Endodontic Management of an Uncommon Three-Rooted Maxillary First Premolar: A Clinical Case Report

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Abstract

Variations in root canal morphology can create challenges in endodontic practice. Among these, the appearance of three distinct roots in a maxillary first premolar is highly unusual, occurring in only a small fraction of the population (0.5%–6%). This report documents the clinical journey of a 28-year-old male patient diagnosed with this rare anatomy. By combining detailed preoperative imaging with careful step-by-step treatment execution, the case was managed successfully, resulting in the thorough cleaning, shaping, and sealing of all root canals.

Keywords: *Three-rooted premolar, Maxillary first premolar anatomy, Root canal therapy, Rare dental morphology, Endodontic case study.*

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Introduction

In endodontics, a precise understanding of root canal morphology is fundamental to achieving predictable treatment outcomes[12]. The maxillary first premolar most often contains one or two roots; however, rare cases may exhibit three completely separated roots, closely mimicking the anatomy of a maxillary molar. This additional root can significantly complicate both diagnosis and clinical management. Missed canals remain a well-documented cause of failure in root canal therapy[1], making careful radiographic assessment and preoperative planning critical. This report presents the diagnosis and management of a three-rooted maxillary first premolar in a young adult patient, highlighting the importance of thorough examination and tailored treatment strategies.

Case Report

A 28-year-old male came to the Department of Conservative Dentistry and Endodontics with pain in the upper left back tooth region. Examination revealed tooth 24 (maxillary left first premolar) with deep caries extending into the pulp chamber. Vertical percussion produced a painful response, and cold testing elicited an exaggerated, lingering reaction. Radiographic evaluation demonstrated an unusual three-root configuration. Diagnosis of symptomatic irreversible pulpitis with associated apical periodontitis in tooth #24 was considered (Fig 1).

Treatment Protocol

- After local anaesthesia, the tooth was isolated with the help of a rubber dam.

- Access preparation revealed three distinct canal orifices.
- Working lengths were measured using an apex locator and confirmed radiographically. Cleaning and shaping were performed with rotary nickel titanium instruments, using 2.5% sodium hypochlorite alternated with saline as irrigants.
- Obturation was completed with gutta-percha and AH Plus sealer via cold lateral condensation.
- A postoperative radiograph confirmed complete obturation.
- The access was temporarily restored, with a definitive full-coverage crown planned.
- Follow-Up: At one-week and one-month reviews, the patient reported no discomfort. The tooth was stable in function, maintained normal occlusion, and exhibited no clinical signs of pathology.

Fig 1: IOPAR showing 3 rooted 24

Discussion

Although most maxillary first premolars exhibit either one or two roots, the occurrence of three distinct roots is rare[2]. Detecting such variations early is vital because untreated canals are a leading cause of persistent infection and treatment failure. Radiographic evaluation from multiple horizontal angulations, and when accessible, cone-beam computed tomography[3], are valuable in identifying these anatomical differences. Additionally, magnification devices such as dental operating microscopes or high-quality loupes, combined with optimal lighting, can significantly improve canal detection. In this case, meticulous review of the preoperative radiograph led to early recognition of the extra root, facilitating comprehensive instrumentation and obturation, and ultimately producing a favorable outcome[13].

Conclusion

The success of endodontic treatment is heavily dependent on locating and treating all existing canals. Awareness of rare root configurations, such as a three-rooted maxillary first premolar, together with careful diagnostic imaging and precise operative technique, is essential in preventing missed anatomy and ensuring long term treatment success.

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