

Expecting The Unexpected

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Abstract: Report of unusual presentation of two root canals in all the mandibular anterior teeth in a single patient. Incidence of two canals in individual mandibular anterior teeth ranges from 5-37% but all six anterior teeth showing two canals is a rare finding and is seen in less than 5% of the population. We report Endodontic management of such case. **Conclusion:** Successful endodontic therapy of a tooth demands that a dentist should have a thorough knowledge of the root canal morphology, making it mandatory towards proper radiographic evaluation and diagnosis of the status of the pulp canals as well as periapical areas. Improper diagnostic protocol may lead to failure of Endodontic treatment. The case presented here shows successful root canal treatment of all the mandibular anterior teeth with two root canals each. The frequency of mandibular anterior teeth having two root canals varies from 5% to 37 % in different populations. Pulp space anatomy of mandibular anterior teeth shows high incidence of complexity which includes variation in canal configurations, number of canals and presence of isthmus. Thorough knowledge of root canal anatomy and morphology, additional radiographs taken at different angles and correct interpretation of radiographs is mandatory [Tagdiwala D Natl J Integr Res Med, 2020; 12(1):99-104]

Key Words: two canals, mandibular incisors, mandibular anterior teeth

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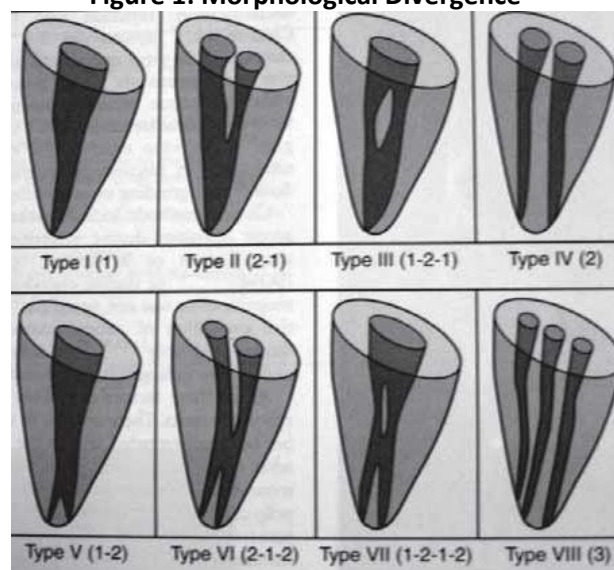
Introduction: Successful endodontic therapy of a tooth demands that a dentist should have a thorough knowledge of the root canal morphology, making it mandatory towards proper radiographic evaluation and diagnosis of the status of the pulp canals as well as periapical areas. Improper diagnostic protocol may lead to failure of Endodontic treatment.

A correct diagnosis is often the most important step towards clinical success in treatment of any pathology pertaining to the human body and the root canal is no exception to this age-old understanding. The discovery of X-rays by Roentgen in 1895 allowed visualization of root canal spaces and their treatment so that many teeth condemned to extraction were retained in the oral cavity. Over the years, as newer and better diagnostic tools have been applied to endodontics, increasingly greater clinical success has been achieved.

With better diagnostic techniques and better magnification we are detecting more aberrant anatomies. In Endodontic treatment of mandibular anterior teeth, finding two canals has become more common than before.

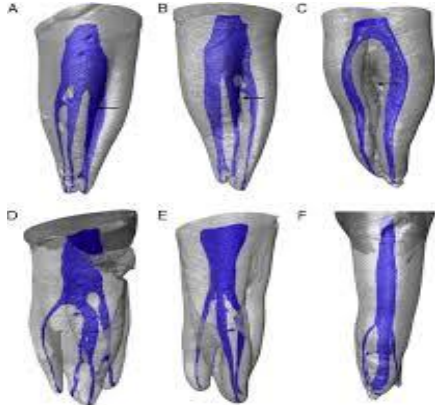
A wide morphological divergence of root canal systems is known to exist, Vertucci has classified the morphological patterns of the root canal systems into eight types. Generally the mandibular incisors have one root canal with one apical foramen (Vertucci type I) or two root canals with one apical foramen (Vertucci type II). This case report describes the successful endodontic treatment of all the mandibular anterior teeth with Vertucci type II classification. Incidence of two canals

Figure 1: Morphological Divergence



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Figure 2: Vertucci's Classification Of Root Canal System



Clinical Report: A 46 year old female patient reported to the Department of Conservative Dentistry and Endodontics in Dr D.Y Patil Dental College and Hospital with a chief complain of pain in the lower anterior teeth since three weeks as well as replacement of missing teeth in both right and left posterior arches.

The tooth was tender on percussion and gave a lingering positive response to the electric pulp tester. There was no swelling and no periodontal pockets associated with the tooth; no involvement of lymph nodes and mobility was in physiologic limits. On intraoral examination severe attrition in the lower anterior teeth was seen.

Diagnosis was made as hypersensitivity of lower anterior teeth secondary to facet attrition. Desensitizing toothpaste was prescribed as a palliative measure for 15 days. However, patient did not have any relief and root canal treatment was suggested for the lower anterior teeth because of hypersensitivity as well as a part of prosthetic rehabilitation. Preoperative radiograph (Figure 3) showed severe attrition and presence of two canals in the right lower anterior teeth, similar findings were seen on the lower left anterior teeth.

Figure 3 : Preoperative Radiograph Showing Two Canals



Local anesthesia was administered using 2% lignocaine with 1:80000 adrenaline (1.8 ml) (Lignox 2% A, Indoco Remedies, India). Conventional coronal access was made with high-speed turbine hand piece using endo access bur (Dentsply Tulsa Dental, Tulsa, OK, USA). A DG 16 endodontic explorer (Hu-Friedy, USA) and Sodium hypochlorite (Novo Dental Products, Mumbai, India) were the adjuncts used to locate the canals. The pulp chamber was completely de roofed, pulp tissue from the chamber was removed and canal orifice location was done using #10 k files (MANI INC, Japan). Careful exploration of the root canal revealed two separate root canals, labially and lingually in all six teeth which is unusual. Working length was established radiographically (Figure 4, Figure 5 and Figure 6). To ensure that the additional root canals were not overlooked, it was necessary to image the tooth from different angles.

Figure 4 and Figure 5: Working length radiograph of 31, 32 and 33 respectively from different angulations.

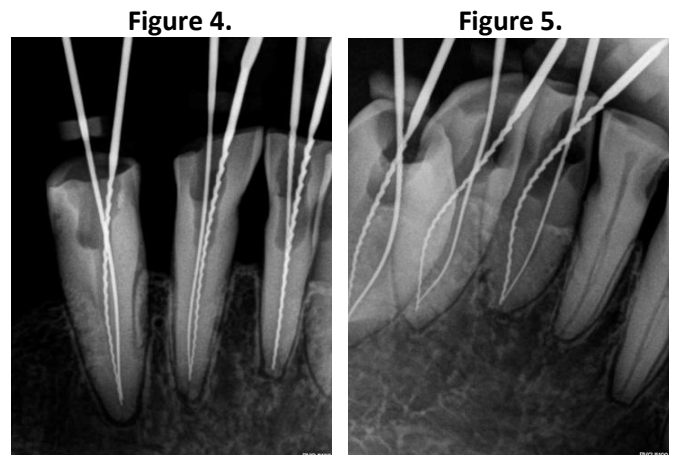
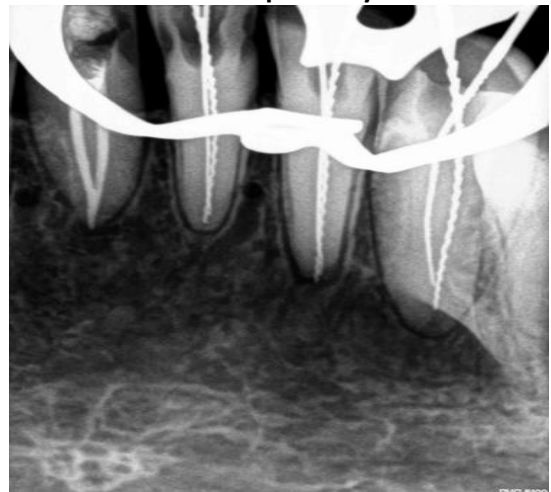


Figure 6: Working Length Radiograph Of 41, 42 And 43 Respectively



Working length was confirmed with the apex locator (J Morita Japan). A glidepath was prepared using 15 # K files. Biomechanical preparation was done in the second sitting. The canals were prepared using step back instrumentation technique upto 40 # instruments. 3% sodium hypochlorite and normal saline were used as irrigant at every change of instruments. RC prep (Premiere products Co) was used as lubricant. A mastercone (Dentsply Mailefer) radiograph was taken (Figure 7,8,9,10,11).

Figure 7: Master Cone Radiograph Of 31. Figure 8: Master Cone Radiograph Of 32 And 33 And Obturation Of 31 Respectively.

Figure 7.



Figure 8.



Figure 9 : Master Cone Radiograph Of 41



Figure 10: Master Cone Radiograph Of 42

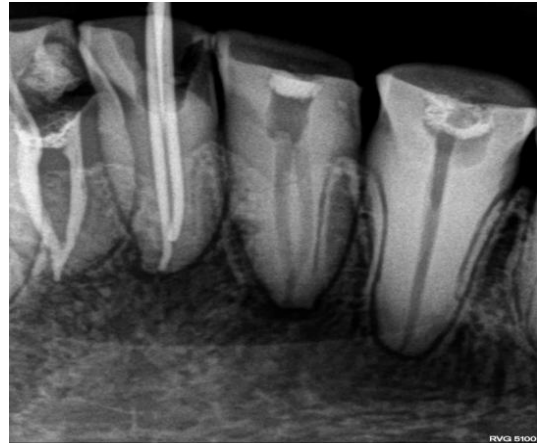
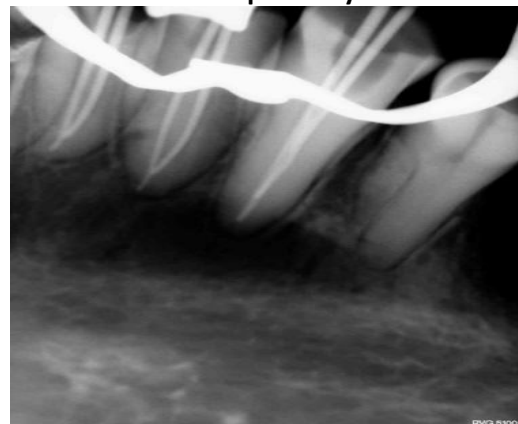


Figure 11: Master Cone Radiograph Of 41,42 And 43 Respectively



Irrigation was done with 17% EDTA (Desmear, Anabond, India) to remove smear layer which was followed by saline wash and final irrigation with 2% chlorhexidine Digluconate (Neelkanth Enterprises, India). The canals were dried using paper points and coated with Zinc oxide eugenol sealer. The mastercones were coated with zinc oxide eugenol sealer and inserted in the canals. Obturation of one tooth at a time was carried out using cold lateral condensation technique. The cavity was sealed with Cavit.

Figure 12: Obturation Of 31



Figure 13: Obturation Of 31 And 33



Figure 14: Obturation Of 31,32 And 33 Respectively and



Figure 15: Obturation Of 41 and 42 Respectively

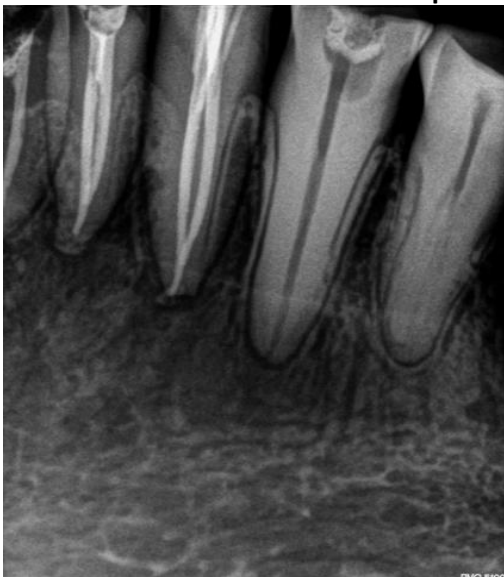
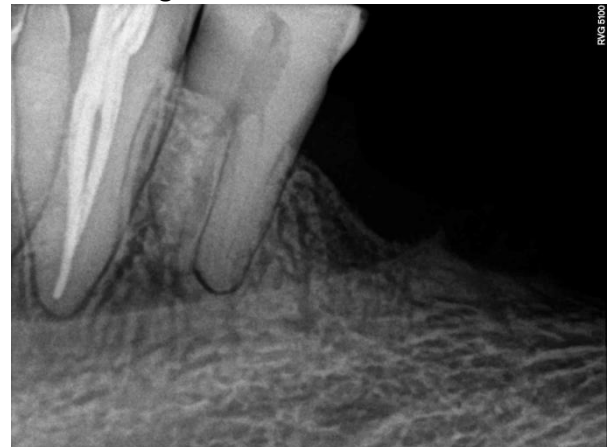


Figure 16: Obturation Of 43



Discussion: Since the success of the root canal treatment is related to the thorough debridement of the root canals and proper seal of the obturated material, a good preoperative radiograph evaluation is necessary. The anatomy of the root canal system dictates the condition under which root canal therapy is carried out and can directly affect the prognosis. The first study describing the mandibular anterior teeth with two root canals dates back to the late 1980s .

Figure 17: Post Obturation Radiograph Of Lower Six Anterior Teeth



Zhonghua et al (1989) carried out a study to determine the incidence of double canals in the lower incisors among Chinese population and to evaluate the usefulness of X rays for locating double canals in the lower incisors; and to propose a method of access cavity preparation for lower incisors when double canals are diagnosed wherein One hundred lower incisors were collected and checked by dental X ray, mesiodistally, buccolingually and at a 30 degrees mesial shift, in order to determine the incidence of double canals and evaluate their images on film and concluded that that 36 out of the 100

lower incisors had double canals and only two of them had two separate apical foramina.

Arcangelo d et al (2001) carried out a study to highlight anatomical variation in the mandibular canine and stated that mandibular canines are recognized as usually having one root and one root canal in most cases, although approximately 15% may have two canals or sometimes two roots.

He BZ et al (2006) carried out a clinical evaluation of the effect of angulation apical X-rays and the X-rays with file in diagnosing multiple canals in mandibular anterior teeth and premolars and concluded that The different angle projection technique will assist the clinician in the detection and treatment of multiple canals in mandibular anterior teeth and premolar, and angle projection technique with file detected more multiple canals. Al Qudah et al (2006) carried out a study to investigate the root canal morphology of mandibular incisors in a Jordanian population using a canal staining and tooth-clearing technique wherein four hundred and fifty extracted mandibular incisors were collected from dental clinics within north Jordan and concluded that the majority of mandibular incisors had a single canal (73.8% of teeth possessed a Type I canal system). Although 26.2% of the roots possessed two canals, only 8.7% had two separate apical foramina.

Hua Xi et al (2008) carried out a study to evaluate the role of dental operating microscope in clinical treatment of lower incisors with multiple root canals wherein 143 mandibular incisors in 128 patients were treated endodontically. Two kinds of preoperative radiographs were taken for each tooth, using straight projection and eccentric projection. The root canal morphology was recorded according to Vertucci's classification and it was concluded that mandibular central incisor with one canal was 73.53% and multiple canals was 26.47% in treated teeth. The mandibular lateral incisor with one canal was 70.67% and multiple canals was 29.33% in treated teeth.

Boruah LC et al (2011) carried out an in vitro study to investigate the morphologic characteristics of root canal of mandibular incisors in North-East Indian population wherein Four hundred and eighty extracted mandibular incisors, collected from dental clinics within

North East India were selected and it was concluded that The prevalence of two canals in this group (of North East Indians) of mandibular incisors was 36.25% and is within the range of previous studies performed on populations of different racial origin.

Aminsobhani M et al (2013) carried out the Evaluation of the root and canal morphology of mandibular permanent anterior teeth in an Iranian population by cone-beam computed tomography wherein four hundred CBCT images of mandibular permanent incisors and canines were performed and concluded that Type 1 Vertucci configuration was the most prevalent configuration (72.3%, 70.6% and 71.8% for the central, lateral incisors and canines, respectively), and type 5 Vertucci canal configuration was the least prevalent type seen (3.3%, 3.2% and 2.3% for the central, lateral incisors and canines, respectively). The most frequent root curvatures in these teeth were distally and buccally.

Rahimi S et al (2013) carried out a study on prevalence of two root canals in human mandibular anterior teeth in an Iranian population wherein they included a total of Rahimi S et al (2013) carried out a study on prevalence of two root canals in human mandibular anterior teeth in an Iranian population wherein they included a total of 463 mandibular anterior teeth, including 186 centrals, 128 laterals, and 149 canines, all the incisors in this study had one root, and 12.08% of the canines had two roots and they found a slightly higher prevalence of the second canal in incisors than in canines (36.62% versus 20.48%).

However, the probability of canines having two separate apical foramina was higher than that for incisors (12.08% versus 0.64%).

Altunsoy et al (2014) carried out a study to determine the root and canal morphology of the maxillary and mandibular anterior teeth in a turkish population by analyzing cone-beam computed tomography (CBCT) images of 417 females and 410 males with a mean age of ranging from 14 to 70 years. A total of 1453 maxillary central incisors, 1504 maxillary lateral incisors, 1523 maxillary canines, 1582 mandibular central incisors, 1603 mandibular lateral incisors, and 1604 mandibular canines were analyzed.

They concluded that Type 1 was the most prevalent canal configuration of maxillary and mandibular anterior teeth in the Turkish population. Type 5 was the most frequently observed canal configuration of the two canal teeth. The incidence of root canal numbers and configurations differs with sex.

Paes da silva et al (2014) carried out a study on detection of various anatomic patterns of root canals in mandibular incisors using digital periapical radiography, 3 cone-beam computed tomographic scanners, and micro-computed tomographic imaging and concluded that double-exposure digital PA radiography for mandibular incisors is sufficient for the identification of the number of root canals. All CBCT devices showed improved accuracy in the identification of single root canal anatomy when a narrow canal is present.

Lin Z et al (2014) carried out a study on the use of CBCT to investigate the root canal morphology of mandibular incisors and they concluded that CBCT imaging was clinically useful for detection of two canals and to determine the position of root canal bifurcations in mandibular incisors.

Liu J et al (2014) carried out a study of CBCT study of root and canal morphology of permanent mandibular incisors in a Chinese population wherein CBCT images of Chinese patients were collected and 1553 permanent mandibular incisors in the images were included in the study and concluded that permanent mandibular incisors, 86.8% had a single root with single canal.

Mandibular lateral incisors (17.5%) had a higher incidence of a second canal compared with mandibular central incisors (8.9%) ($p = 0.000$). A slightly higher percentage of incidence of a second canal was found in males (14.6%) than in females (11.9%) ($p = 0.129$). Permanent mandibular incisors with two canals had a relatively low incidence in this Chinese population

Care should be taken during access opening because exploration and location of canal orifices helps to navigate the canal. Practice of extension of access cavity to more bucco-lingually especially in lower anterior teeth is mandatory to find extra and hidden canals. Extra root or root canals if not detected are a major cause of failure of this treatment. Incomplete removal of all the irritants

from the pulp space may increase the possibility of treatment failure.

Conclusion: Pulp space anatomy of mandibular anterior teeth shows high incidence of complexity which includes variation in canal configurations, number of canals and presence of isthmus. Thorough knowledge of root canal anatomy and morphology, additional radiographs taken at different angles and correct interpretation of radiographs is important for the successful root canal treatment of mandibular anterior teeth.

Modification of the access opening is required which will assist the clinician for a more thorough assessment and successful treatment. The frequency of mandibular anteriors having two root canals varies in different population. The frequency varies from 15% to 36 %.

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