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Endodontic Treatment of Bifurcated Root Canal in Mandibular Incisors - A Case Report

Dr. Dayanand Chole[1], Dr. Rahul Chole[2], Dr. Srinivas Bakle[3],
Dr. Neha Gandhi[4], Dr. Nikhil Hatte[5], Dr. Priyanka Bawa[6]

1Professor and Head: Department of Conservative dentistry and Endodontics, P.D.U Dental College, Solapur
2Post Graduate Student: Department Of Conservative Dentistry and Endodontics, PDU Dental College, Solapur 3,4Reader: Department Of Conservative Dentistry and Endodontics, PDU Dental College, Solapur
5,6Senior Lecturer: Department Of Conservative Dentistry and Endodontics, PDU Dental College, Solapur

Abstract: *Mandibular incisors are smallest teeth in the dentition. It is assumed that mandibular incisor is the most easy tooth to treat but sometimes these teeth are difficult to treat because of presence of extra canal which is present more lingually and often misdiagnosed and leads to treatment failure. Success of root canal treatment depends on careful diagnosis of additional canal and thorough debridement of root canal space and obtaining a fluid-tight seal. Thus, this article emphasis on careful management of mandibular incisors with the bifurcated canal (type III anatomy) in a single patient.*

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I. Introduction

The treatment of entire root canal system is essential to maximize the possibility of obtaining success in the endodontic therapy. It is necessary for the clinician to have a thorough knowledge of the dental anatomy as well as of its variations. Many of the problems encountered during root canal treatment occur because of inadequate understanding of the pulp space anatomy. This applies to mandibular incisor teeth as many dentists fail to recognize the presence of a second canal. Current knowledge of pulp space anatomy is based on research findings and individual case reports. Many studies have examined the root canal systems of mandibular incisors.[1]

A wide morphological divergence of the root canal systems is known to exist. Varying number of the root canals in different teeth, their anatomy and interconnections have been studied and reported by several authors (fig-1). It is generally accepted that many mandibular incisors have 2 canals, which may merge into 1 canal before reaching the apex. In rare cases, separate foramina may form. In a radiographic study of 364 specimens, Benjamin and Dowson reported that 41.4% of the mandibular incisors they studied had 2 separate canals; of these, only 1.3% had 2 separate foramina. [15]

Vertucci (1974) used the clearing technique to study the root canal morphology of 300 extracted mandibular anterior teeth. Two canals were found in 30% of mandibular central incisors and in 25% of mandibular lateral incisors. [2] Mauger et al. (1998) 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.[3-4] Bifurcation of the root canal in mandibular incisors may result in complications or in operative failure during endodontic therapy. Authors studying roots with two canals commonly report an isthmus, fin, or corridor, which may be present between the two canals. Author Green has previously described this corridor as a "ribbon-shaped passage." He had found that this ribbon-shaped passage is present in 22% of mandibular central and lateral incisors.[5]

The aim of this paper is to report a case of Vertucci's 1-2-1 canal configuration in mandibular incisor with a simultaneous ex vivo evaluation.

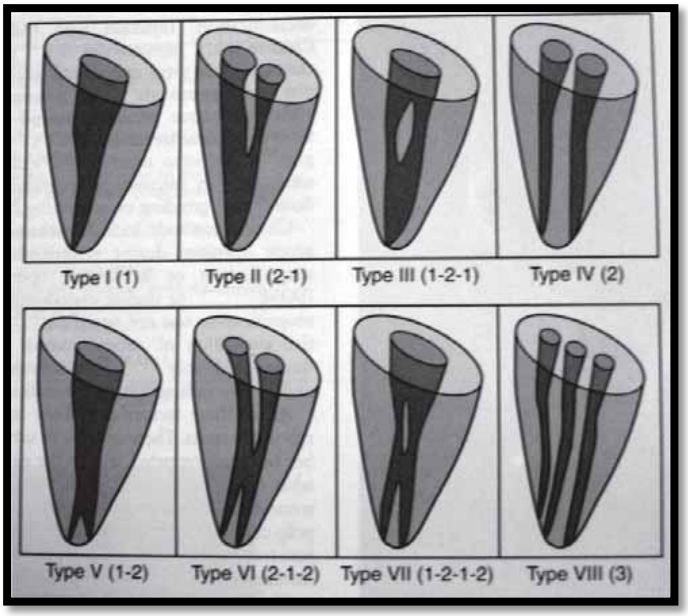

Fig –1. Vertucci's classification of morphological variation of root canals

II. Case Report

A 41-year-old male patient reported to the department of conservative dentistry and Endodontics , Pandit Deendayal Upadhyay Dental college, Solapur with the chief complaint of moderate pain in lower front tooth since past 15 days. The medical history was non contributory. Clinically, there was severe attrition of lower anterior teeth and collapse of anterior bite.

Radiographic examination showed loss of crown structure in the lower anterior region with periodontal ligament widening and bone loss [Figure 2]. Cold test and EPT tests were negative. The diagnosis was made as chronic apical periodontitis. Endodontic treatment was planned . The Central incisor showed a radiolucent canal that stopped abruptly in the middle third of the root, indicating the bifurcation of canals.

After placement of a rubber dam, access was gained from lingual approach using high speed endo access bur under surgical loupe. Entry was made into the pulp chamber and access cavity modified to oval shape wider cervico-incisally. First a 10 number K-file was inserted till the apex and a second 10 number K file was inserted in the same orifice which advanced labial to the previous file .The working length was estimated using electronic apex locator and then confirmed by radiograph [Fig. 3] showing 1-2-1 configuration.

The radiograph suggested that canal was single at the orifice, bifurcated at middle third and united as single just before reaching apical foramen suggesting Vertucci's1-2-1 root canal configuration.

The canals were prepared using a step back instrumentation technique. A 2.5% of sodium hypochlorite and normal saline (sodium chloride injection I.P 0.9% w/v) were alternatively used as irrigants at every change of instruments. The access cavities were then temporarily sealed with Cavit.

At 2 weeks follow-up as the teeth were asymptomatic, obturation of the root canals was done by vertical compaction technique and AH Plus sealer [Figures 4 and 5]. Postobturation radiograph showed well-obturated two canals in all lower incisors, and the access cavities were sealed with Restorative glass ionomer cement.

Fig.2 Pre-op Radiograph of #31

Fig.3 Working length radiograph showing 1-2-1 canal configuration

Fig.4 Master cone Radiograph

Fig.5 Radiograph showing Obturation done

III. Discussion

A good preoperative radiograph is mandatory for initiation of any treatment. To see any variation from normal or an abrupt change in root canal space radiograph with different angulation is also equally important. Prognosis and success of tooth depend on correct diagnosis as well as adequate access opening, debridement of root canal space and achieving a three-dimensional seal with an inert filling material is also needed.[6] The anatomy of root canal systems dictates the condition under which root canal therapy is carried out and can directly affect its prognosis. Extra root or root canals if not detected are a major reason for failure of this treatment.[7] Incomplete removal of all the irritants from the pulp space may increase the possibility of treatment failure.[8-9] The main reason for failure in endodontic treatment of mandibular incisors can be due to inability to detect the presence of a second root canal, which can then not be prepared and obturated during treatment. Thorough knowledge of root canal anatomy and morphology is key to get success.[10]

The incidence of two canals in mandibular anterior teeth has been reported by several authors to vary between 12.4% to 53% respectively.[13] Sert *et al*. studied 200 mandibular central incisors in Turkish population and reported that Type I canal - 65 teeth, Type 2 (2-1) canal - 55 teeth, Type 3 (1-2-1) canal - 54 teeth, Type 4 (2) canal - 20 teeth, Type 5 (1-2) canal - 1 teeth, Type 8 (3) canal - 4 teeth, and 1 tooth showed 1-2-3-2 configuration.[14] Some studies found significant differences in prevalence of two-canal teeth between males and females (the prevalence of two canals in the mandibular anterior teeth was higher in males than in females).[15]

Adequate exploration of canal chamber with an endodontic file or endodontic explorer (DG 16) facilitates to navigate extra canal. The practice of endodontic should involve the buccolingual extension of access for the mandibular anterior teeth.

IV. Conclusion

This case reports highlight the importance of having a thorough knowledge of all possible root canal irregularities. In some cases, it is very difficult to identify additional root canals by radiographic examination, therefore magnification and deep probing during initial endodontic treatment is essential for location of all the canals.

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