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A rare anatomical variation: Non-surgical endodontic management of a two-rooted mandibular canine

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Abstract
Background: Mandibular canines are usually single-rooted with a single canal, making them among the most morphologically stable teeth. The occurrence of a two-rooted mandibular canine is an extremely rare anatomical variation, reported in less than 5% of cases in Asian populations. Such variations can complicate diagnosis and endodontic treatment if not identified early.
Case Presentation: This report describes the endodontic management of a mandibular canine with two distinct roots. The patient wanted fixed partial denture so intentional RCT was planned with respect to lower canine. Clinical examination and initial periapical radiographs suggested unusual root morphology. Angled radiographs confirmed the presence of two roots with separate canals. Endodontic treatment was performed under magnification, with careful biomechanical preparation and obturation of both canals.
Discussion: The presence of additional roots or canals in mandibular canines, though rare, has been documented in literature. Missed roots can compromise endodontic outcomes, leading to persistent pathology. Advanced diagnostic tools such as CBCT, coupled with the use of magnification and modern endodontic armamentarium, significantly improve the ability to detect and manage such variations. This case reinforces the importance of considering anatomical anomalies during routine treatment planning.
Conclusion: A two-rooted mandibular canine is an uncommon but clinically significant finding. Accurate diagnosis, aided by advanced imaging and careful clinical examination, is essential for successful endodontic treatment and long-term prognosis.#

Keywords: Two-rooted mandibular canine, anatomical variation, endodontic management, diagnosis, radiographs (including advanced imaging like cbct)

Introduction

The mandibular canine is typically recognized as a single-rooted tooth with a well-defined morphology that contributes to its functional and aesthetic significance in the dental arch. However, anatomical variations, such as the presence of two roots, are rare but clinically significant findings that can influence endodontic treatment, periodontal management, and surgical procedures [1]. Understanding such deviations from the norm is essential to prevent diagnostic errors and treatment complications.

The incidence of a bifurcated root in mandibular canines has been documented in various populations, with studies reporting its occurrence ranging from 1% to 5% [2]. This anatomical anomaly is often detected through advanced imaging techniques such as cone-beam computed tomography (CBCT) or detailed radiographic analysis, which provide crucial insights into root morphology and canal configuration.[3] Failure to recognize this variation can lead to incomplete debridement in endodontic therapy or complications in extraction procedures.

This case report presents a rare occurrence of a mandibular canine with two roots, emphasizing the importance of careful radiographic evaluation and clinical awareness. By reviewing the literature and discussing the clinical implications, this report aims to contribute to the growing body of knowledge on root morphology variations and their significance in dental practice.

Case report

A 65-year-old male patient was referred from department of prosthodontics to conservative and endodontics department for intentional RCT. Past dental history showed multiple root canal treatments, restorations and fixed partial denture. On clinical examination there was mild attrition present with 43 with normal oral mucosa and no any signs of sinus tract were present. Endodontic treatment was planned as the patient was undergoing full mouth rehabilitation. Radiographic examination from multiple angulations revealed that the root of the mandibular canine bifurcated into two roots at the coronal third.

Local anesthesia (2% lidocaine hydrochloride with 1:80,000 epinephrine) (Lignospan Special, Septodont, Raigad, India) was administered and rubberdam isolation was done with ivory clamp 9.

Fig a

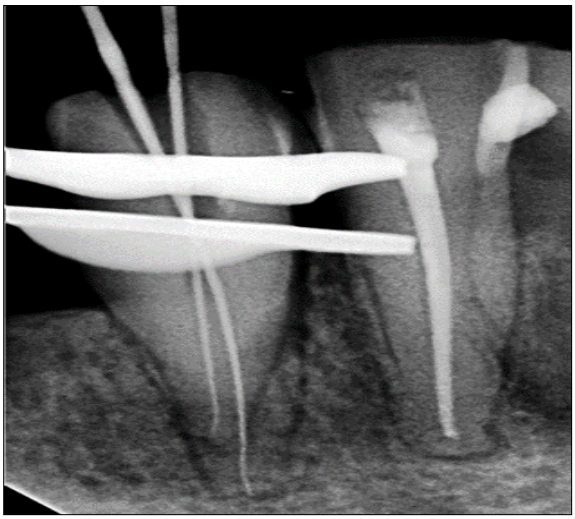

Fig b

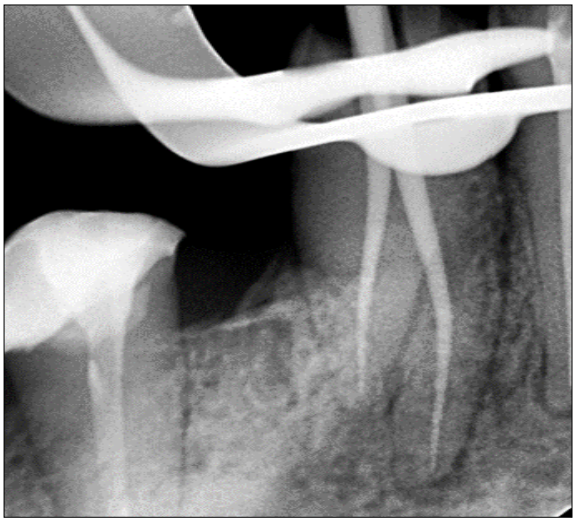

Fig c

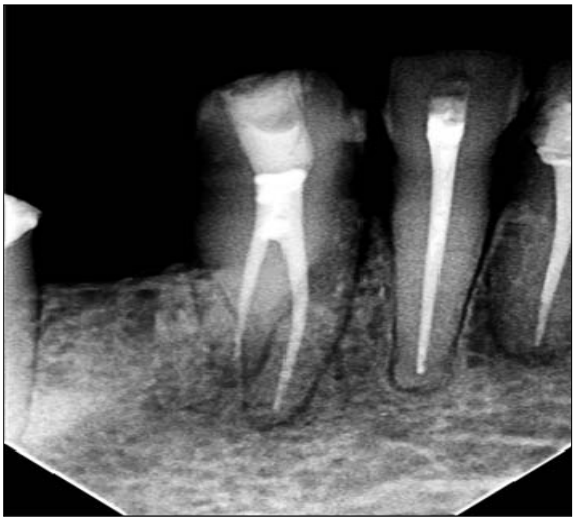

Fig d

Discussion

The presence of a mandibular canine with two roots is a rare anatomical variation that holds significant clinical implications. Typically, the mandibular canine is a single-rooted tooth with a single canal; however, variations such as root bifurcation or multiple canals can occur, albeit infrequently [1]. Studies suggest that the prevalence of mandibular canines with two roots ranges from 1% to 5%, with some populations exhibiting slightly higher occurrences due to genetic and developmental factors [2].

Understanding root morphology is crucial in various dental procedures, particularly in endodontics, where unrecognized root bifurcation can lead to incomplete cleaning, shaping, and obturation of the root canals. Vertucci's classification of root canal configurations highlights that the most common type in mandibular canines is a single canal (Type I), while bifurcated canals (Type II or III) are less frequently observed [3]. Failure to identify such variations may result in persistent infections, compromised treatment outcomes, and an increased risk of endodontic failure [4].

Radiographic evaluation plays a pivotal role in detecting these anomalies. Conventional periapical radiographs may not always reveal bifurcation due to superimposition of structures, emphasizing the importance of advanced imaging techniques such as cone-beam computed tomography (CBCT). CBCT provides a three-dimensional view, allowing better visualization of root morphology, canal configurations, and variations that may otherwise be overlooked in two-dimensional imaging [5]. In the present case, multiple angulated radiographs were taken to confirm the presence of two roots, highlighting the need for careful radiographic interpretation.

From a clinical perspective, the management of a dual-rooted mandibular canine requires meticulous planning. In endodontic treatment, the presence of two canals necessitates careful negotiation, instrumentation, and obturation to ensure complete disinfection. In periodontal and surgical procedures, knowledge of root anatomy is crucial to prevent unnecessary complications, such as accidental root fractures or improper extractions [6].

This case underscores the importance of recognizing rare anatomical variations in routine dental practice. A thorough understanding of root and canal morphology, coupled with the use of advanced diagnostic tools, can significantly enhance treatment outcomes and reduce procedural errors. Further studies and case reports are needed to better understand the prevalence and clinical implications of such variations across different populations.

Table 1

Study (Author, Year)	Country	Method	Sample Size (Mandibular Canines)	Incidence of Two-rooted Canines (%)
Zhengyan *et al*., 2015	China (Chongqing)	CBCT	3,014	0.8%
Han *et al*., 2014	China	Radiographs	(Reported)	1.32%
Pan *et al*., 2019	Malaysia	CBCT	(Reported)	1.2%
Khan *et al*., 2021	Pakistan	CBCT	134	5.22%
Aminsobhani *et al*., (Iran)	Iran	CBCT	(Reported)	4.7%
Srivathsa, 2018	India	IOPAR	202	1.48%
Amardeep *et al*., 2014	India	CBCT	250	Rare (mostly single root, very few two-rooted cases)

Tabular column: Summary of mandibular canine with two roots in Asian population [7, 8, 9, 10, 11, 12, 13, 14, 15]

Conclusion

A thorough understanding of root and canal morphology plays a vital role in achieving successful clinical outcomes. Clinicians should be aware of such variations and incorporate careful radiographic evaluation, precise instrumentation, and appropriate treatment modifications to enhance patient care [4, 5]. This case highlights the importance of recognizing uncommon root anatomy to improve treatment efficacy and minimize complications. Further studies are necessary to better understand the prevalence, genetic influences, and clinical implications of dual-rooted mandibular canines in different populations [6].

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