CASE REPORT

Case Report: Immediate pain relief after partial pulpotomy of cariously exposed young permanent molar using mineral trioxide aggregate and root maturation, with two years follow-up [version 1; peer review: 2 approved with reservations]

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Abstract

Carious exposure of immature first permanent molar is a widespread issue faced in paediatric dentistry. This may be the result of the early eruption of this molar, so parents may think it is replicable to the rest of the deciduous teeth. Preserving pulp vitality is the primary goal in treating those teeth to allow maturation of roots both in length and width. Mineral trioxide aggregate (MTA) is considered a perfect dressing material for pulpotomy (both partial and complete) due to its bio computability and sealing property. We present a case that describes treatment and two years follow-up of a symptomatic immature first permanent molar with a deep carious lesion. For treatment, we started with anaesthesia and rubber dam isolation. After that, the carious lesion was removed, and we performed partial pulpotomy, then applied MTA-Angelos on the fresh wound. Moistened cotton then was lightly packed over MTA for 15 minutes to allow initial setting, followed by application of glass ionomer and final restoration with composite. The following day, the tooth was asymptomatic with the patient reporting pain relief. After three months follow-up, the tooth normally responds to thermal test. After 12 months, a periapical radiograph of the tooth showed root maturation, and after 24 months also, the tooth was clinically and radiographically successful. MTA partial pulpotomy should be considered in the treatment of symptomatic young permanent teeth.

Keywords

MTA-Angelus, mineral trioxide aggregate, partial pulpotomy, vital young permanent, apexogenesis, deep caries.

Open Peer Review

Approval Status

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1. Papimon Chompu-inwai , Chiang Mai University, Chiang Mai, Thailand 2. Hamdi Cem Güngör , Hacettepe University Faculty of Dentistry, Ankara, Turkey Marquette University School of Dentistry, Milwaukee, USA		

Any reports and responses or comments on the article can be found at the end of the article.

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Competing interests: No competing interests were disclosed.

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Introduction

Symptomatic young permanent first molar is a widespread event, since this is the first permanent tooth erupting in the oral cavity and parents may consider it replaceable as the rest of the child's baby teeth. The primary goal for treating those teeth is to maintain healthy pulp to allow the root to continue maturation both in length and width.

Partial pulpotomy is considered as promising modality for treatment of immature permanent teeth with carious pulp exposure. This technique consists of excavation of 2–3 mm inflamed coronal pulp tissue, and the remaining pulp is then capped with dressing material that maintains its viability and promotes healing. When comparing partial with cervical pulpotomy, partial pulpotomy preserves the cell-rich coronal pulp tissue, which is necessary for healing and the formation of dentin bridge in the coronal area. Cervical pulpotomy, on the contrary, removes all the coronal pulp, with an increased risk of cervical fracture due to the loss of physiologic dentin apposition¹.

In a previous study, partial pulpotomy gave a high clinical success rate (91–93%) in asymptomatic young permanent molars with deep caries^{1–3}. However, some case reports reveal that partial pulpotomy may have good prognosis also in symptomatic teeth⁴. In addition, a randomised clinical trial reported treating molars with irreversible pulpitis using partial pulpotomy, and the results were promising⁵.

Choice of capping materials or medicaments can have a massive influence on vital pulp therapy success. Mineral trioxide aggregate (MTA) is considered the gold standard of pulp dressing material. MTA provides a long-term seal, acceptable biocompatibility, and dentinal bridge formation⁶. Roberts *et al.* review in 2008 showed that MTA has excellent potential as a pulpotomy medicament, and can form hydroxyapatite when exposed to physiologic solutions⁷.

This case report presents the treatment of pulpitis in young permanent molar using MTA-Angelos partial pulpotomy.

Case report

Patient information and clinical findings

At our Paediatric Dentistry Clinic, Faculty of Dentistry, Cairo University, Egypt, an 8 year-old boy presented with acute provoked pain in the lower right posterior area that lingered after removal of stimulus, and the parent reported the child taking painkillers. No other medical or psychological problems that would affect the dental treatment were found.

Diagnostic assessment

Clinical and radiographic examinations showed caries in the lower right first permanent molar approaching the pulp. The molar showed incomplete root formation (Figure 1). The diagnosis was acute pulpitis at lower right first permanent molar. Partial pulpotomy was proposed to allow root formation.

Procedure

We began with the administration of inferior alveolar nerve block (Table 1, item 1), followed by isolation of the tooth using a

rubber dam (Table 1, item 2). Removal of caries using a suitable round carbide bur under a copious amount of water coolant was done, then spoon excavator was used to excavate pulp through the exposed part. To control bleeding, gentle flush to the wound with distilled water until bleeding was controlled was performed and a lightly packed cotton pellet was applied. MTA-Angelus (Table 1, item 3) was freshly mixed following manufacturer's directions immediately before being placed and condensed gently over wet cotton against the fresh pulp wound. Excess material was scraped off the application of moistened cotton for 15 minutes to allow initial setting⁸. Subsequently, a self-cure glass ionomer (Table 1, item 4) was applied as a base material at 2 mm thickness. Final restoration using composite was performed (Table 1, item 5)^{6,9}. A periapical radiograph was taken as a baseline record for comparison with follow-up appointments (Figure 2).

Follow-up and outcomes

On the following day, a postoperative phone call to the patient's parents revealed that the patient felt pain relief.

At one week follow-up, the tooth responded to thermal pulpal tests within reasonable limits. After three months, pulpal sensitivity test gave a normal reading, and clinical and radiographic examinations were normal. The patient continues to be

Figure 1. Preoperative radiograph showing deep, curious permanent first molar with blunder-bus open apex and no signs of a periapical lesion.

Table 1. Materials used in the process of partial pulpotomy used in a case of acute pulpitis.

1	Septodont, Scandonest® 2% L Mepivacaine HCl. 2% and Levonordefrin 1:20,000 Injection, USP
2	Roeko Flexi-Dam - Purple Non-Latex Coltène/Whaledent Ltd., UK
3	Industria de Produtos Odontofogicos Ltda, Londrina, Brazil
4	Riva Self Cure Capsules regular set, A2, and A3, SDI, Cologne Germany
5	Zhermack SpA - Via Bovazecchino, 100 45021 Badia Polesine (RO), Italy

followed up every three months with no complaints from the treated tooth for 12 months, and the root showed complete maturation (Figure 3). After that, the patient was lost to follow-up. Twenty-four months later the patient came back to the clinic for treatment of a different tooth, and a lower right first permanent molar examination showed clinical and radiographic success (Figure 4).

Discussion

Partial pulpotomy technique obtains good clinical outcomes with different capping materials^{4,5}. MTA is considered the gold standard for vital pulp therapy⁶. MTA has excellent sealing ability and biological properties that preserve the pulp viability

Figure 2. Radiograph immediately after partial pulpotomy procedure is taken as a baseline record.

Figure 3. Twelve months follow up radiograph showing root maturation.

Figure 4. Twenty-four months follow up radiograph showing normal periapical area and root.

in immature permanent teeth with irreversible pulpitis^{10,11}. Partial pulpotomy using MTA, as opposed to root canal therapy or apexification, is more conservative and allows root maturation both in length and width⁴, and this was observed in our case report.

Conclusions

MTA-Angelus partial pulpotomy appears to be a successful treatment for symptomatic immature permanent teeth with deep caries and vital pulps. However, we recommend conducting more clinical studies with a large sample size and longer follow-up period to validate our observations. Partial pulpotomy technique should also be tested in older ages with mature roots.

Consent

After the full explanation of the procedure, written informed consent was taken from the parent of the child.

The patient's mother gave written informed consent for the publication of this case report and any associated images.

Data availability

All data underlying the results are available as part of the article and no additional source data are required.

Grant information

The author(s) declared that no grants were involved in supporting this work.

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Hamdi Cem Güngör

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The authors report on the use partial pulpotomy procedure which they carried out on a symptomatic first permanent molars. As reported in the manuscript, the tooth presented symptoms of irreversible pulpitis which included acute provoked and lingering pain necessitating use of analgesics. This reviewer suggests major editing/revising on the manuscript in order to attain better readability.

Of the sections of the manuscript, case report and discussion require major revision:

- In case report section a detailed history of the case including examination, diagnosis, treatment and post-treatment could be presented.
- For the discussion section, I would recommend addition of recent literature on the use of partial pulpotomy for teeth with irreversible pulpitis. The authors should also shed more light by discussing the treatment carried out and its outcome for that specific tooth.
- "Partial pulpotomy technique should also be tested in older ages with mature roots." The sentence could be discarded from conclusion as it is irrelevant.
- Proper citation of reference #8 should be made.
- The manuscript could also highly benefit from a professional editing/revision service for better service to the readership.

Is the background of the case's history and progression described in sufficient detail?

No

Are enough details provided of any physical examination and diagnostic tests, treatment

given and outcomes?

No

Is sufficient discussion included of the importance of the findings and their relevance to future understanding of disease processes, diagnosis or treatment?

No

Is the case presented with sufficient detail to be useful for other practitioners?

No

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Pediatric dentistry, dental traumatic injuries, preventive dentistry, fissure sealants, vital pulp treatments for primary and permanent teeth

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Reviewer Report 18 November 2019

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Papimon Chompu-inwai

Division of Pediatric Dentistry, Chiang Mai University, Chiang Mai, Thailand

This case report report described success of partial pulpotomy with MTA-Angelus in irreversible pulpitis teeth of 8 years old child.

However, the background of the case's history, diagnostic tests, treatment given and outcomes were not described in sufficient detail.

- What kind of stimulus produce the pain in this patient? (cold water, sweet?)
- Was the pain lingering?
- What kind of pain killer did the child take? Did it help with the pain?
- Any sensibility tests (Cold or EPT test) was performed before treatment?
- These information will lead to the diagnosis of the tooth. The diagnosis should be consistent throughout (acute pulpitis vs irreversible pulpitis).

- The tooth should be diagnosed before prior to the treatment.
- What type of pulp exposure? Carious, mechanical?
- How big was the exposure type?
- How long did you control the bleeding?
- At three months, pulpal sensitivity test was the EPT test? Please specify.
- At 24 months, please be more specific of clinical and radiographic success.

Please address in discussion

- The histology of irreversible pulpitis that allows the success of partial pulpotomy.
- MTA should not be described as a "perfect" dressing material. It has both desired properties and drawbacks. Besides, biocompatibility and sealing ability, other good biological properties (antibacterial, induce reparative dentin formation, less inflammation compared to calcium hydroxide, etc.) should also be described. Drawbacks should also be described (long setting time, discoloration, poor strength in early phase, etc).
- Why did you choose to use glass ionomer on top of MTA?

There are several misspellings.

- carious not curious.
- blunderbuss not blunder-bus.
- biocompatibility not bio computability.
- MTA-Angelus not Angelos.

References

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Is the background of the case's history and progression described in sufficient detail?

Partly

Are enough details provided of any physical examination and diagnostic tests, treatment given and outcomes?

Partly

Is sufficient discussion included of the importance of the findings and their relevance to future understanding of disease processes, diagnosis or treatment?

Partly

Is the case presented with sufficient detail to be useful for other practitioners?

Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Vital pulp therapy.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

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