



Endodontic Management Of Additional Canals In Mandibular Incisors And Canines: A Rare Case Report

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Abstract

Background:

The root canal anatomy of mandibular anterior teeth is often underestimated. Although these teeth typically exhibit a single canal, anatomical variations involving two or more canals have been documented. The simultaneous occurrence of additional canals in all mandibular incisors and the canine within the same patient is exceptionally rare. Case Presentation:

A 32-year-old female presented with pain and deep caries in mandibular anterior teeth. Radiographs revealed two canals in each mandibular incisor and the canine. Endodontic treatment was completed under magnification using an apex locator, rotary instrumentation, copious irrigation, and single-cone obturation with bioceramic sealer.

Conclusion: Careful radiographic evaluation and magnification are essential for identifying complex canal anatomy. Recognition of such rare variations is crucial to prevent missed canals and improve treatment prognosis.

Keywords: Mandibular incisors, Mandibular canine, Root canal morphology, Anatomical variation, Case report

Introduction

Successful endodontic therapy is largely dependent on a thorough understanding of root canal morphology and the ability to identify and treat all existing canals. Variations in root canal anatomy are frequently encountered in clinical practice and may significantly affect treatment outcomes if not properly recognized. Mandibular anterior teeth, including incisors and canines, are generally considered to have a relatively simple anatomy with a single root and single canal.

The presence of two canals in mandibular incisors has been reported in approximately 11–45% of cases, whereas mandibular canines demonstrate two canals in 5–30% of cases. These anatomical complexities often go undetected due to the narrow mesiodistal dimensions of these teeth, overlapping radiographic

images, and the clinician's reliance on conventional assumptions of canal morphology.

Advanced diagnostic tools such as angled radiographs, cone-beam computed tomography (CBCT), and the use of operating microscopes have enhanced the clinician's ability to detect additional canals. Nonetheless, the successful management of such cases requires both awareness and careful clinical exploration. The concurrent presence of extra canals in all mandibular incisors and canines, within a single patient, is extremely uncommon.

This case report highlights the importance of detailed diagnosis, proper instrumentation, and meticulous canal obturation in achieving favorable treatment outcomes.

Case Presentation

A 32-year-old female patient reported with intermittent pain in the mandibular anterior region. Clinical examination revealed deep carious lesions in the mandibular incisors and canines. All affected teeth showed tenderness to percussion, and vitality testing confirmed irreversible pulpitis.

Periapical radiographs showed unusual root canal outlines. No additional roots were identified, root canal treatment was carried out for all involved teeth. Following rubber dam isolation, access cavities were prepared, and canal orifices were identified under an operating microscope. Buccal and lingual canals were confirmed with #10 K-files. Working lengths were established with an apex locator and confirmed radiographically. Cleaning and shaping were performed using rotary niti instruments with 2.5% sodium hypochlorite and 17% EDTA irrigation. Single-cone obturation was performed with bioceramic sealer. Postoperative radiographs confirmed adequate three-dimensional obturation. The patient was then referred to the department of prosthodontics for full mouth rehabilitation. The patient remained asymptomatic at one-month follow-up.

Discussion

Missed canals are among the most common reasons for endodontic failure [6]. Although mandibular incisors and canines are considered relatively straightforward, anatomical variations with two canals are not uncommon [1–4,7,8].

The morphology of mandibular anterior teeth is often influenced by ethnic, genetic, and developmental factors. Studies have demonstrated significant variation in the incidence of dual canals among populations. Vertucci [1] and Benjamin and Dowson [2] reported the presence of two canals in mandibular incisors in up to 45% of cases, while Pécora et al. [3] observed that mandibular canines may occasionally exhibit bifurcation into two distinct canals. A recent micro-CT analysis further revealed that the lingual canal is often narrower and more curved, making its detection difficult without magnification or CBCT [11]. These findings highlight the need for clinicians to consider population-based anatomical variations during diagnosis and treatment planning.

The use of modern imaging modalities such as cone-beam computed tomography (CBCT) and enhanced visual aids like dental operating microscopes has significantly improved the detection of complex canal systems [8,12]. Conventional periapical radiographs, although essential, often provide two-dimensional images that may conceal overlapping canal structures. Patel et al. [8] emphasized that CBCT can identify accessory canals, apical deltas, and additional roots that conventional imaging might miss. Similarly, operating microscopes improve the detection rate of additional orifices by up to 40% compared to unaided vision [13]. Therefore, integrating these technologies into endodontic practice can enhance diagnostic accuracy and treatment outcomes.

Comparison with Present Case: While multiple reports document extra canals in mandibular incisors [2,8,9] and canines [3,4,7,10], the simultaneous occurrence in all mandibular incisors and canines in a single patient is rare. This case emphasizes that clinicians should assume possible variations even in the most 'simple' anterior teeth.

Conclusion

This case highlights the rare finding of extra canals in all mandibular incisors and the canine of a single patient. Accurate diagnosis with periapical radiographs and magnification, coupled with careful endodontic technique, ensures successful treatment outcomes. Clinicians should always consider the possibility of multiple canals in mandibular anterior teeth to avoid missed anatomy and treatment failure.

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Figures :

Fig. 1: Pre-operative IOPA X-ray with 41, 42, 43



Fig. 2: Working length determination with 41, 42, 43



Fig. 3: Master cone IOPA X-ray with 41, 42, 43



Fig. 4: Post-operative IOPA X-ray with 41, 42, 43



Table 1: summarizes reported variations of mandibular incisors and canines:

Author & Year	Tooth/Region	Canal Configuration	Notes/Diagnostic Method
Ranganathan et al., 2015 [8]	All mandibular incisors	Two canals in all incisors	Case report, CBCT confirmation
Pécora et al., 1993 [3]	Mandibular canines	Two canals, sometimes two roots	Morphological analysis, Brazil
D'Arcangelo et al., 2001 [4]	Mandibular canines	Two roots with two separate canals	Clinical case report
Nagaveni et al., 2011 [7]	Mandibular canine	Two roots and two canals	Case report, radiographic confirmation
Mittal et al., 2016 [10]	Mandibular canine	Three canals (rare)	Case report, CBCT