ORIGINAL ARTICLE

DETERMINATION OF WORKING LENGTH VARIATION IN MAXILLARY CANINE: AN ANALYTICAL STUDY

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ABSTRACT

Accomplishment of a successful root canal treatment is the primary aim of any dental surgeon. There are variable reports that working length of maxillary canines has great impact on the treatment outcome. A descriptive study was conducted with the aim of measuring the average working length of maxillary canine in patients presenting to the Operative Dentistry Department of Rawal Institute of Health and Sciences, Islamabad. During the study the materials and equipment comprised of 5.25% sodium hypochloride, k file (mani), periapical radiograghs and an apex locator. The collected data was analyzed in SPSS software using descriptive statistics to measure mean and standard deviation for numerical variables and frequency and percentages for categorical variables. The sample size was comprised of 30 human maxillary canines, only one teeth was observed per patient. There were 16 males and 14 females. The average working length was 25.1 mm in this study. The results of this study showed that the average canine working length was larger in males than females, however, this difference was not statistically significant. After evaluation of present study findings it can be suggested that knowledge of different canine root lengths have an impact on the obturation methods and also on the accomplishment of successful root canal treatment procedures.

Keywords: *Working length, maxillary canine, root canal treatment, success*

INTRODUCTION

A successful root canal therapy requires complete removal of the pulp followed by thorough cleaning, shaping and obturation of the root canal system so that the tooth may maintain its integrity as a functional unit within the dental arch. For endodontic success and failure the anatomy of root canal system plays a significant role. As it is a complete system that branch along the lateral, apical and furcal portal of exits.[1]

An infected root canal system space harbours microorganisms and endotoxins[2], which are primary cause of apical periodontitis.[3,4] Success and failure of the endodontic treatment is related to the absence and presence of apical periodontitis, consequently the mechanical and chemical aspects of treatment are aimed at removal of these microorganisms and necrotic pulpal tissue completely from the canal system.[5] The canal system is also significant because it forms an anatomical pathway for the egress of irritants beyond the apical foramen.[6]

Therefore, the cementodentinal junction is considered as the ideal end point of endodontic instrumentation and obturation. It creates the smallest wound site and condition for healing is best because it is the narrowest point in the canal containing the smallest diameter of blood vessels. Hence known as the minor diameter of the canal.[2]

The most challenging step in the root canal therapy is determining the accurate working length. It decreases the chances of damaging the periapical tissues from over instrumentation and insufficient removal of pulp and microorganisms.[7]

The best method for accurate working length determination is the radiographic interpretation.[8] In this method, the diagnostic x-ray is used for determining the approximate tooth length. Hence the knowledge of tooth length beforehand is beneficial.

Although, it is considered as a standard measure for endodontic instrumentation in the dentinal portion of root canal but it is difficult to achieve because the of variation of major foramen relation with the cementodentinal junction. Clinical errors in the working

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length determination can be caused by the variables in the radiographic technique, angulation.[9]

MATERIAL AND METHODS

This descriptive study was conducted on 30 human maxillary canines. Teeth with complete root apex and sound cusp anatomy were included. Severely attrition in teeth, immature teeth, patients with cardiac pace makers, teeth with resorbed roots, teeth with roots fracture, roots with open apices patient over age of 50 and mentally handicapped patients were excluded. Only one tooth per patient was taken.

After taking the detailed medical and dental history, patients were briefed about the procedure and written consent was taken. After that a pre-operative periapical radiograph was taken. Local anaesthesia was administered and an endodontic access cavity was prepared. Pulp was extirpated with the help of H-file. Canal was properly irrigated with 5.25% sodium hypochloride. A K file 15 (Mani) was introduced to the estimated working length with the help of preoperative radiograph and apex locator and care was taken not to cross the apex. Before using the apex locator, the tooth was isolated with rubber dam. Working length radiograph was then taken with the manual x-ray parallex technique at 0.90s. (kVP 60, mAs 2). Working length from diagnostic radiograph and apex locator was then confirmed. Sample size was calculated using anticipated population proportion with flip tip extending working length beyond the root in 28.5% cases, relative precision of 15%, confidence level of 95% and the measured sample was 30 cases.

RESULTS

Total sample size comprised of 30 patients with age range from 18 years to 50 years. The mean age of study patients was 31.6 ± 8.3 years. There were 16 (53%) males and 14 (47%) females in this study. (Table 1)

Majority of the study cases presented with acute (40.0%) and chronic pulpitis (36.6%). The mean working length among males and females was 25.12 mm and 24.71 mm respectfully. The difference in the maxillary canine length between males and females was not statistically significant (p-value 0.805). Further details can be seen in table 2 & 3.

DISCUSSION

For root canal therapy to be successful, the knowledge of accurate tooth length is essential. This forms the basis on which locating, cleaning, shaping and restoration of root canal is carried out.[10] Previous literature shows a variation in tooth length in different races and ethnicities. The reason for this variation is genetics (e.g. sex, ethnicity) and environment. Hence, it becomes apparent that there is divergence of opinion as to the anatomy of root canal of human permanent teeth. The endodontic textbooks literature show the tooth length of the causcasian population only. However individual's ethnic origin shows a strong correlation with the dental morphology.[11] It can cause discrepancy in the treatment outcomes. The failure to carry out accurate working length determination can compromise the success of procedure resulting in post treatment disease, pain and/or complication of the treated tooth.[12]

There is a lack of data regarding the tooth working length of South Asian populations. Retentive Maxillary canines are the longest teeth in the human dental arch, and have variation in working lengths.[13] Hence maxillary canines were studied in the present research.

The average working length in this study was 25.1mm, which was consistent with the value suggested in literature i.e. 26.5mm.[14] A study conducted in Brazil by Cabral et al concluded that mesiodistal crown widths of maxillary and mandibular canines and premolars has shown no significant difference in black and whites.[15] The maximum limit in present study was 32mm which forms 15% of our cases. This result correlates with the studies conducted by Zmener et al[16] and Yousaf HA et al[17] where 13.5% of teeth showed working length greater than 32mm.

TABLE 1: GENDER DISTRIBUTION IN THE STUDY (N=30)

Gender	Number	% age
Male	16	53.3
Female	14	46.7

TABLE 2: PULP AND APICAL CONDITIONS (N=30)

	Acute pulpitis	Chronic pulpitis	Apical periodontitis
Patients	12 (40.0%)	11 (36.6%)	7 (23.3%)

TABLE 3: MEAN LENGTH OF CANINE IN STUDY GROUP (N=30)

	Gender	Number	Mean	Std. Deviation	p-value
Length of canine (mm)	Male	16	25.12	4.77	0.805
	Female	14	24.71	4.17	

Although the lengths are variable in different races, these findings suggest a common average value regardless of difference in upper and lower limits.

Some contradictory results are found in several studies in which the tooth size has been shown to have a strong association with both sex and ethnicity.[18,19] Males have consistently larger teeth than females which was also the case in this study. Mesiodistal tooth dimensions of people of African descent have larger mesiodistal tooth dimensions than those of European descent.[20]

CONCLUSION

The average length of maxillary canines was found consistent with previous literature. On average males were found to have longer maxillary canine length than females. Present study highlights the importance of having detailed knowledge of canine root canal lengths.

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4 Resham Hafeez:	Contribuited in data collection and analysis