

Case Report Of Complete Pulpotomy In Maxillary Second Premolar In Dental Practice In A 15 Year Old Patient.

Champilomati Athanasia, Kosidou Georgia

1: General Dentist, 2: Endodontist

Thessaloniki, Greece

Abstract

The goal of this case report is to evaluate the outcomes of complete pulpotomy with mineral trioxide aggregate (MTA) in maxillary second premolar (#25). Clinically and radiographically a large carious lesion was visible under a resin restoration in the disto-occlusal area of the tooth without pulp involvement. The tooth presented the classic symptomatology and signs of reversible pulpitis. The intraoral radiograph also showed no alterations in the periapical area, no clinical and radiographic evidence of pulp degeneration, swelling or sinus tract, internal resorption, absorptions and no periapical bone destruction. During the percussion test no discomfort was noted, and the patient didn't report night pain. Cold test was performed, using Endo ice refrigerant spray (Coltene) and showed no sign of pain after removal of stimulus. Caries and coronal inflamed pulp were removed with the use of a round-/large slow speed bur and bleeding was controlled with 2.5% of sodium hypochlorite. Later, the tooth was restored with GIC resin modified and progress of the tooth was radiographically followed up for 6 months, 1 year and then 2 years, where no periapical alterations or pain were noted.

Keywords: Complete pulpotomy, Mineral Trioxide Aggregate (MTA), Maxillary second premolar (#25), Reversible pulpitis diagnosis, Coronal pulp amputation, Vital pulp preservation, Vital Pulp Therapy, Immature Permanent Teeth, Pulp Vitality Testing.

Date of Submission: 07-12-2024

Date of Acceptance: 17-12-2024

I. Introduction

Pulpotomy is the surgical removal of the coronal portion of vital pulp tissue. A biologically acceptable material is placed in the pulp chamber, and the tooth is restored¹. The primary goal of pulp therapy is to maintain the integrity and health of teeth and their supporting tissues while maintaining the vitality of the radicular pulp of a tooth affected by caries, traumatic injury, or other causes. Especially in young permanent teeth with immature roots, the pulp is integral to continue apexogenesis. Long term retention of a permanent tooth requires a root with a favorable crown/root ratio and dentinal walls that are thick enough to withstand normal function. Therefore, pulp preservation is a primary goal for treatment of the young permanent dentition². Several studies have been carried out to assess MTA's biocompatibility by monitoring numerous parameters including viability and proliferation utilizing various cell types in direct or indirect contact with MTA. It has been shown that MTA has strong biocompatibility³, great sealing ability⁴, and encouragement of pulpal tissue repair, which in our case was needed.

II. Indications And Contraindications

Long term retention of a permanent tooth requires a root with a favorable crown/root ratio and dentinal walls that are thick enough to withstand normal function. Therefore, pulp preservation is a primary goal for treatment of the young permanent dentition. The indications, objectives, and type of pulp therapy are based on the health status of the pulp tissue which is classified as: normal pulp (symptom free and normally responsive to vitality testing), reversible pulpitis (pulp is capable of healing), symptomatic or asymptomatic irreversible pulpitis (vital inflamed pulp is incapable of healing), or necrotic pulp. The clinical diagnosis derived from:

1. a comprehensive medical history.
 2. a review of past and present dental history and treatment, including current symptoms and chief complaint.
 3. a subjective evaluation of the area associated with the current symptoms/chief complaint by questioning the patient/parent on the location, intensity, duration, stimulus, relief, and spontaneity.
 4. an objective extraoral examination as well as examination of the intraoral soft and hard tissues.
 5. if obtainable, radiograph(s) to diagnose periapical or periradicular changes.
 6. clinical tests such as palpation, percussion, and mobility; however, electric pulp and thermal tests are unreliable in immature permanent and primary teeth⁵.
-

Indication for permanent tooth pulpotomy :

- 1) Tooth has no history of spontaneous pain
- 2) Tooth has no discomfort to percussion, no vestibular swelling and no mobility
- 3) Radiographic examination shows normal appearance of periodontal attachment
- 4) Pulp is exposed during caries removal or subsequent to recent trauma
- 5) Tissue appears vital
- 6) Bleeding from the pulp exposure stops with isotonic saline irrigation within 3 minutes⁶

Contraindications for permanent tooth pulpotomy:

- 1) Persistent toothache
- 2) Tenderness on percussion
- 3) Root resorption more than 1/3rd of root length
- 4) Large carious lesion with non-restorable crown
- 5) Highly viscous, sluggish hemorrhage from canal orifice, which is uncontrollable
- 6) Medical contradictions like heart disease, immunocompromised patient
- 7) Swelling or fistula
- 8) External or internal resorption
- 9) Pathological mobility
- 10) Calcification of pulp⁷.

III. Case Presentation And Discussion

A 15 year old patient, at the time, came into the dental practice reporting spontaneous, short lasting and incidental pain, with long remissions. Provoked pain lasted less than 1 minute, there was not any abscesses or fistula and no periapical radiolucencies. Before anything else, the medical history of the patient was reviewed. He had normal development for his age, he had no underlying medical conditions or allergies and he was not under any medications. We have to highlight that the patient was young in age so we had to choose a treatment option that is suitable for reversible pulpitis and to preserve some vitality of the tooth for as long as possible. This is because at least $\frac{2}{3}$ of root length was still present to ensure reasonable functional life. Firstly local anesthesia was injected and then a rubber dam was placed to ensure an aseptic working area. The local anesthetic that it was used had no adrenaline in it and this is because adrenaline causes hemostasis due to its vasoconstrictive action. This can change the bleeding duration after the removal of tectum pulpa and it can cause shorter duration of bleeding, thus changing the outcome of the diagnosis. After that, we started the cavity preparation by removing firstly the defective restoration and after that, all carious tissue from the surrounding walls. Due to mechanical exposure of the pulp we continued moving lastly in pulpal direction, in order not to push any carious fragments into the pulp. Then, tectum pulpa was excised and crown pulp was amputated with the use of a round sterile bur and a turbine with water cooling, entering 1mm into the orifices. Traumatic exposures are capable of causing pulp contamination by saliva and oral bacteria, as the period of time between the initial exposure and treatment increases, pulp removal must be extended apically to make sure that the remaining pulp is completely uncontaminated⁸.

The wound surface was washed with saline solution, to remove any potential carious tissue fragments and bleeding duration was monitored, which didn't last more than 2 minutes. After the pulp was amputated, the pulp chamber was irrigated with sodium hypochlorite solution. Following irrigation, sterile, saline-wetted cotton pellets were applied for 5 minutes on the amputated pulp stumps to achieve hemostasis. Later, the wound surface in the entrance of the orifices of the root canal was covered by a layer of premixed Mineral Trioxide Aggregate paste (NeoPUTTY™ by Avalon Biomed), that was gently pressed and after that covered by a temporary glass ionomer cement in a very careful manner, in order not to occur any bacterial microleakage from the oral environment. The follow up of this procedure included radiographic monitoring, for the observation of the later formation of a fibrous calcified barrier under the wound surface, secondary to reassure the integrity of the root and its surroundings and lastly, to monitor the formation of calcifications. The first radiographic monitoring was made after 3 months, the second one after 6 and the third one after 1 year, no radiolucencies or other alterations were found. EPT was also performed at the first reevaluation of the patient in order to check the pulp vitality.

Extensively, carious permanent premolars and molars with pulp involvement amongst children and adolescents are not uncommon. Therefore, immature permanent premolars and molars may require more advanced and complex treatment at a young age. In these cases, it may be important to establish whether vital pulp therapy procedures can benefit these cariously involved permanent teeth. The advantages for permanent teeth pulpotomy in children include the following: (i) elimination of pain and infection, (ii) preservation of a grossly decayed and cariously exposed tooth, and (iii) the procedure is less demanding clinically, is inexpensive compared to RCT and is better tolerated by a child patient⁹. The treatment can be considered successful when the biological functions of the radicular pulp are restored and the vitality of the radicular pulp is preserved. The root has to

continue its completion and closure of the apex. Also, in the area of the wound surface a fibrous bridge should be formed and later turned into a calcified bridge. In this case, the age of the patient is a favorable factor as for the positive outcome of this kind of therapy and this is because younger patients' pulps, generally under 20 years of age, have greater blood supply and cellularity¹⁰.



Figure A: Preoperative Radiograph Shows Carious Tooth #25 Involving Pulp.



Figure B: Periapical Radiograph Shows Direct Placement Of MTA On Tooth #25 And Temporary Restoration With GIC.



Figure C: Periapical Radiograph Shows Tooth #25 Now With Permanent Restoration And Without Any Periapical Or Other Alterations.

IV. Conclusions

A pulpotomy is defined as “the removal of the coronal portion of the vital pulp as a mean of preserving the vitality of the remaining radicular portion”. Coronal pulpotomy is the treatment indicated in immature teeth with coronal pulp inflammation more than 4mm. The primary objective of pulpotomy is to preserve radicular pulpal tissues that may help to complete apexogenesis in immature permanent teeth. According to American Academy of Pediatric Dentistry (AAPD) guidelines “A pulpotomy is performed in a tooth with extensive caries without evidence of radicular pathology when caries removal results in a carious or mechanical pulp exposure”¹¹. Taha et al. reported the success rates of 100% in one year and 92.7% at three years in their study with regard to outcome of MTA pulpotomy in mature permanent teeth in which pulp was exposed due to caries. If tissue removal during partial or full pulpotomy is extended to a level where the underlying tissue is not inflamed or is reversibly inflamed, the remaining pulp is capable of recovery following appropriate wound dressing and tooth restoration¹⁰.

References

- [1] American Association Of Endodontists. Guide To Clinical Endodontics. 6th Ed. Chicago, Ill.: American Association Of Endodontists; 2013. Available At: “<https://www.aae.org/specialty/clinical-resources/guide-clinical-endodontics/>”. Accessed August 3, 2020.
- [2] American Academy Of Pediatric Dentistry. Pulp Therapy For Primary And Immature Permanent Teeth. The Reference Manual Of Pediatric Dentistry. Chicago, Ill.: American Academy Of Pediatric Dentistry; 2023:457-65.
- [3] Asgary S, Eghbal MJ (2010) A Clinical Trial Of Pulpotomy Vs. Root Canal Therapy Of Mature Molars. Journal Of Dental Research 89, 1080–5.
- [4] Agrawabi J (2000) Sealing Ability Of Amalgam, Super EBA Cement, And MTA When Used As Retrograde Filling Materials. British Dental Journal 188, 266–8.
- [5] American Academy Of Pediatric Dentistry. Pulp Therapy For Primary And Immature Permanent Teeth. The Reference Manual Of Pediatric Dentistry. Chicago, Ill.: American Academy Of Pediatric Dentistry; 2024:466-74.
- [6] Pulpotomy In Mature Permanent Teeth - Part II - F.Shabani. Style Italiano Endodontics. 12/01/2023
- [7] Pedodontics. Forth Stage. Aseel H. Al-Assadi. Baghdad College Of Dentistry 13/5/2020
- [8] Shafaroudi, A. And Hali, H. (2018). Case Report Mineral Trioxide Aggregate (MTA) As A Pulpotomy Agent In Developing Permanent Teeth: A Case Report. Int J Med Invest, [Online] (4), Pp.68–72. Available At: <https://intjmi.com/article-1-354-fa.pdf> [Accessed 27 Oct. 2024].
- [9] Qudeimat, M.A., Alyahya, A., Hasan, A.A. And Barrieshi-Nusair, K.M. (2016). Mineral Trioxide Aggregate Pulpotomy For Permanent Molars With Clinical Signs Indicative Of Irreversible Pulpitis: A Preliminary Study. International Endodontic Journal, 50(2), Pp.126–134. Doi:<https://doi.org/10.1111/iej.12614>.
- [10] Duncan, H.F., El-Karim, I., Dummer, P.M.H., Whitworth, J. And Nagendrababu, V. (2022). Factors That Influence The Outcome Of Pulpotomy In Permanent Teeth. International Endodontic Journal. Doi:<https://doi.org/10.1111/iej.13866>.
- [11] Sadaf, D. (2020). Success Of Coronal Pulpotomy In Permanent Teeth With Irreversible Pulpitis: An Evidence-Based Review. Cureus. Doi:<https://doi.org/10.7759/cureus.6747>.