International Journal Dental and Medical Sciences Research
Volume 7, Issue 4, July – Aug. 2025 pp 233-236 www.ijdmsrjournal.com ISSN: 2582-6018

Combination of Vital Pulp Therapy and Non-Surgical Endodontic Therapyfor the Management of Mature Permanent Mandibular Molar Tooth with Symptomatic Irreversible Pulpitis and Apical Periodontitis: A Case Report

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Date of Submission: 01-08-2025 Date of Acceptance: 10-08-2025

ABSTRACT:
This case report presents a unique approach to managing a permanent mandibular molar with symptomatic irreversible pulpitis, where selective vital pulp therapy was performed on the vital distal canal and non-surgical root canal treatment on the necrotic mesial canals, with a successful one-year follow-up. A previous study supports this approach, showing a 93.3% success rate for combining vital pulp therapy with non-surgical endodontics in mature teeth with apical periodontitis, suggesting it as a viable, minimally invasive option.

Key words : Vital pulp therapy, symptomatic irreversible pulpitis, combination, mature permanent teeth

I. INTRODUCTION:

Pulpal inflammation, or pulpitis, occurs in response to microbial, chemical, or physical irritants.A diagnosis of symptomatic irreversible pulpitis signifies that the inflamed pulp is beyond recovery and unable to heal, indicating a need for further intervention(1).Root canal therapy is the preferred treatment for teeth with apical periodontitis, boasting a high success rate of up to 95%, as supported by various studies (2).Compared to root canal therapy, coronal pulpotomy offers a promising alternative for treating symptomatic irreversible pulpitis, with a high success rate of 98.3%, while potentially being more efficient and cost-effective(3).Vital pulp therapy (VPT) aligns with minimally invasive dentistry principles, prioritizing tooth structure preservation. A study reported 65.7% success when vital pulp therapy (VPT) was done in teeth with apical periodontitis after five years (4).Recent research indicates a high success rate of 93.3% for VPT in treating mature permanent molars with apical periodontitis, suggesting it as a promising, less invasive alternative to traditional root canal therapy (5). This case report details the management of a mature permanent mandibular molar with apical periodontitis using a combined approach of pulpotomy and nonsurgical endodontic treatment (NSET), with a one-year follow-up period.

II. CASE REPORT :

A 20-year-old male patient reported to the Department of Conservative Dentistry and Endodontics with a complaint of spontaneous dull pain in the lower right quadrant.The clinical examination revealed a carious lesion on the occlusal surface of the right mandibular permanent first molar. The patient experienced pain on palpationand percussion, but there was no noticeable swelling or sinus tract.Tooth #46 responded positively to the electric pulp test (EPT; Kerr Vitality Scanner; SybronEndo, Glendora, CA, USA) and exhibited lingering pain lasting over 10 seconds after the thermal (cold) test(Coltene Roeko EndoFrost), indicating pulpitis.The periapical radiograph showed a coronal radiolucency involving enamel, dentin, and pulp with loss of lamina dura in relation to the mesial root of tooth #46. Based on the findings, tooth #46 had been diagnosed with symptomatic irreversible pulpitis with symptomatic apical periodontitis.

A vital pulp therapy or a combination were explained and informed consent was taken from the patient. The patient was informed about vital pulp

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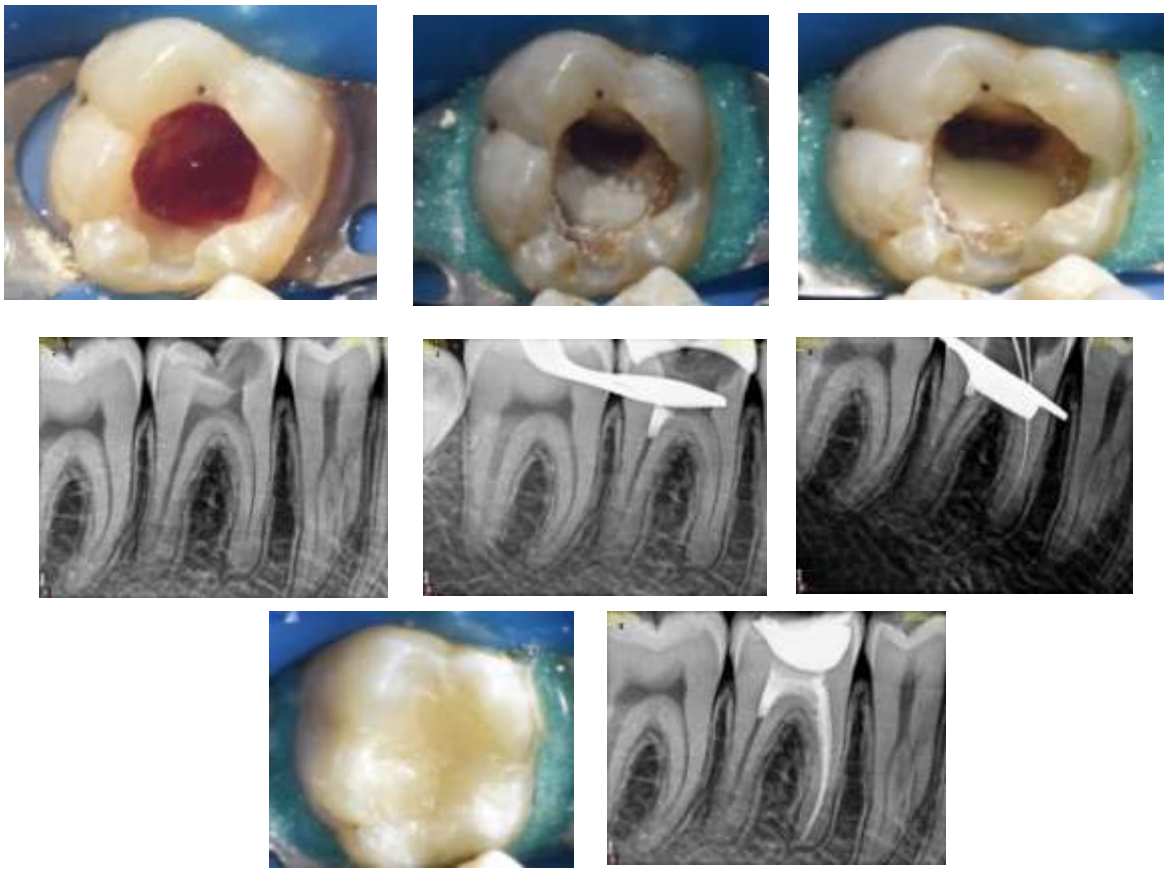
therapy options. Local anesthesia was administered using 2% lidocaine with 1:100,000 adrenaline(Lox 2%, Neon Lab., New Delhi), followed by rubber dam isolation (Hygienic, Coltene, U.S.A) and disinfection of the dental damusing 2.5% sodium hypochlorite.

The caries were excavated with a high speed airotor handpiece and round bur.The procedure was conducted with the aid of a 3.2x dental magnifying loupe (TTL Galileon loupe, Admetec, Israel) for precise visualization.After access opening, and extirpation of coronal pulp tissue a sharp spoon excavator, the mesial root canal orifices appeared necrotic. Whereas the distal canal orifice showed persistent bleeding.A high-speed diamond bur was used to remove the exposed pulpal tissue to the level of the distal canal orifice.

The single distal canal was kept un instrumented.By using a 2.5% NaOCl moistened cotton at the level of distal orifices for 5 minutes, followed by a pressure pack with dry cotton, the hemostasis was established (5).After controlling the bleeding, 2-3 mm of Biodentine (Septodont, Lancaster PA, USA) was packed over the orifices using a condenser. A layer of light-cure RMGIC (Fusion I- Seal, Prevest DenPro, Jammu, India)was then applied over the set Biodentine and light-cured for 20 seconds.

The mesial canals underwent non-surgical endodontic treatment as they appeared necrotic.

A precurved #10k file is used for negotiating MB,ML canals and the working lengthwas determined(Root ZX, J Morita USA, Inc. Irvine, CA).The canals were prepared with 0.04 taper #17 to 25 EdgeFile Rotary Files (EdgeEndo, Albuquerque, NM, USA) with 2.5% sodium hypochlorite (Hyposol, Prevest DenPro, Jammu). Following this passive ultrasonic irrigation (Ultra X, Eigteeth, Orikam, India) followed by 17% EDTA (Prevest DenPro, Jammu India) irrigation and final saline irrigation were done. Obturation of the mesial canals were done using the warm compaction technique. A composite restoration(Filtek Z250, 3M ESPE)was used to seal the access cavity. The patient was reviewed for 3, 6 and 12 months. On follow-up, the patient remained asymptomatic with no radiographic signs of peri-apical pathosis.



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Figs 1A to J: (A)Bleeding in the pulp chamber of tooth 46;(B) Biodentine placed over the distal canal orifice of tooth 46 after achieving hemostasis;(C)RM-GIC placement following biodentine pulpotomy;(D) Pre-operative radiographic image of tooth 46;(E) Radiographic image showing Biodentine pulpotomy in distal orifice;(F) Radiographic working length determination in the mesial canals of tooth 46; (G)Radiographic image with master apical cones in mesial canals of tooth 46;(H) Post-operative radiographic image;(I)Composite restoration done in tooth 46;(J)12-month follow-up radiographic image

III. DISCUSSION :

Non-Surgical Endodontic Therapy (NSET) effectively treats irreversible pulpitis and apical periodontitis but is invasive, removing healthy pulp tissue and potentially compromising the tooth's regenerative capacity, proprioception, and innervation(6). The success of treatment depends on pulpal status, which can't be determined clinically with certainty. Notably, in irreversible pulpitis, histological findings show inflammation typically doesn't extend beyond 2 mm from the carious exposure site (8).

By removing only the irreversibly damaged portion of the pulp, the radicular pulp can potentially be preserved, allowing for continued vitality and function of the remaining pulp tissue (7). Achieving hemostasis at the root canal orifice with 2.5% NaOCl within 5-10 minutes can indicate the radicular pulp's healing potential. Research, such as Taha et al. (2017), has shown promising results, with MTA pulpotomy achieving a 100% success rate in mature permanent teeth with carious pulp exposures after one year (9).

Research has shown promising results for pulpotomies using Biodentine in mature permanent teeth with irreversible pulpitis, with reported success rates of 100% clinically and 93.8% radiographically after one year. Other studies have also demonstrated high success rates for vital pulp therapy, such as Cushley et al. (97.4% clinical and 95.4% radiographic success) and Koli et al. (93.3% success rate in teeth with apical periodontitis). This treatment approach, termed "EndoVital," introduced by Koli et al enables simultaneous removal of damaged pulp tissue and preservation/repair of the remaining vital pulp, making it as a promising option for cariously exposed teeth (5).

The success of the case report can be attributed to adherence of the established protocols, specifically those outlined by the AAPD (2014) and AAE (2018), with careful consideration of key factors such as pulp bleeding and color during treatment.In this case, achieving hemostasis under 5 minutes suggested a healthy pulp in the distal canal. Biodentine, like MTA, is a bioactive cement offering benefits such as quick setting, biocompatibility, suitable compressive strength, and excellent sealing ability(11).

Research by Pérard et al. found that bioceramic materials like MTA and Biodentine are suitable for vital pulp therapy, demonstrating favorable effects on gene expression in cultured spheroids (12). This case highlights the importance of accurate diagnosis, achieving hemostasis, selecting suitable biomaterials, and understanding pulp biology for successful combined pulpotomy and endodontic therapy in teeth with apical periodontitis. The immediate permanent restoration also contributed to the favorable outcome, both aesthetically and therapeutically.

IV. CONCLUSION:

Patientsmay receive favourable treatment outcome by combining vital pulp therapy (VPT) along with selective root canal treatment in mature permanent teeth with apical periodontitis. An accurate diagnosis, case selection and proper treatment planning is of paramount importance in this treatment approach.

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