



A Stitch in Time Saves Nine: Retreatment of Missed Canal in Mandibular Central Incisor After 12 Years of Root Canal Treatment - A Case Report

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Abstract

The simplest teeth to treat with a root canal are those with a single root. The literature has reports of single rooted tooth with multiple canal instances. The main reason why endodontic therapy doesn't go well is because the presence of a second canal is not detected. The secret to an effective endodontic procedure is through cleaning and shaping with generous irrigation. A thorough grasp of the internal anatomy and morphology of the root canal system is necessary for cleaning and shaping treatments. The two distinct canals in the mandibular anterior teeth were discovered during standard endodontic re treatments, which is the case in the given case report.

Keywords: Aberrant Anatomy; Retreatment; Mandibular Incisors; Root Canal Anatomy; CBCT; Magnification; Access Cavity

Abbreviations

CBCT, SLOB, EDTA, NaOCl

Introduction

An endodontic treatment is successful when the entire internal anatomy of the root canal system is understood [1,2]. Knowing whether or not there is aberrant internal root canal morphology affects the overall prognosis of teeth that have undergone endodontic treatment. The inability to locate, prepare or fill additional roots and/or root canals can be the cause of post operative illness in endodontic treated teeth [2,3]. The gamble of missing canals during root canal therapy is high as a result of intricacy of the root canal system.

Teeth having a single root are frequently regarded as the least demanding teeth endodontically. Mandibular central and lateral

incisors have fundamentally the same morphology. They frequently present three pulp horns and a single root, albeit a few studies have likewise introduced that the root canal anatomy of mandibular incisors isn't quite as straight forward as it gives off an impression of being on periapical radiographs and is consulted by the presence of bifurcated and lateral canals. At the bifurcation of the root, a single canal parts into two more modest canals that follow divergent pathways. In certain occurrences, these canals might rejoin to frame a single canal once more. There is bountiful documented data supporting the anatomical varieties and irregularities in morphology and canal configuration of mandibular anteriors [4-7]. According to Rahimi, the frequency of mandibular incisors with two canals goes from 11.5 to 50% [4]. Because of the variety and intricacy of the root canal morphology, exact conclusion and effective endodontic treatment is dependably a test to the clinician. The disappointment in endodontic treatment likewise happens because of inadequate

information on root canal variations like separations, anastomoses, additional canals, distorted canal pattern, supplemental canals and isthmus. These can be diagnosed by utilising different diagnostic techniques. Customary ways of diagnosis consist of champagne or bubble test with warm 2.6% NaOCl, staining the chamber with 1% methylene blue, use of sharp explorers, searching of bleeding signs, preoperative radiographs using the SLOB technique are used to find extra canals [8]. Newer methods are use of magnification such as magnifying loupes, operating microscopes, CBCT [9].

The case report presents the non-surgical re treatment of mandibular central incisors with two canal orifice and one apical foramen in mandibular left central incisor.

Case Report

A 52-year-old male patient reported to the Department of Conservative Dentistry and Endodontics with the chief complain of pain in the lower front teeth which had undergone root canal treatment twelve years ago. The patient gave the history of sharp, shooting, intermittent, nocturnal pain since past one week. The pain aggravated on mastication and only relieved by medications (Dolo 500 mg). The patient also informed that the teeth were asymptomatic since past twelve years after the treatment. On intraoral examination, prosthesis (bridge) was seen in relation to 32, 31, 41, 42 and tenderness on percussion was present in relation to 31, 32, 41, 42. Radiographically, incomplete obturation, which was (5-6 mm) short of the apex was seen along with vertical bone loss in relation to 32, 31, 41, 42. Periapical radiolucency in relation to 31 was also appreciated in intraoral periapical radiograph. A diagnosis of acute exacerbation of chronic irreversible pulpitis along with symptomatic apical periodontitis and chronic generalised gingivitis was made in relation to 31 and 32,41,42 respectively. Non-surgical intervention with re treatment in relation to 31, 32, 41, 42 was planned after removal of prosthesis. Removal of prosthesis was advised for easy detection of secondary caries, if any in relation to teeth being treated. Prosthesis was removed with the help of crown removal kit (Crown remover automatic, GDC). Local anaesthesia was administered and isolation was done using rubber dam. Complete removal of secondary caries was done. The access cavities preparation was done and canals were assessed using a No.10 K file (Dentsply). Two No.10K files were placed into each orifice and radiographs were taken using the SLOB technique to detect the presence of two canals in relation to 31. CBCT was performed in order to confirm the presence of two canals in relation to 31. Working length was determined using radiograph and electronic apex locators. Conventional hand instruments were used to perform the biomechanical preparation along with irrigation of normal saline, 5.25% sodium hypochlorite, 17% EDTA. The canals were irrigated with normal saline after each change of instrument. Final irrigation was done with metronidazole and 2% chlorhexidine. After the

complete biomechanical preparation and shaping was done, master cone radiograph was taken followed by obturation by lateral compaction technique. The obturation done was confirmed by radiographs.

Discussion

Pulp space and the root canal system show complex anatomical variations. Root canals may divide and merge or be extra in numbers [10]. The complexities of this system pose an endodontic challenge. Over the years a number of classifications and their modifications have been proposed for describing the root canal configurations. First clinical classification was given by studying the mesiobuccal root of maxillary first molar by Weine S., *et al.* [11]. This classification was further detailed by Vertucci FJ in 1984. Vertucci included the configuration for three canals also [12]. It is one of the most widely used classification in most of the studies. However, advances in imaging techniques like CBCT, micro-computed tomography along with use of magnification have reported an increased reports of complex anatomy of the root canal system [13]. These complex configurations can't be classified by Vertucci classification therefore several newer classifications have been proposed by HMA Ahmed., *et al.* [14], Kartal N., *et al.* [15], Sert S and Bayirli GS [16], Gulabivala., *et al.* [17], MI Karobari., *et al.* [18] and many more researchers.

A study revealed that 42% of endodontic retreatment happens to be because of missed canals [19] another study by Mustafa., *et al.* [20] revealed that endodontic failure occurring by missed canals was 14.4% The key for a successful endodontic therapy depends on a number of factors, one of them being diagnosis of aberrant canals in preoperative intraoral periapical radiograph. If the radiograph shows overlapping of roots or unusual changes in the course of canals etc., then radiograph is taken using the SLOB technique. Proper exploration of the canal orifices with a sharp instrument also helps in detecting aberrant canals. Mandibular anterior teeth usually have a single root and a single canal; however, studies have shown that the gender, ethnicity, age play a significant role in prevalence of anatomical variations in the root canal system [21]. Mandibular incisors access cavities are one of the most challenging ones as the size of tooth is very small. The second canals which if present lingually in these teeth is often missed because of removal of lingual shoulder which helps in localization of canals [22]. The access cavity should be accessed into the cingulum gingivally in order to locate the lingual canal. When two canals are present, it is easy to locate the buccal canal which is straighter than the lingual canal whereas the lingual canal is hidden by the lingual shelf [23].

According to a study on the same teeth in Asian population, 4.16% of Iranian and only 4% of Indian population had double canals [24]. Another study concluded that 41% of mandibular in-

cisors had double canal but only 1.3% had two separate foremen [25]. A study revealed the prevalence of mandibular incisors with single root canal having ribbon or ovoid shape to be 71.8-73.6% and with double canal it is 26-28.1% [21]. According to another study evaluating 400 mandibular incisors in North-East Indian population, 36.25% of them had two canals and only 6.25% had separate apical foramen [26]. Therefore, for a successful endodontic treatment it is important to locate, debride, shape and obturate the extra canal along with copious irrigation.

In the present case report, the missed canal in relation to 31 remained undetected 12 years after the root canal therapy. This helps us understand that the host defence mechanism also plays an important role in fighting and confining the infection to an area.



Figure 1: Pre-operative IOPAR showing incomplete obturation and Prosthesis irt 32 31 41 42.

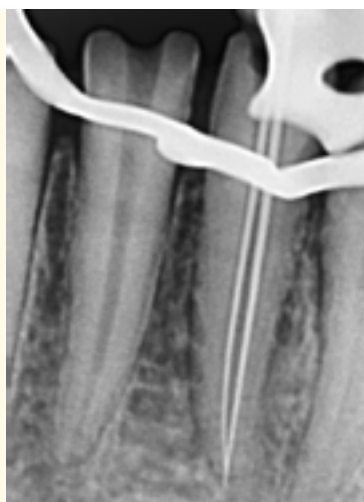


Figure 2: IOPAR irt 31 showing two canals irt 31.

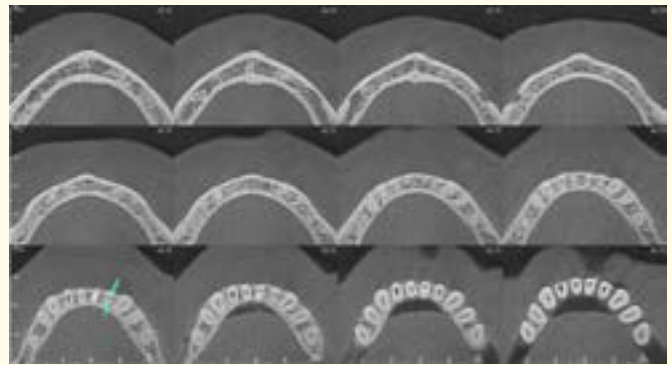


Figure 3: CBCT showing double canal irt 31 (Green Arrows).

DIAGNOSTIC OBJECTIVE: Evaluation of ANTERIOR MANDIBILE SCAN.
 The patient was referred for a Cone-beam CT (CBCT) imaging series at Raydent i-cat dental & maxillofacial imaging centre, portnagar, hokhok. Routine Cone Beam Computed Tomography was performed with i-cat CB 500 machine for ANTERIOR MANDIBILE SCAN. Data was acquired as a volume acquisition and reconstructed in multiple planes. Evaluation of soft tissues is somewhat limited by bone algorithm processing.

RADIOGRAPHIC FINDINGS:

QUALITATIVE ASSESSMENT:

- Tooth 31- Shows endo-access cavity in the coronal region with hypodense coronal restoration.
- Exhibits single root with single canal suggestive of Vertucci's type II root canal configuration (1-1) [correlate with image given below].
- Is partially endodontically treated with endodontic material noted 3.3mm short of the radiographic apex.
- Apical blunting of root apex noted with surrounding periapical radiolucency suggestive of periapical abscess formation.

Figure 4: CBCT report confirming Vertucci Type II canal configuration irt 31.



Figure 5: Working length determined irt 31 showing double canal irt 31.



Figure 6: Final obturation irt 32 31 41 42.

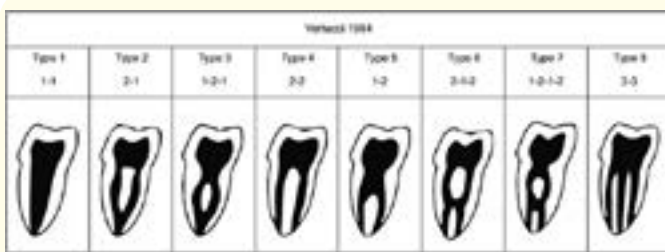


Figure 7: Pictorial Representation of Vertucci's classification of canal configuration.

Conclusion

Variations in the number and configuration of root canals are quite common in teeth including the lower incisors. Since inability to detect and treat the extra canal (lingual in case of lower incisors) is one of the main reasons for failure of endodontic therapy, it is therefore essential to instill the practice of carefully interpreting the radiographs.

Aberrant anatomy of root canals if remain undetected cause failure of the endodontic therapy and if detected can lead to a successful treatment.

Proper extension of the access cavity in the buccolingual direction as well as sub gingivally beneath the cingulum will help the clinician to detect additional lingual canal, if present, in the mandibular incisors.

In this case proper extension of access cavity led to detection, debridement and obturation of the lingual canal in mandibular incisor. The treatment had favourable outcome.

Bibliography

1. Krasner P and Rankow HJ. "Anatomy of the pulp-chamber floor". *Journal of Endodontics* 30.1 (2004): 5-16.
2. Rödiger T and Hülsmann M. "Diagnosis and root canal treatment of a mandibular second premolar with three root canals". *International Endodontic Journal* 36.12 (2003): 912-919.
3. Cantatore G., et al. "Missed anatomy: frequency and clinical impact". *Endodontic Topics* 15.1 (2006): 3-1.
4. Rahimi S., et al. "Prevalence of two root canals in human mandibular anterior teeth in an Iranian population". *Indian Journal of Dental Research* 24.2 (2013): 234-236.
5. Zhao Y., et al. "Cone-beam computed tomography analysis of root canal configuration of 4674 mandibular anterior teeth". *Beijing Da Xue Xue Bao Yi Xue Ban* 46.1 (2014): 95-99.
6. Sert S and Bayirli GS. "Evaluation of the root canal configurations of the mandibular and maxillary permanent teeth by gender in the Turkish population". *Journal of Endodontics* 30.6 (2004): 391-398.
7. Perlea P., et al. "Endodontic configuration of the lower incisors in a Romanian population: a radiological study". *Romanian Journal of Morphology and Embryology* 54.3 (2013): 775-778.
8. Vertucci FJ., et al. "Tooth morphology and access cavity preparation". In *Cohen's Pathways of the Pulp* (2011): 136-222.
9. Bhat G., et al. "Root and root canal morphology and its variation of the human mandibular canine: a literature review". *International Research Journal of Pharmacy* 5.3 (2014): 136-142.
10. Cleghorn BM., et al. "Morphology of teeth and their root canal systems". *Endodontics* 6 (2008): 151-210
11. FS Weine., et al. "Canal configuration in the mesiobuccal root of the maxillary first molar and its endodontic significance". *Oral Surgery, Oral Medicine, Oral Pathology* 28.3 (1969): 419-425.
12. F Vertucci., et al. "Root canal morphology of the human maxillary second premolar". *Oral Surgery, Oral Medicine, Oral Pathology* 38.3 (1974): 456-464.
13. Jain S and Mandke L. "The hunt for the hidden – Methods of locating root canals". *International Journal of Oral and Dental Health* 8.1 (2022): 18-22.
14. H M A Ahmed., et al. "A new system for classifying root and root canal morphology". *International Endodontic Journal* 50.8 (2017): 761-770.

15. Kartal N and Yanikoğlu FC. "Root canal morphology of mandibular incisors". *Journal of Endodontics* 18.11 (1992): 562-564.
16. S Sert and G Bayirli. "Evaluation of the root canal configurations of the mandibular and maxillary permanent teeth by gender in the Turkish population". *Journal of Endodontics* 30.6 (2004): 391-398.
17. Gulabivala., *et al.* "Root canal morphology of Burmese mandibular molars". *International Endodontic Journal* 34 (2001): 359-370.
18. MI Karobari., *et al.* "Root and canal morphology of the anterior permanent dentition in Malaysian population using two classification systems: a CBCT clinical study". *Australian Endodontic Journal* (2020).
19. Uma Ch., *et al.* "Canal and isthmus morphology in mandibular incisors - An *in vitro* study". *Endodontology* 16 (2004): 7-11.
20. Mustafa M., *et al.* "Evaluation of the Causes of Failure of Root Canal Treatment among Patients in the City of Al-Kharj, Saudi Arabia". *Nigerian Journal of Clinical Practice* 24.4 (2021): 621-628.
21. Daokar SG., *et al.* "All the mandibular incisors with double canals in a single patient: a rare case". *Journal of International Oral Health* 7.2 (2015): 46-49.
22. Kayaoglu G., *et al.* "Root and canal symmetry in the mandibular anterior teeth of patients attending a dental clinic: CBCT study". *Brazilian Oral Research* 29.1 (2015): 1-7.
23. Kokane VB., *et al.* "Treatment of two canals in all mandibular incisor teeth in the same patient". *Case Reports in Dentistry* 2014 (2014): 893980.
24. Benjamin KA and Dowson J. "Incidence of two root canals in human mandibular incisor teeth". *Oral Surgery, Oral Medicine, Oral Pathology* 38.1 (1974): 122-126.
25. Scarlatescu S., *et al.* "Root canal morphology of mandibular central incisors in a South-Eastern Romanian population: Endodontic and periodontal implications". *Timisoara Medical Journal* 60.4 (2010): 280-283.
26. Boruah LC and Bhuyan AC. "Morphologic characteristics of root canal of mandibular incisors in North-East Indian population: An *in vitro* study". *Journal of Conservative Dentistry* 14.4 (2011): 346-350.