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ENDODONTIC MANAGEMENT OF MANDIBULAR CENTRAL INCISOR WITH 3 ROOT CANALS - A RAREST CASE REPORT

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ABSTRACT

A wide morphological divergence of the root canal system is known to exist. One of the main reason for endodontic failure can be missed an extra canal. Most of the case report reveals two root canals in mandibular incisors or two roots with two canals. This case report describes the successful endodontic treatment of mandibular central incisor with three root canals. So this present case is rarest because this is the only case of mandibular central incisor having three canals leaving the apical foramen with two canals.

KEYWORDS : three root canals, mandibular central incisor, missed canal, endodontic failure

INTRODUCTION

Thorough knowledge of the dental anatomy and root canal morphology is one of the main factors which would increase the success of endodontic treatment. Investigators have shown that the pulp canal system is complex, and canals may branch, divide and rejoin [1-3]. Variations in root canal anatomy such as presence of extra canal, multiple foramina, apical delta, furcal accessory canals etc. are common findings. To achieve a healthy response following root canal treatment, the entire root canal system must be adequately debrided and filled [4]. A canal is often left untreatedbecause dentist fails to recognize its presence. Careful interpretation of pre-operative radiographs is very important for diagnosing the teeth with unusual root anatomy.

Many anatomical studies have reported that mandibular central incisor has two root canals. 40% of mandibular incisors have two canals – buccal and lingual with only 2 to 3% having separate foramina [5]. Jordanian population showed that 73.8% of the roots possessed a single canal. Although 26.2% of the roots possessed two canals, only 8.7% had two separate apical foramina [6]. North East Indian population showed 63.75% of roots had a single canal. Although 36.25% of the roots possessed two canals, only 6.25% had two separate foramina [7].In case of mandibular central incisor, second canals are difficult to locate because of the angulation of anatomic crown and location of standard access cavity on the lingual aspect.Therefore, clinicians must be familiar with the various root canal configurations and their characteristic features in various racial groups. The present case reports the features and endodontic therapy of mandibular left central incisor with 3 root canals merging into 2 in middle third of root and exiting the apex through 2 separate foramina.

CASE REPORT

A 33-year-old male was referred to the Department of Endodontics with the chief complain of pain in lower front tooth.No significant medical history was present. Root canal treatment had been initiated by a general practitioner for the tooth in question 15days before. On clinical examination no facial asymmetry was noticed. An intra-oral examination revealed temporary restoration in mandibular left central incisor. No soft tissue abnormalities were seen in relation to mandibular left central incisor. Tooth was tender on palpation and vertical percussion. Patient had an intra-oral periapical radiograph which was taken 15 days back. (Figure 1)

Figure 1: Pre-operative radiograph

Temporary restoration was removed with small round diamond point (BR-41) and canal was irrigated with normal saline. Careful examination of previously made access opening was done. Access opening was observed to be round in shape. 15# K-file was inserted in canal orifice and it was more towards labial side. This indicated there may be a chance of an extra canal which may be present under the lingual shelf of dentin. So access opening was modified to oval shape using non-end cutting diamond point (EX-24). On further exploration, under cotton roll isolation, two distinct root canal orifices were observed, one labial and one lingual. 10# hand K-files were introduced into each canal orifices and radiograph was taken. A thin radiolucent line was observed extending between 2 radiopaque lines of instruments on the radiograph, which indicated presence of third root canal between labial and lingual canals. The third canal was located and then again working length radiograph was taken with 20# K-file in labial, 15# K-file in lingual and 10# K-file in middle canal. (Figure 2) Radiograph showed that labial canal was separate and K-file reached up to the apex. K-file in the lingual canal was reached upto the apex and K-file in the middle canal merged with lingual canal in middle third of the root, indicating presence of 3 root canals merging into 2 in middle third of root and exiting the apex through 2 separate foramina in

mandibular left central incisor. All 3 canal orifices were enlarged with 25# 08% Hyflex rotary file. Apical preparation was done in labial canal up to size of 30# hand K-file and in lingual canal up to size of 25 # hand K-file. Then with placing 25# K-file into the lingual canal, apical preparation of middle canal was done till working length up to size of 25# hand K-file. And shaping was completed with conventional step back preparation. Apical patency was maintained with 15# hand K-file. Cleaning was done with simultaneous use of 3% sodium hypochlorite and normal saline after using each instrument. After completion of cleaning and shaping, 3 root canal orifices were very well appreciated. (Figure 3) Intra canal Calcium hydroxide [$Ca(OH)_2$] was placed in thecanals as an inter-appointment antibacterial medicament and closed temporary restoration was given. Patient was recalled after 8 days.

Figure 2: Working length radiograph with 3 Separate K-files

Figure 3: 3 separate opening after completion of cleaning and shaping

Patient was asymptomatic on recall visit. Rubber dam isolation was done and temporary restoration was removed. $Ca(OH)_2$ was removed from all the canals using master apical file of the respective canal. Copious irrigation was done with normal saline to remove all the residue of the $Ca(OH)_2$. Absorbent points were used to dry all 3 canals. After canals were dried, master cone radiograph was taken with size 30# 02% gutta percha cone in labial canal up to its working length till apex and size 25# 02% gutta percha cones in lingual canal up to apex and 25# 02% gutta percha cone in middle canal up to the working length till it merged with lingual canal. (Figure 4) Obturation was done using lateral compaction technique in all the 3 canals with zinc oxide eugenol sealer. Access cavity was sealed with temporary restorative material. Post obturation radiograph was taken to assess the obturation. (Figure 5) Patient was recalled after 4 days for permanent restoration and referred to department of prosthodontics for placement of a crown.

Figure 4: master cone radiograph

Figure 5: post obturation radiograph

DISCUSSION

An understanding of the morphology of pulp cavity is necessary for successful root canal therapy.Endodontic treatment of mandibular anterior teeth is being carried out since years under the general assumption that these teeth possess only one root canal. However, the operator must be aware of the possibility of a bifurcated canal, or an extra canal when treating mandibular incisors [8-10].

The literature on mandibular incisors reveal that 11–68% of mandibular incisors possesstwo canals, although in many of these cases, the canals merge into one in the apical 1–3 mm of the root [9-12]. Vertucci [8] examined the root canal morphology of 300 mandibular anterior teeth and reported a second canal in 27.5% of mandibular incisors. Miyashita et al. [9] reported that 12.4% of mandibular incisors consisted of two canals; however, only 3% had two different foramina. Sert et al. [10] noted that two canals were present in 68% of mandibular central incisors. Mauger et al. [12] evaluated the canal morphology at different root levels in one hundred mandibular incisors,and reported that 98–100% of the teeth had one canal in the area 1–3 mm from the apex.

In a radiographic study of 364 specimens, Benjamin and Dowson [13] reported that 41.4% of mandibular incisors they studied had 2 separate canals; of these, only 1.3% had 2 separate foramina. Kartalet al. reported in his microscopic study that there is only 1% chance of three separate canals in the coronal third in mandibular central incisor. Funato et al. reported a case of a mandibular central incisor with two root canals and two separate apical foramina [14]. No clinical case report has been reported till date for mandibular central incisor having 3 root canals. Gulabivala et al. in 2001 described a classification of variations in the root canal system for molar teeth in which,

type 12 configuration is for tooth consisting of three canals in coronal third, merging into two and leaving the apex through two separate apical foramina. But in thepresent case, this configuration coincides with the configuration seen in mandibular central incisor, which is very rare.

One reason for an unfavorable outcome in endodontic treatment of mandibular incisors is the inability to detect the presence of a second canal, which then will not be prepared, disinfected and obturated [11]. Thus, it is essential that clinicians know the clinical and radiographic signs that suggest the presence of extra canals. Nattress et al. [15] radiographed 790 extracted mandibular incisors and premolars in order to assess the incidence of canal bifurcation in a root. Using the 'fast break' guideline, the disappearance or narrowing of a canal suggests that it divides, which resulted in failure to diagnose one-third of these divisions from a single radiographic view. In some cases, it is very difficult to identify additionalroot canals by radiographic examination and thereforevisualization and deep probing during initial endodontictreatment is essential for the location of all canals. Clinically, the presence of continuous bleeding in teeth with pulpitis or normal pulps despite complete instrumentation can suggest the presence of such canals [16]. In caseswith necrotic pulps or when the canals are pulpless, thepresence of an apical rarefaction on the lateral side of theroot may suggest the presence of an extra canal.Some of the other indications could be the eccentric location of an endodontic file on a radiograph during working length determination, inconsistent apex locator readings, a sinus tract that traces laterally away from the main canal, or the feeling of a 'catch' on the canal wall during instrumentation of a wide and unobstructed main canal. Complete disappearance of the lumen in the coronal third of the root on the periapical radiograph suggests the possible presence of second canal.

A common reason for not locating a second canal in mandibular incisors is an inadequate access opening into the tooth which leaves a lingual shelf of dentine over the second (usually the lingual) canal [13]. Thereforeit may be necessary to modify the conventional access preparation to permit better visualization and instrumentation of additional canal even at the expense of compromising the crown structure. Some authors recommended that when entering mandibular incisors in order to perform endodontic treatment, clinicians should always prepare access cavity with appropriate size and location, and then thoroughly search for the second canal [17].

An important aid for locating root canals is the dental-operating microscope which was introduced into endodontics to provide magnification and illumination. It enhances the dentist's ability to selectively remove dentin with great precision thereby minimizing procedural errors. Several studies have shown that it significantly increases the dentist's ability to locate and negotiate canals [18,19].

CONCLUSION

The complexity of root canal system isa major concern for many dentists undertaking root canal treatment.A thorough knowledge of tooth morphology, careful interpretation of angled radiographs, proper access preparation, a detailed exploration of the interior of the tooth are essential prerequisites for a successful treatment outcome, because even the most routine of cases such as mandibular central incisor might deviate from the usual.

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