

CASE REPORT

Unusual Root Canal Morphology in a Mandibular Second Premolar: A Case Report of a Three-Canal Variation

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ABSTRACT

The mandibular second premolar is typically described as having a single root and canal, with anatomical variations being relatively rare. The presence of three distinct canals in this tooth is an uncommon clinical finding that can pose diagnostic and therapeutic challenges. This report presents the successful endodontic management of a mandibular second premolar with three separate root canals. Emphasis is placed on the role of advanced diagnostic techniques, such as angled radiography and careful exploration under magnification, in identifying aberrant canal configurations. A concise review of the prevalence, classification, and clinical implications of such variations is also presented.

KEYWORDS

• Root Canal Morphology • Mandibular Second Premolar • Aberrant Canal

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INTRODUCTION

A thorough understanding of root canal anatomy is crucial for the success of endodontic therapy. Mandibular premolars, particularly the second premolar, are known for their variable internal anatomy. Although the majority of mandibular second premolars present with a single canal, studies have documented cases with two or more canals, with three canals being exceptionally rare.

The incidence of three canals in mandibular second premolars is reported to range from 0.4% to 0.5% in clinical and radiographic studies.^{1,2} Failure to detect and treat all root canals may lead to persistent infection and endodontic failure.³ This report aims to highlight the importance of careful clinical and radiographic assessment, as demonstrated in a case involving a three-canal mandibular second premolar, which was successfully managed with nonsurgical root canal therapy.

Case Presentation

A 23-year-old male patient presented to the hospital with the chief complaint of spontaneous pain in the lower right posterior region for the past three days. Clinical examination revealed a deep carious lesion involving the mandibular left second premolar (tooth #35). The diagnosis is confirmed as symptomatic irreversible pulpitis with symptomatic apical periodontitis.

Periapical radiography showed mild periapical radiolucency, but a faint suggestion of more than one canal was noted. Due to the suspicion of anatomical complexity, an additional angulated radiograph was taken, which revealed a trifurcation of the canal in the middle third of the root. Given the ambiguity in canal configuration, root canal treatment was initiated under rubber dam isolation.

Access cavity preparation revealed an unusually broad buccolingual pulp chamber. Initial exploration with #10 K-files (Dentsply Sirona) under magnification (4.5× loupes) and illumination revealed three distinct orifices mesiobuccal (MB), distobuccal (DB), and lingual (L) as seen in *Figure 1*. Working lengths were established using an apex locator (Root ZX, J. Morita) and confirmed radiographically observed in *Figure 2*. The canals were shaped using ProTaper Gold rotary files up to size F2 and irrigated with 5.25% NaOCl, 17% EDTA, and saline.

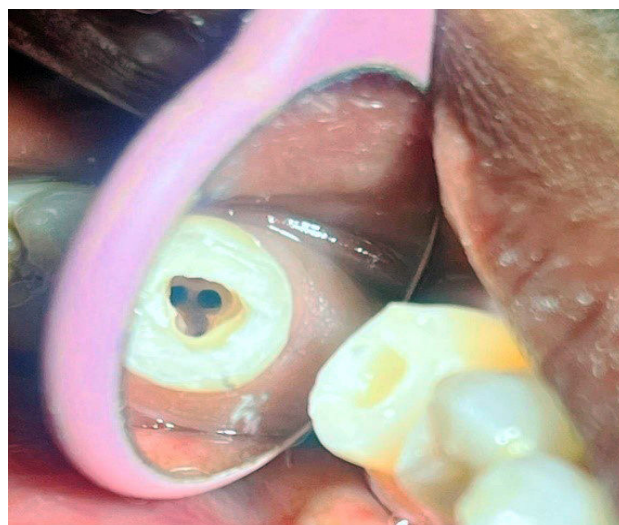


Figure 1: Access opening and orifices enlargement

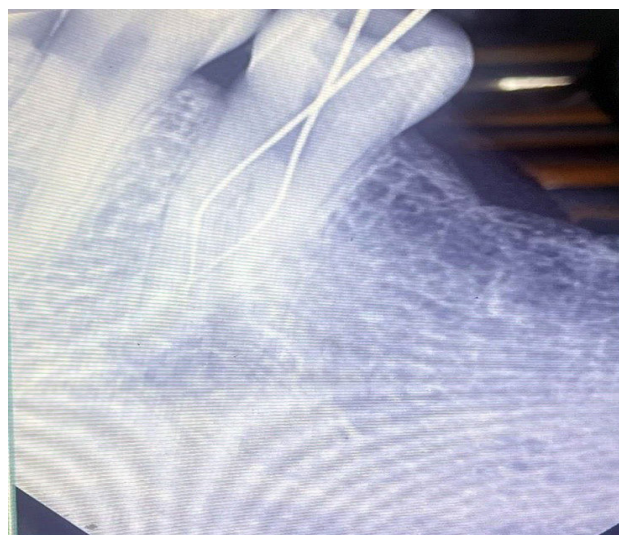


Figure 2: Working length determination

Calcium hydroxide was placed as an intracanal medicament for one week. At the follow-up appointment, the tooth was asymptomatic, and final obturation was completed using warm vertical compaction of gutta-percha and AH Plus sealer seen in *Figure 4*.



Figure 3: Placement of master cones

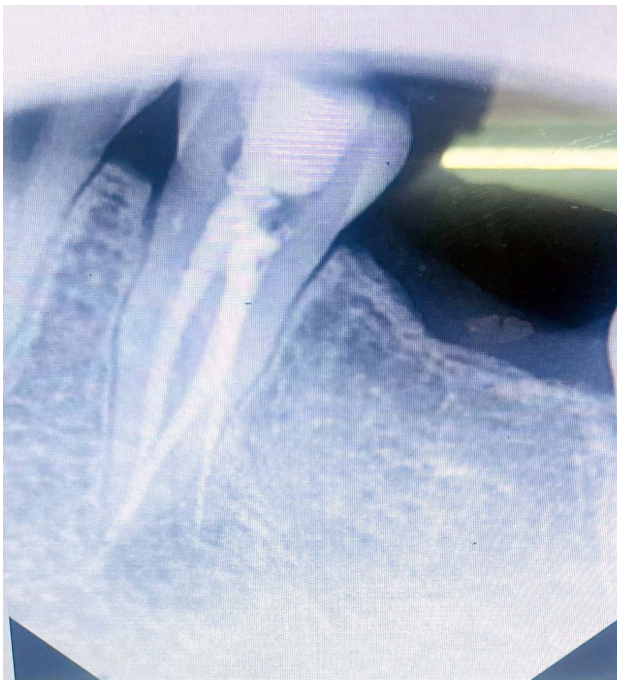


Figure 4: Final Obturation

DISCUSSION

Mandibular premolars are among the most challenging teeth for endodontic treatment due to their anatomical variability and frequent presence of bifurcations or curvatures in the canal system.⁴ Vertucci's classification of root canal systems has been widely used, and variations such as Type V, VI, or more complex systems have been reported.⁵ However, the presence of three separate canals in mandibular second premolars remains rare and is seldom encountered in clinical practice.

Missed canals are a significant cause of endodontic failure.⁶ Studies by Zillich and Dowson⁷ and later by Cleghorn *et al.*² demonstrated that the incidence of two or more canals in mandibular second premolars is relatively low, with three canals being an anomaly. In the present case, careful interpretation of angled radiographs and meticulous exploration under magnification were instrumental in identifying the additional canals.

Cone-beam computed tomography (CBCT) is often recommended in cases of complex anatomy, offering three-dimensional visualization.⁸ However, in resource-constrained settings or in cases where radiographic hints suffice, conventional methods may still yield successful outcomes when paired with clinical vigilance.

Several anatomic studies suggest that canal bifurcation typically occurs in the middle or apical third of the root.⁹ Clinicians should thus be alert to sudden changes in canal direction or fading of the canal outline on radiographs, which may suggest such complexities.

Magnification devices (loupes or operating microscopes) and adequate illumination are now considered standard tools in modern endodontics, significantly enhancing the detection of additional canals.^{10,11} The careful negotiation, cleaning, and obturation of each canal is paramount in preventing endodontic failure due to residual infection.¹²

CONCLUSION

The successful management of a mandibular second premolar with three canals underscores the importance of clinical suspicion, radiographic interpretation, and use of magnification in identifying unusual anatomy. Clinicians should always consider anatomical variations in mandibular premolars to avoid missing additional canals, which could compromise treatment outcomes.

Clinical Significance

Thorough exploration of the pulp chamber, use of angled radiographs, and magnification are indispensable for identifying rare anatomical variations such as a three-canal mandibular second premolar. Awareness and preparedness for such anomalies can significantly improve endodontic prognosis.

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