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### Induction of Reparative Dentin Following Pulpotomy with Mineral Tri Oxide Aggregate (MTA) One Week Follow up visit: A Case Report

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#### Abstract

This study examines whether pulpotomy with mineral trioxide aggregate could induce reparative dentin formation without eliciting adverse side effects in pulpotomy of premolar teeth, *in vivo*. Non-carious lower left first premolar tooth was used for pulpotomy with Mineral Trioxide Aggregate (MTA), and the induction of reparative dentin was assessed after one week of extraction. Following mouth preparation of patient, a round shape cavity (diameter: 2 mm) were prepared on the occlusal surface to expose the pulp by using a flat end fissure bur with a high-speed hand piece under sufficient cooling arrangement. Following control of bleeding with sterile cotton pellets, the exposed pulp tissue was covered with Mineral Tri Oxide Aggregate (MTA) according to manufacturer's recommendations. At 1

week, tooth was extracted under local anesthesia and fixed in cold 4% neutral buffered formaldehyde for 24 hours. The specimen was dematerialized and embedded in paraffin. After longitudinal serial sectioning (6 $\mu$ m), every section was stained with haematoxylin and eosin. Series of sections containing pulp tissue was observed by a blinded observer in a light microscope equipped with a digital camera and computer for histometry. The amount of new hard tissue formed was assessed from experimental tooth. The area covered by newly formed hard tissue in these sections was measured by using digital, histometry equipment. It was found that the thickness of reparative dentin formation is  $1.2 \pm 0.2\mu$ m and completely covers the exposed pulp tissue. There is no pulpal inflammation at 7 weeks.

**Keywords:** Vital Tooth, Pulpotomy, Mineral Tri Oxide Aggregate, Reparative Dentin Formation

#### Introduction

A frequent treatment for asymptomatic cariously exposed pulp without involvement of the radicular section is pulpotomy, which helps to prevent the tooth from being lost too soon<sup>[1]</sup>. A reliable diagnosis of the inflamed tooth pulp is essential for a successful pulpotomy procedure, as is the selection of a medicine that is both efficient and biocompatible<sup>[2-3]</sup>. The perfect capping substance should be non-toxic to surrounding tissues and cells, bactericidal, aid in the healing of pulp tissue, and not obstruct normal root resorption<sup>[4-6]</sup>.

MTA, which is made up of fine hydrophilic powder, can be applied to the tooth pulp or periradicular tissues to support repair and preserve pulp vitality<sup>[1-3]</sup>. MTA causes pulp canal obliteration or radicular stenosis in root canals by encouraging the active

deposition of mineralized tissue [2-5]. Pulpotomy is regarded as a low-cost procedure with undeniable societal value, therefore MTA's high cost is a notable inconvenience even if it has high clinical, radiographic, and histological success rates [6-7]. This is why different treatments have been looked into to find an inexpensive pulp capping material that works just as well as MTA. Therefore, the current study's goal was to assess the histological results from lower left first premolar tooth subjected to pulpotomy with MTA.

#### Case Report:

A 15-year-old patient came to the department of Orthodontics, with the chief complaint of aesthetic. On extra oral examination no abnormalities were detected. On Intra oral examination revealed proclination of upper anterior segment of jaw. No swelling was present and no pain on palpation and percussion. On vitality test tooth is vital. On radiographic examination no abnormal periapical pathosis were detected. He needs extraction of his four upper and lower first premolar teeth for correction of aesthetic. For aesthetic correction he needs of his four first premolar teeth. For our study purpose, intentionally pulpotomy was done with Mineral Tri Oxide Aggregate (MTA) to see the amount of reparative dentin formation which covers the exposed pulp tissue.

#### Treatment Procedure:

Lower left first premolar tooth was used for Mineral Trioxide Aggregate (MTA) pulpotomy and then histological investigation was performed after one week for assessing the reparative dentin formation. After mouth preparation of each patient, a round shape cavity (diameter: 2 mm) were prepared on the occlusal surface to expose the pulp by using a flat end fissure bur (Shofu Dental Corporation, Japan) with a high-speed hand piece under sufficient cooling arrangement. Following control of bleeding with sterile cotton pellets, the exposed pulp tissue was covered with, Mineral Tri Oxide Aggregate (MTA) according to manufacturer's recommendations. The test material was applied after the cavity preparation and pulpotomy has been performed.

#### Assessment:

##### Qualitative analysis:

At 1 week after pulpotomy, tooth was extracted under local anesthesia and fixed in cold 4% neutral buffered formaldehyde for 24 hours. The specimen was dematerialized and embedded in paraffin. After longitudinal serial sectioning (6 $\mu$ m), every section was stained with haematoxylin and eosin. Series of sections containing pulp tissue was observed by a blinded observer in a light microscope equipped with a digital camera and computer for histometry.

##### Quantitative analysis of new hard tissues:

The amount of new hard tissue formed was assessed from experimental tooth. The area covered by newly formed hard tissue in these sections was measured by using digital, histometry equipment.

#### Result

The histological sections of MTA showed no inflammation in the entire extension of the root canal and the presence of stenosis and dentin barrier formation. Thickness of reparative dentin formation is  $1.2 \pm 0.2 \mu\text{m}$  and completely

covers the exposed pulp tissue. The healing of pulp was satisfactory with without affecting the normal function of the remaining pulp.



Fig 1: Mineral Trioxide Aggregate (MTA)

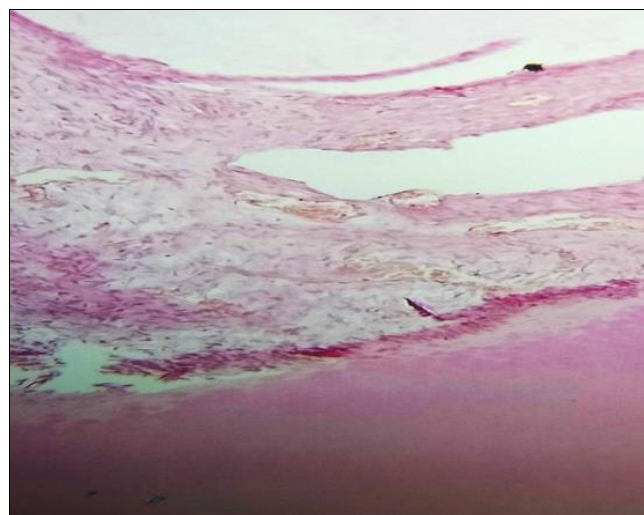


Fig 2: Histology of reparative dentin

#### Discussion

The histological sections of the MTA revealed stenosis, dentin barrier development, and the absence of inflammation along the root canal's extension. In contrast to our findings, Agamy *et al* [8], examined the pulp response to white and gray MTA and discovered a firm tissue barrier in both groups. It is worth mentioning that the pattern of necrotic and subjacent inflammatory layers is comparable to that found in teeth treated with formocresol, but without the undesirable features of carcinogenicity and risk of causing enamel defects and abnormal root development of the permanent successor [9].

Although some authors showed incomplete hard tissue barrier formation [10], our findings show that the use of MTA pulpotomy can provide a favorable pulp tissue response. However, the lack of control over the tooth extraction period results in the difficulty to obtaining the histological slides [11]. Even though our results are encouraging, the number of teeth assessed histologically was obviously small and cannot be extrapolated to general population. Further long-term follow-up studies are needed to evaluate the histological reaction of the dental pulp mainly to MTA. Based on this study, MTA are effective for pulpotomy of tooth.

## Conclusion

Mineral Tri Oxide Aggregate (MTA) are capable to induce pulpal wound healing and reparative formation in the exposed teeth without affecting the normal function of the remaining pulp. More study was need for conclusive result.

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