CASE REPORT

ENDODONTIC MANAGEMENT OF MANDIBULAR INCISORS WITH VERTUCCI TYPE III CANAL CONFIGURATION
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ABSTRACT

The poor prognosis of the periapical pathology in mandibular incisors following an endodontic treatment is mostly because of the presence of unnoticed second and/or lateral canals. Knowledge of the variations in the root canal anatomy is important to carry out a successful root canal shaping. This case report describes management of mandibular incisors with Vertucci type III root canal configuration in all mandibular anterior teeth by non surgical approach.

Key words: Mandibular Anteriors; Double Canals; Nonsurgical; Spiral Computed Tomography; Vertucci

Introduction
Success of an endodontic therapy depends on the thorough debridement and obturation of the pulp space. However root canal system is highly complex and show wide variations. Up-to-date, several researchers have examined the root canal systems of mandibular incisors. Vertucci studied the root canal morphology of 300 extracted lower incisors and showed that two canals were present in 30% of mandibular central incisors.1 Pecora et al. assessed the prevalence of mandibular anterior teeth with two canals.1 This situation was encountered in 29.7% of 300 lower central incisors.1 Mauger et al. assessed the canal anatomy at different root levels in 100 lower incisors and reported that 98–100% of the teeth had one canal in the area situated 1–3 mm above the apex.1 A detailed knowledge of these canal variations and good clinical skill is prerequisite for successful root canal treatment.1 This case report describes management of mandibular incisors with Vertucci type III root canal configuration in all mandibular anterior teeth by non surgical approach.

Case Report
A 47-year-old male patient presented with a chief complaint of swelling and pain in the front region of lower jaw. Patient had a history of traumatic injury to the same region 40 years back. He remembered the experience of intermittent pain and swelling in the lower anterior region till he became 20 years. Clinical examination revealed an intraoral abscess in relation to mandibular central incisors. There was severe anterior deep bite with gross attrition of mandibular incisors. Electric (Parkell Inc., Edgewood, NY) pulp test was negative for all four mandibular incisors. An intraoral periapical radiograph (Figure 1) shows large radiolucent lesion in relation to both central incisors. Preoperative radiograph had a presence of Vertucci type III canals in mandibular right lateral incisor and left canine. Based on clinical and radiographical findings a diagnosis of acute exacerbation of chronic apical abscess in relation to both the mandibular central incisors and pulp necrosis in relation to both the mandibular lateral incisors were made. Treatment was planned as an emergency access opening in both the central incisors followed by root canal treatment in all four incisors. An emergency access cavity was prepared in both the central incisors (Figure 2-5) with safety tip carbide bur. As the teeth had attrition access cavity was prepared through the incisal edges with an oval shaped outline form. Both the incisors when endodontically explored were found to have single canal dividing into two canals. As soon as the canals were explored, copious, mucopurulent fluid was drained through the root canals. Canals were thoroughly irrigated with 5% sodium hypochlorite, 17% EDTA and normal saline. Final rinse of canals was performed using 2% Chlorhexidine digluconate. Canals were dried and calcium hydroxide was placed as an intracanal medicament. Patient was prescribed analgesics and antibiotics and recalled after one week.

During the first follow up after one week resolution of the acute symptoms were noticed and a spiral computed tomography (SCT) scan for better understanding of complicated root morphology of the incisors was planned. An informed consent was obtained from the patient and a SCT scan of mandible was performed. The transverse sections of 1 mm thickness were obtained (Figure 6,7). All the lower anterior teeth were found with Vertucci type III canal configuration.

Root canal treatment of 32 was carried out under rubber dam isolation. An oval shaped incisal access cavity was prepared to explore the dividing canal. Working length was estimated using apex locator and was confirmed using radiography. Biomechanical preparation was done with standardized technique using hand K files (Mani Inc., Tochigi Japan). During this, instrumentation was carried out up to the apex in buccal canal and up to the joining part of both canals in lingual canal. Canals were thoroughly irrigated with 5% sodium hypochlorite, 17% EDTA and normal saline. Final rinse of the canals was performed using 2% Chlorhexidine digluconate. Canals were dried and obturated using lateral compaction of gutta-percha (Densply Maillefer) and A H Plus resin sealer (Maillefer Densply, Konstanz, Germany). A final radiograph was taken to determine the quality of obturation (Figure 4). The same procedure was followed for tooth no 31, 41, 42 respectively (Figure 8-11).

Discussion
The canal configurations were categorized according to Frank J Vertucci’s classification,4 as follows: type I: a single canal extends from the pulp chamber to the apex; type II: two separate canals leave the pulp chamber and join short of the apex to form one canal; type III: one canal leaves the pulp chamber...
and divides into two within the root; the two then merge to exit as one canal; type IV: two separate, distinct canals extend from the pulp chamber to the apex; type V: one canal leaves the pulp chamber and divides short of the apex into two separate, distinct canals with separate apical foramina; type VI: two separate canals leave the pulp chamber, merge in the body of the root, and redivides short of the apex to exit as two distinct canals; type VII: one canal leaves the pulp chamber, divides and then rejoins in the body of the root, and finally redivides into two distinct canals short of the apex; type VIII: three separate, distinct, canals extend from the pulp chamber to the apex. Generally, the mandibular incisors show presence of any of the first three types. A huge variation in the percentage of occurrence of type III canals in mandibular anteriors have been noted by various authors.\(^\text{7,12}\)

Kabak YS and Abbott PV reported a case series of mandibular incisors with double canals. These cases were managed successfully with non-surgical endodontic approach.\(^\text{13}\) Treatment options to manage large periapical lesions range from non-surgical root canal treatment and/or apical surgery to extraction. Current philosophy in the treatment of teeth with large periapical lesions includes the initial use of non-surgical root canal treatment. When this treatment is not successful in resolving the periradicular pathosis, additional treatment options should be considered. Oztan MD reported a case with a large periapical lesion in relation to mandibular incisors.\(^\text{14}\) The case was managed successfully with non-surgical endodontic approach using chlorhexidine gluconate and calcium hydroxide for infection control.

The case presented in this report had Vertucci type III canal configuration (1-2-1) for all four mandibular anterior teeth. It is uncommon that occurrence of all four mandibular anterior teeth in the same patient with Vertucci type III (1-2-1) root canal configuration. Periapical radiographs from different angulations helped in determination of second canal. Along with radiographic images, SCT data were particularly useful in assessing the canal morphology in the present case. In the present case, SCT was planned instead of CBCT because of its limited availability and high cost. Spiral CT axial images confirmed the presence of Vertucci type III canals in all the mandibular anteriors.

The main reason for unfavourable outcomes in endodontic treatment of mandibular incisors is the inability to detect the presence of a second canal which can then not be prepared and filled during treatment. Historically, the lingual approach was used for esthetic and restorative reasons; but, with the improvement of restorative materials this should be less of a concern today. When a lingual access is made, a prominent bulge of dentin is often left in the cingulum area which makes detection and debridement of a lingual canal difficult. Hence Janik has proposed extension of the lingual wall to involve more of the cingulum area in order to explore the lingual canal. While in cases with moderate to extensive incisal wears, Mauger has proposed an incisal access for straight line access to both the canals.\(^\text{15}\) In present case all the incisors were moderately attrited hence incisal access with an oval shaped access cavity was preferred. Buccal canal was instrumented up to the root apex and lingual canal up to the point where it joins the buccal canal as it had a straight line access to the apex. Instrumentation of both the canals up to apex would lead to ‘hourglass’ preparation at the apex (Figure 12).

Root canal treatment is based primarily on the removal of microbial infection from the complex root canal system. During irrigation of canals final rinse of the canals was carried out using 2% chlorhexidine gluconate. Chlorhexidine gluconate is as effective as sodium hypochlorite in its antimicrobial activity.
Calcium hydroxide was used as an antibacterial dressing and was changed every week for 4 weeks. Use of calcium hydroxide as a dressing for 1 week efficiently eliminates bacteria in the root canals. It has also been reported that treatment with calcium hydroxide resulted in a high frequency of periapical healing and some lesions, especially in young patients, were reduced or had completely disappeared only 1 or 3 months after treatment. At six months follow up patient was asymptomatic and radiographically the periapical radiolucency in relation to both the central incisors was resolved (Figure 13).

**Conclusion**

This case report highlights the importance of having a thorough knowledge of all possible root canal irregularities. Use of SCT imaging in endodontically challenging cases can facilitate a better understanding of the complex root canal anatomy. With advances in modern endodontic techniques, most teeth with complex root canal anatomies can be successfully treated without surgical intervention.

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