Endodontic treatment of maxillary lateral incisor with two roots: case report

Eduardo **NUNES**[1]
Maria Aparecida Barbosa de **SÁ**[1]
Frank Ferreira **SILVEIRA**[1]

DOI: https://doi.org/10.14436/2358-2545.10.1.062-067.oar

ABSTRACT

Morphological changes in teeth may adversely affect the success of endodontic treatment. The upper lateral incisors are characterized by the presence of a canal and a single root. Several studies have reported variations in the number of roots and canals. A careful interpretation of radiographs under enhanced illumination and magnification is of extreme importance for detecting these anatomic variations. this report aimed to describe a clinical case of unusual endodontic retreatment of an upper lateral incisor with two roots. The operative microscopy played a fundamental role in accomplishing the new treatment. The procedure involved the use of solvents, manual files, and ultrasonic tips to remove the obturator, and instrumentation of root canals with stainless steel type K manual files. Root canals were obturated with gutta-percha and Pulp Canal Sealer cement using the thermoplastic technique. : A favorable prognosis was confirmed after a follow-up of 216 months.

Keywords: Anatomy. Endodontics. Retreatment.

How to cite: Nunes E, Sá MAB, Silveira FF. Endodontic treatment of maxillary lateral incisor with two roots: case report. Dental Press Endod. 2020 Jan-Apr;10(1):62-7. DOI: https://doi.org/10.14436/2358-2545.10.1.062-067.oar

[1] Pontifícia Universidade Católica de Minas Gerais, Departamento de Odontologia (Belo Horizonte/MG, Brazil).

» The authors report no commercial, proprietary or financial interest in the products or companies described in this article.

» Patients displayed in this article previously approved the use of their facial and intraoral photographs.

Submitted: February 20, 2018. Revised and accepted: November 04, 2018.

Contact address: Eduardo Nunes
E-mail: edununes38@terra.com.br

Introduction

Morphological and anatomic variations in the root canal system have been frequently encountered and should be examined by all practicing dentists.[1] A comprehensive knowledge of dental anatomy and its variations is essential for every dental surgeon as these factors determine the success or failure of endodontic therapy.[1,2]

The lack of understanding of the root canal system or ignorance of its anatomic variations can prevent proper cleaning and shaping of canals, thus affecting the endodontic procedure. Moreover, the presence of irritants results in pathological manifestations, leading to unfavorable prognosis, compromised treatment, and the need of retreatment.[3-5]

The maxillary lateral incisors usually have a single root and a single canal; however, anatomic variations such as supernumerary roots have been reported.[6-13] Although uncommon, anatomic complexities like extra roots and canals can pose significant challenges to the endodontic treatment.[14]

A careful interpretation of preoperative radiographs and accurate examination of the pulp chamber using techniques equipped with enhanced illumination and magnification features, such as operative microscopyare extremely relevant and useful in detecting these variations.[15] Although intraoral radiographic examination is still one of the most widely used imaging modality in endodontics, with incontrovertible importance and applicability, its usefulness in certain anatomic complexities is limited. In order to replace it, computed tomography has emerged as a highly recommended diagnostic tool in such cases.[16]

Based on this background, the present study reports a clinical case of successful endodontic retreatment of an upper lateral two-root incisor.

Clinical case

A 37-year-old patient with TAL, feoderma, was referred to the specialized dental office for evaluating the quality of the endodontic treatment of tooth 22, which involved removal of the molten metal core and replacement of the denture.

During anamnesis, the patient said to have been undergone an endodontic treatment on the tooth around 15 years ago. Extraoral physical examination did not show any abnormal findings. Intrabuccal, unsatisfactory prosthetic restoration, and absence of fistula, edema, or mobility were observed. The result of the palpation test was negative and the result vertical percussion one was positive.

Periapical radiographic examination revealed the molten metallic nucleus and radiolucent lines, what is suggestive from an anatomic variation. A careful interpretation of radiographs showed the anatomic complexity of the case— the presence of two roots. Irregularities were noticed observed in the condensation and filling of the plug material in one of the root canals and absence of sealing material in the second root canal. In addition, a radiolucent area showing moderate periapical bone rarefaction was observed (Fig 1). A radiolucent image in the apical region of the tooth was also noticed. The pulp sensitivity test result was positive and the incisive foramen was atypically projected.

After a thorough diagnosis, retreatment was instituted as a treatment modality. The temporary restoration was first removed, followed by removal of the metal core using an ST-09 insert (Osada; Tokyo, Japan) coupled to the ENAC endodontic ultrasound (Osada). The operative field was isolated by adapting a clamp 206 on tooth 24 and using a dental dam to secure the rubber sheet to the tooth along with a gingival protector (FGM Products Odontológicos Ltda; Santa Catarina, Brazil). The obturator was removed using the operative microscope (DF Vasconcellos; São Paulo, Brazil) and the eucalyptol solvent, ST 21 insert (Osada) coupled with the ENAC endodontic ultrasound (Osada) and manual files type k (Dentsply; Baillagues, Switzerland).

The working length was measured radiographically (Fig 2). Both canals were cleaned and modelled using stainless steel type K (Dentsply), followed by irrigation with 2.5% sodium hypochlorite solution. Paramono Chlorophenol Poultry, Coltosol sealing (Vigodent SA Indústria e Comércio, Rio de Janeiro, Brazil) was used as an intracanal medication, and the provisional restoration was adapted in the proximal ones using acrylic resin.

In the next clinical session, the provisional and intracanal medications were removed and the root canals were flooded with 17% trisodium EDTA for 3 minutes. The root canals were subsequently irrigated using 2.5% sodium hypochlorite and dried with sterile

absorbent paper tips (Fig 3) . Then, the canals were filled with gutta-percha and Pulp Canal Sealer cement (Fig 4) using the FM (Analytic Endodontics; Redmond, WA, USA) heat conductor coupled to the System B device (SybronEndo Corporation; Orange, CA, USA) at 200 °C for 10 seconds, leaving a 4-mm obturation and the space for placement of the pin (Fig 5).

When the obturation was completed, the tooth was sealed. The pin was removed to retain the temporary restoration (Fig 6). The patient was referred for final prosthetic restoration. Clinical and radiographic images (periapical radiography and CT scan) (Figs 7 and 8) obtained after 18 years of preservation confirmed the success of the therapy.

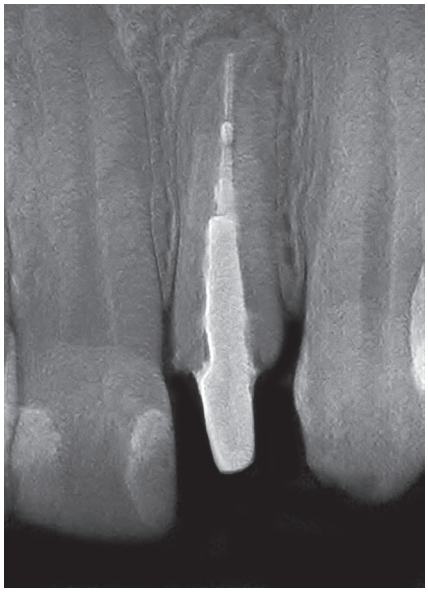

Figure 1. Initial X-ray.

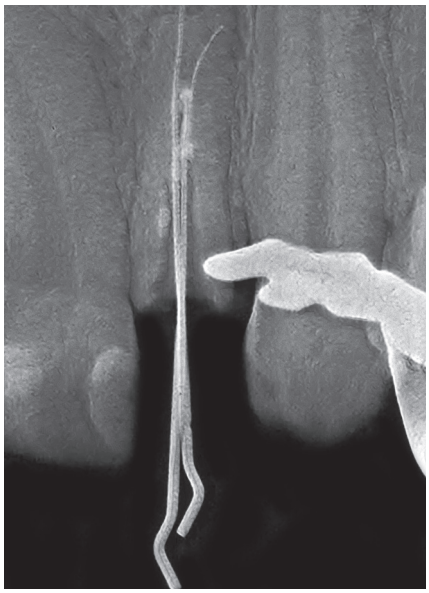

Figure 2. Odontometry.

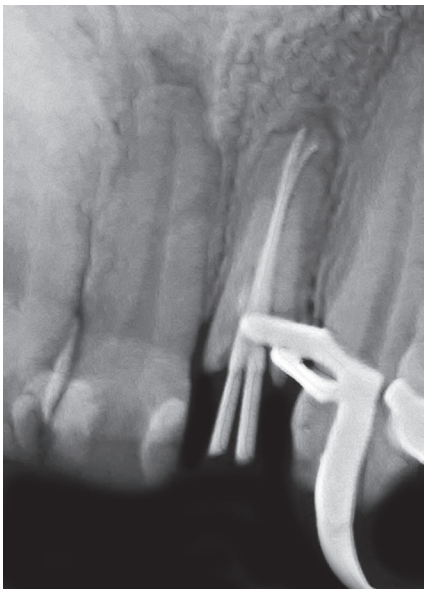

Figure 3. Cone proof.

Figure 4. Shutter.

Figure 5. Space for pin placement.

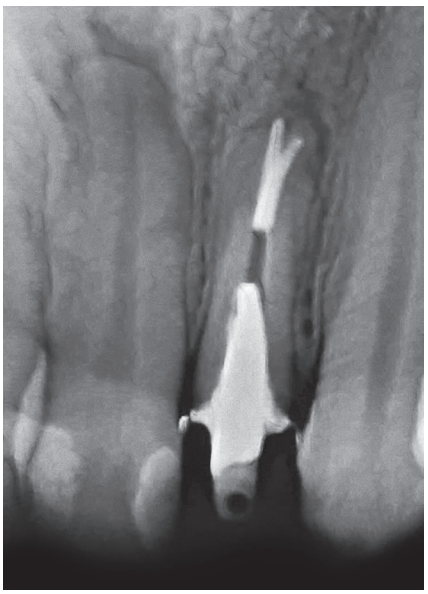

Figure 6. Final X-ray.

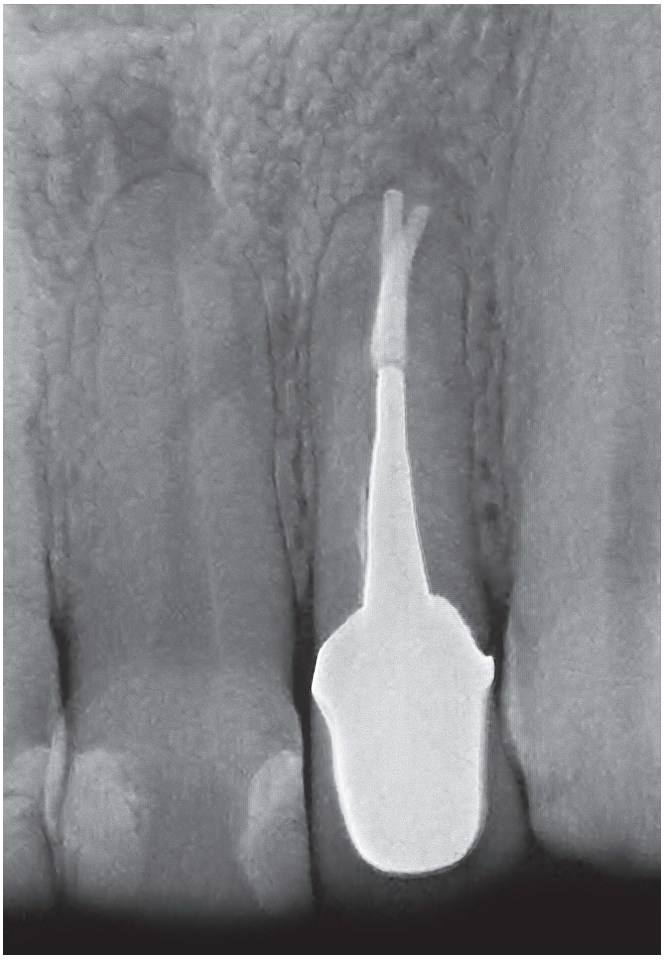

Figure 7. Follow-up after 18 years.

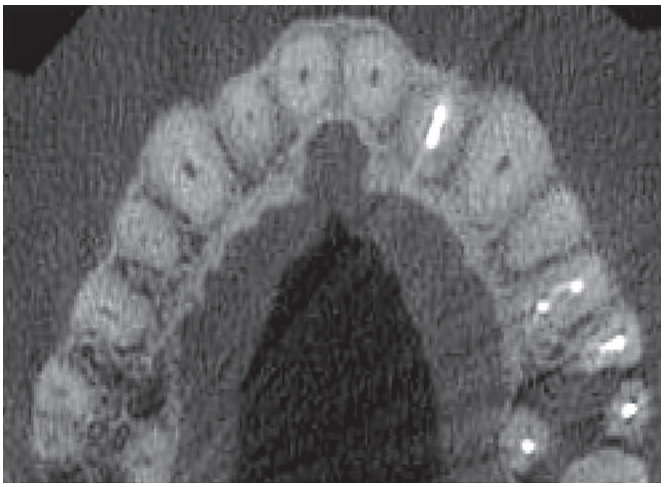

Figure 8. Cone beam computed tomography at a follow-up of 216 months.

Discussion

Although the internal and external dental morphology of different tooth groups follow a certain pattern, these undergo frequent variations. However, changes in the radicular anatomy of upper lateral incisors are relatively rare. Anatomic studies conducted by Pineda and Kuttler and Vertucci confirmed upper lateral incisors to have a single canal and a single root in 100% of the cases analyzed,[17,18] thereby countering the authors who reported the occurrence of these variations.[8,10,11,12,13,19,20]

When compared to the classic description of the anatomy of a tooth to be single rooted with a single canal, the term "supernumerary root" is used to define conditions with teeth having extra roots.[21] Teeth most affected by this condition include the molars, especially the third, upper, and lower followed by the lower and premolar canines.[19] The incidence of this variation in lateral incisors is uncommon with limited findings in the literature.[8,22,23]

According to Bhasker,[24] dimensions and number of roots in a developing tooth are determined by a perpendicular fold of the end of the epithelial sheath of Hertwig. The reasons for the presence of more than one root in some lateral incisors are still unknown. However, abnormalities during tooth development are among the main etiologies for its occurrence. In this context, it is important to consider the presence of birradiculate lateral incisors as well, such as fusion, twinning, concrescence, or palatogingival groove.[24,25]

The success of endodontic treatment depends on complete bacterial elimination and hermetic filling of the root canal system. In clinical practice, the inability to recognize and treat an extra canal or root culminates in the persistence of the irritant source.[26] Such failure mostly requires retreatment, which is the first-choice procedure for a tooth that has already undergone a previous unsuccessful treatment and requires a new endodontic intervention to achieve clinical and radiographic success.[27]

Endodontically, treating a tooth with variations in its usual anatomy is challenging. However, it poses a greater clinical challenge if the tooth in question has already been treated, as in the present case, or when it has extensive calcified canals or restorations. Therefore, it is essential for the professional to

thoroughly understand the dental anatomy to evaluate possible alterations before starting the treatment.[28]

Thus, an accurate diagnose of any possible anatomic variation is of paramount importance for the treatment to be successful.[26] The periapical radiography, although still the most widely used and indispensable method for diagnosis and endodontic planning, provides a two-dimensional image, with the possibility of distortion and overlapping of structures. An alternative to this treatment could be Clark's technique that is based on the change in angulation of the X-ray beam and that in the present report, determined the presence of extra roots in tooth 12. Similarly, Hoseini et al.[10] and Dexton et al.[19] used the same radiographic method to identify the second root in the lateral incisor in their studies.

Another valuable diagnostic technique that played a crucial role in exploring the internal dental anatomy of the present case was operative microscopy. It allows enhanced illumination and thus a better operative field view , creating favorable conditions for the endodontist to be able to view all internal and deep aspects of the root canal system with a magnification of up to 20 times.[29-32]

The results of the present study confirm that a change in the number of roots does not necessarily correspond to a similar alteration in the morphology of the crown.[33] For example, a number of cases reported the presence of maxillary anterior teeth with two canals or two roots with a normal clinical crown compared with the contralateral tooth.[25,34,35] This information indicates the importance of careful radiographic examination and intraoperative exploration of the pulp chamber and the canal system after preparing the access cavity.

The anatomic complexity of the root canal system and the limitations of the instrumentation of accessory and lateral canals make it difficult to complete the debridement of the canals and obturation after biomechanical preparation of one of the most important stages of endodontic treatment.[36-38]

The thermoplasticized obturation technique, used in the present case, has been reported to provide a greater contact of the gutta-percha with the root canal's wall, and filling of the isthmus and irregular spaces of the root canal system with a three-dimensional sealing of the endodontic cavity,[39,40] when compared with conventional techniques such as lateral condensation.[41] Moreover, the use of a heat conductor facilitates obturation, especially in creating the space for placing intracanal seal.[42]

One of the limitations of the present case study is that we did not utilize CT, a highly indicated imaging technique under these conditions, as it provides high-resolution, three-dimensional images in a rapid, precise, and non-invasive manner.[43-45]

However, our patient reported a favorable prognosis with no clinical and radiographic signs of endodontic disease, confirming that the above limitation did not interfere with the success of the therapy.

Conclusion

It is imperative for endodontic professionals to master dental anatomy and enhance their understanding of possible anatomic variations and their clinical significance. The careful preoperative evaluation performed through physical examination of teeth and the use of accurate imaging techniques constitute crucial components of endodontic treatment. These, combined with an improved disinfection and filling process followed by clinical and radiographic preservation of the case, are decisive factors for successful treatment.

References

1. Vertucci FJ. Root canal morphology and its relationship to endodontic procedures. Endod Topics. 2005 Mar;10(1):3-29.
2. Roy DK, Cohen S, Singh VP, Marla V, Ghimire S. Endodontic management of mandibular canine with two roots and two canals: a rare case report. BMC Res Notes. 2018 Feb 8;11(1):111.
3. Kelly JR. Birooted primary canines. Oral Surg Oral Med Oral Pathol. 1978 Dec;46(6):872-72
4. Tabassum S, Khan FR. Failure of endodontic treatment: the usual suspects. Eur J Dent. 2016;10(1):144-7.
5. Alenezi MA, Al-Hawwas AY. Permanent mandibular canine with two roots and two root canals: two case reports. Saudi Endod J. 2016;6(2):98-100.
6. Yoshikawa M, Hosomi T, Sakiyama Y, Toda T. Endodontic therapy for a permanent maxillary lateral incisor having two roots. J Osaka Dent Univ. 1987 Oct; 21(2):87-91.
7. Zillich RM, ASh JL, Corcoran JF. Maxillary lateral incisor with two roots and dens formation: a case report. J Endod. 1983 Apr.;9(4):143-4.
8. Shubbar A, Bolhari B, Fakhari N, Alemi P, Nosrat A. Non-surgical retreatment of maxillary lateral incisor with unusual anatomy: A case report and mini review. Iran Endod J. 2017;12(3):381-5.
9. Gandhi A, Kathuria A, Gandhi T. Gandhi A, Kathuria A, Gandhi T. Endodontic-periodontal management of two rooted maxillary lateral incisor associated with complex radicular lingual groove by using spiral computed tomography as a diagnostic aid: a case report. Int Endod J. 2011 June;44(6):574-82.
10. Hoseini A, Abbaszadegan A. Endodontic treatment of a maxillary lateral incisor with two roots; a case report with 6 months follow-up. J Dent. 2014 Dec;15(4):204-7.
11. Mohan AG, Rajesh EA, George L, Sujathan, Josy SA. Maxillary lateral incisors with two canal sand two separate curved roots. Contemp Clin Dent. 2012 Oct.-Dec.;3(4):519-21.
12. Ravindranath M, Neelakantan P, Subba Rao CV. Maxillary lateral incisor with two roots: a case report. J Endod. 2011 Jan-Feb;59(1):68-9.
13. Singh Matta M. Two rooted maxillary lateral incisor: a case report. Iran Endod J. 2012 Oct;7(4):215-8.
14. Soares JA, Leonardo RT. Root canal treatment of three-rooted maxillary first and second premolars - A case report. Int Endod J. 2003 Oct;36(10):705-10.
15. Jabali AH. Middle mesial and middle distal canals in mandibular first molar. J Contemp Dent Pract. 2018 Feb 1;19(2):233-6.
16. Patel S, Durack C, Abella F, Shemesh H, Roig M, Lemberg K. Cone beam computed tomography in Endodontics - a review. Int Endod J. 2015 Jan;48(1):3-15.
17. Pined F, Kuttler Y. Mesiodistal and buccolingual roentgenographic investigation of 7,275 root canals. Oral Surg Oral Med Oral Pathol. 1972 Jan;33(1):101-10.
18. Vertucci FJ. Root canal anatomy of human permanent teeth. Oral Surg Oral Med Oral Pathol. 1984 Nov;58(5):589-99.
19. Dexton AJ, Arundas D, Rameshkumar M, Shoba K. Retreatodontics in maxillary lateral incisor with supernumerary root. J. Conserv Dent. 2011 July;14(3):322-4.
20. Hoseini A, Abbaszadegan A. Endodontic treatment of a maxillary lateral incisor with two roots; a case report with 6 months follow-up. J Dent (Shiraz). 2014 Dec;15(4):204-7.
21. Neville BW, Damm DD, Allen CM, Bouquot JE. Patologia oral e maxilofacial. 2a ed. Rio de Janeiro: Guanabara Koogan; 2002. p. 88.
22. Platt JA. A two-rooted maxillary lateral incisor. Gen Dent. 1995 Jan-Feb;43(1):72.
23. Vire DE. Two-rooted maxillary lateral incisor. Oral Surg Oral Med Oral Pathol. 1985 Mar;59(3):321-21.
24. Bhasker S. Orban's oral histology and embryology. 8th edition. St. Louis: CV Mosby; 1976. p. 37.
25. Lambruschini GM, Camps J. A two-rooted maxillary central incisor with a normal clinical crown. J Endod. 1993 Feb;19(2):95-6.
26. Daokar SG, Kalekar Yadao AS, Ghunawat DB, Kakde DD. All the mandibular incisors with double canals in a single patient: a rare case. J Int Oral Health. 2015;7(2):46-9.
27. Hulsmann M, Bluhm V. Efficacy, cleaning ability and safety of different Rotary NiTi instruments in root canal retreatment. Int Endod J. 2004 July;37(7):468-76.
28. Krasner P, Rankow HJ. Anatomy of the pulp-chamber floor. J Endod. 2004 Jan;30(1):5-16.
29. Durack C, Patel S. Cone beam computed tomography in endodontics. Braz Dent J. 2012 June;23(3):179-91.
30. Patel S, Durack C, Abella F, Shemesh H, Roig M, Lemberg K. Cone beam computed tomography in Endodontics - a review. Int Endod J. 2015 Jan;48(1):3-15.
31. Stropko JJ. Canal morphology of maxillary molars: Clinical observations of canal configurations. J Endod. 1999 June;25(6):446-50.
32. Alaçam T, Tinaz AC, Genç O, Kayaoglu G. Second mesiobuccal canal detection in maxillary first molars using microscopy and ultrasonics. Aust Endod J. 2008 Dec;34(3):106-9.
33. Ahmed HMA, Abbott PV. Accessory roots in maxillary molar teeth: a review and endodontic considerations. Aust Dent J. 2012 June;57(2):123-31.
34. Hatton JF, Ferrillo PJ Jr. Success fult reatment of a two-canaled maxillary lateral incisor. J Endod. 1989 May; 15(5):216-8.
35. Reid JS, Saunders WP, MacDonald DG. Maxillary permanent incisors with two root canals: a report of two cases. Int Endod J. 1993 July;26(4):246-50.
36. Goldberg F, Artaza L, De Silvio A. Effectiveness of different obturation techniques in the filling of simulated lateral canals. J Endod. 2001 May;27(5):362-4.
37. Royzenblat A, Goodell G. Comparison of removal times of Thermafil plastic obturators using profile rotary instruments at different rotational speeds in moderately curved canals. J Endod. 2007 Mar;33(3):256-8.
38. Carvalho E, Andrade Júnior J, Malvar M, Albergaria S. Avaliação do selamento apical em dentes obturados pela técnica da condensação lateral hibrida, de Tagger e Thermafil. R Ci Med Biol. 2006. Set-Dez;5(3):239-44.
39. Saunders WP, Saunders EM. Influence of smear layer on the coronal leakage of Thermafil and laterally condensed gutta-percha root fillings with a glass ionomer sealer. J Endod. 1994;20(4):155-8.
40. Gilbert SD, Witherspoon DE, Berry CW. Coronal leakage following three obturation techniques. Int Endod J. 2001 June;34(4):293-9.
41. Clinton K, Van Himel T. Comparison of a warm gutta-percha obturation technique and lateral condensation. J Endod. 2001 Nov;27(11):692-5.
42. Venturi, M. Evaluation of canal filling after using two warm vertical gutta-percha compaction techniques in vivo: a preliminary study. Int Endod J. 2006 July;39(7):538-46.
43. Soleymani A, Namaryan N, Moudi E, Gholinia A. Root canal morphology of mandibular canine in an Iranian population: a CBCT assessment. Iran Endod J. 2017;12(1):78-82.
44. Durack C, Patel S. Cone beam computed tomography in endodontics. Braz Dent J. 2012 June;23(3):179-91.
45. Patel S, Durack C, Abella F, et al. Cone beam computed tomography in Endodontics - a review. Int Endod J 2015 Jan;48:3-15.