https://doi.org/10.48047/AFJBS.6.13.2024.2108-2115

African Journal of Biological Sciences

Journal homepage: http://www.afjbs.com

Research Paper Open Access

Partial Pulpotomy as an Alternative to Root Canal Therapy in Young Adults with Irreversible Pulpitis: A Case Report

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Article History
Volume 6, Issue 13, 2024
Received: 18 June 2024
Accepted: 02 July 2024
doi:
10.48047/AFJBS.6.13.2024.2108-2115

Abstract

Aim and background: To present a case report on partial pulpotomy as an alternative to root canal therapy in a young adult patient with irreversible pulpitis and a normal periodontium.

Case description: A case of a young adult patient presenting with a symptomatic irreversible pulpitis in a mature permanent molar tooth was managed with a partial pulpotomy procedure. Following caries removal, pulpal exposure, and haemorrhage control, the exposed pulp tissue was covered with mineral trioxide aggregate (MTA) and a bonded composite restoration.The patient remained asymptomatic at the 1-week, 1-month, and 3-month follow-up visits. Radiographic evaluation showed the presence of a dentinal bridge along the pulp-MTA interface, indicating successful pulp capping and continued root development.

Conclusions: Partial pulpotomy can be considered an effective alternative to root canal therapy in young adult patients with irreversible pulpitis and a healthy periodontium. The preservation of pulp vitality, continued root development, and favourable long-term prognosis make it a viable treatment option in appropriate clinical scenarios.

1. **Keywords**Partial pulpotomy, vital pulp therapy, direct pulp capping, root canal treatment, MTA

2. **Abbreviations**

MTA- mineral trioxide aggregate, post op- post operative, RMGIC- resin modified glass ionomer cement, NaOCl- sodium hypochlorite

3. Introduction

Young adults with irreversible pulpitis and a healthy periodontium can be effectively treated with partial pulpotomy as an alternative to root canal therapy.

Irreversible pulpitis refers to a state of pulpal inflammation that is beyond the point of reversibility, often requiring intervention to prevent further progression of disease and avoid tooth loss.(1) The symptoms usually include severe pain that is spontaneous and worsens with thermal stimuli. The minimally invasive treatment concept has scope in different aspects of dental treatment. In endodontics, partial pulpotomy has shown promise as an alternative to complete root canal therapy in certain cases. Cvek in 1978 first described the partial pulpotomy technique as a conservative treatment approach for vital exposed pulps in young permanent teeth.(1,2)Such vital pulp treatment allows physiological root development and apexogenesis to continue. This continued root development has the benefit of strengthening the tooth structure and decreasing the risk of future root fractures.

4. Patient selection and treatment protocol

Not all cases of irreversible pulpitis are suitable candidates for partial pulpotomy.(2,3) The ideal patients are young adults (typically 18-30 years old) presenting with a diagnosis of irreversible pulpits but with no signs of apical periodontitis, sinus tract, or radiographic evidence of apical bone resorption.(1)After administering local anaesthesia, the carious/affected dentin is removed, exposing the pulp. The exposed pulp tissue is then gently amputated to a depth of 2-4 mm. Haemostasis, for healthy pulp, occurs within 5 minutes.(1,3) Conventional technique involves the use of sterile diamond bur, to incise the infected pulp and the subsequent use of 2.5% NaOCl(sodium hypochlorite)as a haemostatic and disinfecting agent. But NaOCl might have some adverse effects such as cytotoxicity to superficial layers of pulp tissue and reducing the organic content of dentin by deproteinising the collagen.

After amputation of the superficial pulp tissue, which is infected, A bioactive material such as calcium silicate cement or mineral trioxide aggregate is then placed over the exposed pulp, followed by a suitable permanent restoration.

The partial pulpotomy procedure maintains the vitality of the remaining pulp tissue, allowing for continued root development and strengthening of the overall tooth structure. This conservative approach can be an effective alternative to root canal therapy in young adult patients with irreversible pulpitis and a healthy periodontium.

Partial pulpotomy is performed in dental trauma or symptomatic deep dentinal caries or in teeth with developmental defects that result in pulp exposure.(3,4) The mechanism of action involves stimulating the retained pulp tissue to heal, re-differentiate, and regenerate.(1) The alkaline pH of the cementmaterial stimulates odontoblast-like cell differentiation, promoting reparative dentin formation.(5) This dentinal bridge formation isolates the pulp from the irritants and bacterial microleakage.(6)MTA forms a thicker dentinal bridge with less tunnel defects and a more evident odontoblastic layer as compared to calcium hydroxide.(7)MTA shows good sealing, marginal adaptation and biocompatibility. This has resulted in the consideration of MTA as the Gold Standard for vital pulp therapies. Newer materials like biodentin, and bioactive glass are showing promising results.(8–10)

5. Success rates and outcomes

Successful partial pulpotomy has been reported in upto 96% of cases in mature permanent teeth with irreversible pulpitis and a normal periapical status.(11)The prognosis depends on clinical presentation, age of the tooth, size of pulpal exposure, time-lapse since injury, and bioactive material used for capping. Continued root maturation and apex formation have been observed in immature teeth treated with partial pulpotomy.

6. Case report

An 18-year-old female patient reported to the hospital with spontaneous pain in the upper right second premolar for the past week. Clinical examination revealed a deep carious lesion. Radiographic evaluation showed deep dentinal caries involving pulp and a normal periodontium. Pulp sensibility tests confirmed a diagnosis of symptomatic irreversible pulpitis.

The treatment plan was decided as a partial pulpotomy. An informed consent of the patient was taken after explaining the different treatment options and prognosis.

Local anaesthesia was administered

Following rubber dam isolation, Caries removal was done. The operative field was cleaned with 5.25% hypochlorite. The pulp was exposed with a new sterile bur under water spray. The depth of amputation was to a level, where the bright pink colour of the pulp tissue could be noted. The cavity was rinsed with sterile cold saline and haemostasis was achieved with cotton dipped in sodium hypochlorite placed on the pulp.

The exposed vital pulp was covered with a 3mm layer of mineral trioxide aggregate (MTA),which was lined by a 2mm layer of RMGIC and bonded composite restoration was given.The patient was prescribed analgesics and recalled for follow-up.(8)

The patient was recalled at 1 week, 1 month and 3 months for clinical and radiographic evaluation. The tooth remained asymptomatic, with no signs of pulpal or periapical pathology. Radiographic evaluation showed the presence of radiopaque dentinal bridge along the pulp MTA interface. Normal pulp sensibilty tests were recorded after 1 month review.(11)

7. Discussion

Partial pulpotomy is a valuable minimally invasive endodontic procedure that can be considered an effective alternative to root canal therapy in young adult patients with irreversible pulpitis and a healthy periodontium. It preserves the vitality of the remaining pulp tissue, allowing for continued root development and strengthening of the overall tooth structure. It is defined as the surgical removal of a portion of the coronal pulp tissue, followed by the placement of a biocompatible material to encourage the formation of a dentinal bridge and healing of the remaining pulp.(12)

The successful treatment outcome depends on various factors including patient selection criteria, proper isolation, bioactive material selection, and atraumatic surgical technique.(5,6)

Irreversible pulpitis in mature permanent teeth can be successfully managed by partial pulpotomy, with reported success rates of up to 96%.(11) Associated symptoms like periapical pathosis, sinus tract or advanced root canal therapy are contraindications. Intraoperative factors like adequate haemorrhage control, disinfection of the exposure site, and choice of disinfectant also influence the treatment outcome.(5)

However, pulpal histological status can be reliably correlated with presenting clinical symptoms. Diagnosis of reversible pulpitis matched histologic diagnosis in 97% of cases and for irreversible pulpitis, it was 84%.

In a the rationale behind partial pulpotomy is to remove infected irreversibly inflamed pulp as well as infected dentin, to remove the bacterial colonisation and irritants while preserving the vital uninfected pulp tissue.(12)

The ultimate goal is to achieve a clean surgical wound in pulp surrounded by mineralised non-infected dentin.

The intraoperative decision-making process is aided by the use of magnification. A dental operating microscope allows enhanced visual acuity and helps in better evaluation of the extent of pulpal involvement. Removal of infected tissue is performed sequentially until clean tissue is reached devoid of inflammation and infection in pulp and dentin respectively.

Matsuo et al found that profuse bleeding that is difficult to arrest is indicative of advanced pulpal inflammation. In such cases, the treatment should be modified.
Hypochlorite in 5.25% concentration has been routinely used to disinfect the operative field. Hypochlorite for haemorrhage control is controversial as it may damage the pulp tissue and delay healing.(11)
Compared to root canal therapy, partial pulpotomy has higher long-term survival rates and better preserves the tooth structure and function. It is also a more cost-effective treatment option.(12)
The use of MTA as a pulp capping material has resulted in superior outcomes compared to traditional calcium hydroxide. MTA demonstrates excellent sealing ability, biocompatibility, and induction of reparative dentine bridge formation.(8)
The case report demonstrates the successful management of a young adult patient with irreversible pulpitis using a partial pulpotomy approach. The high success rates reported in the literature, along with the potential long-term benefits, make partial pulpotomy a treatment option that should be considered in appropriate clinical scenarios.

8. Conclusion

Partial pulpotomy is a valuable minimally invasive endodontic procedure that can be considered an effective alternative to root canal therapy in young adult patients with irreversible pulpitis and a healthy periodontium. The successful outcome depends on proper case selection, meticulous surgical technique, and the use of biocompatible pulp-capping materials.

9. Conflict of interest

There is no conflict of interest.

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Figure 1: pre operative radiograph

Figure 2: intra operative clinical view- disinfection of operative field

Figure 3: pulp amputation and haemostasis

Figure 4: MTA placement

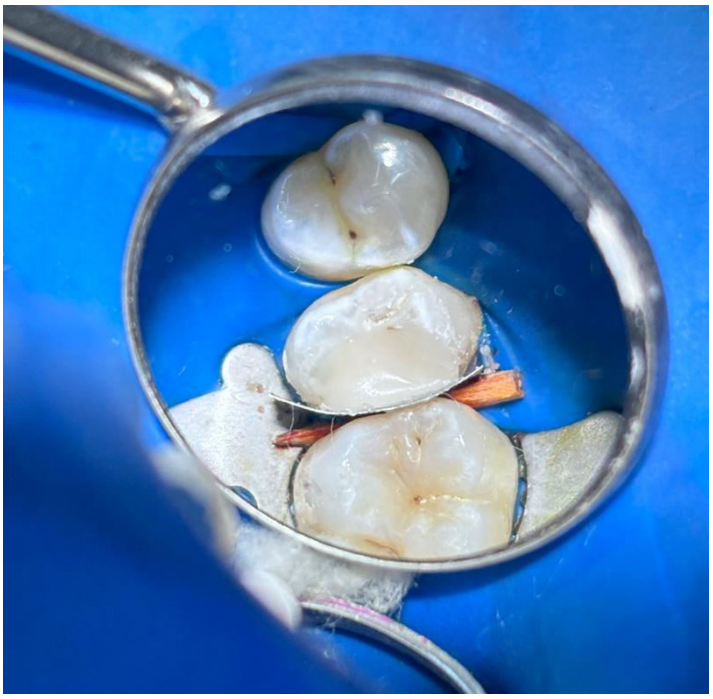

Figure 5: post endodontic bonded restoration

Figure 6: post op radiograph

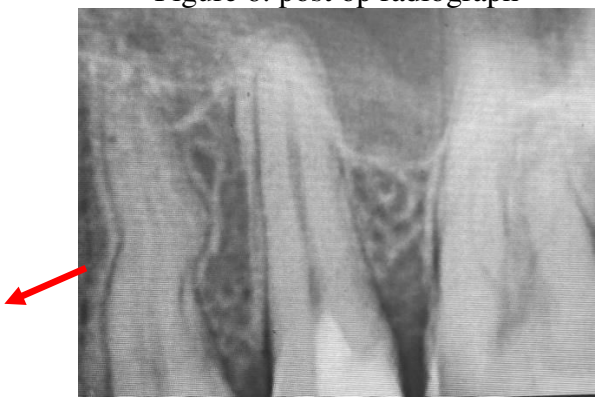

Figure 7: 3 month review- arrow indicates the calcific barrier visible radiographically