



Pulpotomy in the Adult Patient: Does It Work? A Case Report

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

Article Information

Editor(s):

(1) Dr. M. Jaya Nagendra Krishna, Kamineni Institute of Dental Sciences, India.

Reviewers:

(1) Nishant Narayan Ajsaonkar, Maharashtra University of Health Sciences, India.

(2) Anita Rao, Kaloji Narayana Rao University, India.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/61121>

Case Study

Received 10 July 2020
Accepted 14 September 2020
Published 07 October 2020

ABSTRACT

Pulp exposure due to caries is exceedingly common. Generally, a tooth diagnosed with irreversible pulpitis can be treated and maintained successfully with conventional root canal treatment. However, emerging scientific evidence has shown that such teeth treated with pulpotomy as a first line of treatment provides increasingly predictable results. In this case report, the author describes a step-by-step treatment procedure for pulpotomy in an adult tooth. Proper case selection and adhering to a rigid clinical protocol contributes to a successful outcome of pulpotomy treatment. In this case, Mineral Trioxide Aggregate (MTA) was placed as a capping material; haemostasis was achieved within 4 minutes and the tooth was restored with an excellent margin.

Keywords: *Pulpotomy; root canal therapy; mineral trioxide aggregate; irreversible pulpitis.*

1. INTRODUCTION

Pulpotomy is a dental procedure carried out on badly decayed teeth with infected pulp tissue. In this procedure, the coronal pulp is removed leaving behind the radicular pulp tissue, with the

intention of preserving the vitality of the tooth. Previously pulpotomy was done primarily on molar teeth in children, however, recent emerging scientific evidence has revealed that successful outcomes can be obtained in adult patients as well [1-3].

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Dental pulp is not a “doomed organ” as was originally thought. It can heal well if given a conducive enough environment [4]. Root canal treatment (RCT) on a traumatized or decayed tooth, or teeth with iatrogenic exposure of dental pulp is no longer the only treatment with predictable outcomes. Studies have shown that clinical signs and symptoms do not accurately reflect the pulp status; especially in cases with irreversible pulpitis. A study in 2014 reported that as much as 16% of teeth are unnecessarily treated with root canal treatment [5]. Literature is also replete with reports that the survival rate of endodontically treated teeth is not as high as that of vital teeth [6,7]. Pulpotomy in contrast, has been shown to be a viable alternative where patients experience less postoperative pain and complications when compared to root canal treatment [8].

The vitality of the dental pulp is fundamental to the health of the tooth, especially in developing teeth. By maintaining the vitality of the tooth, there is greater likelihood that the tooth would continue development of its apex and subsequent thickening of the dentinal wall. Maintaining vitality of the dental pulp would also preserve the proprioceptive mechanisms [9] of the pulp which would help prevent over loading of the tooth during mastication thereby reducing the risk of tooth fracture.

Recent research reports have demonstrated that pulpotomy with bioactive materials such as Mineral Trioxide aggregate (MTA) and Biodentine showed success rates of up to 90-98 % [2,3]. A randomized clinical trial too, showed that MTA is a better material than Calcium Hydroxide (CH), a previously used standard material for pulpotomy treatment [10]. MTA was introduced by Mohmoud Torabinejad in the 1990's. It is a calcium silicate base material consisting of Portland cement (75%), bismuth oxide (20%) and gypsum (5%) [11]. MTA is widely used in dentistry for pulpotomy, perforation repairs, as root end fillings, as an apical barrier for open apices, root canal sealer and regeneration therapy. It is a biocompatible material which seals well with dentine besides having the ability to induce dentinal bridge formation. The major disadvantage of MTA is, its tendency to cause tooth discoloration which may not be appealing from the patient perspective, especially if the tooth is the aesthetic zone. Other shortcomings attributable to MTA are its' long setting time, high cost and the need for multiple patient visits. However, despite these

shortcomings, MTA or calcium silicate base material is much preferred over CH as the latter does not bond to dentine, thereby diminishing the ability to provide a hermetic seal. CH also dissolves over time in the oral fluids and often develops tunnel defects [12] which may act as pathways for microleakage and subsequent failure of the restoration.

This case report describes the technique of MTA pulpotomy in an adult, mature permanent lower right premolar with pulp exposure due to a large carious lesion with a diagnosis of irreversible pulpitis.

2. PRESENTATION OF CASE

A 37-years old South-East Asian adult female with an unremarkable medical history presented to our department complaining of pain from the lower right quadrant and multiple missing teeth. She described her pain as being spontaneous, and intermittent in nature that started 2 weeks earlier with the occasional short sharp pain on consuming cold drinks, which was relieved when the stimulus was removed. There was no history of swelling or pus discharge.

Clinical examination revealed multiple missing teeth with large carious lesions on the buccal surfaces of both the lower permanent right premolars.

Diagnostic test revealed normal sensibility test for lower right first premolar tooth (LR4) but the lower right second premolar (LR5) was hypersensitive to cold test with lingering pain and slight tenderness to percussion test. Intra-oral peri-apical radiograph (Fig. 1a) showed large carious lesions on both lower right premolars with notable widening of the periodontal ligament space of LR5 and while no abnormality was detected on the apical tissue of LR4.

Corroborating the clinical and radiographic findings; a diagnosis of irreversible and reversible pulpitis was made for both LR5 and LR4 respectively. Considering that both teeth presented with large carious lesions, pulp exposure was imminent. Both the affected teeth were planned for pulpotomy with MTA capping.

The LR5 was treated first as it was the most symptomatic. The tooth was anaesthetized using 2% lidocaine with 1:80,000 Adrenaline. The tooth was isolated with rubber dam placement (Fig. 2a). Careful excavation with slow speed

rose-head bur was made. The caries was removed from the periphery towards the axial wall, to minimize risk of microbial contamination of the pulp chamber (Fig. 2b). Then, a new sterile slow speed rose-head bur was used to remove a small portion (2 mm depth) of the coronal pulp. A sterile cotton pellet soaked with 2.5% sodium hypochlorite was then placed on top of the pulp chamber. Haemostasis was achieved in less than 4 minutes (Fig. 2c). MTA (ProRoot MTA, Dentsply Tulsa Dental) was then placed as the pulp capping material (Fig. 2d). A thin layer of Glass ionomer cement (GIC) (Fuji IX, GC Tokyo, Japan) was placed over the MTA as a liner (Fig. 2e). The tooth was then restored with composite (Spectrum TPH3, Dentsply Sirona) (Fig. 2f). The LR4 was also treated with MTA pulpotomy the following visit. Upon completion of oral health stabilization, she was referred for fabrication of partial dentures.

The patient was recalled at 6- 12- and 18-month intervals for reviews. The teeth were deemed to be fully functional showing positive results to cold test with no lingering pain. There was no evidence of swelling or sinus tracts and no tooth discoloration (Fig. 2g). The post-operative radiograph showed excellent healing (absence of periapical pathology) and recovery of normal periodontal space for both LR5 and LR4 (Fig. 1b).

3. DISCUSSION

Numerous studies have shown that pulpotomy can be a successful alternative to RCT with

proper case selection and adherence to specific protocol; in teeth that are symptomatic or asymptomatic [1], reversible or irreversible pulpitis [9], with or without periapical radiolucency [13]. Pulpotomy can be carried out with different materials such as MTA, Biodentine or CH with successful outcomes. However long-term success of CH is limited [14].

In this case report, pulpotomy with MTA proved to be successful, even in an adult patient. The outcome concurs with a clinical study done by Taha et al 2017b, which showed that success rate was 93% at 3 years with no difference between age groups (ranging from 11 to 51 years old). In addition, a recent long-term evidence-based study showed that the overall pulp survival rate was 90% at 5 years for teeth with intact restorations, with a median age of 40 years (range, 21–75 years) [3]. It is also interesting to note that a historical publication reported successful treatment of adult teeth aged 60 years old and over, utilizing CH as the capping material [15]. Furthermore, a systematic review done by Aguilar & Linsuwanont, 2011 reported that there was little evidence with the effect of age or status of root development on the outcome of vital pulp therapy [1].

Pulpotomy is preferred over root canal treatment because of its high success rate, reduced clinical time and cost. It is a minimally invasive procedure and lengthens the survival period of the tooth in the dental arch. Even if the treatment does fail in the future, it would delay the extraction of the tooth.

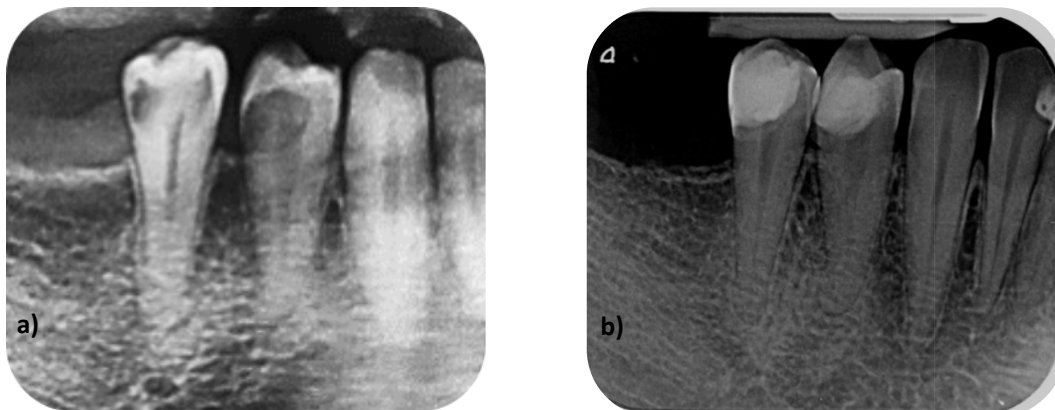


Fig. 1. Radiographs of lower right premolars, a) Pre-operative radiograph of the Lower right premolars, showing large carious lesions with appeared to have widening of PDL associated with Lower right second premolar tooth. 1b) 18 months review periapical radiograph of the Lower right premolars, showing normal periapical tissue

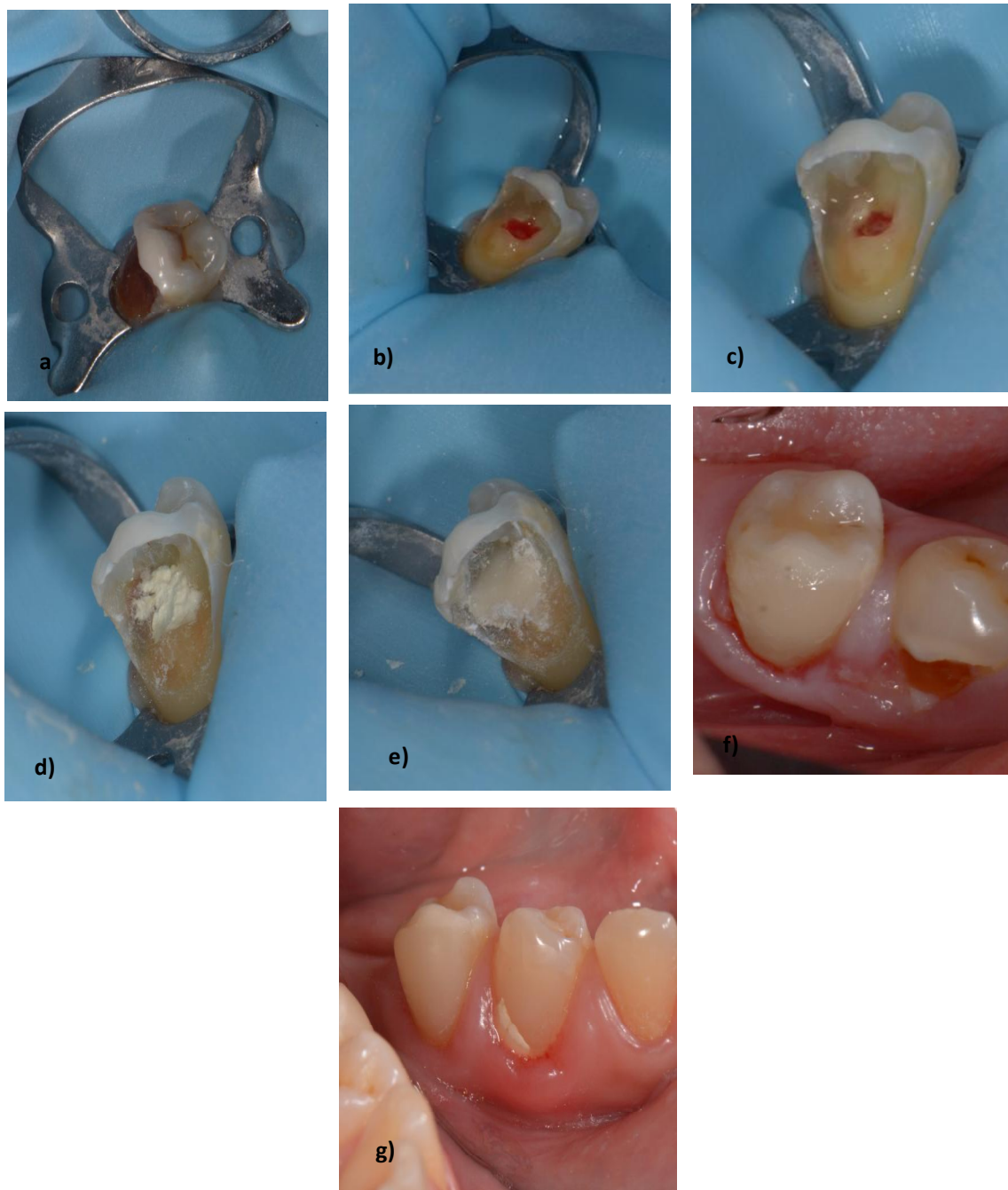


Fig. 2. Clinical pictures of LR5 tooth. a) placement of rubber dam, b) Carious exposure of pulp with hard stained dentine on distal region, c) hemostasis achieved after placement of cotton pellet soaked with 2.5% hypochlorite, d) MTA capping material placed over the exposed pulp, e) Glass ionomer cement placed over the MTA capping, f) Lower right second premolar immediately after restoration with composite. g) Lower right first and second premolar at 18 months review

The above pulpotomy treatment was done in a single visit. GIC was placed as a barrier over partially set MTA to avoid removal of unnecessary tooth structure. Additionally, this would also prevent MTA from being washed off during etching and rinsing when composite

restoration is placed. According to Nandini et al 2007, it is possible to do MTA placement in one visit as there is no effect on the setting reaction [16].

Both teeth (LR4 and LR5) responded positively to cold test with no lingering pain. Previously the LR5 was hypersensitive with lingering pain and widening of the PDL space was noted radiographically. At 6 months review and subsequent reviews, the tooth was positive to cold test with no lingering pain and the periapical radiograph taken at 18 months shows the PDL space was normal and no sign of periapical lesion. Taha et al, reported similar findings in 2017 [13].

From the clinical picture (Fig. 2g), there was no sign of tooth discoloration. According to Shokouhinejad et al 2016, blood contamination in calcium silicate-based material could significantly increase tooth discoloration [17].

It was suggested that contributing factors for the success of pulpotomy treatment was haemostasis obtained within 10 minutes and good restorative margins. Uncontrollable hemorrhage may indicate severely inflamed pulp with lesser chance of recovery and hence may be intended for root canal treatment.

4. CONCLUSION

Pulpotomy with MTA has been shown to have a successful outcome in adult permanent teeth. With proper case selection, teeth with vital pulp exposures could be treated with vital pulp therapy as a first line of treatment rather than conventional root canal treatment. Hence, this procedure can be considered to be a viable and predictable treatment option in the endodontic therapeutic armamentarium.

CONSENT

All necessary consent was obtained from patient for all photographs and radiographs pertaining to the case for publication. The patient was forewarned about the possibility of tooth discoloration and her procedural consent was obtained.

ETHICAL APPROVAL

It is not applicable.

ACKNOWLEDGEMENTS

The author thanks Dr Uday Kumar Umesan, BDS (Hons.) MDS (Ortho), FDS RCSEd, MSc RCSEd, FDTFEd, FICD, Consultant Orthodontist from National Dental Center Brunei for proofreading the manuscript.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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Peer-review history:

The peer review history for this paper can be accessed here:
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