triple rooted maxillary first premolars are very rare entity. It is reported to be between 0.8-6% [6,7,9,12,18]. In our study, only one sample had three roots.

Regarding the length of the tooth, our study has found that there is

Sex	Single root	Double root	Fused root	Triple root	Total
Male	16(61.5%)	4 (15.4%)	6 (23.1%)	-	26
Female	42 (56.8%)	16 (21.6%)	15 (20.3%)	1 (1.4%)	74
Overall	58 (58%)	20 (20%)	21 (21%)	1 (1%)	100

Table 1: Root form distribution.

Tooth/Root length	Sex	N	Mean	Standard Deviation	p-value	Significance
Tooth length		64	21.00	1.77		
Root length			12.76	1.65		
Tooth Length	Male	20	21.02	2.09	0.948	NS
	Female	46	20.99	1.65		
Root Length	Male	20	13.08	2.00	0.341	NS
	Female	46	12.63	1.50		

NS: Not Significant

Table 2: Tooth length and root length measurement.

Author	Year	Population	Sample size	One root	Double root	Triple root	Fused root
Woelfel J [6]	1990		200	38	61	1	
Chapparo AJ, Segura JJ, Guerrero E, Jimenez-Rubio A, Murillo C et al. [7]	1999	Spanish	150	40	56.7	3.3	
Loh HS [9]	1996	Singaporean	957	49.4	50.6	-	32.1
Walker RT [10]	1987	Chinese	100	60	40	-	-
Pecora JD, Saquy PC, Sousa Neto MD, Woelfel JB [12]	1992	Brazilian	240	55.8	41.7	2.5	
Ingle JI [14]	1965			43	55	-	33
Vertucci FJ, Gegauff A [15]	1979	Caucassian	400	26.2	70		13.5
Tian YY, Guo B, Zhang R, Yu X, Wang H, Hu T, et al. [16]	2012	Chinese south	300	66	33	1	
Awawdeh L, Abdullah H, Al-Qudah A. [17]	2008	Jordanian	600	30.8	68.4	.8	
Ateih MA [18]	2008	Saudi	246	17.9	80.9	1.2	
Rwenyonyi C, Kutesa A, Muwazi L, Buwembo W [19]	2011	Uganda	202	26.7	60.9		12.37
Present Study	2015	Nepalese	100	58	17.1	22.4	1.3

Table 3: Root forms in different populations.

no significant difference on root and tooth length between males and female samples. The mean tooth length was 21 mm and root length was 12.76 mm. This length is shorter than the established tooth and root length mentioned by Ash [11]. However the study done by Pecora on Brazilian population has found the result similar to our study. In their study, the mean length of the tooth was found to be 21.0 mm [12]. In our study the mean length is 21 mm with minimum 17.52 mm and maximum length 24.56 mm.

Conclusion

Based on the findings of the study we conclude that the maxillary first premolars in Nepalese population have a tendency to be single rooted and tooth length is shorter than the previously established data.

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