

Permanent Mandibular Incisor with two root canals- A Case Report

Running title: Unusual canal morphology in Mandibular Incisor.

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Abstract:-Single rooted tooth are regarded to be the easiest tooth to perform root canal treatment. Single rooted tooth showing more than single canal cases has been documented in the literature. The inability to detect the presence of second canal is the main cause for unfavourable outcome during endodontic treatment. Complete cleaning and shaping with copious irrigation is the key to successful endodontic treatment. Cleaning and shaping procedures requires careful understanding of the internal anatomy and morphology of the root canal system. The present case report presents a rare entity of two separate canals in mandibular anterior teeth, detected while performing routine endodontic treatment.

Keywords: Abberant anatomy, Mandibular Incisor, Root canal anatomy, Vertucci.

1. INTRODUCTION

A complete knowledge of internal anatomy of root canal system makes endodontic treatment successful ^[1,2]. The overall prognosis of endodontically treated teeth depends on the knowledge about the presence of aberrant internal root canal morphology. The postoperative disease in endodontically treated teeth can be caused by the inability to locate, prepare or fill

all roots and/or root canals [2,3]. The risk of missing canals during root canal treatment is high because of the complexity of the root canal system.

Single rooted teeth are often regarded as the easiest teeth to treat endodontically. The mandibular central and lateral incisors have very similar morphology. These teeth often present three pulp horns and a single root canal, although some studies have also presented that the root canal anatomy of mandibular incisors is not as simple as it appears to be on periapical radiographs, and is complicated by the presence of bifurcated and lateral canals. At the bifurcation of a root canal a single canal splits into two smaller canals which follows divergent pathways. In some instances, these canals may rejoin to form a single canal again.

There is abundant documented data supporting that mandibular anteriors can display anatomic variations and abnormalities in morphology and canal configuration [4-7]. According to Rahimi the incidence of mandibular incisors with double canals ranges from 11.5 to 50% [4]. studied the root canal morphology of extracted mandibular incisors and have reported a prevalence of two canals in 12–35% of the cases [5].

Due to variation and complexity of root canal morphology, accurate diagnosis and successful endodontic treatment is always a challenge to the clinician. The failure in endodontic treatment also occurs due to insufficient knowledge on root canal variation such as bifurcations, anastomosis, extra canal, aberrant canal configuration, accessory canals and isthmus. This can be eliminated by using various diagnostic methods. Traditional methods of diagnosis includes Champagne or bubble test" with warm 2.6% NaOCl, Staining the chamber with 1% methylene blue, Use of sharp explorers, Looking for bleeding signs, Obliquely angled preoperative radiographs are used to locate extra canals (SLOB) [9]. Newer methods Use of magnifying loupes, Operating microscopes, Computed tomography, Cone beam computed tomography [10].

This case report presents the nonsurgical endodontic management of a mandibular incisor with 2 orifices with 1 apical foramina.

CASE REPORT

A 62-year-old male patient was referred to the Department of Conservative Dentistry and Endodontics. The chief complaint was pain in lower front tooth. The patient gave a history of mild, intermittent, nocturnal, aggravates on mastication and relieves at rest for past one week. On intraoral examination, dental caries was seen in relation to 42, 14, and tenderness on percussion was present. Radiographically, radiolucency was seen involving enamel, dentin and approximating pulp irt 42 [Figure 1-A]. A diagnosis of dental caries with acute reversible pulpitis with symptomatic apical periodontitis in relation to 42 was made. Nonsurgical root canal therapy (NSRCT) was planned for 42. Local anesthesia was administered and isolation was achieved with rubber dam. Complete carious removal was done. The access cavity preparation was done and canals were accessed with #10 K file. Two files, one H file (Hedstrom) were placed into each orifice and radiographs were taken from different horizontal angulation in order to confirm the presence of two canals and Working Length was obtained [Figure 1-B]. Conventional hand instruments were used to perform biomechanical preparation. 2.5% of Sodium hypochlorite and 17% EDTA were used for irrigation. The canals were irrigated with normal saline after each instrument change. After completion of cleaning and shaping, master cone radiograph was taken [Figure 1-C]. This was followed by obturation with cold lateral compaction technique. The Obturation was verified using radiograph taken in angulations followed by restoration of coronal access cavity [Figure 1-D].

2. DISCUSSION

It has been observed that the root canal system shows complex anatomical features when there is presence of extra canals which poses an endodontic challenge. The canal systems were classified by Vertucci [11].

Successful Endodontic treatment depends on many factors. A study reveals that 42% of endodontic retreatment is because of missed canal^[15]. The first step to diagnose aberrant root canal anatomy is taking preoperative intraoral periapical radiograph. If the radiograph shows overlapping of roots or presents unusual finding, then radiograph is taken using Clark's rule. For diagnosing extracanals the exploration of root canal orifices also plays an important role. Mandibular anterior teeth usually consist of a single root and single canal in majority of cases. Studies have revealed ethnicity, age and gender plays a role in the prevalence rate of these morphological and anatomic variations^[12]. Thus, it is important to expect presence of double canals during access opening of teeth. Mandibular incisors are one of the most difficult access cavities to prepare because of their small size. The second canal which is located lingually is often missed by the clinician because of the removal of the lingual shoulder during access cavity is critical to facilitate its localization^[13]. Hence, the clinician should extend the access preparation well into cingulum gingivally to avoid missing lingual canal. Whenever there is presence of two canals, it is easy to locate the buccal canal. The buccal canal is usually straighter than the lingual canal, while the lingual canal is often shielded by lingual shelf. Hence in such cases with presence of lingual canal, the access opening is extended lingually beneath the cingulum revealing the missed lingual canals in all mandibular incisors^[14]. The failure to locate, debride, and obturate the missed lingual canal forms one of the main reasons for endodontic treatment failure in mandibular incisor teeth. A study involving 50 extracted mandibular incisor to evaluate canal and isthmus morphology radiographically and concluded that Type I and Type III canal configuration are common than Type II canal are rarely found^[15]. However, a study 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^[16]. Another study revealed that in 41% of mandibular incisors dual canals was reported but only 1.3% had two separate foramen^[17]. The prevalence of mandibular incisor with single canal showing either ovoid or ribbon shapes in the range of 71.8-73.6% and with double canal is in the range of 26-28.1%. Hence to achieve success in endodontic therapy it's important to locate, shape and obturate these extra canals^[18]. Antibacterial irrigation in association with mechanical debridement of the root canal is essential to treat endodontic infections^[19]. With all the available techniques, the protest is still on to penetrate, reach, and kill bacteria, which are well-known to protect themselves from the dentinal mud, their own secretions, and biofilms. The success of root canal therapy is aided by ample of irrigation and disinfection. In the present case, 5.25% (NaOCl) and 17% (EDTA) were the active irrigants. This article describes a case report with aberrant morphology of root canals of mandibular incisors and their successful endodontic management. The paper points were used to remove excess moisture from the canals. Obturation was done using lateral compaction technique.

3. CONCLUSION

Lower incisors often have deviations in the number and the configuration of root canals. The inability to detect and treat extra canal, mostly lingual canal is the main reason for failure of endodontic treatment of mandibular incisor. Therefore, it is essential to carefully interpret radiographs taken in different angulations. Hence, it is important to inculcate practice of extending access cavity buccolingually and gingivally beneath cingulum which will help to detect additional lingual canal if present in each mandibular incisor. This case report details the endodontic management of mandibular incisor with two canals which ended with a favorable outcome. If aberrant anatomical variation is misdiagnosed will lead to failure and if diagnosed correctly leads to successful treatment.

4. REFERENCES

1. Krasner P, Rankow HJ. Anatomy of the pulp-chamber floor. *Journal of endodontics*. 2004 Jan;30(1):5-16.
2. Rödiger T, Hülsmann M. Diagnosis and root canal treatment of a mandibular second premolar with three root canals. *International endodontic journal*. 2003 Dec;36(12):912-9.
3. Cantatore G, Berutti E, Castellucci A. Missed anatomy: frequency and clinical impact. *Endodontic Topics*. 2006 Nov;15(1):3-1.
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 Journal of dental research*. 2013 Mar;24(2):234-36.
5. Zhao Y, Dong YT, Wang XY, Wang ZH, Li G, Liu MQ, Fu KY. Cone-beam computed tomography analysis of root canal configuration of 4674 mandibular anterior teeth. *Beijing Da Xue Xue Bao Yi Xue Ban*. 2014 Feb;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 Jun;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(3 Suppl):775-8.
8. Al-Fouzan KS, AlManee A, Jan J, Al-Rejaie M. Incidence of two canals in extracted mandibular incisors teeth of Saudi Arabian samples. *Saudi Endodontic Journal*. 2012 May;2(2):65-69.
9. Vertucci FJ, Haddix JE. Tooth morphology and access cavity preparation. In *Cohen's Pathways of the Pulp 2011* Jan 1 (pp. 136-222). Mosby.
10. 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.
11. Cleghorn BM, Goodacre CJ, Christie WH. Morphology of teeth and their root canal systems. *Endodontics*. 2008;6:151-210.
12. 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 Feb;7(2):46-9.
13. Kayaoglu G, Peker I, Gumusok M, Sarikir C, Kayadugun A, Uçok O. Root and canal symmetry in the mandibular anterior teeth of patients attending a dental clinic: CBCT study. *Brazilian Oral Research*. 2015;29(1):1-7.
14. Kokane VB, Patil SN, Gunwal MK, Kubde R, Atre S. Treatment of two canals in all mandibular incisor teeth in the same patient. *Case Rep Dent*. 2014;2014:893980.
15. Uma Ch, Ramachandran S, Indira R. Canal and isthmus morphology in mandibular incisors- An *in vitro* study. *Endodontology*. 2004;16:7-11.
16. 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.
17. 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.
18. Scarlatescu S, Didilescu AC, Stratul SI, Rusu D, Grigore M, Greabu M, Iliescu A. Root canal morphology of mandibular central incisors in a South-Eastern Romanian population: Endodontic and periodontal implications. *Timisoara Med J*. 2010;60(4):280-3. Cleghorn BM, Christie WH, Dong CC. The root and root canal morphology of the human mandibular first premolar: a literature review. *Journal of endodontics*. 2007 May;33(5):509-16.