Dental
Communication

Biosc.Biotech.Res.Comm. Special Issue Vol 13 No (7) 2020 Pp-446-450

BBRC
Bioscience Biotechnology
Research Communications

Incidence of C Shaped Canal In Mandibular Second Molar - A Cbct Study

Srinisha M[1] and Anjaneyulu K[2]

[1]*Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai - 600077, India*

[2]*Reader, Department of Conservative Dentistry and Endodontics, Saveetha Dental College and Hospitals , Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai - 600077, India*

ABSTRACT

The aim of this study is to evaluate the prevalence of C-shaped root canals in mandibular second molars using cone beam computed tomography. In endodontics, root canal treatment of a tooth requires proper knowledge of the variable anatomy of the root canal . One such anatomic variation is the C-shaped root canal system which is commonly seen in mandibular second molars. Cone beam computed tomography is used to analyse the presence of C shaped canals in the mandibular second molar. A total of 50 cone beam computed tomography scans of both the arches were obtained from the radiology lab of Saveetha dental college and 100 mandibular second molars were assessed. The data was tabulated and assessed for statistical significance using the SPSS software. The Incidence of C shaped canals in mandibular second molars was found to be 3.0% . Incidence of C-shaped canals was more in tooth number 37 (2.0%) than in tooth number 47 (1.0%). This was found to be statistically not significant according to chi square test (p=0.558, statistically not significant). Recognition of a C-shaped canal prior to root canal treatment is very important in order to prevent any complications during root canal treatment.

KEY WORDS: C-SHAPED CANAL; CONE BEAM COMPUTED TOMOGRAPHY; MANDIBULAR SECOND MOLARS.

INTRODUCTION

In endodontics, root canal treatment of a tooth requires proper knowledge of the variable anatomy of the root canal . One such anatomic variation is the C-shaped root canal system which is commonly seen in mandibular second molars but have also been observed in mandibular premolars, maxillary first molars, and maxillary and mandibular third molars (Baisden et al., 1992; Demirbuga et al., 2013; Yu et al., 2012). Roots with C-shaped canals have a square or conical configuration (de Azevedo et al., 2019; Jerome, 1994; Manning, 1990) .

C shaped canals have been found to have a high prevalence in mandibular second molars (Weine et al., 1988).Various research is conducted to determine the incidence of C shaped canals in mandibular second molars. The incidence of C shaped canals can differ in different populations. Higher incidence of C-shaped anatomy were seen in Lebanese population compared to the other West Asian population groups (Al-Fouzan, 2002; Al-Qudah and Awawdeh, 2009; Haddad et al., 1999; Rahimi et al., 2008) .The complex nature of the canal configuration proves to be a challenge with respect to obturation and possibly the prognosis during root canal therapy (Chai and Thong, 2004; Melton et al., 1991) . Recognition of a C-shaped canal before treatment can be very effective in management, which will prevent

ARTICLE INFORMATION

*Corresponding Author: Kanjaneyulu.sdc@saveetha.com
Received 14th June 2020 Accepted after revision 5th August 2020
Print ISSN: 0974-6455 Online ISSN: 2321-4007 CODEN: BBRCBA

Thomson Reuters ISI Web of Science Clarivate Analytics USA and Crossref Indexed Journal

NAAS Journal Score 2020 (4.31) SJIF: 2020 (7.728)

Online Contents Available at: http//www.bbrc.in/
Doi: http://dx.doi.org/10.21786/bbrc/13.7/74

irreparable damage to the tooth (de Azevedo et al., 2019; Weine, 1998).

Ever since the identification of the C-shaped canal anatomy, various causes have been postulated to explain its formation,one of the most accepted theories is failure of fusion of Hertwig's epithelial sheath for the formation of the C-shaped canal configuration (Orban and Mueller, 1929) . The irregular fusion of the Hertwig's epithelial sheath may be due to trauma, such as radiation or chemical interference, but it is more likely to be of genetic origin (Fischischweiger and Clausnitzer, 1988; Manning, 1990) . Intra oral periapical radiographs basically do not give an accurate image of the presence or absence of such complex morphology due to superimposition of adjacent anatomic structures. So, in most cases cone beam computed tomography is used to analyse the presence of C shaped canals in the mandibular second molar. C shaped canals can be of different types.

We have numerous highly cited publications on well designed clinical trials and lab studies (Azeem and Sureshbabu, 2018; Govindaraju et al., 2017; Janani and Sandhya, 2019; Jenarthanan and Subbarao, 2018; Khandelwal and Palanivelu, 2019; Malli Sureshbabu et al., 2019; Manohar and Sharma, 2018; Nandakumar and Nasim, 2018; Poorni et al., 2019; Rajakeerthi and Ms, 2019; Rajendran et al., 2019; Ramarao and Sathyanarayanan, 2019; Siddique, Nivedhitha, et al., 2019; Siddique, Sureshbabu, et al., 2019; Siddique and Nivedhitha, 2019; Teja et al., 2018). This has provided the right platforms for us to pursue the current study. Our aim is to evaluate the incidence of C-shaped root canals in the mandibular second molar using cone beam computed tomography.

MATERIAL AND METHODS

A total of 50 cone beam computed tomography scans of both the arches were obtained from the radiology lab of Saveetha dental college and 100 mandibular second molars were assessed for presence of C shaped canals .Cone beam computed tomography (CBCT) scans were considered because Intra oral periapical (IOPA) radiographs do not give an accurate image of the presence or absence of such morphology due to superimposition of adjacent anatomic structures. The data was tabulated and assessed for statistical significance using the SPSS software 20.0. Descriptive statistics and comparison of variables were done. Chi square test was used to detect the significance between tooth number and presence or absence of C shaped canals where P value less than 0.05 was considered to be statistically significant.

RESULTS AND DISCUSSION

C-shaped root canals are an important variation seen in routine endodontic practice. The crown morphology of teeth does not show special features that can help in the diagnosis of teeth with C-shaped canal. The clinical recognition of C-shaped canals is mainly based on the anatomy of the floor of the pulp chamber (Xu et al., 1996) .

Figure 1: CBCT image showing C shaped canal in 37 .

Figure 2: CBCT image showing C shaped canal in 37.

CBCT helps to prevent problems of overlap which is common in two dimensional views (Bóveda et al., 1999; Sour et al., 2012). Thus, it acts as an important diagnostic aid in detecting C shaped canals. CBCT helps in better understanding of the anatomy of the root canal (Matherne et al., 2008), aids in root canal preparation (Estrela et al., 2008) and vertical fracture detection (Hassan et al., 2009). During root canal treatment in the

mandibular second molar with C shaped canals use of an apex locator helps to prevent furcation perforation (Melton et al., 1991; Weine et al., 1988). Figures 1, Figure 2 and Figure 3 shows the CBCT images depicting C shaped canal in mandibular second molars.

Figure 3: CBCT image showing C shaped canal in 47.

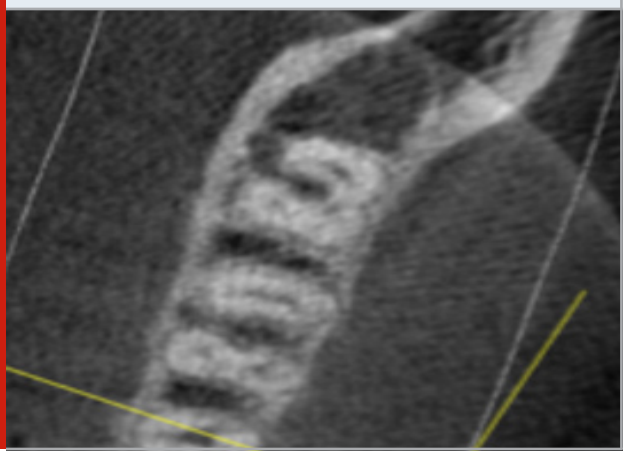
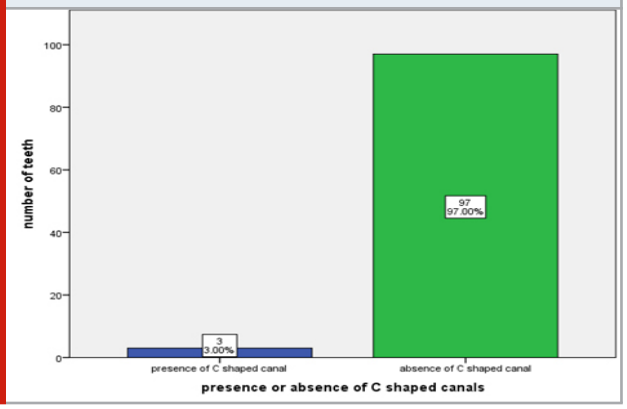


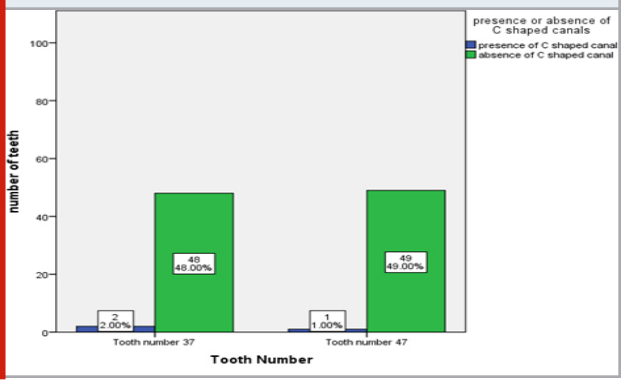
Figure 4: Bar graph depicting presence or absence of C shaped canals in mandibular second molar. X axis denotes the presence and absence of C shaped canals and Y axis denotes the number of teeth. Blue colour depicts the presence of C shaped canals (3.0%) and Green colour depicts the absence of C shaped canals (97.0%).The incidence of C shaped canals in the mandibular second molar was found to be 3%.



Only 3 out of 100 mandibular second molars have C shaped canals. Thus, the incidence of C shaped canals in the mandibular second molar was 3.0% (Figure 4). Similar evidence was seen in study by Tassoker, et al. among 444 teeth only 47 teeth had C-shaped canals, thus incidence of c shaped canals was 10.6% (Tassoker and Sener, 2018). Incidence of C shaped canals in the mandibular second molars 37 and 47 were compared and it was found that incidence of C-shaped canals were more in tooth number 37 (2.0%) than in tooth number 47 (1.0%). However this value was statistically not significant (Figure 5). According to Chi square test ,p= 0.558 ,statistically not significant (p<0.05,statistically significant).

Higher incidence of C-shaped canals were seen in Lebanese population (19.1%) compared to the other West Asian population groups (Al-Fouzan, 2002; Al-Qudah and Awawdeh, 2009; Haddad et al., 1999; Rahimi et al., 2008). According to a study done by Weine, C shaped canals have been found to have a high prevalence in mandibular second molars with a percentage ranging between 2.7%-45.5% (Weine et al., 1988). According to a study done by Saeed Rahimi,et al,. 7.2% mandibular second molars had C-shaped canals (Rahimi et al., 2008)

Figure 5: Bar graph depicts the comparison of tooth number and presence or absence of C shaped canals. X axis denotes the tooth number 37 and tooth number 47 and Y axis denotes the number of teeth. Blue colour depicts the presence of C shaped canal and green colour depicts the absence of C shaped canal. Incidence of C shaped canals in tooth number 37 was 2% and incidence of C shaped canals in tooth number 47 was 1%. This was found to be statistically not significant. (Chi square test,P=0.558 >0.05).



The success of a root canal treatment completely depends on the proper identification of the anatomic variations present in the teeth. The knowledge of presence of C shaped canals helps in performing root canal treatment without any complications. Thus, This study aims in finding the incidence of C-shaped root canals in mandibular second molars using cone beam computed tomography.

CONCLUSION

According to this study there is 3.0% occurence of C shaped canals in the mandibular second molar. Although the incidence of C shaped canals differ in different populations, diagnosing these cases at an early treatment stage provides success to endodontic treatment. CBCT must be used for diagnosis as conventional radiographic examination does not provide information about C shaped canals.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the help and support rendered by the Department of Conservative Dentistry and Endodontics and Information Technology of Saveetha Dental College and Hospitals and the

management for their constant assistance with the research.

Conflict of Interest: Nil

REFERENCES

Al-Fouzan KS (2002) C-shaped root canals in mandibular second molars in a Saudi Arabian population. International endodontic journal 35(6). europepmc.org: 499–504.

Al-Qudah AA and Awawdeh LA (2009) Root and canal morphology of mandibular first and second molar teeth in a Jordanian population. International endodontic journal 42(9). Wiley Online Library: 775–784.

Azeem RA and Sureshbabu NM (2018) Clinical performance of direct versus indirect composite restorations in posterior teeth: A systematic review. Journal of conservative dentistry: JCD 21(1): 2–9.

Baisden MK, Kulild JC and Weller RN (1992) Root canal configuration of the mandibular first premolar. Journal of endodontics 18(10). Elsevier: 505–508.

Bóveda C, Fajardo M and Millán B (1999) Root canal treatment of an invaginated maxillary lateral incisor with a C-shaped canal. QUINTESSENCE INTERNATIONAL-ENGLISH EDITION- 30. QUINTESSENCE PUBLISHING CO LTD: 707–711.

Chai WL and Thong YL (2004) Cross-sectional Morphology and Minimum Canal Wall Widths in C-shaped Roots of Mandibular Molars. Journal of endodontics 30(7). Elsevier: 509–512.

de Azevedo KRV, Lopes CB, Rosana H T L, et al. (2019) C-shaped canals in first and second mandibular molars from Brazilian individuals: A prevalence study using cone-beam computed tomography. PloS one 14(2). Public Library of Science: e0211948.

Demirbuga S, Sekerci AE, Dinçer AN, et al. (2013) Use of cone-beam computed tomography to evaluate root and canal morphology of mandibular first and second molars in Turkish individuals. Medicina oral, patologia oral y cirugia bucal 18(4). Medicina Oral SL: e737.

Estrela C, Bueno MR, Leles CR, et al. (2008) Accuracy of Cone Beam Computed Tomography and Panoramic and Periapical Radiography for Detection of Apical Periodontitis. Journal of endodontics 34(3). Elsevier: 273–279.

Fischischweiger W and Clausnitzer E (1988) Root formation in molar teeth of the CD-1 mouse. Journal of endodontics 14(4). Elsevier: 163–168.

Govindaraju L, Neelakantan P and Gutmann JL (2017) Effect of root canal irrigating solutions on the compressive strength of tricalcium silicate cements. Clinical oral investigations 21(2): 567–571.

Haddad GY, Nehme WB and Ounsi HF (1999) Diagnosis, classification, and frequency of C-shaped canals in mandibular second molars in the Lebanese population. Journal of endodontics 25(4). Elsevier: 268–271.

Hassan B, Metska ME, Ozok AR, et al. (2009) Detection of Vertical Root Fractures in Endodontically Treated Teeth by a Cone Beam Computed Tomography Scan. Journal of endodontics 35(5). Elsevier: 719–722.

Janani K and Sandhya R (2019) A survey on skills for cone beam computed tomography interpretation among endodontists for endodontic treatment procedure. Indian journal of dental research: official publication of Indian Society for Dental Research 30(6): 834–838.

Jenarthanan S and Subbarao C (2018) Comparative evaluation of the efficacy of diclofenac sodium administered using different delivery routes in the management of endodontic pain: A randomized controlled clinical trial. Journal of conservative dentistry: JCD 21(3): 297–301.

Jerome CE (1994) C-shaped root canal systems: diagnosis, treatment, and restoration. General dentistry 42(5). ncbi.nlm.nih.gov: 424.

Khandelwal A and Palanivelu A (2019) Correlation Between Dental Caries And Salivary Albumin In Adult Population In Chennai: An In Vivo Study. Brazilian Dental Science 22(2): 228–233.

Malli Sureshbabu N, Selvarasu K, V JK, et al. (2019) Concentrated Growth Factors as an Ingenious Biomaterial in Regeneration of Bony Defects after Periapical Surgery: A Report of Two Cases. Case reports in dentistry 2019: 7046203.

Manning SA (1990) Root canal anatomy of mandibular second molars: Part II C-shaped canals. International endodontic journal 23(1). Wiley Online Library: 40–45.

Manohar MP and Sharma S (2018) A survey of the knowledge, attitude, and awareness about the principal choice of intracanal medicaments among the general dental practitioners and nonendodontic specialists. Indian journal of dental research: official publication of Indian Society for Dental Research 29(6): 716–720.

Matherne RP, Angelopoulos C, Kulild JC, et al. (2008) Use of Cone-Beam Computed Tomography to Identify Root Canal Systems In Vitro. Journal of endodontics 34(1). Elsevier: 87–89.

Melton DC, Krell KV and Fuller MW (1991) Anatomical and histological features of C-shaped canals in mandibular second molars. Journal of endodontics 17(8). Elsevier: 384–388.

Nandakumar M and Nasim I (2018) Comparative evaluation of grape seed and cranberry extracts in preventing enamel erosion: An optical emission spectrometric analysis. Journal of conservative dentistry: JCD 21(5): 516–520.

Orban B and Mueller E (1929) The development of the bifurcation of multirooted teeth. The Journal of the American Dental Association (1922) 16(2). Elsevier: 297–319.

Poorni S, Srinivasan MR and Nivedhitha MS (2019) Probiotic strains in caries prevention: A systematic review. Journal of conservative dentistry: JCD 22(2): 123–128.

Rahimi S, Shahi S, Lotfi M, et al. (2008) Root canal configuration and the prevalence of C-shaped canals in mandibular second molars in an Iranian population. Journal of oral science 50(1). jstage.jst.go.jp: 9–13.

Rajakeerthi R and Ms N (2019) Natural Product as the Storage medium for an avulsed tooth – A Systematic Review. Cumhuriyet Dental Journal 22(2): 249–256.

Rajendran R, Kunjusankaran RN, Sandhya R, et al. (2019) Comparative Evaluation of Remineralizing Potential of a Paste Containing Bioactive Glass and a Topical Cream Containing Casein Phosphopeptide-Amorphous Calcium Phosphate: An in Vitro Study. Pesquisa brasileira em odontopediatria e clinica integrada 19(1): 1–10.

Ramarao S and Sathyanarayanan U (2019) CRA Grid - A preliminary development and calibration of a paper-based objectivization of caries risk assessment in undergraduate dental education. Journal of conservative dentistry: JCD 22(2): 185–190.

Siddique R and Nivedhitha MS (2019) Effectiveness of rotary and reciprocating systems on microbial reduction: A systematic review. Journal of conservative dentistry: JCD 22(2): 114–122.

Siddique R, Sureshbabu NM, Somasundaram J, et al. (2019) Qualitative and quantitative analysis of precipitate formation following interaction of chlorhexidine with sodium hypochlorite, neem, and tulsi. Journal of conservative dentistry: JCD 22(1): 40–47.

Siddique R, Nivedhitha MS and Jacob B (2019) Quantitative analysis for detection of toxic elements in various irrigants, their combination (precipitate), and para-chloroaniline: An inductively coupled plasma mass spectrometry study. Journal of conservative dentistry: JCD 22(4): 344–350.

Sour E, Gröndahl H-G, Baksı BG, et al. (2012) Does a Combination of Two Radiographs Increase Accuracy in Detecting Acid-induced Periapical Lesions and Does It Approach the Accuracy of Cone-Beam Computed Tomography Scanning? Journal of endodontics 38(2). Elsevier: 131–136.

Tassoker M and Sener S (2018) Analysis of the root canal configuration and C-shaped canal frequency of mandibular second molars: a cone beam computed tomography study. Folia morphologica 77(4). journals.viamedica.pl: 752–757.

Teja KV, Ramesh S and Priya V (2018) Regulation of matrix metalloproteinase-3 gene expression in inflammation: A molecular study. Journal of conservative dentistry: JCD 21(6): 592–596.

Weine FS (1998) The C-shaped mandibular second molar: Incidence and other considerations. Journal of endodontics 24(5). Elsevier: 372–375.

Weine FS, Pasiewicz RA and Rice RT (1988) Canal configuration of the mandibular second molar using a clinically oriented in vitro method. Journal of endodontics 14(5). Elsevier: 207–213.

Xu X, Wang DG and Wang XY (1996) Clinical significance of the abnormal radiographic manifestations of pulp cavity. Shanghai kou qiang yi xue= Shanghai journal of stomatology 5(2). europepmc.org: 85–86.

Yu X, Guo B, Li K-Z, et al. (2012) Cone-beam computed tomography study of root and canal morphology of mandibular premolars in a western Chinese population. BMC medical imaging 12(1). Springer: 18.