

Masterclass in Clinical Practice

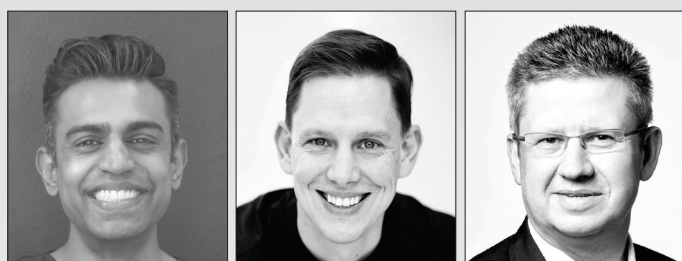
Endodontics

with

Dr Maheshan Pillay¹

Prof Martin Vorster²

Prof Peet J. van der Vyver³



Masterclass in Endodontics: Full pulpotomy as a conservative endodontic treatment option for carious molars with irreversible pulpitis

¹ Maheshan Pillay
BChD(UWC); PG Dip Dent Endo(Pret); PG Dip Dent
Aesthetic Dentistry(Pret); MSc(Dent)(Pret)

² Martin Vorster,
BChD (Pret); PGDipDent (Endo); MSc(Dent), PhD

³ Peet J. van der Vyver,
BChD (Pret); Dip. Odont (Aest Dent);
Dip.Odont (Endo); MSc Odont (Endo), PhD (Endo)

Introduction

Contemporary endodontics is witnessing a significant shift from traditional concepts of complete pulp removal to a more biologically conservative approach that emphasises pulp preservation. One of the most compelling developments in this regard is the choice of full pulpotomy as a definitive treatment modality in mature permanent teeth with symptomatic irreversible pulpitis. Once considered strictly an emergency or interim measure, full pulpotomy is now gaining traction as a biologically credible alternative to conventional root canal therapy (RCT), particularly with the advent of advanced bioactive materials and supportive clinical evidence.

RCT has long been proven the conventional gold standard for the management of teeth with symptomatic irreversible pulpitis, with a 10 year survival rate of 85%.¹ However, RCT also has drawbacks such as requiring a high level of clinical skill, high costs, multiple appointments and complete pulp removal resulting in substantial dentine loss, weakened coronal structure and reduced long-term survival of the tooth due to fracture susceptibility.^{2,3}

In contrast, full pulpotomy—involving the amputation of only the inflamed coronal pulp and preservation of the radicular pulp—offers a minimally invasive alternative that prioritises the preservation of pulp vitality, structural integrity, and function.

Full pulpotomy is now considered as an accepted treatment modality for symptomatic cariously exposed teeth by the European Society of Endodontology (ESE) and the American Association of Endodontists (AAE).⁴

Recent studies have consistently demonstrated that full pulpotomy using mineral trioxide aggregate (MTA), Biodentine (Septodont), or calcium-enriched mixture (CEM) cement can yield clinical and radiographic success rates comparable to or exceeding those of RCT, in teeth diagnosed with irreversible pulpitis.⁵⁻⁷ The use of MTA is recommended in non-aesthetic zones due to potential discolouration, with Biodentine being the suitable choice for use in aesthetic zones.²

For example, Taha et al. reported a 92.7% survival rate at three years post-treatment with Biodentine,⁶ while in a series of studies by Asgary et al. 98% of cases with teeth with irreversible pulpitis treated with MTA or CEM achieved clinical success at the 5 year recall.⁸⁻¹⁰ These materials have emerged as the preferred materials for not only their excellent biocompatibility and sealing ability but also their potential to actively stimulate dentine bridge formation, pulp cell proliferation, and tissue regeneration.^{11,12}

However, a key challenge in the clinical application of full pulpotomy lies in diagnostic uncertainty. Many symptomatic teeth may be non-responsive to sensibility testing, yet



Figure 1: Pre-operative periapical radiograph illustrating caries extending into pulp of the right mandibular first molar



Figure 2: Pre-operative clinical image that shows the occlusal outline of the carious lesion

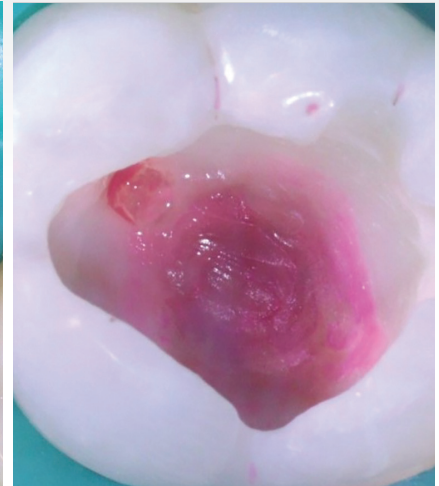


Figure 3: Clinical image illustrating the extend of the caries infected dentine as stained with caries indicator

histological studies¹¹ show an absence of inflammation in the radicular pulp if the coronal inflammation is promptly managed. This highlights the importance of clinical judgment, careful case selection, and effective haemorrhage control—a step often cited as a proxy for pulpal viability.^{13, 14}

Moreover, long-term pulpotomy success is highly dependent on coronal sealing. The most frequently cited cause of pulpotomy failure is microleakage due to compromised restorations.¹⁵ Therefore, clinical protocols must emphasise restoration quality and periodic assessment to ensure marginal integrity.

Full pulpotomy also presents significant advantages in terms of cost, chair time, patient compliance, and technical simplicity, particularly in settings with limited access to

specialist endodontic care or for patients who decline RCT for financial reasons.^{16,17} This makes it especially appealing in public health contexts and low-resource environments, where the burden of untreated endodontic disease is high.

This masterclass explores the use of full pulpotomy with MTA as a treatment option for carious mandibular molars which presented with symptomatic irreversible pulpitis.

Case Presentation 1

A 19-year-old female presented with a main complaint of spontaneous sharp pain on her right mandibular first molar (46), often painful at night. The patient had no previous history of dental treatment on the tooth. Radiographic and clinical examination revealed a large carious lesion extending into

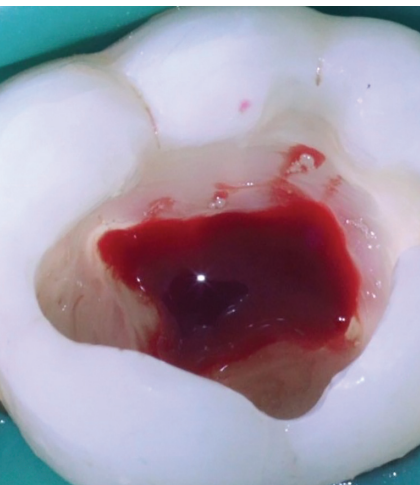


Figure 4: Clinical image showing the pulp exposure after removal of the caries infected dentine

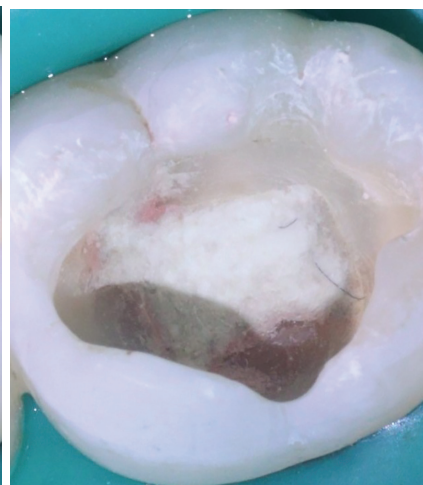


Figure 5: Clinical image showing the pulpotomy with MTA



Figure 6: Periapical radiograph illustrating the MTA Placement



Figure 7: Periapical radiograph illustrating the Glass Ionomer layer over the set MTA

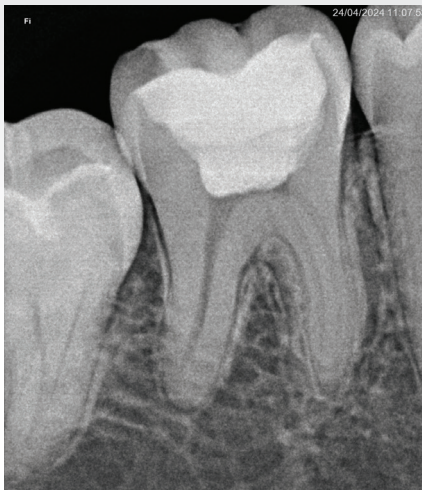


Figure 8: Periapical radiograph illustrating completed full pulpotomy and final restoration

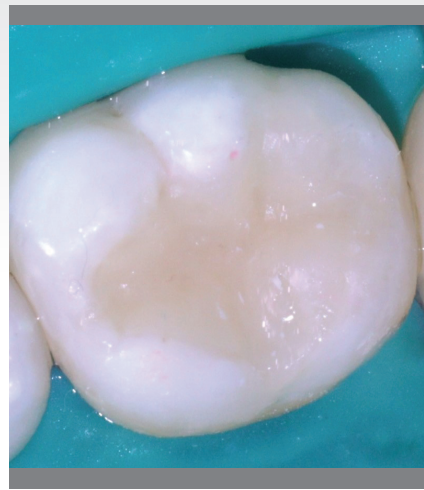


Figure 9: Occlusal view of the final composite restoration



Figure 10: Periapical radiograph at follow up visit at 13 months

the pulp chamber of the tooth (Figures 1 and 2). A clinical diagnosis of irreversible pulpitis was made.

After informed consent was obtained, Lignospan 2% (Septodont) was administered and a rubber dam placed. The caries on the lateral walls were removed first, with the aid of Red Detector caries indicator (Cerkamed) (Figure 3). A round diamond bur was used to remove the caries on the floor of the cavity resulting in the exposure of a hyperemic pulp (Figure 4). The entire content of the pulp chamber was removed with the round bur.

Haemostasis was achieved using pressure with a cotton pellet moistened with 3.5% sodium hypochlorite for 2 minutes. A 2mm layer of ProRoot MTA (Dentsply Sirona) was placed over the pulpal exposure (Figures 5 and 6), then covered with a 2mm layer of Glass Ionomer Ionostar Plus (VOCO) (Figure 7), followed by a 2mm layer of SDR Plus (Dentsply Sirona) and 2mm layer of Tetric N Ceram Composite (Ivoclar) (Figures 8 and 9).

The tooth was assessed after 13 months (Figure 10) for

pulpal and apical signs and symptoms, restorative marginal integrity, and periodontal health. The treatment was considered successful as both the clinical and radiographic presentations were normal or showed reduced radiolucency. There were no clinical signs and symptoms of pain, pulpal pathosis, tenderness to percussion, soft tissue swelling, internal or external resorption and sinus tracts.

Case Presentation 2

An 8-year-old male child presented with a main complaint of spontaneous sharp pain on his left mandibular first molar (36), often painful at night. The patient had no previous history of dental treatment on the tooth. Radiographic and clinical examination revealed a large carious lesion extending into the pulp chamber of the tooth (Figure 11). A clinical diagnosis of irreversible pulpitis was made.

After informed consent was obtained, the same clinical



Figure 11: Pre-operative periapical radiograph illustrating caries extending into pulp of the left mandibular first molar



Figure 12: Periapical radiograph illustrating full pulpotomy using MTA



Figure 13: Periapical radiograph illustrating full pulpotomy and final restoration



Figure 14: Periapical radiograph at 11 month follow up visit



Figure 15: Periapical radiograph at 26 month follow up visit



Figure 16: Periapical radiograph at 43 month follow up visit.

protocol and materials were used as prescribed in Case presentation 1.

A 2mm layer of ProRoot MTA (Dentsply Sirona) was placed over the pulpal exposure (Figure 12). Teflon tape was placed over the MTA layer followed by a layer composite as a temporary restoration.

The patient was recalled two weeks later for a final restoration as the tooth was asymptomatic. The MTA was covered with a 2mm layer of Glass Ionomer Ionostar Plus (VOCO), followed by a 2mm layer of SDR Plus (Dentsply Sirona) and 2mm layer of Tetric N Ceram Composite (Ivoclar) (Figure 13).

The tooth was assessed after 11 months (Figure 14), 26 months (Figure 15) and 43 months (Figure 16) for pulpal and apical signs and symptoms, restorative marginal integrity, and periodontal health. The treatment was considered successful as both the clinical and radiographic presentations were

normal or showed reduced radiolucency. There were no clinical signs and symptoms of pain, pulpal pathosis, tenderness to percussion, soft tissue swelling, internal or external resorption and sinus tracts.

Conclusion

Full pulpotomy in mature permanent teeth—when performed with contemporary bioceramic materials and strict clinical protocols—challenges the traditional view that irreversible pulpitis necessitates complete pulp extirpation. By preserving radicular pulp vitality, maintaining dentinal architecture, and reducing procedural complexity, pulpotomy embodies the principles of minimally invasive dentistry and opens new possibilities for biologically based endodontic care. As the literature base grows, this treatment may soon become standard in cases previously thought to require full RCT—a paradigm shift with far-reaching clinical implications.

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