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Management of Ellis Class III fracture using a novel approach- a case report

Running title : Management of Ellis Class III fracture with MTA

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ABSTRACT:
This case report describes the successful use of Mineral Trioxide Aggregate (MTA) for apexification in a 10-year-old patient with a fractured maxillary central incisor and an immature apex. Traditional calcium hydroxide (Ca(OH)2) treatment has limitations, but MTA offers advantages including biocompatibility, strong apical seal, and stimulation of tissue regeneration.Following trauma, the patient presented with pain, a fractured crown, and radiographic signs of apical periodontitis. Treatment involved splinting, MTA apexification, and permanent restoration. MTA demonstrated efficacy in inducing a calcified barrier and facilitating root development. This case highlights MTA as a viable alternative to $Ca(OH)_2$ for apexification in immature teeth with necrotic pulp.
Key-words: Apexification, Mineral trioxide aggregate, Splint, Gutta- Percha
Key Messages: MTA apexification is a dental procedure to stimulate a calcified barrier in immature teeth with open apices and necrotic pulp. It promotes continued root end development. Compared to traditional methods, MTA offers better sealing, faster treatment, andincreased patient comfort.

I. INTRODUCTION:

Anterior crown fracturesimpact childrendue to its position and eruption pattern [1]. Without swift treatment of teeth withopen apex,one can notice short roots, thin dentin walls, aberrant crown-to-root ratio, mobility, and obturation difficulties[2]. Apexification is done to induce a calcified barrier and promote root end development [3]. Mineral trioxide aggregate (MTA) is a viable substitute to $Ca(OH)_2$ as its biocompatible, has strong canal sealing ability, and capacity to stimulate the regeneration of dental pulp and periradicular tissue[4,5,6].This case report uses MTA in the treatment of a fractured crown with an immature apex.

A ten-year-old patient had reported to the department with a grievance of pain in the upper front tooth region for the past two days. Dental history suggested a dental trauma event which occurred one month back due to a fall from bed. Medical history was insignificant. Clinical and radiographic examination (Figure 1) disclosed fracture of the maxillary right central incisor. There was Grade 2 mobility seen with respect to 11. No sensitivity/pain on palpation and percussion test was present. Pulp sensibility tests revealed a positive response. Only hard tissue injury of coronal tooth fracture was observed. An intraoral periapical radiograph was taken, revealing coronal fracture involving the enamel, dentin, and pulp along with radiolucency in the peri radicular area and widening of the periodontal ligament space and loss of lamina dura with respect to the upper right central incisor. Based on clinical and radiographic a diagnosis of Ellis Class III fracture with apical periodontitis was made. The treatment included splinting of 13,12,11,21,22,23 using a 21G stainless steel wire and composite splint followed by MTA apexification of 11 with tailor made gutta percha obturation.

Access opening was done under rubber dam isolation, working length determined and

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necrotic pulp tissue was removed. Shaping was done using 80 size K file (Mani Tochigi, Japan). Debridement was done using 2.5% sodium hypochlorite and saline. Calcium hydroxide with iodoform (Metapex, META Biomed Co. Ltd., Korea) was placed in the root canal and patient was recalled after 15 days. The root canal was re-entered, instrumented, irrigated, and dried in subsequent appointment. MTA putty (Kids-e-dental LLP, Andheri West, Mumbai, India) was carried to the canal with an MTA carrier (GDC MTA Carrier, GDC Fine Crafted Dental Pvt. Ltd. Hoshiarpur, Punjab, India). MTA plugger and microfibre brush was used to push the material into the canal space. A 4 mm-long apical plug was inserted and radiographically corroborated. A wet cotton pellet was placed into the canal to facilitate setting. Tailor-made gutta-percha points was made to roughly match the dimensions of the canal to be filled radiographically checked to ensure proper fit. The remaining canal was sealed using this and zinc oxide eugenol sealer. Permanent restoration with glass ionomer cement and composite was done and crown was delivered.

Intraoral images

(Figure 1)

Maxillary arch

Mandibular arch

Frontal

Left lateral

Right lateral

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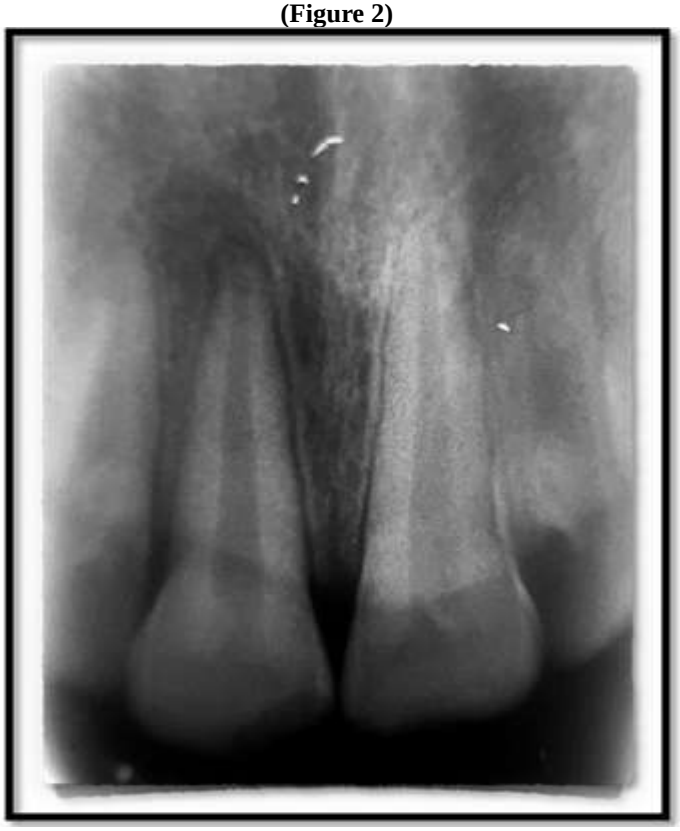
Investigation (IOPAR)

(Figure 2)



Intraoral images
Treatment done - Splinting

(Figure 3)

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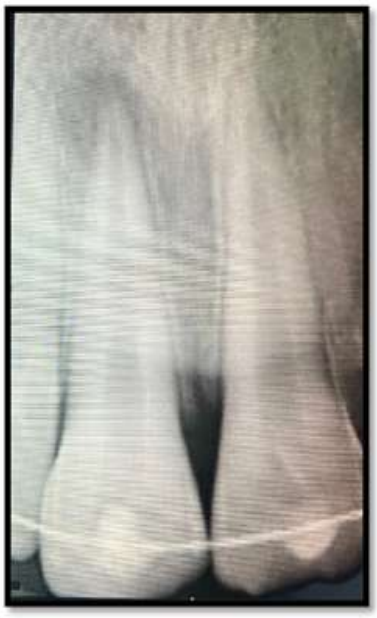
Apexification

(Figure 4)



Post splinting radiograph

Calcium hydroxide intra canal medicament

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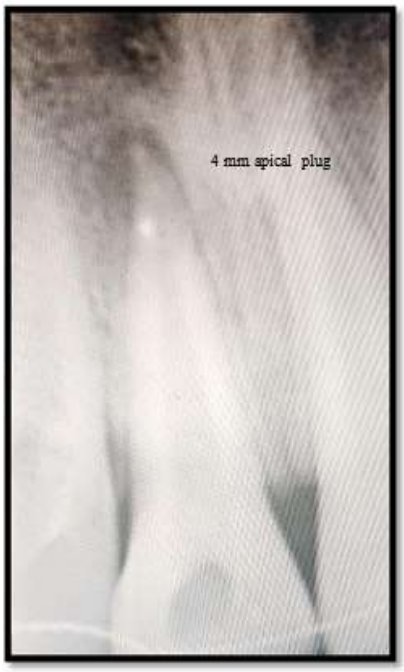
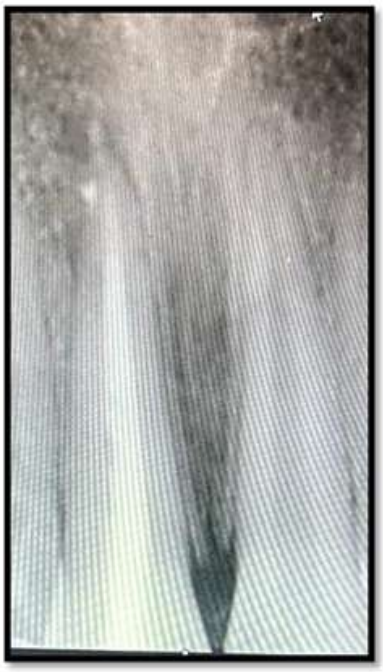
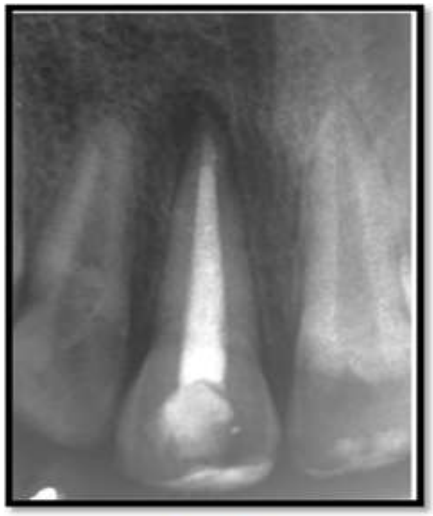


MTA Apical plug



Immediate post obturation radiograph



1-week follow up

15 days follow up

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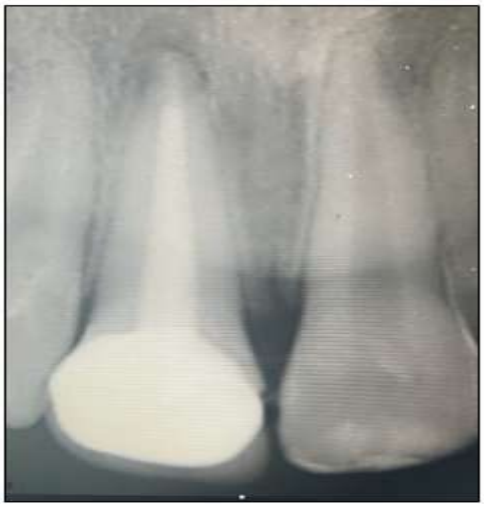

1- month follow up

Post op

II. DISCUSSION:

According to the International Association of Dental Traumatology (IADT), one in two children suffer dental injuries [7]. The interruption of root development and apical closure is caused by pulp necrosis in young permanent teeth is seen in such cases. To accomplish permanent root canal filling, apexification must be employed to build a calcific barrier at the apical end [8].

Apexogenesis or apexification are the two viable strategies, depending on the vitality of the damaged pulp [9]. Apexification is defined as 'a method to induce a calcified barrier in a root with an open apex or the continued apical development of an incomplete root in teeth with necrotic pulp'[10].It is an optimal endodontic treatment for immature teeth with a necrotic pulp where the root dentinal walls are already thick enough to resist a fracture [11].

While Ca $(OH)_2$ was used traditionally, it caused reinfection due to unpredictable apical closure, prolonged times for barrier formation, and difficulties with patient compliance [12,13]. MTA is a hydrophilic cement that sets in presence of moisture [14]. The hermetic seal created by MTA is strengthened when exudates, blood, or tissue fluid are present [15]. It is widely accepted that the resolution of periapical infection depends on an optimal seal from the oral environment [16]. The antibacterial activity of MTA is believed to stem from its alkaline pH of 12.5, which stays the same even after setting. [17].

MTA apexification was chosen as the treatment modality as the pulp was necrotic and incapable to producing viable cells for root end development [18,19,20]. Using MTA for apexification might improve patient compliance, minimize treatment duration, and produce better results [21]. Unlike Ca $(OH)_2$, this material has very low solubility and maintains its physical integrity after placement.

III. CONCLUSION-

MTA has a wide spectrum of uses, from pulpotomy to apexification. MTA offers several benefits, such as fewer visits, optimum apical seal

formation, and superior biocompatibility. MTA sets in the presence of moisture and does not require a moisture free environment. Therefore, MTA apexification may be a practical and successful course of therapy for open apices.

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