

Correlation between height of the individual and working length of the teeth-An Institutional based cross sectional study

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Abstract:

Background: Root canal therapy (RCT) is a process that involves treating diseases of the pulp and periapex of a diseased tooth. The ultimate goal of RCT is to give a hermetic seal of root canal right up to the apical constriction and any instrumentation and obturation beyond the apical constriction will lead to inflammatory reactions of the periapical zone. The accurate working length determination, one of the most challenging steps is a prerequisite to successful root canal therapy. Accurate working length determination reduces the chance of insufficient cleaning of the canal or damaging the periapical tissues from over instrumentation. It also helps to limit the extend of obturation. This study aims to determine any association between height of individual and working length of teeth.

Methods: This is an institution based study conducted in Government dental college Kozhikode on 200 subjects who reported for root canal treatment on tooth number 46, tooth number 36, tooth number 11 and tooth number 21. Data was collected regarding their height, weight, gender and the working length. Working length was measured using electronic apex locator. Measurements obtained were compared separately for males and females using descriptive statistics and Pearson correlation coefficient.

Results: It was observed that in tooth number 11 and tooth number 21 there is a 0.5 mm increase in the working length in the taller group in both females and males. In tooth number 46 and 36, there was an increase of 1mm in the mean working length in tall males in ML canal. The mean working length of distal, distobuccal and distolingual canal of tooth 46 and 36 also showed an increase of 0.5 mm to 1mm in tall males. These findings show that there is a positive association in height and working length of teeth especially in tall males even though there is no statistical significance may be due to small sample size.

Conclusion: Within the limitation of this present clinical study there is a positive correlation between height of an individual and working length of teeth in both males and females. Further research and study with a larger sample is necessary in this regard.

Key words: Root canal treatment, males, females, working length

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I. Introduction

Root canal therapy (RCT) is a process that involves treating diseases of the pulp and periapex of a diseased tooth. The ultimate goal of RCT is to give a hermetic seal of root canal right up to the apical constriction and any instrumentation and obturation beyond the apical constriction will lead to inflammatory reactions of the periapical zone. The generally accepted method of working length determination is the radiographic method but the apical constriction cannot be accurately determined radiographically. The electronic apex locator has attracted a great deal of attention as it operates on the basis of electronic principles rather than by a visual inspection. The electronic apex locator is one of the breakthroughs that brought electronic science into the traditionally endodontic practice.⁽¹⁾ Numerous studies indicated an existence of strong genetic influence on tooth dimensions⁽²⁾⁽³⁾ There are various reports in literature comparing the stature of a person to the anterior teeth⁽⁴⁾ but information about correlation with length of the molars and individual's stature is lacking. This study was done to explore the relationship between the tooth length and body size in the modern man. To the best of my knowledge no such studies were done in Malabar or Kerala population. The aim of this study is to investigate and determine the relationship between the height of a person and the working length of

molars and incisors. This data hopes to help the clinicians to assess the preoperative working length and thereby enhance the success of endodontic treatment.

II. Materials and Methods

This institutional based observational study was conducted in Government Dental College, Kozhikode after obtaining permission from Institutional Ethical committee and prior consent from the persons participating in the study.

Sample size calculation⁽⁵⁾ : Sample size was estimated to be 200

Study Duration :November 2017 to November 2018

Sample selection: Sample subjects aged above 15 years were randomly selected from patients willing to participate in the study after obtaining written informed consent and were scheduled for root canal treatment.

Inclusion criteria: Patients scheduled for root canal therapy in Government dental college, Kozhikode and willing to be included in the study was selected.

Exclusion Criteria: Patients who had fractured teeth, attrition, severely worn out teeth, resorbed roots, invisible canals on radiographs, teeth with open apex and with systemic and congenital abnormalities were excluded from the study.

Grouping of samples:Subjects were grouped into male and female categories.Females greater than 155cm were considered as tall and females less than 155cm are considered as short. In the male category, subjects above 165.1cm were considered as tall and less than 165.1 is considered short⁽⁶⁾⁽⁷⁾

Procedure: Root Canal therapy was initiated and tooth length in millimetre (mm) was measured using Mesiol-Lingual Cusp tip as an occlusal reference point for mandibular first molars and incisal tip for maxillary incisors. The working lengths of all the teeth were measured with long cone paralleling technique using RadioVisioGraphy (RVG) and which was further reconfirmed Electronic Apex Locator [Root ZX, J Morita] in mm. Where the instrument did not reach the anatomic apex in the RVG suggesting a curved root (buccal or lingual curvature), the apex was confirmed with the Electronic apex locator. Where the readings of Apex locator were shorter than the length measured on RVG image, it was considered as a lateral exit canal and the subjects were excluded from the study. The working lengths were calculated for Mesiobuccal [MB], Mesiolingual [ML] and Distal [D] canal for mandibular first molars for males and females respectively

Stature of the individual was measured as the vertical distance from vertex to the floor using stadiometer, a centimetre measuring tape with wall stop. Measurement was taken by making the subject stand upright on the floor barefooted, with the feet grounded flat on the floor and the head oriented in Frankfurt's plane, while the shoulder and buttocks touching the wall behind. The movable gauze of the stadiometer mounted high on the wall was pulled downwards to contact the vertex in the mid sagittal plane. ⁽⁸⁾⁽⁹⁾

Statistical Analysis: Mean and standard deviation were calculated for all the parameters. Comparisons were made between measurements recorded with respect to the gender using descriptive statistics, student's t test and Relationships between the parameters were assessed by Pearson's correlation coefficient.

III. Results

Table 1: Descriptive statistics of study group

	Variables	Frequency
Age group	25 and below	123
	26-35	36
	36-45	30
	Above 45	11
	Total	200
Gender	Short Females	38
	Tall females	78
	Total females	116
	Short males	46
	Tall males	38
	Total males	84
	Grand total	200

Out of the 200patients in the study group, there were 116 females and 84 males. When the study subjects was analyzed with respect to age, it was observed that 123 patients were below 25 years of age,36 patients were between 26 years and 35 years, 30 patients were between 36years and 45 years and 11 patients was in the group above 45.

Table 2: Mean working length of tooth 11 in respect with height

FEMALE		Working length of Tooth 11		
Height	Mean	Std. Deviation	p-value	Inference
Short 155 and below	21	0.70711	0.623	There is no significant difference
Tall Above 155	21.4211	1.15786		
MALE		Working length of Tooth 11		
Height	Mean	Std. Deviation	p-value	Inference
Short 165 and below	21.15	1.63384	0.843	There is no significant difference
Tall Above 165	21.4	1.86318		

The results of Table 2 show that there is no statistical significant difference in the mean working length of tooth 11 and height of females and males as the p value is above 0.05. The mean working length of tooth 11 in short females is 21 and tall females are 21.4. The mean working length of tooth 11 in short males is 21.15 and tall males are 21.4. It also shows that there is no difference in the working length of tooth 11 and mean working length in both males and females but there is a 0.5 mm increase in the working length in the taller group in both females and males.

Table3: Mean working length of tooth 21 in respect with height

FEMALE		Working length of Tooth 21		
Height	Mean	Std. Deviation	P-value	Inference
Short :155 and below	20.25	0.98742	0.301	There is no significant difference
Tall: Above 155	20.7105	1.07129		
MALE		Working length of Tooth 21		
Height	Mean	Std. Deviation	p-value	Inference
Short :165 and below	20.3	1.08525	0.901	There is no significant difference
Tall: Above 165	20.6333	1.14122		

The results of Table 3 show that there is no statistical significant difference in the mean working length of tooth 21 and height of females and males as the p value is above 0.05. The mean working length of tooth 21 in short females is 20.25 and tall females are 20.71. The mean working length of tooth 21 in short males is 20.3 and tall males are 20.63. It also shows that there is no difference in the working length of tooth 21 in both short males and short females but there is a 0.5 mm increase in the working length in the taller group in both females and males

Table: 4 Mean working length of MB, ML, D, DB and DL canal of tooth 46 with respect to height

Working length of MB canal of tooth 46	Height of females	Short (155 and below)	Mean	Std. Deviation	p value
		Tall (Above 155)	19.25	1.20761	
Working length of ML canal of tooth 46	Height of males	Short (165 and below)	19.021	1.13296	0.755
		Tall (Above 165)	19.233	1.04994	
Working length of ML canal of tooth 46	Height of females	Short 155 and below	19	1.41421	0.446
		Tall Above 155	19.35	1.1068	
	Height of males	Short 165 and below	18.956	1.06508	0.171

Working length of D canal of tooth 46	Height of females	Tall Above 165	20	0	0.601
		Short 155 and below	20.285	1.28638	
	Height of males	Tall Above 155	19.725	1.26153	0.529
		Short 165 and below	20.1154	1.41648	
Working length of DB canal of tooth 46	Height of females	Tall Above 165	21	-	0.658
		Short 155 and below	19.36	1.25831	
	Height of males	Tall Above 155	19.633	1.89297	0.48
		Short 165 and below	19.5	2.12132	
Working length of DL canal of tooth 46	Height of females	Tall Above 165	21	0	0.825
		Short 155 and below	20	0.86603	
	Height of males	Tall Above 155	20	1.5	1.00
		Short 165 and below	19.5	2.12132	
		Tall Above 165	21	0	

The tabulation in table 4 shows that there is no statistical significant relationship of working length of MB, ML, D, DB and DL canals of 46 to height. The mean working length of MB canal of 46 is 19 mm in both short and tall females and males. The mean working length of ML canal of 46 is 19 mm in both females and short males, but in tall males it is 20mm. The mean working length of D canal of 46 is 20 mm in both females and short males, but in tall males it is 21mm. The mean working length of DBcanal of 46 is 19.5 mm in both females and short males, but in tall males it is 21mm. The mean working length of DL canal of 46 is 20 mm in females and short males it is 19.5 but in tall males it is 19mm.

Table 5: Mean working length of MB, ML, D, DB and DL canal of tooth 36 with respect to height

			Mean	Std. Deviation	P value
Working length of MB canal of tooth 36	Height of females	Short (155 and below)	18.7938	1.08041	0.455
		Tall (Above 155)	19.1765	1.35717	
	Height of males	Short (165 and below)	19.2273	0.93176	0.666
		Tall (Above 165)	19.8333	0.8165	
Working length of ML canal of tooth 36	Height of females	Short 155 and below	18.6875	0.89209	0.195
		Tall Above 155	19.2941	1.43678	
	Height of males	Short 165 and below	19.3182	1.2303	0.347
		Tall Above 165	19.8333	0.8165	
Working length of D canal of tooth 36	Height of females	Short 155 and below	19.4333	1.16292	0.062
		Tall Above 155	20.4063	1.61471	
	Height of males	Short 165 and below	19.8889	1.08333	0.16
		Tall Above 165	20.75	1.08397	
Working length of DB canal of tooth 36	Height of females	Short 155 and below	19.4333	1.16292	0.062
		Tall Above 155	20.4063	1.61471	
	Height of males	Short 165 and below	19.8889	1.08333	0.16
		Tall Above 165	20.75	1.08397	
Working length of DL canal of tooth 36	Height of females	Short 155 and below	19.4333	1.16292	0.062
		Tall Above 155	20.4063	1.61471	
	Height of males	Short 165 and below	19.8889	1.08333	0.16
		Tall Above 165	20.75	1.08397	

The tabulation in table 5 shows that there is no statistical significant relationship of working length of MB, ML, D, DB and DL canals of 36 to height. The mean working length of MB and ML canal of 36 is 19 mm in both short and tall females and short males, but it is 19.8 mm in tall males. The mean working length of D, DB and DL canal of 36 is 19.43mm in short females and short males it is 19.8mm, but in tall males it is 21mm.

IV. Discussion

Success is the expected outcome after root canal treatment (RCT), regardless of the clinical conditions. Achieving an optimum working length is thought essential for successful root canal treatment, so adopting any of these landmarks is associated with certain risks and benefits.⁽¹⁰⁾ Usually, the working length of the root canal is determined radiologically, but the radiographic image shows only the anatomical apex, not the apical constriction and depends on the dentist's ability to interpret the radiographic image⁽¹¹⁾. On the other hand, the apical constriction is clinically detectable, either by the tactile sensation, either by apex locator, and the reliability varies respectively between one clinician to another. An underestimation of working length decreases

the chances of successful endodontic treatment.⁽¹²⁾ However, it is rational to speculate that taller people possess longer teeth since the teeth contribute to the height of the face⁽¹³⁾.

In this study, there was no statistical significant correlation with height of an individual and working length of teeth. But it was observed that in tooth number 11 and tooth number 21 there is a 0.5 mm increase in the working length in the taller group in both females and males. In tooth number 46 and 36, in both females and males, there was no difference in mean working length in MB canal. In tooth number 46 and 36, there was an increase of 1mm in the mean working length in tall males in ML canal. The mean working length of distal canal of tooth 46 and 36 also showed an increase of 1mm in tall males. The mean working length of distobuccal canal of tooth 46 and 36 showed an increase of 0.5mm in both tall females and tall males. The mean working length of disto lingual canal of tooth 46 and 36 showed an increase of 0.5mm to 1mm in both tall females and tall males. These findings show that there is a positive association in height and working length of teeth especially in tall males. This is similar to the study of Reddy et al⁽¹⁴⁾ which revealed that there is a positive association between stature and posterior tooth length in both males and females. Prahu S et al⁽¹⁵⁾ evaluated multiple dimensional parameters of the maxillary central incisor tooth and found a small, albeit statistically significant correlation to the body height. Contradictory findings were reported by the study of Alam et al⁽¹⁶⁾ which showed that tooth length has no significance on sex of the people of same race. Jaywardena CK et al⁽¹⁷⁾ in a study in Sri Lankan Sinhalese individuals also came to the similar conclusion that tooth morphometrics do not determine body height of the subject.

In our study, tall males exhibited a tendency of increase in mean working length when compared to females. Similar correlation was seen in Anderson and Thompson⁽¹⁸⁾ study who suggested that tooth form did correlate with skeletal maturation in males and females. The reason for this difference may be due to the findings of the study of Alvesalo⁽¹⁹⁾ who found that the sex chromosomes have modifying effects not only on tooth shape, structure, and root size, but also influenced craniofacial form, body size and shape. He also found that Y chromosome promotes both dentin and enamel growth, whereas effect of X chromosome seems to be limited to enamel.

V. Conclusion

The present clinical study reveals that there is a positive correlation between height of an individual and working length of teeth in both males and females. A positive association between individual's stature and teeth could be very helpful to any dental surgeon in predicting the working length during root canal treatment, especially in difficult situations. Further research and study with a larger sample is necessary in this regard.

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