Annals of Clinical Case Reports

Case Report
Published: 05 Aug, 2019

A Rare Morphological Variation of Mandibular Anterior Teeth with Double Canals

Nisha Acharya[1], Riasat Hasan[2], Dashrath Kafle[3], Akashlynn Badruddoza Dithi[2] and Takashi Saito[2]*

[1]Department of Conservative Dentistry and Endodontics, Dhulikhel Hospital, Kathmandu University School of Medical Sciences, Nepal

[2]Department of Oral Rehabilitation, School of Dentistry, Health Sciences University of Hokkaido, Japan

[3]Department of Orthodontics, Dhulikhel Hospital, Kathmandu University School of Medical Sciences, Nepal

Abstract

The success of an endodontic treatment depends upon the through debridement, disinfection and three dimensional fluids tight sealing of the canals. In order to achieve this, clinicians must be familiar with the normal configuration of root canal system and its potential variations with aberrations. Mandibular anterior teeth are usually perceived as teeth with single root canal. However, the anatomy of mandibular anterior teeth is not always as simple as it is expected. Hence, one of the main reasons for failure of endodontic treatment in mandibular anterior teeth is the missed lingual canal or an untreated isthmus. This clinical case report aims to present a rare entity of two separate canals in five mandibular anterior teeth, detected during routine endodontic treatment in a single patient.

Keywords: Double canal; Endodontic therapy; Lingual canal; Mandibular anterior; Root canal system

OPEN ACCESS

Correspondence:
Riasat Hasan, Department of Oral Rehabilitation, Division of Clinical Cardiology, Endodontology and School of Dentistry, Health Sciences University of Hokkaido, 1757 Kanazawa, Tobetsu-cho, Ishikari-gun, Hokkaido 061-0293, Japan, Tel: +81-133231129; E-mail: riasat@hoku-iryo-u.ac.jp

Received Date: *18 Jul 2019*
Accepted Date: *31 Jul 2019*
Published Date: *05 Aug 2019*

Citation:
Acharya N, Hasan R, Kafle D, Badruddoza Dithi A, Saito T. A Rare Morphological Variation of Mandibular Anterior Teeth with Double Canals. Ann Clin Case Rep. 2019; 4: 1701.

ISSN: 2474-1655

Introduction

Single rooted teeth are often considered as the easiest teeth to treat endodontically. However, accurate diagnosis and successful endodontic treatment is always a challenge to the clinician due to variation and complexity of root canal morphology. Inadequate knowledge of root canal variation such as bifurcations, anastomosis, extra canal, aberrant canal configuration, accessory canals and isthmus often leads to the failure of the treatment [1]. Morphologically, mandibular central and lateral incisors have root canals that are oval in shape, wider bucco-lingually and narrower mesio-distally in the coronal third of the root canal. This shape tapers and gradually becomes narrower bucco-lingually at the middle third of the root [2]. Mandibular incisors usually have a single root and single canal. However, in some cases there is presence of dentinal bridge that divides the canal into two [2,3]. Moreover, mandibular canines are also very similar to mandibular incisors with one root and one canal, that is wider bucco-lingually. These teeth rarely have two or more roots or canals [2,3]. However, there is abundant data on morphology and canal configuration of mandibular anteriors stating that these teeth can display anatomic variations and abnormalities [4-7]. According to Rahimi et al. [4] the incidence of mandibular incisors with double canals ranges from 11.5 to 50%. Similarly, Gandhi et al. [8] stated that the occurrence of two root canals in the same root of mandibular canine ranges from 1% to 5%, which is quite rare. Inability to locate and disinfect the extra canal despite its high or low prevalence is the cause of consistent periapical inflammation and subsequent failure of the endodontic treatment. Hence, knowledge of possible external as well as internal anatomical variation and morphological diversities in the number of roots and root canals is essential during the treatment of the patients presenting with such variations. This clinical case reports presents the endododntic treatment of all mandibular incisors and canine, each with two separate canals which merge into a single canal before exiting the tooth through a single apical foramen.

Case Presentation

A 57-year-old female patient with a noncontributory medical history was referred to the Department of Conservative Dentistry and Endodontics, Bhairahawa, Nepal, from Department of Prosthodontics and Dento-facial Prosthesis, with the chief complaint of pain and sensitivity in lower

Figure 1: Preoperative clinical view of tooth 31, 32, 41, 42 and 43.

Figure 2: Intraoral photograph showing floor of the pulp chamber with buccal and lingual canal orifices after enlargement.

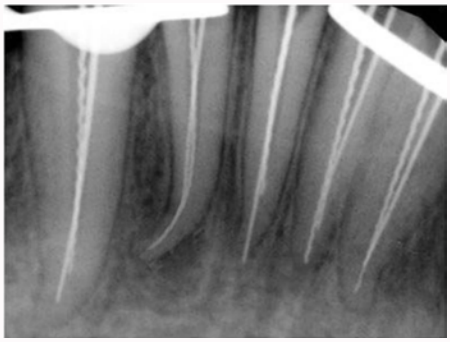

Figure 3: Periapical radiograph for determination of working length.

front area since 4 months and patient requested for replacement of missing posterior teeth. On history taking, patient complained of localized, continuous pain that was aggravated on chewing and on taking cold foods which lingered even after removal of stimulus. On clinical examination, five teeth were present in mandibular anterior region namely 31, 32, 41, 42 and 43 (Federation Dentaire International, FDI system of tooth numbering) (All the mandibular anterior teeth were severely attrited with no signs of swelling or associated sinus tract (Figure 1). Tenderness on percussion test revealed a negative response from all teeth except tooth 42. Sensibility testing (cold test and electric pulp test) showed exaggerated responses with lingering sensation to cold, in all the teeth except 42, which was nonresponsive. Routine intra oral periapical radiograph revealed no widening of lamina dura in relation to 31, 32, 41, 43 suggestive of symptomatic irreversible pulpitis and a diagnosis of symptomatic apical periodontitis was made with tooth 42 due to the presence of widened lamina dura No morphological variation in either the roots or root canals was noted clinically or radiographically. Non-surgical endodontic treatment was planned for this case. Informed consent was obtained from the patient and the teeth were isolated under rubber dam after anesthetizing with local anesthesia (2% lignocaine with 1:80,000 adrenalines). Each tooth was accessed with endo access burs (SS White, Philadelphia, USA) from occlusal aspect due to

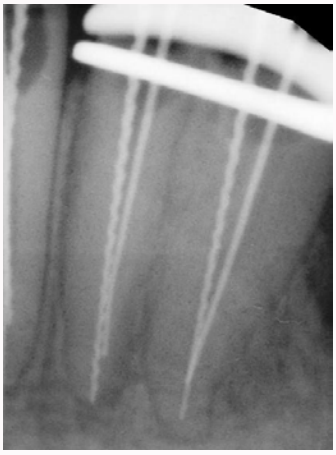

Figure 4: Mesially angulated periapical radiograph of tooth # 31 and 32 with two canals coronally merging at apical third.

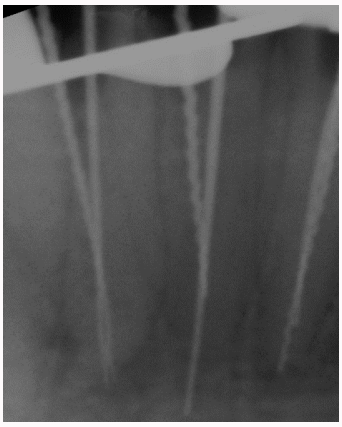

Figure 5: Mesially angulated periapical radiograph of tooth # 41 and 42 with two canals coronally merging at middle third.

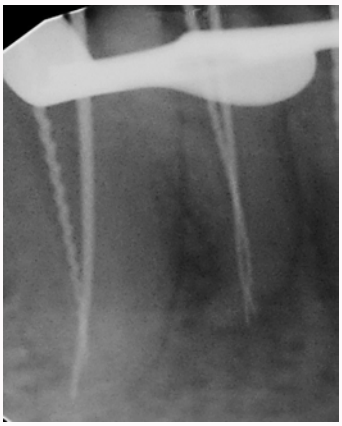

Figure 6: Distally angulated periapical radiograph of tooth # 43 with two canals coronally merging at apical third.

attrition. The pulp chambers were filled with 3% sodium hypochlorite solution (NaOCl Pyrex, India) to remove the debris. On careful intraoral examination with DG 16 endodontic explorer (Hu-Friedy, USA) and tracing the dentinal map under 3.0x magnification by dental loupes (Carl Zeiss, USA), 2 canal orifices (buccal and lingual) with a clear dentinal map between the two orifices were located in the pulpal floors of all five teeth (Figure 2). After checking for the

Figure 7: Clinical picture after restoring the access cavity with Glass Inomer Cement as an intermediate restoration.

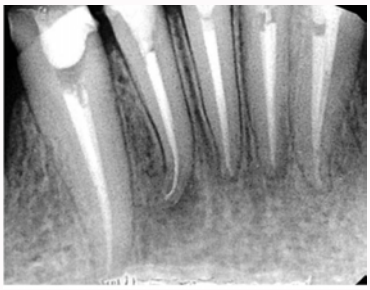

Figure 8: Post obturation radiograph.

patency of the canal with #10 K files (Dentsply Maillefer, USA), pulpal tissue were removed using #15 H files (Dentsply Maillefer, USA). Working length was determined with apex locater (CanalPro, Coltene, Whaledent, USA) and confirmed with intraoral periapical radiograph (Figure 3). Two files, one H file (Hedstrom file, Dentsply Maillefer, USA) and one K file (Kerr file, Dentsply Maillefer, USA), was placed into each orifice and radiographs were taken from different horizontal angulation in order to confirm the presence of two canals. All the radiographs obtained showed two files separated by dentine confirming the presence of two canals (Figures 4-6).

Biomechanical preparation of the canals were completed with rotary ProTaper Next X2 files (Dentsply Maillefer, USA) using EDTA (Dentsply Maillefer, USA) as an lubricant. 3% sodium hypochlorite and 17% EDTA (MD-Cleanser, Metabiomed, Korea) solution were used as an irrigant. The canals were then dried with sterile paper points and calcium hydroxide intracanal dressing was given using lentulo spiral paste carrier. The teeth were then temporized with temporary filling material (Cavit W, 3M ESPE).

After a week the temporary filling material was removed. Calcium hydroxide intracanal dressing was removed using NaOCl solution and Endo activator tips (Dentsply Tulsa Dental Specialties, Tulsa, OK, USA).Teeth were then dried and each canal was obturated with resin based sealer (AH Plus, Dentsply) and guttapercha point of respective size and taper as that of the rotary files using single cone obturation technique. The pulp chambers were then sealed with glass ionomer cement (GC Fuji IX GP Extra, GC, Tokyo, Japan) as an intermediate restoration (Figure 7) and post obturation radiograph was taken (Figure 8).

Discussion

Mandibular anterior teeth are recognized as usually consisting of a single root and single canal in majority of cases. However, the pulp canal system is complex, with multiple variations like extra root and canals, bifurcations, branching and rejoining [9]. Thus, during endodontic treatment, clinician should not have a predetermined

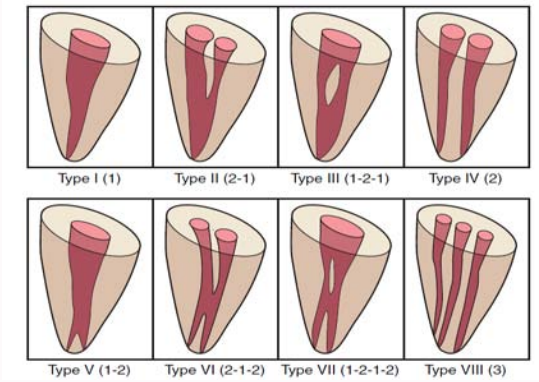

Figure 9: Vertucci's classification of root canal system (Type I -Type VIII) [13].

concept of number of root and root canals for a given tooth as there are number of morphological variation present [10]. Failure to detect these variations can lead to missed canal/s and eventually lead to the failure of the treatment. These single rooted teeth are not as simple as they appear in radiographs as variation do exists [11]. Although ethnicity, age and gender do play a role in the prevalence rate of these morphological and anatomic variations, double canals should be expected and looked for during access opening of teeth [1]. The second canal which is located towards the lingual is usually missed by the clinician as removal of the lingual shoulder during access cavity is critical to facilitate its localization [12]. In this case report, the tooth was endodontically accessed from incisal aspect due to presence of attrition and the double canals were not missed as there was direct visualization of the pulpal floor and the lingual shoulder was removed effectively.

In 1974, Vertucci classified root canal configuration of the teeth with broad buccolingual diameter into following eight types (Figure 9) [13]:

- Type I: Single canal from the pulp chamber till the apex [1].
- Type II: Two separate canals leave the pulp chamber, merge and exit as one canal (2-1).
- Type III: One canal leaves the pulp chamber and divides into two within the body of the root, then merge again and exit as one canal (1-2-1).
- Type IV: Two separate and distinct canals from pulp chamber till the apex [2].
- Type V: One single canals leaves the pulp chamber, bifurcates near the apex and exit as two canals (1-2).
- Type VI: Two separate canals leaves the pulp chamber, merge at middle of the root and then again divide and exit as two canals (2-1-2).
- Type VII: One single canal leaves the pulp chamber, divide into two then merge as one and again divides into two before exiting from apical foramen (1-2-1-2).
- Type VIII: Three separate and distinct canals from the pulp chamber till the apical foramen [3].

In this clinical case, root canal morphology of all five teeth was found to have Vertucci's Type II (2-1) canal configurations. Sert et al.

[6] in 2004 reported the highest incidence (63%) of second canal in mandibular incisors in Turkish populations. However, Boruah et al. [14] in 2011 concluded that 4.16% of Iranian and only 4% of Indian population sample had double canals, when the same teeth were studied in Asian populations. In this case report, patient belonged to the Aryan ethnicity from Asian community. Benjamin and Dowson also reported dual canals in 41% of mandibular incisors but only 1.3% had two separate foramen [15]. On Contrary, data collected by Uma et al. [16] showed that Type I and Type III canal configurations are more common than uncommonly found Type II. Similarly, Scarlatescu et al. [17] found Type I root canal configuration in 65.5%, Type II in 25%, Type III in 6.3% and Type VII in 3.1% in extracted mandibular incisors.

A single diagnostic method might not be sufficient when dealing with anatomic variation of the root canals. Thus, various diagnostic measures, such as multiple pre-operative and intra operative radiographs with different horizontal angulations, proper clinical examination of the pulp chamber floor with sharp DG 16 probe, troughing of anatomic grooves with ultrasonic tips, staining the chamber floor with dyes, performing champagne bubble test with sodium hypochlorite, visualizing the pulp chamber anatomy by red and white line test etc. should be utilized to locate extra canals [2]. Besides, proper illumination with magnification is also one of the important supplementary aids for location of extra canal orifices [2]. In this case, along with using multiple projection radiographs, pulp chamber was explored with DG 16 endodontic explorer under magnification which aided in location of canals during the treatment. Recently, Cone Beam Computed Tomography (CBCT) has revolutionized dentistry and it has become one of the most valuable tools for extra canal location in endodontics [18]. However, access to CBCT was limited in this case as the patient reported to a satellite clinic in rural Nepal. Clinically, all these clinical and radiographic measures are important to look for a second canal in mandibular anterior teeth. This clinical case report emphasizes on highlighting the importance of through knowledge of root canals, its variations and various measures taken to identify and locate the extra canals in mandibular anterior teeth. At times, access cavity modification is required to find these variations. In this case the teeth were attrited, with the pulp horns clearly visible from dentin on the incisal surface. Unlike other non attrited mandibular anterior teeth, where the access cavity is prepared from lingual surface, we prepared an access cavity form the incisal aspect due to the presence of attrition. This cavity preparation provides a straight line access and visibility of the canal orifice/s due to direct access to the canal orifices compared to a conventional lingual preparation, where presence of lingual shoulder in the cingulum can obstruct the visibility of extra canals [1,12]. Hence, the incisal access cavity preparation made it easier for us to locate the extra canals in this case.

References

1. 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.
2. Vertucci FJ, Haddix JE. Tooth morphology and access cavity preparation. In: Hargreaves KM, Cohen S, Berman LH, editors. Cohen's Pathways of the Pulp 10ed. Missouri: Mosby Elsevier Inc, USA; 2011. p. 136-222.
3. Victorino FR, Bernardes RA, Baldi JV, Moraes IG, Bernardinelli N, Garcia RB, et al. Bilateral mandibular canines with two roots and two separate canals: case report. Braz Dent J. 2009;20(1):84-6.
4. Rahimi S, Milani AS, Shahi S, Sergiz Y, Nezafati S, Lotfi M. Prevalence of two root canals in human mandibular anterior teeth in an Iranian population. Indian J Dent Res. 2013;24(2):234-6.
5. Zhao Y, Dong YT, Wang XY, Wang ZH, Li G, Liu MQ, et al. Cone-beam computed tomography analysis of root canal configuration of 4674 mandibular anterior teeth. Europe PMC. 2014;46(1):95-9.
6. Sert S, Bayirli GS. Evaluation of the root canal configurations of the mandibular and maxillary permanent teeth by gender in the Turkish population. J Endod. 2004;30(6):391-8.
7. Perlea P, Nistor CC, Toma C, Dimitriu B. Endodontic configuration of the lower incisors in a Romanian population: a radiological study. Rom J Morphol Embryol. 2013;54:775-8.
8. Gandhi A, Bhat S. A rare morphology of lower mandibular canine with two roots and two roots canal-A Case Report. Sch J Med Case Rep. 2014;2(6):368-70.
9. Bhat SP, Sheth R, Kumar P, Khilosiya A. Root canal morphology and assessment of incidence, type and position of isthmus in permanent mandibular central incisor in North Indian population: An *in vitro* study. Endodontology. 2017;29(2):107-14.
10. Acharya N, Singh A, Samant PS, Gautam V. Endodontic Management of Radix Paramolaris with Six Canals: A Clinical Case Report. Kathmandu Univ Med J. 2013;11(44):338-41.
11. Cantatore G, Berutti E, Castellucci A. Missed anatomy: Frequency and clinical impact. Endod Top. 2009;15(1):3-31.
12. Kayaoglu G, Peker I, Gumusok M, Sarikir C, Kayadugun A, Ucok O. Root and canal symmetry in the mandibular anterior teeth of patients attending a dental clinic: CBCT study. Braz Oral Res. 2015;29(1).
13. Cleghorn BM, Goodacre CJ, Christie WH. Morphology of teeth and their root canal systems. In: Ingle JI, Bakland LK, Baumgartener JC, editors. Ingle's Endodontics. 6th ed. PMPH USA: BC Decker Inc; 2013. p. 151-220.
14. Boruah LC, Bhuyan AC. Morphologic characteristics of root canal of mandibular incisors in North-East Indian population: An *in vitro* study. J Conserv Dent. 2011;14(4):346-50.
15. Benjamin KA, Dowson J. Incidence of two root canals in human mandibular incisor teeth. Oral Surg Oral Med Oral Pathol. 1974;38(1):122-6.
16. Uma Ch, Ramachandran S, Indira R, Shankar P. Canal and isthmus morphology in mandibular incisors- An *in vitro* study. Endodontology. 2004;16:7-11.
17. Scarlatescu S, Didilescu AC, Stratul SI, Rusu D, Grigore M, Greabu M, et al. Root canal morphology of mandibular central incisors in a south-eastern Romanian population: Endodontic and periodontal implications. TMJ. 2010;60(4):280-3.
18. Bhat G, Dodhiya S, Shetty A, Hegde MN. Root and root canal morphology and its variation of the human mandibular canine: a literature review. Int Res J Pharm. 2014;5(3):136-42.