

Schilder technique for vertucci type II configuration in maxillary first molar: A case report

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Abstract

Objective: This case report describes the endodontic management of a maxillary first molar with a Vertucci type II canal configuration, an anatomical complexity that increases the risk of procedural errors and treatment failure, utilizing the Schilder technique to achieve a complete, hermetic seal.

Case Report: A 29-year-old female patient presented at the Hasanuddin University Dental Hospital with a dislodged filling and pain in the right maxillary first molar (tooth #16). Clinical examination revealed a deep occlusal carious lesion. Periapical radiography showed pulpal radiolucency with no periapical abnormalities and revealed a root canal system consistent with Vertucci type II classification. The final diagnosis was asymptomatic irreversible pulpitis. The tooth was managed with root canal treatment using

the crown-down preparation technique, followed by obturation using the Schilder technique and placement of a direct composite restoration.

Results: The crown-down preparation creates the ideal tapered funnel shape required for advanced obturation techniques. The Schilder technique then utilizes thermally plasticized gutta-percha, allowing it to flow and adapt into the complex merging canals and irregularities inherent to a Vertucci Type II configuration.

Conclusion: The Schilder technique is essential for successfully treating maxillary molars with complex Vertucci Type II anatomy, as it yields a dense, well-adapted obturation characterized by a radiographically confirmed hermetic seal.

Keywords: Maxillary first molar, Obturation, Root canal treatment, Schilder technique, Vertucci type II
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Introduction

A thorough understanding of root canal anatomy is essential for successful endodontic treatment, and Vertucci's classification is one of the most widely used systems to describe the complex internal morphology of root canals. Vertucci's classification outlines eight types of canal configurations based on the number and pattern of canals from the pulp chamber to the apex, providing a standardized framework for identifying both simple and intricate canal systems.¹ Among these, the type II configuration is characterized by two separate canals leaving the pulp chamber and merging into a single canal before exiting at the apex.¹

Maxillary first molars frequently present with a complex Vertucci type II root canal configuration, a challenging anatomical variation with a high prevalence of 45–59% in various populations.² This morphology significantly increases the risk of endodontic failure due to factors like missed canals and incomplete debridement.³

Proper management, therefore, hinges on accurate identification of this morphology, which requires careful interpretation of angled periapical radiographs and enhanced visualization with a dental operating microscope (DOM).⁴ Once identified, achieving a complete seal in these interconnected canals is critical.

The Schilder technique is a root canal obturation technique using the warm vertical

compaction method of gutta-percha, which aims to fill the root canal densely and effectively, especially in root canals with irregular shapes.⁵ This case report describes the successful management of a maxillary first molar with a Vertucci type II configuration, where this combined approach was used to achieve a dense, well-adapted obturation and a favorable clinical outcome.

Case Report

A 29-year-old female patient presented to Hasanuddin University Hospital in Makassar with complaints of a dislodged previous dental filling and tooth pain. Objective examination revealed caries in the occlusal area of the right maxillary first molar. Periapical radiography showed a radiolucent area in the pulp without periapical abnormalities.

During the first visit, clinical and radiographic examinations were conducted to establish the diagnosis and determine the treatment plan. The final diagnosis was asymptomatic irreversible pulpitis. The patient was informed about the condition of the tooth, the proposed treatment plan, potential complications and risks, treatment costs, and was asked to fill out and sign the informed consent form. Isolation was achieved using a rubber dam, followed by cavity cleaning with carbide and diamond burs to ensure a straight-line access to the root canal orifices.

Working length measurements were taken

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Figure 1. Clinical and initial radiographic images.

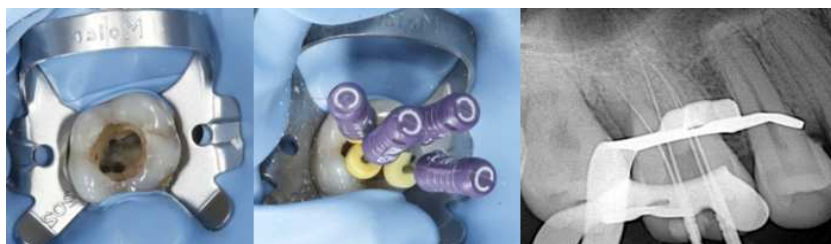


Figure 2. Root canal orifice of 16, working length measurement, radiographic of working length measurement.



Figure 3. Gutta-percha trial, obturation, radiographic confirmation of hermetically obturated canals.

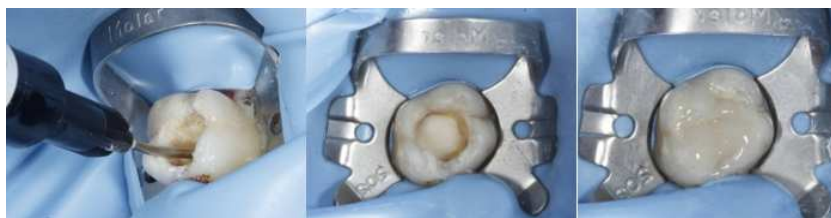


Figure 4. Ionoseal base liner application, after Ionoseal application, direct composite restoration.

using a #10 K-file (Dentsply Sirona, Switzerland) and an apex locator (Propex Pixi, Dentsply, Switzerland) confirmed with radiographic imaging. The working lengths were as follows: mesiobuccal 1 (MB1) = 20.5 mm, mesiobuccal 2 (MB2) = 21 mm, distobuccal (DB) = 20.5 mm, and palatal (P) = 23 mm. Preparation was carried out using the crown-down pressureless technique with Protaper Gold rotary files up to file #F1 for MB1, MB2, and DB, and up to file #F3 for the palatal root, according to the working length. Irrigation was performed with 5.25% NaOCl, sterile distilled

water, 17% EDTA, and sterile distilled water again at each file change.

Then, a gutta-percha trial (Dentsply, Switzerland) was performed and confirmed with radiography. Additionally, upon insertion of the intracanal medication Calcium Hydroxide, dissemination into the adjacent root canal was noted, consistent with Vertucci type II classification. The root canals were dried with sterile paper points, and intracanal medication with Ca(OH)₂ was applied, followed by a temporary filling. The patient was instructed to return for a follow-up visit in two weeks.

At the second visit, the patient remained asymptomatic, and the root canal system was thoroughly irrigated to remove the intracanal medication and dried. A master cone corresponding to the final preparation size was selected, confirming tug-back and apical fit radiographically. Obturation was performed using the Schilder warm vertical compaction technique with AH Plus sealer (Dentsply Sirona, Switzerland).

Obturation was performed using the Schilder technique. First, a thin layer of resin-based sealer (AH Plus, Dentsply Sirona, Switzerland) was applied to the canal walls. The downpack phase was initiated using a heat carrier to plasticize the master cone, followed by vertical compaction with pre-fitted hand pluggers to within 5 mm of the working length. This step aimed to achieve a hermetic apical seal and force the softened gutta-percha into the isthmus connecting the merging canals. Subsequently, the backfill phase was completed using the FastFill obturation system (Eighteeth, China), injecting thermoplastified gutta-percha in increments while condensing vertically until the canal was filled to the orifice level.

Following obturation, the pulp chamber floor was sealed with a resin-modified glass ionomer baseliner (Ionoseal, Voco, Germany). To reinforce the remaining tooth structure, a short fiber-reinforced composite (EverX Posterior, GC, Japan) was applied as a dentin-replacing substructure. Finally, the restoration was completed with a layer of high-filled packable composite resin (Voco, Germany) to restore occlusal anatomy and wear resistance.

One week after obturation, an objective examination of tooth #16 revealed no complaints, with negative results for percussion and palpation tests, and normal surrounding tissues. The treatment was completed with a high-filler incremental direct composite restoration (Voco, Germany), and the patient remained asymptomatic with normal clinical and radiographic findings at the 6-month follow-up.

Discussion

The endodontic management of maxillary first molars presents a considerable clinical challenge,



Figure 5. Radiographic of three months follow up.

primarily due to the intricate anatomy of the mesio-buccal (MB) root.^{6,7} The Vertucci type II canal configuration, where two canals merge into a single apical foramen, is a frequently encountered variation in this root, with a prevalence reported to be as high as 27% in diverse global populations.⁸ Failure to identify and treat the MB2 canal is a major cause of root canal treatment failure, with missed MB2 canals significantly increasing the risk of persistent infection and retreatment.⁹

Therefore, accurate preoperative diagnosis and root canal disinfection are vital for achieving predictable endodontic outcomes.¹⁰ Radiography remains an indispensable diagnostic tool in clinical practice, often revealing the presence of merging canal pathways. Furthermore, the use of a dental operating microscope (DOM) substantially enhances the clinician's ability to locate the MB2 orifice, which is often concealed by a dentinal shelf.¹¹

Although single-visit treatment is often feasible for vital cases, a two-visit protocol was strategically employed in this case.¹² The inter-appointment application of calcium hydroxide served a critical diagnostic function; its observed dissemination from the main canal into the adjacent canal clinically confirmed the communicating isthmus characteristic of the Vertucci type II configuration. Furthermore, given the limitations of mechanical instrumentation in cleaning the narrow isthmus between coalescing canals, this interval allowed for the proteolytic dissolution of organic tissue within these irregularities, ensuring a pristine environment for the subsequent obturation.¹²

The quality of the final root canal filling is a reliable clinical predictor of long-term success.¹³ In this case, the warm vertical compaction technique was utilized, a method that aligns perfectly with Schilder's objective of achieving a dense, hermetic seal throughout the canal system, including its lateral and apical ramifications. Radiographic evaluation revealed a well-condensed, void-free obturation

extending to the prepared apical length. The absence of voids is particularly significant, as they are often associated with microbial leakage and persistent periapical disease.¹⁴

The superiority of warm vertical compaction over other methods in complex anatomies is well-supported by recent micro-CT studies. Comparative analysis indicates that while cold lateral compaction can result in apical void percentages ranging from 4.50% to 9.80% with only fair-to-poor adaptation, the Schilder technique consistently yields the lowest void percentages (0.25–1.15%) and excellent adaptation to canal irregularities.¹⁵ Even modern single-cone techniques using bioceramic sealers exhibit higher porosity (2.10–5.50%) compared to the warm vertical approach.¹⁶ Consequently, the successful outcome achieved in this case report reinforces that a disciplined application of Schilder's foundational shaping principles is indispensable for managing anatomical complexities and achieving a high-quality, predictable obturation that promotes periapical healing.

Schilder techniques require significant operator skill and precise temperature control to avoid material extrusion, but their superior sealing ability makes them preferred for complex root canal morphologies.¹⁷ Finally, the long-term prognosis of an endodontically treated tooth is highly dependent on the quality of the definitive coronal restoration.¹⁸ In this case, a bilayered restorative approach was employed to enhance structural integrity. A short fiber-reinforced composite (SFRC) was utilized as a substructure to mimic the stress-absorbing properties of dentin. Literature confirms that SFRC has superior fracture toughness compared to conventional composites and acts as a stress-breaker, effectively arresting crack propagation and dissipating occlusal loads.^{19,20} This fiber substructure was then capped with a particulate filler composite to ensure surface hardness and wear resistance, creating a restoration that mechanically reinforces the tooth against fracture, a common cause of failure in posterior teeth following root canal therapy.^{19,20}

Conclusion

The Schilder technique is essential for successfully treating maxillary molars with complex Vertucci Type II anatomy, as it yields a dense, well-adapted obturation characterized by a radiographically confirmed hermetic seal.

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Conflict of Interest

The authors report no conflict of interest.

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