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# APEXIFICATION OF TRAUMATIZED PERMANENT LOWER LATERAL INCISOR WITH NON-VITAL PULP USING MTA BARRIER- A CASE REPORT

Dentistry

**Mohit Zarekar*** MDS, Paedodontics & Preventive Dentistry, Private practice, Maharashtra, India. *Corresponding Author

**Apurva Satpute** BDS, PG Resident, Dept of Conservative Dentistry & Endodontics, Govt. Dental College & Hospital, Aurangabad.

**Mohini Zarekar** BDS, Masters Student, Institute of Tropical Medicine, Charité Universitätsmedizin Berlin, Germany.

## ABSTRACT

This report presents a clinical case with a 25-year-old male patient with a permanent mandibular lateral incisor that has a history of trauma and a nonvital pulp. The therapeutic approach encompasses apexification utilising mineral trioxide aggregate (MTA) and endodontic therapy via gutta percha obturation. Endodontic problems may arise as a consequence of traumatic dental injuries occurring during the time of root formation. The standard approach of apexification, which involves the use of calcium hydroxide, presents some limitations, including the requirement for prolonged treatment duration in order to facilitate the creation of a barrier. MTA was chosen for apexification because of its superior sealing ability, biocompatibility, antimicrobial activity, solubility, dimensional stability and tolerance to moisture over other dental materials. The major goal of treating a non-vital tooth with an open apex is to first eliminate microorganisms, followed by thoroughly disinfecting the root canal system and promoting apical closure in order to provide favourable conditions. The objective of this study was to document the effective apexification procedure performed on a non-vital lateral incisor with open apices, utilising mineral trioxide aggregate (MTA) as the root end filling material.

## KEYWORDS

Apexification, MTA barrier, Open apex, lower lateral incisor

## INTRODUCTION:

The management of permanent teeth with an open apex has posed significant challenges for clinicians and researchers for an extended period of time. Regenerative endodontics has emerged as a novel approach for the treatment of immature and diseased root canals. This procedure has gained significant attention and is known to promote apexogenesis, leading to apical closure when appropriately recommended.[1] The process of root formation is initiated through the stimulation and differentiation of Hertwig's epithelial root sheath (HERS), which results in the continuous deposition of dentin and cementum. The interruption and arrest of root development can occur due to trauma or infection, resulting in interference with the normal growth process. This can manifest as a thin and fragile dentinal wall and the absence of natural apical constriction. These conditions can pose several technical challenges for clinicians when performing root canal therapy.[1,2] The process of biomechanical preparation becomes challenging in cases where cleaning and shaping are involved, and the effectiveness of 3D obturation becomes uncertain when a suitable apical stop or barrier is not present.[2] Apexification with calcium hydroxide, which was the most accepted method, has certain drawbacks, such as the need for long-term therapy to enable barrier formation.[3]

The utilisation of MTA for the management of open apex instances has been acknowledged as a highly efficacious therapeutic modality for nonvital immature permanent teeth.[4] Usage of MTA apexification in the restoration of an immature tooth aims to enhance the structural integrity of the root, hence preserving the tooth's functionality. [6]

Numerous researches have been conducted to investigate the efficacy of MTA in the context of one visit apexification procedures. MTA has garnered significant attention because to its notable attributes, including biocompatibility, antibacterial capabilities, exceptional sealing capacity, and potential for periapical tissue regeneration.[5,6] There is a scarcity of case reports in the existing literature pertaining to the practise of MTA apexification in fully developed permanent anterior teeth. This case report illustrates the effective utilisation MTA in the establishment of an apical barrier in a permanent lower lateral incisor.

**Case Report**: -

A 25-year-old male presented with a chief complaint of pain and mobility of the lower anterior tooth for a duration of four weeks. Approximately 16 years ago, he substantiated the existence of a historical trauma. The patient had no recollection of any prior instances of edoema or purulent exudate. The medical and dental history exhibited no complications. The intraoral examination of hard tissues identified tooth no. #32 exhibiting discolouration, grade I movement, and the absence of teeth 31 and 41. The percussion examination demonstrated soreness at the tooth #32. A comprehensive radiographic assessment of the tooth demonstrated a wide canal, with an open apex and a notable radiolucency in the periapical region (Fig.1). Conclusively, the development of the tooth had been interrupted by the trauma occurred years ago. Based on the history, radiographic and clinical findings, a provisional diagnosis of acute onset of chronic periapical abscess was made. The available treatment options were discussed and informed consent was obtained from the patient. Root canal therapy with calcium hydroxide dressing, followed by apexification with MTA was selected.

After injecting 1 ml of local anaesthesia containing 40mg articaine hydrochloride and 0.005 mg epinephrine (Septanest, Septodont, Saint-Maur-des-Fossés, France) and isolation with a rubber dam, access gained. Accessible pulpal remnants were removed using barbed broaches. Apex locator produced inconsistent canal length reading so a check radiograph was used to confirm the actual working length (Fig.2). Minimum instrumentation using hand files was done under irrigation using 2.5% NaOCl and saline. A calcium hydroxide paste (ApexCal , Ivoclar Vivadent) was placed into the apical portion of canal with a lentulo spiral as intracanal medication Access cavity was closed with a cotton pellet and a temporary cement Cavit (3M ESPE, Seefeld, Germany). Patient was scheduled for next visit after 2 weeks.

In the next session after 2 weeks it was observed that the tooth was completely asymptomatic during the postoperative period and the temporary filling was intact. After administration of local anesthesia and isolation with rubber dam, temporary cement and cotton pellet was removed from access cavity. A copious amount of 2.5% sodium hypochlorite ultrasound activated irrigation with negative apical pressure by using EndoVac system used to remove CH paste from the canal. A final rinse of 17% EDTA for 1 minute was performed. Canal was dried using a paper point. MTA was mixed according to manufacturer's instruction and carried into canal using mta carrier and condensed with hand pluggers to form an apical plug and confirmed radiographically (Fig.3). A sterile cotton pellet moistened with sterile water was placed over the canal orifice and the access cavity was sealed with Cavit (3M ESPE, Seefeld, Germany). After 72 h, the hard set of MTA was confirmed and the remainder of the root canal was obturated with thermoplasticised gutta-percha (Obtura III MAX, Obtura Corporation) (Fig.4). The access cavity was then restored with composite. After 2 weeks, the patient was recalled for his aesthetic rehabilitation as discoloration of crown was evident. Patient was recalled after 3 months for follow up (Fig.5) which showed disappearance of clinical and periodontal signs justifies use of MTA as an apexification material.

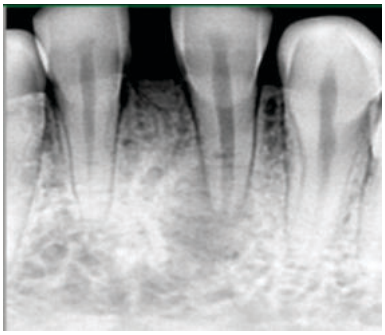

**Fig.1. Preoperative radiograph**

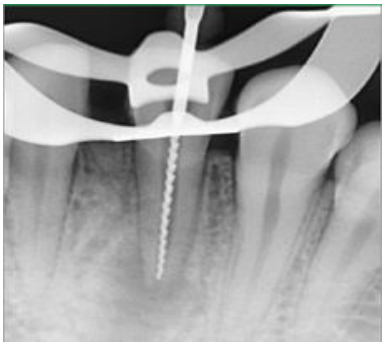

**Fig.2. Working length measurements**

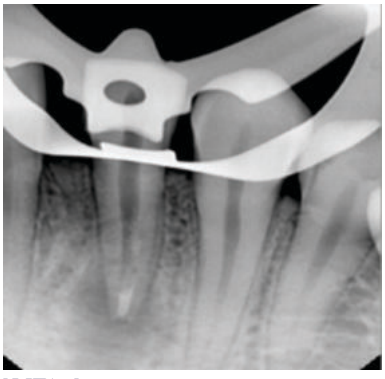

**Fig.3. Apical MTA plug**

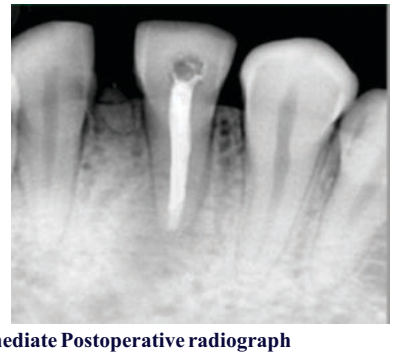

**Fig.4. Immediate Postoperative radiograph**

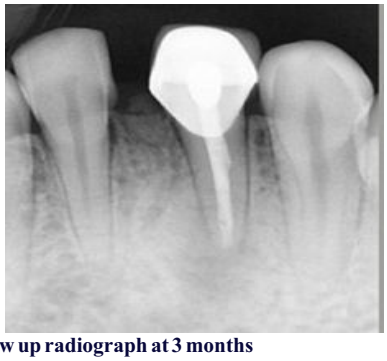

**Fig.5. Follow up radiograph at 3 months**

## DISCUSSION:

Numerous prior studies have demonstrated the efficacy of calcium hydroxide in achieving favourable outcomes for immature permanent teeth. However, it is important to acknowledge the potential drawback associated with employing calcium hydroxide for apexification, namely the prolonged treatment duration, which may expose patients to the risk of complications during the interim period.[5]. Calcium hydroxide (Ca(OH)2) is frequently used in the treatment of immature teeth owing to its elevated pH and potent antibacterial properties. Nevertheless, while the use of calcium hydroxide during apexification does result in the closure of the apex, it does not promote an increase in the thickness of the entire root dentin.[5,1]

Hence, employing advanced materials would be appropriate in this particular context. Numerous investigations have demonstrated that MTA exhibits favourable sealing abilities, biocompatibility, and a reduced requirement for multiple treatment sessions. Several studies have provided evidence indicating that mineral trioxide aggregate (MTA) exhibits the capacity to induce odontoblastic differentiation. Moreover, the MTA material demonstrates favourable attributes like a high degree of radiopacity, poor solubility, raised pH levels, and outstanding antibacterial activities. Therefore, it can be concluded that MTA is a highly effective material that is suitable for the aim of root end filling.[7]

The study conducted by Pradhan et al demonstrated that the treatment of open apex cases using hand filing in combination with either MTA or calcium hydroxide resulted in an average time of $3 \pm 2.9$ months or $7 \pm 2.9$ months, respectively, for the formation of the apical hard tissue barrier.[8] Furthermore El-Meligy and Avery demonstrated that open apex managed by hand filing plus MTA or calcium hydroxide needed nearly 12 months to form a hard tissue apical barrier and two cases failed treated by calcium hydroxide. In the current case reports, the placement and condensation of MTA were performed manually using pluggers. Certain publications have suggested the use of a pre-existing apical membrane as a suitable surface for the condensation of mineral trioxide aggregate (MTA). However, it is important to note that this particular technique was not employed in the current investigation. Following the placement of MTA, a radiographic evaluation was promptly performed. In a randomised clinical research conducted by Eric Bonte and colleagues, a comparison was made between the use of mineral trioxide aggregate (MTA) and calcium hydroxide (Ca (OH)2) in the apexification treatment of non-vital immature permanent teeth. The findings of this study revealed that, upon assessment at the 12-month mark, the group treated with MTA had superior outcomes in relation to apical closure.[9,10]

## CONCLUSION:

In the context of the present case report, it was seen that following MTA apexification, there was a rapid resolution of clinical manifestations, particularly pain and tenderness upon percussion, within a period of two weeks post-treatment. It is important to note that these findings are subject to the constraints of the study. The absence of periodontal indicators during the 3-month follow-up appointment provides justification for the selection of mineral trioxide aggregate (MTA) as the material for root end filling.

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