



Research Paper

# Management of Single Canal in Permanent Maxillary 2<sup>nd</sup> Molar Using Thermoplastized Gutta-Percha: A Case Report

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## ABSTRACT

The anatomical complexity of maxillary second molars often presents a significant challenge in endodontic treatment. Typically, these teeth exhibit a triad of canals, with occasional variations in number and configuration. The presence of a single canal in a maxillary second molar is exceedingly rare and sparsely documented in dental literature.

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## I. Introduction

The permanent maxillary second molar typically exhibits a complex root canal system, often comprising three or four canals distributed among three roots. Variations in the number and configuration of these canals are common, posing a significant challenge for endodontic diagnosis and treatment. Understanding these anatomical intricacies is crucial for the success of root canal therapy. Despite the variations documented, the occurrence of a single canal in a maxillary second molar is an exceedingly rare anatomical anomaly.

The permanent maxillary second molar typically possesses three roots and three canals. However, variations in root canal anatomy have been documented, including instances with four roots <sup>[1]</sup>, two roots <sup>[2,3]</sup>, and even a single root with one canal <sup>[4]</sup>. The occurrence of a single canal in the maxillary molar is relatively rare, with a prevalence reported between 0.5% and 0.6%. <sup>[1,4]</sup>

The use of multiple angled radiographs, advanced radiographic diagnostic methods such as cone beam computed tomography (CBCT), and magnification tools like loupes or operating microscopes can facilitate accurate diagnosis and effective management of complex root canal anatomy <sup>[5]</sup>

Kim et al. <sup>[6]</sup>, utilizing CBCT, identified a 10.7% incidence of single-rooted maxillary second molars in the Korean population. Similarly, Zhang et al. <sup>[5]</sup> reported a 10% incidence in the Chinese population. Conversely, a study by Neelakantan et al. <sup>[7]</sup> on the Indian population found that 0.9% of maxillary second molars had a single root, but none of these had a single root canal.

The importance of accurate canal identification and thorough debridement cannot be overstated in endodontic practice. Missed canals can lead to persistent infections and treatment failures, necessitating the use of advanced diagnostic tools. Cone-beam computed tomography (CBCT) has become an invaluable asset in endodontics, offering three-dimensional imaging that enhances the visualization of root canal morphology.

This case report presents a unique instance of a maxillary second molar with a single canal, confirmed through clinical examination and CBCT imaging. The rarity of this anatomical configuration underscores the need for diligent diagnostic protocols and the potential for advanced imaging techniques to reveal uncommon canal systems. This report aims to contribute to the limited body of literature on such anatomical variations and to highlight the clinical considerations essential for successful management of similar cases.

### **Case Presentation**

Endodontics and Aesthetic dentistry , Ahmedabad Dental College with a chief complaint of persistent throbbing pain in the upper right posterior region since last 4-5 days. Patient gives no significant medical history. Pain was relieved on taking over the counter medication. Soon as the effect of pain medication wear off , patient starts experiencing pain . The pain was exacerbated on chewing. Clinical examination revealed tenderness on percussion and revealed deep distal caries approximating pulp with respect to tooth # 17. No significant periodontal pockets were noted but generalized recession was present and no mobility of tooth was present. Based on clinical and radiographic evaluation, the diagnosis was acute irreversible pulpitis, and root canal treatment was recommended for tooth #17

### **Diagnostic Assessment**

A periapical radiograph of tooth #17 was taken, revealing proximal caries on distal surface approximating pulp . Interestingly, the radiograph indicated the presence of a single root. To further assess the root canal morphology, a cone-beam computed tomography (CBCT) scan was performed. The CBCT scan confirmed the presence of a single root with a single canal.



FIGURE-1 CBCT DIAGNOSIS

### **Treatment**

- Local anaesthesia (1:80,000 Indoco Warren Lignox Lignocaine )was administered, and the tooth was isolated using a rubber dam. Access to the pulp chamber was achieved using a high-speed diamond bur. Upon entry, the pulp chamber floor was carefully examined, and only one canal orifice was identified. The working length was determined using an electronic apex locator (CanalPro Apex Locator, Coltene) and confirmed radiographically.



FIGURE-2 : WORKING LENGTH UNDER RUBBER DAM ISOLATION USING 15K FILE

The canal was prepared with hand file till apex upto # 20 K file. The canal was instrumented using a crown-down technique with Protaper gold rotary nickel-titanium files ( Dentsply Sirona , USA ) till file number F5 for creating a more uniform and tapered canal shape. Irrigation was performed with 3% sodium hypochlorite( CanalPro , Coltene) and was activated using ultrasonic activator for enhancing the effectiveness of disinfectant solutions by promoting their distribution throughout the root canal system due to the wide nature of the canal, increased emphasis was placed on chemical disinfection followed by saline between each irrigation and 17% EDTA(Canalarge , Ammdent ) to remove the smear layer.After thorough cleaning and shaping, the canal was dried with paper points (DiaDent) and obturated with gutta-percha using the hybrid obturation technique using thermoplastized gutta percha ( Calamus , Dentsply Sirona , USA) and zinc oxide-eugenol sealer .



FIGURE-3 : MASTER CONE RVG



FIGURE:4 RVG OF 5mm GP PLUG



FIGURE: 5 OBTURATION USING THERMOPLASTIZIED GP

Master apical cone number F5 was placed up to working length and radiograph was taken. The gutta percha was sheered off by keeping only apical 5mm gutta pecha to form a apical plug onto which obturation was completed with thermoplastized gutta percha technique using Calamus ( Denstply Mallifer).

Post endodontic restoration was done using composite resin.



FIGURE: 6 Post Root Canal Filling

## II. Discussion

Variations in maxillary molars, such as the presence of a single root and a single canal, can sometimes be detected in routine radiographs. However, multiple preoperative radiographs are often necessary to determine if two canals are superimposed buccolingually. Advanced diagnostic methods like cone beam computed tomography (CBCT) can effectively identify complex root canal anatomies when conventional radiographs are inconclusive.<sup>[7]</sup>

Searching for a missing canal can result in iatrogenic errors like perforation or excessive tooth removal. These errors can be avoided if the clinician has a general understanding of root canal system variations. Thorough preoperative evaluation, including multiple angled radiographs and CBCT when necessary, helps identify complex canal structures. Additionally, using magnifying loupes or a dental operating microscope enhances precision, enabling more effective root canal treatment.<sup>[8]</sup>

Various studies have investigated the anatomical variations in the root canals of maxillary and mandibular molars, both in vivo and in vitro. Libfeld and Rotstein<sup>[1]</sup> found that 0.5% of maxillary second molars had a single root and single canal among 200 endodontically treated radiographs. Rwenyonyi et al.<sup>[9]</sup> also observed single-rooted maxillary molars, though these roots were fused. Wang et al.<sup>[10]</sup> indicated that maxillary second molars with a single root and canal are very rare. Similarly, Ng et al.<sup>[11]</sup> and Alavi et al.<sup>[12]</sup> did not encounter any cases of single-rooted and single-canaled maxillary second molars in their studies of 77 molars.

In this case report of Vertucci class-1 canal present in permanent maxillary 2<sup>nd</sup> molar thermoplastized gutta pecha was used for 3D obturation. Thermoplastized gutta-percha obturation techniques have gained popularity in endodontics due to their numerous advantages such as Improved Adaptation to Canal Walls, Enhanced Three-Dimensional Fill, Reduction of Voids, Better Apical Seal, Adaptability to Complex Canal Morphologies, Reduced Risk of Root Fracture as it eliminated the pressure applied during lateral condensation procedure, Time Efficiency saving valuable chair time for both the patient and the practitioner

These benefits contribute to higher success rates and more reliable outcomes in root canal treatments, making thermoplastized gutta-percha a valuable tool in modern endodontics.<sup>[13,14]</sup>

These findings indicate that single-rooted maxillary molars are uncommon, highlighting the need for careful identification of such cases during endodontic treatment to prevent procedural errors.

### **III. Conclusion**

This case report underscores the necessity for clinicians to be aware of anatomical variations in root canal morphology. The successful treatment of a maxillary second molar with a single canal demonstrates the effectiveness of meticulous diagnostic and therapeutic procedures in managing atypical root canal anatomy with thermoplastized gutta pecha technique.

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