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Original Article

Dentistry Section

Evaluation of Apical Root Morphology of Maxillary Incisors using Cone Beam Computed Tomography in Brazilian Subpopulation: A Cross-sectional Study

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ABSTRACT

Introduction: The prevalence of Apical Root Resorption (ARR) after orthodontic treatment is high. It is associated with several factors, such as tooth group, type and duration of treatment, applied force and root morphology.

Aim: To evaluate the apical root morphology of maxillary incisors in a Brazilian subpopulation using Cone Beam Computed Tomography (CBCT) images.

Materials and Methods: In this retrospective and cross-sectional study, 400 maxillary incisors from 167 patients registered in the data base of Dental Radiology Clinics between January 2012 and April 2017 were analysed. The apical root configuration was verified by navigating 0.1 mm/0.1 mm, in the three planes, axial, coronal, and sagittal sections on CBCT images, from the root canal entrance to the apical foramen, as well as from the apical direction to the crown. The standard reference for apical root form corresponded to the long axis of the tooth. The root forms and their frequency were characterised according to the classification proposed by Levander and Malmgren (1988). The qualitative variables were analysed by the Chi-square test. The level of significance was p-value <0.05.

Results: A total of 400 maxillary anterior teeth (central and lateral incisors; n=200 each) from 167 patients (101 women; mean age was 41.8±16.20 years) were analysed. The most common apical root form presented in the central incisors was the blunt root {99 (49.5%)}, followed by pipette-shaped root {69 (34.5%)}. The less frequent was the short root {13 (6.5%)} (p-value <0.001). In the lateral incisors, the highest frequency presented was lacerated root {111 (55.5%)}, followed by blunt root {47 (23.5%)}, and pipette-shaped root {37 (18.5%)} (p-value <0.001).

Conclusion: Maxillary central incisors had a higher frequency of rhomboid (blunt) root morphology, while lateral incisors had a higher frequency of curved (lacerated) root form.

Keywords: Imaging exam, Root anatomy, Root resorption

INTRODUCTION

Imaging exams have been routinely indicated in dental treatment [1-3]. Cone Beam Computed Tomography (CBCT) is a technology that allows three dimensional visualisation of mineralised maxillofacial structures [3]. This imaging method has favoured the precise definition of the challenges and the planning of the therapeutic protocols [2-7].

Apical root resorption (ARR) is characterised by the loss of tooth structure due to clastic activity cells [8,9]. The prevalence of ARR after orthodontic treatment is high and may be associated with several factors, such as tooth group, type and duration of treatment, applied force, and root morphology [10,11].

Previous studies have analysed the frequency and risk factors for ARR associated with orthodontic treatment [12-19]. Levander E and Malmgren O studied the risk of severe root resorption and the importance of root morphology in resorption [15]. Regarding the evaluation of the importance of the root form, more severe resorptions (3 and 4 grades) were observed in blunt (39%) and pipette-shaped (78%) roots. Maues CP et al., determined the prevalence of severe external root resorption and explored the potential risk factors arising from orthodontic treatment [14]. Teeth located in the upper anterior region, overjet greater than or equal to 5 mm at the beginning of treatment, treatments involving tooth extractions, prolonged therapy time, and complete root formation at the time of the beginning of orthodontic treatment were identified as possible risk factors. Other studies have associated the degree of ARR to the root width and length and type of orthodontic device [20-22].

The root morphology of maxillary anterior teeth has been analysed by using conventional radiographic images [10,14,15,23], whose limitations are now well discussed [7,10,24,25]. Nevertheless, few studies have focused on the use of CBCT or were projected to study root morphology before orthodontic treatment [18,19,26]. Taking into consideration the multifactorial aetiology of ARR [12-19] and based on the individual biological variability and genetic predisposition [18], the present study aimed to evaluate the apical root morphology of maxillary incisors in a Brazilian subpopulation using CBCT. The null hypothesis was that there was no difference in apical root morphology frequencies between maxillary incisors.

MATERIALS AND METHODS

This retrospective, cross-sectional study was conducted between January 2012 and April 2017 in Federal University of Goias, Brazil. The data were collected and analysed from May 2017 to December 2018. This study was approved by the Research Ethics Committee of the Federal University of Goiás, Brazil (protocol CAAE 06486919.0.0000.5083).

Inclusion criteria: The CBCT images of high resolution and presenting healthy teeth with fully formed apices were included.

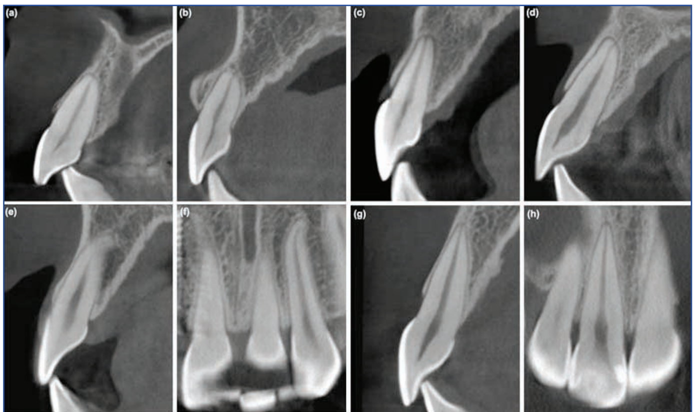
Exclusion criteria: Root canals with calcification, endodontic treatment, intraradicular pins or crown, teeth with internal or external root resorption, developmental disorders, and patients with history of traumatic dental injury, orthodontic treatment, and systemic disease were excluded.

Sample size calculation: The sample size for the present study was calculated based on a pilot study that allowed analysing 90% of the apical root configurations, varying 8% more or less, depending on the evaluated tooth root. At a power of 80% (effect size=0.5) and an alpha error probability of 0.05, a minimum sample of 52 roots was required for each group. So, a sample size of 400 teeth (200 central incisors and 200 lateral incisors) was taken.

The CBCT scans were selected from patients registered in the database of private Dental Radiology Clinics (CIRO, Goiânia, GO, Brazil and CROIF, Cuiabá, MT, Brazil) between January 2012 and April 2017. All CBCT had been performed either to guide the diagnostic process or as part of the patient's dental treatment plan.

CBCT Scan Acquisition and Determination of Apical Root Morphology

The apical root configuration of the maxillary anterior incisors was analysed by navigating 0.1 mm/0.1 mm, in the three planes, axial, coronal, and sagittal sections on CBCT images, from the root canal entrance to the apical foramen (root apex), as well as from the apical direction to the crown. The CBCT image navigation strategy was based on previous studies [24,25,27,28]. The standard reference for root form corresponded to the main root canal navigation in the three planes individualised for each tooth. When necessary, CBCT images were oriented to correct the parallax error. The determination of the root morphology and its frequency were performed according to the classification of abnormalities in root morphology proposed by Levander E and Malmgren O, recorded in four categories: 1) short root; 2) blunt root; 3) root with an apical bend (lacerated root); 4) pipette-shaped root. In the present apical root morphological analysis, we categorised and compared those that were not considered normal [Table/Fig-1a-h] [15].



[Table/Fig-1]: CBCT images of maxillary incisors showing a,b) Sagittal section-short; c,d) Sagittal section-blunt;e-sagittal; f: Coronal section-lacerated (curved); g) Sagittal section; h) Coronal section-pipette shaped roots configuration.

Two dental radiology specialists with more than ten years of experience were the observers who analysed all CBCT images and were calibrated from the evaluation of 10% of the sample. Facing possible differences, a consensus was reached after a third observer analysed the image.

STATISTICAL ANALYSIS

The frequency and percentage of qualitative variables were obtained. Qualitative variables were evaluated by the Chi-square test and processed using the Statistical Analysis System (SAS) 9.1 software (SAS, Cary, NC, USA). Values of p<0.05 were considered significant.

RESULTS

A total of 400 maxillary anterior teeth (central and lateral incisors; N=200 each) from 167 patients (101 women; mean age=41.8±16.20 years) were analysed. [Table/Fig-2] summarises the results of frequencies (%) of apical root morphologies for central incisors. The highest frequency was a blunt root (n=99; 49.5%), followed by a pipette-shaped root (n=69; 34.5%) and lacerated root (n=19; 9.5%) (p-value <0.001). [Table/Fig-3] summarises the results for lateral incisors. The highest frequency was lacerated root (n=111; 55.5%), followed by blunt root (n=47; 23.5%), and pipette-shaped root (n=37; 18.5%) (p-value <0.001). [Table/Fig-4] presents the comparative statistics between maxillary central and lateral incisors regarding root morphology. There were significant differences in apical root form in central and lateral incisors (p-value <0.05) except short root configuration of central incisor vs short root of lateral incisor (p-value=0.054) and blunt root configuration of central incisors vs lacerated root of lateral incisors (p-value=0.230).

Root configuration	n (%)
Short	13 (6.5)^{A}
Blunt (rhomboid)	99 (49.5)^{B}
Lacerated (curved)	19 (9.5)^{A}
Pipette-shaped	69 (34.5)^{C}
p-value	<0.001*

[Table/Fig-2]: Frequency of root configuration in maxillary central incisors.
*Chi-square test; Same letters are not statistically different from each other (p>0.05)

Root configuration	n (%)
Short	5 (2.5)^{A}
Blunt (rhomboid)	47 (23.5)^{B}
Lacerated (curved)	111 (55.5)^{C}
Pipette-shaped	37 (18.5)^{B}
p-value	<0.001*

[Table/Fig-3]: Frequency of root configuration in maxillary lateral incisors.
*Chi-square test; Same letters are not statistically different from each other (p>0.05)

Root configuration of central incisor	Root configuration of lateral incisor	p-value*
Short	Short	0.054
	Blunt/rhomboid	<0.001
	Lacerated/curved	<0.001
	Pipette-shaped	<0.001
Blunt/rhomboid	Short	<0.001
	Blunt/rhomboid	<0.001
	Lacerated/curved	0.230
	Pipette-shaped	<0.001
Lacerated/curved	Short	0.003
	Blunt/rhomboid	<0.001
	Lacerated/curved	<0.001
	Pipette-shaped	0.009
Pipette-shaped	Short	<0.001
	Blunt/rhomboid	0.015
	Lacerated/curved	<0.001
	Pipette-shaped	<0.001

[Table/Fig-4]: Comparison of root morphology between maxillary central and lateral incisors.
*Chi-square test; Values of p<0.05 were considered significant

DISCUSSION

The present study aimed to evaluate the apical root morphology of maxillary incisors in a Brazilian subpopulation by using CBCT. The results showed that there were significant differences in apical root form frequencies in central and lateral incisors except short root configuration of central incisor vs short root of lateral incisor (p-value=0.054) and blunt root configuration of central incisors vs lacerated root of lateral incisors (p-value=0.230). Therefore, the tested null hypothesis was rejected.

The present study employed CBCT images to analyse root morphology since this method of imaging has increasingly been indicated in clinical dental practice [7], and due to lack of studies using this methodology [6,18,19]. The CBCT imaging providing accurate identification of frequency, position of roots, root canals, and apical foramina, favours the treatment modality in human permanent teeth [24,25]. In addition, CBCT appears to be useful in assessing root resorption, and its diagnostic performance was better than that of periapical radiography [6,18,19]. However, it should be considered that the final result of CBCT imaging may suffer interference from multiple factors, such as the Computed Tomography (CT) scanner (including the acquisition software), the patient, and the analysis software [7].

The analysis of the present study was performed on maxillary central and lateral incisors because they are the teeth most affected by root resorption after orthodontic treatment [10,14,23,29]. Picanco GV et al., evaluated factors common to patients who developed moderate or severe external root resorption in the maxillary incisors during fixed orthodontic treatment [12]. The results demonstrated that the risk factors for severe root resorption in the upper incisors during orthodontic treatment were root resorption before initiation of treatment, extractions, reduced root length, decreased crown/root ratio, and thickness. Fernandes LQP et al., conducted a review of possible risk factors for external ARR in patients undergoing orthodontic treatment [17]. The research was conducted in the MEDLINE and PubMed databases from 1993 to 2016. The patient's gender and age do not appear to influence the degree of external ARR, and other clinical and orthodontic treatment related factors, with exception of prolonged treatment time and heavy force application, which were associated with higher levels of external ARR.

Among the risk factors involving root resorption in orthodontically treated teeth is apical root morphology [10,15,30-33]. Thus, the determination of apical root morphology in CBCT scans before orthodontic treatment can establish better predictability of results regarding root resorption after orthodontic treatment [18,19,33]. The results of the present study showed that the most common apical root form presented in the central incisors was the blunt root (49.5%), followed by pipette-shaped root (34.5%), and lacerated root (9.5%). In the lateral incisors, the highest frequency presented was lacerated root (55.5%), followed by blunt root (23.5%), and pipette-shaped root (18.5%). These findings corroborate the results obtained by Ahlbrecht CA et al., and differ from those observed by de Andrade Vieira W et al., [26,33]. Methodological and population differences were compared with present study which explain the divergence of results found in the literature [Table/Fig-5] [10,23,26,33].

It has been demonstrated that teeth presenting narrower pipette-shaped apex and lacerated roots are more susceptible to suffer resorption during orthodontic treatment [30,32]. Oyama K et al., analysed stress distribution in cases of different root morphologies during an orthodontic force application using finite element models [30]. Five root models were employed (normal, short, rhomboid, lacerated, and pipette) with orthodontic forces applied in the vertical (intrusive) and horizontal (lingual) directions to the tooth axis. The models tended to focus stress on the cervical region and the base portion of the crown support after intrusive force. There was no relevant stress concentration at the root of the normal root model when orthodontic forces were applied. The forces applied to roots with short, torn, pipette-shaped morphologies resulted in greater root strain than those applied to normal root forms during orthodontic treatment.

Author's name and year	Place of study	Sample size (tooth group)	Imaging method	Prevalence of different root morphologies
Sameshina GT and Asgarifar KO, 2001 [10]	USA	743 teeth (premolars, canines, lower incisors, molars and upper incisors)	Panoramic and periapical films	Panoramic film: blunt (3%), dilacerated (10%), normal (85%), bottle-shaped (1%) and pointed (<1%)
				Periapical film: blunt (4%), dilacerated (15%), normal (78%), bottle-shaped (2%) and pointed (1%)
Ahuja PD et al., 2017 [23]	India	900 teeth (upper and lower incisors, canines, premolars and molars)	Panoramic and periapical films	Panoramic film: dilacerated (11%), normal (83%), blunt (4%), pointed (1%) and bottle shape (1%)
				Periapical film: dilacerated (16%), normal (76%), blunt (5%), pointed (3%) and bottle shape (1%)
Ahlbrecht CA et al., 2017 [26]	USA	55 patients (upper central and lateral incisors	CBCT scans	Central incisor: neutral (25.5%), blunt (10.9%), long (27.3%), conical (14.5%), short (14.5%), lingual dilaceration (0%), distal dilaceration (5.5%), mesial dilaceration (1.8%)
				Lateral incisor: neutral (25.5%), blunt (25.5%), long (20%), conical (0%), short (3.6%), lingual dilaceration (5.5%), distal dilaceration (16.4%), mesial dilaceration (3.6%)
de Andrade Vieira W et al., 2020 [33]	Brazil	335 patients (nonsyndromic tooth agenesis and control groups; upper incisors)	Periapical film	Agenesis: normal (64.2%), short (7.5%), blunt (4.5%), apically bent (11.9%) and pipette-shaped (11.9%)
				Control: normal (99.3%), short (0.4%), blunt (0%), apically bent (0%) and pipette-shaped (0.4%)
Current study	Brazil	400 teeth (upper central and lateral incisors)	CBCT scans	Central incisor: short (6.5%), blunt (49.5%), lacerated (9.5%), and pipette-shaped (34.5%)
				Lateral incisor: short (2.5%), blunt (23.5%), lacerated (55.5%), and pipette-shaped (18.5%)

[Table/Fig-5]: Percentages of apical root morphologies found in previous published studies [10,23,26,33].

Limitation(s)

There are some limitations in the present study, which include the collection of the CBCT scans from only two images centres and evaluation limited only to maxillary anterior teeth (central and lateral incisors). More reliable information may be obtained by collecting data from several centres and involving different teeth groups.

CONCLUSION(S)

Despite the limitations of the present study, CBCT scans demonstrated that maxillary central incisor has a higher frequency of rhomboid (blunt) root morphology, while lateral incisor had a higher frequency of curved (lacerated) root form. All these morphological characteristics should be taking into consideration during the orthodontic practice in order to improve the success rates and be more predictable as the occurrence of root resorption. Further longitudinal prospective studies, in which the same patient is observed over time, should be developed to better understand the impact of apical root morphology on the severity of root resorption.

REFERENCES

[1] Mozzo P, Procacci C, Tacconi A, Martini PT, Andreis IA. A new volumetric CT machine for dental imaging based on the cone-beam technique: Preliminary results. European Radiology. 1998;8(9):1558-64.
[2] Scarfe WC, Farman AG, Sukovic P. Clinical applications of cone-beam computed tomography in dental practice. J Can Dent Assoc. 2006;72(1):75-80.
[3] Bueno MR, Estrela C, Azevedo BC, Brugnera Junior A, Azevedo JR. Cone-beam computed tomography: Revolution of dentistry. Revista da Associação Paulista de Cirurgiões Dentistas. 2007;61(5):354-63.

[4] Estrela C, Bueno MR, Leles CR, Azevedo B, Azevedo JR. Accuracy of cone beam computed tomography and panoramic and periapical radiography for detection of apical periodontitis. J Endod. 2008;34(3):273-79.

[5] Estrela C, Bueno MR, Azevedo BC, Azevedo JR, Pecora JD. A new periapical index based on cone beam computed tomography. Journal of Endodontics. 2008;34(11):1325-31.

[6] Estrela C, Bueno MR, De Alencar AH, Mattar R, Valladares Neto J, Azevedo BC, et al. Method to evaluate inflammatory root resorption by using cone beam computed tomography. J Endod. 2009;35(11):1491-97.

[7] Bueno MR, Estrela C, Azevedo BC, Diogenes A. Development of a new cone-beam computed tomography software for endodontic diagnosis. Brazilian Dental Journal. 2018;29(6):517-29.

[8] Ne RF, Witherspoon DE, Gutmann JL. Tooth resorption. Quintessence International. 1999;30(1):09-25.

[9] Fuss Z, Tsesis I, Lin S. Root resorption-diagnosis, classification and treatment choices based on stimulation factors. Dent Traumatol. 2003;19(4):175-82.

[10] Sameshima GT, Asgarifar KO. Assessment of root resorption and root shape: Periapical vs panoramic films. Angle Orthod. 2001;71(3):185-89.

[11] Segal GR, Schiffman PH, Tuncay OC. Meta analysis of the treatment-related factors of external apical root resorption. Orthod Craniofac Res. 2004;7(2):71-78.

[12] Picanco GV, de Freitas KM, Cancado RH, Valarelli FP, Picanco PR, Feijao CP. Predisposing factors to severe external root resorption associated to orthodontic treatment. Dental Press Journal of Orthodontics. 2013;18(1):110-20.

[13] Pastro JDV, Nogueira ACA, Salvatore de Freitas KM, Valarelli FP, Cancado RH, de Oliveira RCG. Factors associated to apical root resorption after orthodontic treatment. The Open Dentistry Journal. 2018;12:331-39.

[14] Maues CP, do Nascimento RR, Vilella Ode V. Severe root resorption resulting from orthodontic treatment: Prevalence and risk factors. Dental Press Journal of Orthodontics. 2015;20(1):52-58.

[15] Levander E, Malmgren O. Evaluation of the risk of root resorption during orthodontic treatment: A study of upper incisors. Eur J Orthod. 1988;10(1):30-38.

[16] Khan AR, Fida M, Shaikh A. Evaluation of apical root resorption in endodontically treated and vital teeth in adult orthodontic subjects. J Ayub Med Coll Abbottabad. 2018;30(4):506-10.

[17] Fernandes LQP, Júnior JC, Campos KdPL, Michelon MMM, Júnior GMV. Evaluation of possible risk factors for external apical root resorption after orthodontic treatment. Revista Brasileira de Odontologia. 2017;74(2):138.

[18] de Freitas JC, Lyra OC, de Alencar AH, Estrela C. Long-term evaluation of apical root resorption after orthodontic treatment using periapical radiography and cone beam computed tomography. Dental Press Journal of Orthodontics. 2013;18(4):104-12.

[19] Castro IO, Alencar AH, Valladares-Neto J, Estrela C. Apical root resorption due to orthodontic treatment detected by cone beam computed tomography. The Angle Orthodontist. 2013;83(2):196-203.

[20] Taithongchai R, Sookkorn K, Killiany DM. Facial and dentoalveolar structure and the prediction of apical root shortening. American Journal of Orthodontics and Dentofacial Orthopedics. 1996;110(3):296-302.

[21] Sameshima GT, Sinclair PM. Predicting and preventing root resorption: Part I. Diagnostic factors. Am J Orthod Dentofacial Orthop. 2001;119(5):505-10.

[22] Artun J, Van 't Hullenaar R, Doppel D, Kuijpers-Jagtman AM. Identification of orthodontic patients at risk of severe apical root resorption. Am J Orthod Dentofacial Orthop. 2009;135(4):448-55.

[23] Ahuja PD, Mhaske SP, Mishra G, Bhardwaj A, Dwivedi R, Mangalekar SB. Assessment of root resorption and root shape by periapical and panoramic radiographs: A comparative study. J Contemp Dent Pract. 2017;18(6):479-83.

[24] Estrela C, Couto GS, Bueno MR, Bueno KG, Estrela CRA, Porto OCL, et al. Apical foramen position in relation to proximal root surfaces of human permanent teeth determined by using a new cone-beam computed tomographic software. J Endod. 2018;44(11):1741-48.

[25] Estrela C, Bueno MR, Couto GS, Rabelo LE, Alencar AH, Silva RG, et al. Study of root canal anatomy in human permanent teeth in a subpopulation of Brazil's center region using cone-beam computed tomography- Part 1. Brazilian Dental Journal. 2015;26(5):530-36.

[26] Ahlbrecht CA, Ruellas ACO, Paniagua B, Schilling JA, McNamara JA, Jr., Cevidanes LHS. Three-dimensional characterisation of root morphology for maxillary incisors. PLoS One. 2017;12(6):e0178728.

[27] Porto OCL, Silva BSdF, Silva JA, Estrela CRdA, Alencar AHGd, Bueno MdR, et al. CBCT assessment of bone thickness in maxillary and mandibular teeth: An anatomic study. J Appl Oral Sci. 2020;28:e20190148.

[28] Bueno MR, Estrela C, De Figueiredo JA, Azevedo BC. Map-reading strategy to diagnose root perforations near metallic intracanal posts by using cone beam computed tomography. J Endod. 2011;37(1):85-90.

[29] Silva Filho OGd, Berreta EC, Cavassan AdO, Capelozza Filho L. Evaluation of root resorption in 50 properly treated orthodontic cases. Ortodontia. 1993;26(1):24-35.

[30] Oyama K, Motoyoshi M, Hirabayashi M, Hosoi K, Shimizu N. Effects of root morphology on stress distribution at the root apex. The European Journal of Orthodontics. 2007;29(2):113-17.

[31] Malmgren O, Goldson L, Hill C, Orwin A, Petrini L, Lundberg M. Root resorption after orthodontic treatment of traumatized teeth. American Journal of Orthodontics. 1982;82(6):487-91.

[32] Harris EF. Root resorption during orthodontic therapy. Seminars in Orthodontics. 2000;6(3):183-94.

[33] de Andrade Vieira W, Souza-Silva BN, de Macedo Bernardino Í, Santana ES, de Matos FR, Vieira Bittencourt MA, et al. Maxillary incisor root morphology in patients with nonsyndromic tooth agenesis: A controlled cross-sectional pilot study. Am J Orthod Dentofacial Orthop. 2020;157(2):212-17.

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