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The Mystery of Anomalous Anatomy: A Case Report on Endodontic Treatment of Two Root Canals in a Mandibular Central Incisor

Dr. Pradnya Bansode[1], Dr. Seema Pathak[2], Dr. Madhuri Ambhure[3], Dr. Madhura Dange[4]

[1]Professor, Department of Conservative Dentistry and Endodontics, Government College and Hospital, Chhatrapati Sambhajinagar
[2,3]Associate Professor, Department of Conservative Dentistry and Endodontics, Government College and Hospital, Chhatrapati Sambhajinagar
[4]Student, Department of Conservative Dentistry and Endodontics, Government College and Hospital, Chhatrapati Sambhajinagar

Abstract
The root canal system of mandibular incisors often has three pulp horns and a single root canal configuration. However, anatomical variations in these teeth, though rare, can pose significant diagnostic and therapeutic challenges for clinicians. This case report presents a unique instance of a mandibular central incisor with two root canals, an anomaly that highlights the importance of detailed clinical and radiographic evaluation in endodontic diagnosis and treatment planning. Not to know the endodontic anatomy is one of the reasons of a root canal failure.

Introduction

Successful endodontic treatment requires a thorough understanding of root canal morphology and its variations[1,10]. The primary objective of endodontic therapy is to prevent or treat endodontic disease and apical periodontitis. Achieving these goals necessitates the complete identification, cleaning, shaping, and obturation of the entire canal system. Inadequate knowledge of the variations is a significant factor contributing to treatment failure[2].

Single-rooted teeth, including mandibular central and lateral incisors, are generally considered straightforward for endodontic treatment. However, numerous studies have shown that their root canal systems are more complex than they appear on standard periapical radiographs[3,11].Anatomical variations, such as the presence of an additional canal, are well-documented and require advanced diagnostic techniques to identify.

Studies indicate that approximately 11–68% of mandibular incisors exhibit two canals, although in most cases, they converge in the apical 1–3 mm of the root[6] .Despite this, clinicians frequently fail to identify the second canal during treatment, which can lead to incomplete cleaning and obturation, increasing the likelihood of treatment failure.

This case report highlights the unique occurrence of an additional canal in all mandibular incisors.

Case Report

A 61-year-old male patient visited the Department of Conservative dentistry and Endodontics, Government Dental College and Hospital, Chhatrapati Sambhajinagar with the chief complaint of pain around his lower front tooth since10 days. The pain was continuous in nature and elicited on hot stimulation.

A clinical evaluation was conducted. The examination revealed generalized severe attrition in the mandibular anterior teeth. Tenderness on percussion was present with 31 and 41. The radiograph revealed widening of periodontal ligament space.

The patient was informed about the need for a root canal treatment for these teeth. The procedure was explained and consent was taken from the patient. Local anaesthesia (lidocaine) was administered, and the procedure was carried out under rubber dam isolation. An access cavity was then created, maintaining adequate isolation with the rubber dam. The working length was measured with an apex locator and verified with an intraoral periapical radiograph.

The teeth were isolated and access cavity preparation was done

During the procedure, while recording the working length with a digital radiograph, a second canal was detected. The presence of an additional lingual canal was confirmed, and the access cavity of tooth 41 and 31 was modified buccolingually.

Working Length was determined with 31 and 41

Using a no. 6 K-file, the patency of the canals was checked. The lingual canals were then prepared with consequently higher number K files, that is, no.8K file and number 10K file. The Digital radiography was used to insert 15 and 20 no. K-files into the buccal and lingual canals, respectively, to establish the working length. Various radiographic angulations confirmed the existence of distinct canals. Standardized 2% K-files were then used to complete the biomechanical preparation.

Master Cone radiograph was taken with 31 and 41

Irrigation was performed with a solution of 17% EDTA, normal saline and 2.5% sodium hypochlorite, and after each instrument change, the canals were rinsed with saline. Intracanal medicament of calcium

hydroxide was given after every seven days for three weeks. The tooth remained asymptomatic during subsequent visits. A master cone radiograph was taken, confirming that both canals converged at the apex. The final obturation was then completed and post operative radiograph was taken.

Obturation radiograph with 31 and 41

Discussion

"The objective of clinical dentistry is to institute preventive measures to relieve suffering and to cure disease. To achieve this goal, a clinician should have sound knowledge of dental anatomy and differential diagnostic modalities." - Dr. Hermann Prinze once stated[7]. This principle underscores the importance of thorough diagnostic evaluations in endodontic treatment, particularly in identifying anatomical variations in the root canal system. Radiographic observations such as sudden changes in canal radiodensity, narrowing of canal space, or abrupt disappearance of the canal space often indicate the need for additional angulated radiographs to diagnose extra roots or canals.

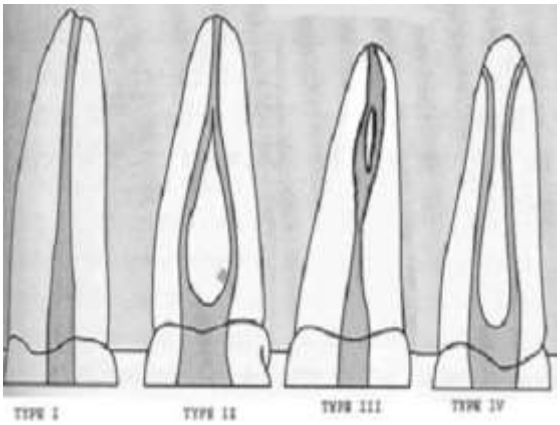
Vertucci (1974)[4] classified mandibular incisor canal configurations into four types:

Type I: A single canal extends from the pulp chamber to the apex.

Type II: Two separate canals emerge from the pulp chamber but merge short of the apex to form one canal.

Type III: A single canal exits the pulp chamber, divides into two within the root, and then merges again to exit as one canal.

Type IV: Two distinct canals extend from the pulp chamber to the apex[5].



Mandibular incisors, despite their small size, often pose significant challenges during endodontic therapy due to their complex internal anatomy. Studies have shown that these teeth frequently contain two canals, which are typically oriented buccolingually[6]. The buccal canal is usually more straightforward to locate as it tends to be straight, while the lingual canal is often hidden beneath the lingual shelf of dentine. This anatomical complexity makes it crucial to prepare an access cavity that provides optimal visualization and accessibility to all canals.

Research by Uma et al. on 50 extracted mandibular incisors highlighted the importance of well-defined access preparation[8]. Proper access not only preserves healthy tooth structure but also facilitates direct instrumentation of the apical foramina or, at the very least, the early curve of the canal.

Failure to locate the lingual canal is a common reason for endodontic failure in mandibular incisors. Sinzianna Scarlatescu et al. studied mandibular incisors in a South Eastern Romanian population using a color detector and tooth-clearing techniques. They found that Type I canal configuration was most prevalent (65.5%), followed by Type III (25%), Type II (6.3%), and Type VII (3.1%). The root canal system of mandibular incisors is typically ovoid or ribbon-shaped, with a single canal present in 71.8–73.6% of cases and double canals in 26–28.1%[9].

To enhance the accuracy of diagnosis and treatment, radiographic assessments from various angulations are crucial before initiating endodontic therapy. If an extra canal is suspected, additional diagnostic techniques, such as cone-beam computed tomography (CBCT), can provide detailed insights into the root canal morphology.

This case emphasizes the importance of adapting access preparations to the specific anatomy of mandibular incisors. By extending the access cavity into the cingulum and eliminating the lingual shoulder, the previously hidden lingual canal was successfully located.

Conclusion-

Extra canals in mandibular incisors are not uncommon. One must be cautious when opening the access and to enlarge the mandibular incisors buccolingually. A thorough understanding of anatomical variations, coupled with precise diagnostic and clinical techniques, is key to achieving successful endodontic outcomes in such complex cases.

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