



INVITRO EVALUATION OF LAWS OF PULP CHAMBER ANATOMY IN NORTH KERALA POPULATION IN INDIA

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ABSTRACT

Context: This study was conducted in the department of Conservative Dentistry and Endodontics , Govt Dental College Calicut to evaluate the anatomy of the pulp chamber and the pulp chamber floor in North Kerala population in India and to see if specific, consistent landmarks or configurations exist and are quantifiable.

Aims:

1. To observe the anatomy of the pulp chamber and the pulp chamber floor.
2. To study the relationships of the pulp chamber to the clinical crown and relationship of the orifice on the pulp chamber floor.
3. To verify the anatomic laws of pulp chamber anatomy in North Kerala population

Settings and Design: Sixty extracted permanent molars were collected from the Department of Oral & Maxillofacial Surgery, Govt. Dental College Calicut The teeth were divided into three groups

- (i) 20 mandibular molar teeth with three root canals
- (ii) 20 mandibular molar teeth with four root canals
- (iii) 20 maxillary molar teeth

Methods and Material: All teeth were sectioned at the level of cement enamel junction (CEJ) by using micromotor with straight handpiece and diamond disk so that the outline of the pulp chamber relative to the CEJ could be observed. Each cut section was irrigated with water, dried and examined. The teeth were analyzed at National Institute of Technology, Calicut under stereomicroscope and digital photographs were taken to record observed anatomical relationship.

Statistical analysis used: Observations were statistically analysed using SPSS17 software

Results, Conclusions : The present study shows that laws regarding the location of orifices, namely law of orifice location 1,2 and 3 were also found to be valid after the teeth were viewed under stereomicroscope.

KEYWORDS : pulp chamber, canal orifice, cement enamel junction

Introduction

The endodontic therapy must be preceded with a thorough understanding of the anatomy of both the pulp chamber and the root-canal system.(1). There is a wide range of variation reported with respect to the frequency of occurrence of the number and shape of the canals in each root.(2,3,4,5) A number of factors contribute to these variations including ethnic background, age and gender of the population studied. (6)

The success of endodontic treatment mainly depends on detection of number of root canals and their location. The anatomy of the root canal system dictates the parameters under which root canal therapy will be carried out and can directly affect the probability of the success.(7) External root anatomy is determined by the internal pulp and therefore external root surface can be considered as a reliable guide in locating root canals.

Paul Krasner and Henry .J. Rankow formulated several anatomic laws when they observed that there are consistent, identifiable, anatomic configurations of the pulp chamber and pulp chamber floor. They recommended cementoenamel junction(CEJ) as the ultimate Northstar for locating the pulp chamber. (2)

This study was undertaken to observe the anatomy of the pulp chamber and the pulp chamber floor in North Kerala population in India and to see if specific, consistent landmarks or configurations exist and are quantifiable. This could aid in a rational approach to root-canal therapy.

The study was conducted in the Dept. of Conservative Dentistry, Govt. Dental college, Calicut and stereomicroscopic images were taken at

National Institute of Technology, Calicut.

Aims and objectives

1. To observe the anatomy of the pulp chamber and the pulp chamber floor.
2. To study the relationships of the pulp chamber to the clinical crown and relationship of the orifice on the pulp chamber floor.
3. To verify the anatomic laws of pulp chamber anatomy in North Kerala population

Materials and methods

Sixty extracted permanent molars were collected from the Department of Oral & Maxillofacial Surgery, Govt. Dental College Calicut. Collected teeth were washed immediately after extraction and stored in 3% sodium hypochlorite. The teeth had a variety of crown conditions: virgin crowns, small restorations, large restorations and caries. The teeth were divided into three groups

- i) 20 mandibular molar teeth with three root canals
- ii) 20 mandibular molar teeth with four root canals
- iii) 20 maxillary molar teeth

Armamentarium used :

1. Micromotor and Straight handpiece with diamond disk.(Marathon)
2. Stereomicroscope (LEICA).

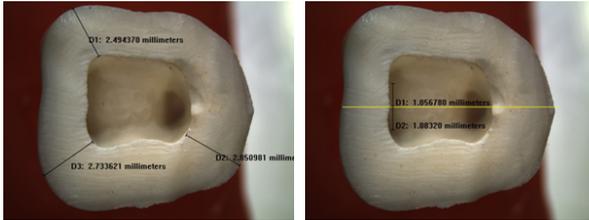
Method

All teeth were sectioned at the level of CEJ by using micromotor with straight handpiece and diamond disk so that the outline of the pulp chamber relative to the CEJ could be observed. Each cut section was

irrigated with water, dried and examined. The teeth were analyzed at National Institute of Technology, Calicut under stereomicroscope and digital photographs were taken to record observed anatomical relationship.

Measurements related to the study were made using the 'Image pro plus'. The distance between walls of the pulp chamber to the external surface of the crown were measured at the level of CEJ at different points. The difference between the individual distances were calculated and statistically analyzed using SPSS17 software to prove law of concentricity and law of centrality.

To prove law of symmetry, a line is drawn in a mesial-distal direction across the center of the floor of the pulp chamber and the distance from the orifices of the canals on either side to the line drawn are measured. (photograph 1&2) The difference between these two distances were statistically analyzed.



observations

Two categories of anatomic patterns were observed: relationships of the pulp chamber to the clinical crown and relationships of orifices on the pulp chamber floor.

Relationships of the pulp chamber to the clinical crown

The following observations were noted:

1. The pulp chamber was always in the center of the tooth at the level of CEJ
2. The walls of the pulp chamber were always concentric to the external surface of the crown at the level of CEJ
3. The distance from the external surface of the clinical crown to the walls of the pulp chamber was the same throughout the circumference of the tooth at the level of CEJ.

Relationships on the pulp chamber floor

1. The floor of pulp chamber is always a darker color than the surrounding dentinal walls.
2. The orifices of the root canals are always located at the junction of the walls and floor
3. The orifices of the root canals are located at the angles in the floor wall junction
4. The orifices lay at the terminus of developmental root fusion lines, if present.
5. The developmental root fusion lines are darker than the floor color

The following observations were noted in mandibular molars

1. If a line is drawn in a mesial – distal direction across the center of the floor of the pulp chamber, the orifices of the canals on either side of the line are equidistant.
2. If a line is drawn in a mesial distal direction across the center of the floor of the pulp chamber, the line connecting the orifices of the canals on either side are perpendicular to it.

Graph.1 :Mean of distances measured from pulp chamber wall to the external tooth surface in mandibular molar teeth with three root canals

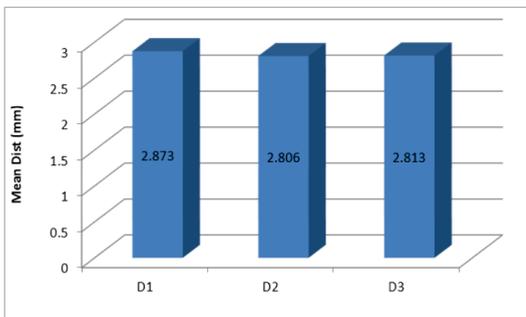


Table.1: Mean of distances measured from pulp chamber wall to the external tooth surface in mandibular molar teeth with three root canals

DISTANCE	Descriptives		
	N	Mean	Std. Deviation
1	20	2.8735	.3406
2	20	2.8061	.3784
3	20	2.8137	.3470
Total	60	2.8311	.3510

ANOVA

DISTANCE	ANOVA	
	F	Sig.
Between Groups	.216	.807

The p-value between groups was 0.807 which was not significant as observed in above tables.

Thus it is confirmed that within the 20 teeth used (mandibular teeth with three root canals), there was no statistical difference between the three individual distances measured from the pulp chamber wall to the external tooth surface thus proving the Laws of concentricity. Similarly we got the same result with mandibular molars with four root canals and in maxillary molars.

The law of CEJ, was evaluated in all the 60 teeth and we found CEJ to be the most consistent repeatable landmark for locating position of the pulp chamber.

After analyzing the Law of symmetry 2 in our specimens we found that the orifices of the canals lie on a line perpendicular to a line drawn in a mesio distal direction across the center of the floor of the pulp chamber. The color of the pulp chamber floor is always darker than the walls, was found in 40 mandibular teeth and the 20 maxillary teeth. Thus confirming the Law of color change.

The laws regarding the location of orifices, namely law of orifice location 1,2 and 3 were also found to be valid after the teeth were viewed under stereomicroscope.

Conclusion

From the study it was observed that the laws put forward by Krasner and Rankow are applicable to the North Kerala population and there are definite patterns and relationships of the pulp chamber and on the pulp-chamber floor. From these observations, clinicians can more systematically locate pulp chambers and the number and position of root-canal orifices on the pulp-chamber floor. The only requirement for proper use is that the access to the chamber be completed so that the entire floor of the pulp chamber is visible without any overlying obstruction. of orifices. These laws can aid practitioners in determining the number and position of orifices of root canals of any tooth. However further studies using large sample size including all teeth are required to establish these anatomical laws. Therefore, the only way to provide the best environment for success is to establish the full extent of the root-canal system. (12)

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