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ABSTRACT

Thorough knowledge of root canal anatomy is an integral part of endodontic treatment that directly deals with success in all phases of the procedure. The root canal system of the mandibular incisors can present a number of variations. They often have three pulp horns and a single root canal and there could also be presence of bifurcated and lateral canals also. Because of the high percentage of two canals in the mandibular incisors, there should be more attempts to detect the second canal during access preparation. Two Case Reports are presented here to discuss the endodontic management of complex canal systems in mandibular incisors.

INTRODUCTION

Successful Endodontic therapy requires a comprehensive knowledge of the teeth and root canal morphology. [1,2] A wide morphological divergence of the root canal systems is known to exist. Varying number of root canals in different teeth, their anatomy and interconnections have been studied and reported. [3] The morphology of mandibular incisors is very analogous. Oval root canals are predominant in mandibular incisors with a single canal. [4] More than 40% of mandibular incisors have 2 canals and more than 1% have 2 separate apical foramina. [5] Mandibular anterior teeth are known to have one canal in 15 – 68% of cases. However, in many studies the prevalence of additional canals is the popular point of interest.

Studies have demonstrated that the root canal anatomy of the mandibular incisors is not as simple as it may appear on standard peri apical radiographs and that it may be complicated by the presence of bifurcated and lateral canals. The bifurcation of a root canal is the position at which a single canal splits into two smaller canals that follow divergent pathways; in some cases these canals may rejoin to form a single canal again. Lateral canals are canals that emanate from the main canal but take a perpendicular course to exit into the periodontal ligament space. [6] Failure to recognize the anatomy of a root canal system as well as the possible developmental anomalies leads to inadequate debridement which may contribute to unfavourable endodontic treatment outcomes and the subsequent need for endodontic retreatment or surgical intervention.

The main reasons for failure in endodontic treatment of mandibular incisors is the inability to detect, debride and obturate the presence of a second root canal. [7] The canal usually missed is the lingual canal. This Case Report describes the occurrence of two Cases with 2 canals in the mandibular incisors.

Case Report

Case 1

A 32 year old male reported to the Department of Conservative Dentistry and Endodontics with the chief complaint of pain in the front side of the lower jaw that interferes with biting. Clinical examination revealed pain on palpation and percussion in 41. Pre Operative radiograph (Fig.1A) was taken and the diagnosis was acute pulpitis with chronic apical periodontitis in 41 for which Root canal treatment was indicated.

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Local Anesthesia was administered and local infiltration of 2% lignocaine with 1:80,000 epinephrine. After the placement of the rubber dam, carious lesion was removed and access cavity was prepared using a high speed diamond point under a copious water spray.

Access cavity was made and Working Length was established using an apex locator and confirmed radiographically. The access was then enlarged labio lingually. After a successful negotiation of the lingual canal, a confirmatory radiograph was taken. Careful exploration of radiograph revealed 2 root canals in them, labially and lingually with Type IV morphology of root canals.

The canals were prepared using step back instrumentation technique upto #40 instruments. 2.5ml Sodium Hypochlorite and Normal Saline were used alternatively as irrigants. The canals were dried with paper points and finally obturated with GP points and AH26 Sealer using Lateral Compaction Technique. Post Operative radiograph shows 2 separate canals and 2 separate foramina. The access cavity was sealed with Glass Ionomer Cement.

Case 2
A 32 year old male presented to the Department for endodontic treatment of mandibular right lateral incisor with a pulpless, infected root canal system and chronic apical periodontitis. The treatment had been commenced by a general dentist who had then referred the patient.

Pre Operative radiograph was taken and the tooth number 42 was treated over two appointments. In the first appointment, the tooth was anesthesized and the working length was determined which revealed two canals with Type II configuration. The canals were prepared in a similar manner as described before. In the second appointment the canals were filled with gutta percha and Zinc oxide Eugenol sealer by lateral compaction technique and access was sealed with GIC.

Six Month Follow Up: The patient reported no symptoms following endodontic treatment at the review appointment.

DISCUSSION
Thorough knowledge of root canal anatomy is an integral part of endodontic treatment that directly deals with success in all phases of the procedure. Extra Root or root canal if not detected is a major reason for failure of this treatment. It is essential that clinicians know the clinical and radiographic signs that suggest the presence of extra canals.
Clinically, the presence of continuous bleeding in teeth with pulpsitis or normal pulps despite complete instrumentation can suggest the presence of such canals. [9] In cases with necrotic pulps or when the canals are pulpless, the presence of an apical rarefaction on the lateral side of the root 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. [10] 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. [11] Prior to access preparation, one should study the radiographs from different angles. If one notices that a root canal shows sudden narrowing or even disappears, it means that at this point the canal divides into two parts.

Clinicians should always prepare an access cavity with the appropriate size and location, and then thoroughly search for the two canals.[12] To achieve success the opening must be longer incisingivally than is customarily thought necessary. [13] Only after such a search fails to reveal a second canal should clinicians be satisfied that the tooth has only one root canal. This case report describes the occurrence of two canals in the mandibular incisors.

The frequency of two root canals in the mandibular incisors is 45% as reported by Kartal and Yanikoglu. The percentage of two root canals with a separate apical foramina in the mandibular central and lateral incisors are 3% and 2% respectively. [14] Prevalence of Vertucci’s Type IV and more are noteworthy because they have atleast two separate foramina, leading to two separate avenues to the peri apical region.

There are many studies on the prevalence of additional canals revealing diverse results. Some of these contributing factors include sex, ethnic background, age, methodology of study, clearing and injection, MicroCT, peripheral quantitative computed tomography (pQCT), conventional radiography and clinical inspection. Some methods like CBCT and MicroCT have gained popularity with benefits like eliminating superimpositions, more precision, rapid detection of peri apical pathosis, missed canal detection and root fracture detection. However, they are also accompanied by several limitations such as artifacts near amalgam or gutta percha or some of the prosthetic restorations, device size, method and position of imaging, inaccessibility and cost.

**CONCLUSION**

These case reports highlight the importance of having a thorough knowledge of all possible root canal irregularities. It is sometimes difficult to identify additional root canals by radiographic examination. Visualization and deep probing during initial endodontic treatment is therefore essential for location of all canals. It is suggested that the pre operative radiographs must be taken from various angles to anticipate the presence of extra canal.

Advances in modern endodontic techniques have made treatment of teeth with complex root anatomies successful without surgical intervention. CBCT imaging can be considered as it is an excellent method for detection of different canal configurations of mandibular incisors.

**References**