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Anatomical Evaluation of Root Apex Morphology

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- **INTRODUCTION**

Evidence of Root Apex Morphology

INVESTIGATION – Anatomical Evaluation of Root Apex Morphology

INTRODUCTION

- Knowledge of the root canal system anatomy is a key factor in the success of endodontic therapy.
- The root apex requires special attention to foraminal location and establishment of the appropriate extension of instrumentation and filling.
- Great variation exists in root apex anatomy as well as in foramen position and location

Potential clinical problems

Clinical problems that can arise from endodontic practices are due to variations in the apexes of root canals, which are reflected in the various dentistry specialities, with anatomic and physiological knowledge being fundamental so as to the carrying out of a diagnosis and planning of the adequate treatment.

*Sayão Maia et al. Study of foramen openings and their concurrence with root apexes. Revista Sul Brasileira de Odontolgia , 2005 (2) 1: 7-11. (ISSN 1806-7727)

INTRODUCTION

- Evidence of Root Apex Morphology

INVESTIGATION – Anatomical Evaluation of Root Apex Morphology

Frequency of apical foramen deviation from tip of root apex

Study	Sample size (teeth)	Sample description	Frequency of apical foramen deviation (%)
Kuttler[4]	268	18-25 years	68
		≥55 years	80
Green[16]	400	Anteriors	56-78*
Green[17]	700	Posteriors	40-73*
Chapman[5]	120	Anteriors	84
Burch and Holen[18]	877	All teeth	78-98.8*
Pineda and Kuttler[19]	4183	All teeth	83
von der Lehr and Marsh[20]	436	Anteriors	63
Kashara *et al.*[21]	510	Maxillary central incisors	45
Stein and Corcoran[22]	111	-	79
Blaśković-Šubat *et al.*[23]	230	All teeth	76
Mizutani *et al.*[9]	90	Maxillary anteriors	84-94*
Morfis *et al.*[24]	213	All teeth (except canines, 2nd molars and maxillary 1st premolars)	39-90.5*
Gutierrez and Aguayo[25]	140	10 of each tooth type	100
Ponce and Vilar Fernández[26]	18	Maxillary anteriors	72.3
Martos *et al.*[27]	926	Anteriors	17
		Posteriors	43
		mandibular teeth	35
		maxillary teeth	25
		Overall	61
Degerness and Bowles[28]	153	MB roots of maxillary first and second molars	71.8
Ding *et al.*[29]	356	Single-rooted teeth	49.4
Martos *et al.*[30]	845	All teeth	41.6

*Range

***Martos et al.** Anatomical Measurements of the Apical Root in Anterior and Posterior Teeth. J Endod 2010, (36) 4: 664-668

*** evidence**

The position of apical constriction

Study	Sample size and description	Position of the apical constriction		
		Distance from the apical foramen (mm)		Distance from the apex (mm)
Kuttler[4]	268 maxillary and mandibular teeth	Young group	0.524*	-
		Old group	0.659*	
Chapman[5]	120 anteriors	-		0.5-1† in 92.5% of the sample
Chunn *et al.*[6]	20 canals	0.73*		-
Dummer *et al.*[7]	270 anteriors and premolars	-		0.89*
McDonald and Hovland[8]	25 anteriors	0.7*		-
	30 posteriors	0.4*		
Mizutani *et al.*[9]	90 maxillary anteriors	-		0.825-1.01‡
Hassanien *et al.*[10]	50 mandibular premolars	1.20*		-
Arora and Tewari[11]	800 maxillary and mandibular posteriors	-		0.632-0.996‡

*Mean, †Range, ‡Mean range

*** Olson DG, Roberts S, Joyce AP, et al. Unevenness of the apical constriction in human maxillary central incisors. J Endod 2008;34:157–9.**

*** evidence**

Distance between the apical foramen and the type of root apex

Study	Sample size	Type of teeth	Age (years)	Distance between the apical foramen and apex (mm)
Kuttler[4]	268	All teeth	18-25	0.495*
			≥55	0.607*
Green[16]	400	Maxillary incisors	>40	0.3*
		Maxillary canines		0.3*
		Mandibular incisors		0.3*
		Mandibular canines		0.2*
Green[17]	700	Premolars and molars	-	0.3-0.5†
Chapman[5]	120	Maxillary anteriors	-	0.364*
		Mandibular anteriors		0.346*
Vande Voorde and Bjorndahl[31]	101	Anteriors	-	0.3*
Burch and Holen[18]	877	All teeth	-	0.59*
Stein and Corcoran[22]	111	-	26-77	0.476*
Blaśković-Śubat *et al.*[23]	230	Anteriors	40-75	0.73*
		Posteriors	18-30	1.1*
Mizutani *et al.*[9]	90	Maxillary anteriors	11-73	0.44-0.5†
Hedrick *et al.*[32]	39	Posteriors	-	0.41*
Morfis *et al.*[24]	213	All teeth (except canines, 2nd molars and maxillary 1st premolars)	>45	0.418-0.978†
Gutierrez and Aguayo[25]	140	10 of each tooth type	21-68	0.2-3.8‡
Martos *et al.*[27]	926	All teeth	-	0.69*

*Mean, †Range, ‡Mean range

***Althomani et al. The Anatomy of root apex**. Saudi Endodontic Journal 2013, (3) 1: 1-9

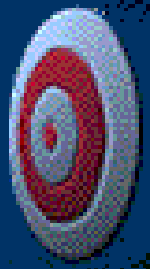
*** evidence**

INTRODUCTION

Evidence of Root Apex Morphology

- **INVESTIGATION – Anatomical Evaluation of Root Apex Morphology**

AIM



The aim in our study was to determine:

- the morphologic shape and
- position of the root apex and
- the major foramen in maxillary teeth.

MATERIAL AND METHOD

- A total of 120 maxillary human teeth were evaluated.
- Central and lateral incisors, canines, premolars, and molars with completely formed apices were used.

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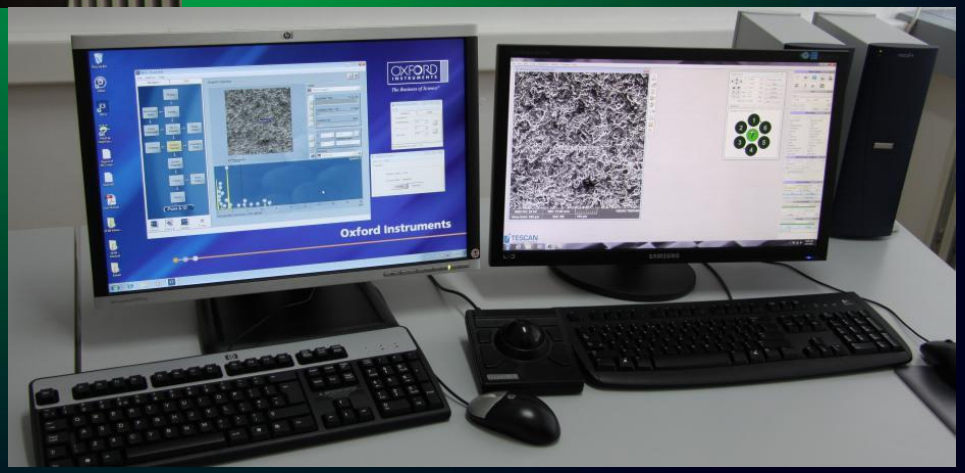

- Each root specimen was measured at each root apex by using a calibrated microscope at magnification of 4.5X.
- The anatomic parameters evaluated were the shapes of peripheral contours of major apical foramen (rounded, oval, asymmetric, semilunar) and the root apex (rounded, flat, beveled, elliptical).
- The location was recorded and classified as center, buccal, lingual, mesial, or distal surface for both root apex and the major apical foramen.

RESULTS

MORPHOLOGY OF THE ROOT APEX					
TOOTH	ROUNDED (%)	FLAT (%)	BEVELED (%)	ELIPTICAL (%)	N
INCISORS	12 (35)	9 (25)	7 (20)	7 (20)	35
CANINES	8 (23)	7 (20)	5 (14)	15 (43)	35
PREMOLARS	11(45)	7 (27)	3 (12)	4 (16)	25
MOLARS	8 (32)	6 (24)	3 (12)	8 (32)	25
MORPHOLOGY OF THE MAJOR FORAMEN					
TOOTH	ROUNDED (%)	OVAL (%)	ASIMETRIC (%)	SEMILUNAR (%)	N
INCISORS	16 (46)	9 (26)	6 (17)	4 (11)	35
CANINES	15 (43)	9 (25)	7(20)	5 (12)	35
PREMOLARS	11 (46)	8 (33)	3 (13)	2 (8)	25
MOLARS	17 (67)	5 (19)	2 (8)	1(6)	25

RESULTS

LOCATION OF THE ROOT APEX					
TOOTH	CENTRALIZED (%)	BUCCAL (%)	LINGUAL (%)	MESIAL (%)	DISTAL (%)
INCISORS	15 (43)	7 (20)	2 (7)	4 (10)	7 (20)
CANINES	17 (48)	6 (18)	3 (8)	5 (14)	4 (12)
PREMOLARS	13 (52)	2.5 (10)	1.5 (6)	2.5 (10)	5.5 (22)
MOLARS	20 (81)	1 (5)	1 (5)	1 (5)	1 (5)
LOCATION OF THE MAJOR FORAMEN					
TOOTH	CENTRALIZED (%)	BUCCAL (%)	LINGUAL (%)	MESIAL (%)	DISTAL (%)
INCISORS	11 (32)	8 (24)	3 (8)	4 (10)	9 (26)
CANINES	15 (44)	3 (8)	1 (4)	3 (8)	13 (36)
PREMOLARS	10.5 (42)	3 (12)	2.5 (10)	1 (4)	8 (32)
MOLARS	10 (40)	2.5 (10)	1 (4)	1.5 (6)	10 (40)

CONCLUSION

- The predominant morphology of the root apex in incisors and premolars was the round shape.
- In canines and molars, the predominant configuration was the pointed shape.
- The morphology of the apical foramen showed a predominance of the rounded shape followed by the oval shape.
- The prevalent location of the root apex and the foramen was the central position followed by the distal position.

Thank you for your atention

ANY QUESTIUONS ?