Original Article

Ex vivo measurements of tooth length in Nepalese population

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ABSTRACT

Introduction: To know the measurement of tooth/root length is of great importance in endodontics.
Objectives: Present study aimed to observe the vertical dimensions of extracted teeth in Nepalese population.
Materials and Methods: Five hundred twenty three extracted permanent teeth from Bir Hospital and different dental clinics in Kathmandu were collected and the length of the teeth was measured by using digital caliper. Data were expressed in Mean±SD and one sample *t* test was used to find out the difference from the data in the literature. Level of significance was set at ≤5%.
Results: Vertical dimensions of Nepalese teeth showed 0.5 to 6 mm less in measurement than the previous studies in the literature and the difference was statistically significant.
Conclusion: Nepalese population showed shorter tooth lengths than the data available in the literature. However, this finding should be substantiated with larger sample size with focus on individual tooth in detail.

Key Words: dental anthropology, human dentition, morphologic variation, nepal, tooth length

INTRODUCTION

Cognizance of tooth length measurement is the important factor in dentistry especially in endodontics[1]. The determination of the working length is one of the first procedures and is an important aspect of endodontic therapy[2,3]. Initial approximation of the exact length of the root canal during endodontic therapy is indispensable to avoid injury to the periapical periodontal tissues[4,5].

After carious involvement of either permanent or temporary teeth, they may subsequently undergo pulpal damage. Clinical management of these teeth can be different, based mainly on the differences between the two types of teeth[6] albeit root canal therapy is invariably solicited. Many procedures have been adopted to determine root canal length though the ideal technique has yet to be determined as no method is near to 100 percent reliable and accurate till date. Radiography has been widely used in the measurement and determination of tooth lengths[5-8]. However, radiography has its own limitations since x-rays provide a two-dimensional image of a three-dimensional object[9-11].

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Similarly, Small degrees of resorption are not distinct radiographically which may predispose to the over instrumentation and overobturation[7].

Electronic apex locators were invented in 1962[12], with an aim to have more accurate measurements of the root length and have been widely used on permanent teeth since then[3, 13-16]. The Root ZX ((Morita, Sao Paulo, SP, Brazil) apex locator is a third-generation electronic device which can detect the smallest diameter of the root canal in both moist and dry conditions[17], and even in root resorption[18]. However, application of these methods may not be possible all the time due to many constraints such as skill, economy, availability, geography, etc in a developing country like Nepal. So in this regard, having the preliminary data on Nepalese population may give the initial idea about the Nepalese tooth measurements and be complementary to the abovementioned methods for tooth length determination.

To the best of our knowledge, we lack preliminary data on Nepalese tooth length measurements hitherto. So this study was aimed to generate baseline data on the tooth lengths by measuring vertical dimensions of extracted teeth in Nepalese population.

METHODS

A total number of 523 extracted permanent teeth were collected from Bir Hospital and different clinics in Kathmandu, Nepal and those 165 teeth meeting the inclusion criteria were included in the study. Inclusion criteria involved mature permanent teeth with intact incisal or cuspal integrity and root apex. Exclusion criteria involved third molars and permanent teeth with apical resorption, wide open apical foramena (young permanent teeth), apical cementoma, gross decay and fracture. Measurements were taken using a Starrett digital calliper (0–150 mm, 799A-6/150, Starrett tools (Suzhou) Co. Ltd, China with accuracy of ±0.01 mm). The digital calliper was placed in between the crest of cusp and/or incisal margin and root apex for the measurement. All measurements were taken by single investigator. Three repeat measurements were taken and they were averaged. Data were expressed as mean ± SD. One sample *t* test was used to compare this study with previous data in the literature using SPSS version 10.

RESULTS

Out of 165 extracted teeth, 87 (52.8%) were maxillary and 78 (47.2%) mandibular (Fig 1). Frequency of distribution and percentage of different tooth extractions has been presented in table 1. Maxillary central incisor showed highest variation in the length measurement being 22.8±2.5 mm whereas mandibular central incisors had least variation i.e. 18.0±0.6 mm. Tooth length measurements have been presented as mean± SD in table 2. This study showed 0.5 to 6 mm less measurement in the tooth lengths than that of previous available resources (Table 3).

Table 1: Total number and percentage of the extracted maxillary and mandibular tooth

Tooth N=165	CI	LI	C	1PM	2PM	1M	2M	Total
Max(%)	16 (9.7)	8(4.8)	10(6.1)	5(3.0)	6(3.6)	21(12.7)	23(13.9)	87(52.8)
Man(%)	6 (3.6)	6(3.6)	14(8.5)	10(6.1)	7(4.3)	13(7.9)	20(12.2)	78(47.2)
Total(%)	22 (13.3)	14(8.4)	24(14.6)	15(9.1)	13(7.9)	34(20.6)	43(26.1)	165(100)

CI- central incisor, LI- lateral incisor, C-canine, 1PM- first premolar, 2PM- second premolar, 1M- first molar, 2M- second premolar

Table 2: Measurements of the extracted maxillary and mandibular teeth

Tooth	CI Mean±SD (in mm)	LI Mean±SD (in mm)	C Mean±SD (in mm)	1PM Mean±SD (in mm)	2PM Mean±SD (in mm)	1M Mean±SD (in mm)	2M Mean±SD (in mm)
Max	22.8±2.5	18.5±1.2	25.5±1.4	20.5±1.0	20.4±1.4	19.6±1.4	18.6±1.2
Mand	18.0±0.6	19.8±1.4	21.0±1.9	19.6±2.4	20.9±1.0	20.0±1.3	18.3±1.4

CI- central incisor, LI- lateral incisor, C-canine, 1PM- first premolar, 2PM- second premolar, 1M- first molar, 2M- second premolar

Table 3: Comparison of tooth measurements between present and previous studies

Tooth	Maxillary (in mm)				Mandibular (in mm)			
	Grossman[19]	Bjorndahl et al[20]	Wheelers[21]	Present study	Grossman[19]	Bjorndahl et al[20]	Wheelers[21]	Present study
CI	23	23.7	23.5	22.8[a,b,c]	20.5	21.8	21.5	18[a,b,c]
LI	22	23.1	22	18.5[a,b,c]	21	23.3	23.5	19.8[a,b,c]
C	26.5	27.3	27	25.5[a,b,c]	25.5	26	27	21[a,b,c]
1PM	20.5	22.3	22.5	20.5[b,c]	20.5	22.9	22.5	19.6[a,b,c]
2PM	21.5	21.3	22.5	20.4	22	22.3	22.5	20.9
1M	20.5	22.3	20.5	19.6[a,b,c]	21	22	21.5	20[a,b,c]
2M	20	22.2	19	18.6[a,b]	20	21.7	19	18.3[a,b]

CI- central incisor, LI- lateral incisor, C-canine, 1PM- first premolar, 2PM- second premolar, 1M- first molar, 2M- second molar; [a]P<0.05 with Grossman, [b]P<0.05 with Bjorndahl et al, [c]P<0.05 with Wheelers (One sample *t* test).

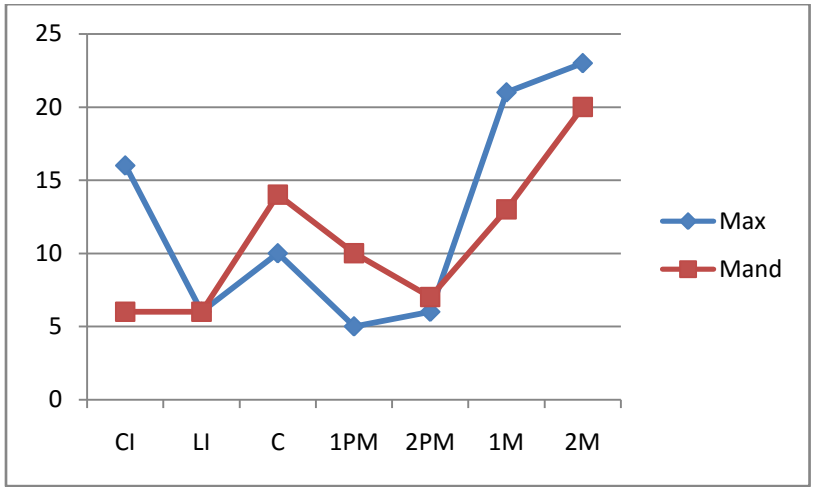

Fig 1: Distribution of maxillary and mandibular teeth. CI- central incisor, LI- lateral incisor, C-canine, 1PM- first premolar, 2PM- second premolar, 1M- first molar, 2M- second molar, Max- maxillary, Mand- Mandibular.

DISCUSSION

Present study was set to observe the vertical measurement of extracted teeth in Nepalese population. All the permanent teeth except third molars were included in the study as third molars are generally not conducive for root canal treatment, usually impacted and extracted surgically quite often. Findings showed that maxillary teeth were more frequently extracted (52.8%) than mandibular teeth. Among maxillary teeth, maxillary second premolar had the highest frequency (13.9%) whereas maxillary first premolar showed the least frequency (3%) of extraction.

Based on the tooth lengths, the order of frequency of variation from highest to lowest was found to be maxillary central incisor, mandibular first premolar, mandibular canine, mandibular lateral incisor (maxillary canine, maxillary second premolar, maxillary first molar and mandibular second molar), mandibular first molar, maxillary second molar (maxillary lateral incisor), maxillary first premolar (mandibular second premolar) and mandibular central incisor (Table 2).

Data in the literature also showed variations in the vertical dimensions of the teeth[19,20]. Mean values of the tooth measurements of previous and present findings (Table 3) showed 0.5 to 6 mm less length of the teeth included in this study than that of values in the literature. All the measurements except for maxillary and mandibular second premolar differed significantly with the previous studies (Table 3).

CONCLUSION

Findings of this study suggest that tooth length of Nepalese population has shorter vertical dimensions than the data in the literature. Measurement of individual tooth in detail rather than the all teeth with more sample size is further recommended.

Limitations

Small sample size of the study is major limitation. Moreover, root curvature has not been considered as canal curvature of more than 25 degree may affect the root length by more than 0.5 mm[22]. Additionally, for the multi-rooted teeth longest root has been considered for the measurement and attrition or erosion of the teeth has not been considered in the study.

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