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A novel technique for intraradicular rehabilitation using MTA, fiber post and composite: A case report

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Abstract
Restoring a endodontically treated teeth may present a restorative problem, due to common inadequate sound coronal and radicular tooth structure. The flared apices of canal anatomy makes complete debridement and control of the obturation material nearly impossible. Apexification is a method of inducing a calcified barrier at the apex of a nonvital tooth with incomplete root formation. MTA appeared to be a valid option for apexification with the added advantage of speed of completion of therapy. Most endodontically treated teeth today are restored with adhesive materials. Adhesive materials provide an immediate seal and some immediate strengthening of the tooth. The canal can be reinforced using a fiber post system involving intraradicular rehabilitation using composite resin. This article presents a clinical case with fractured anterior tooth with a short root and open apex reinforced intraradicular with composite and a light transmitting fiber post.

Keywords: novel technique, intraradicular rehabilitation, MTA

1. Introduction
In clinical practice, endodontically treated teeth commonly present restorative problems because of frequent insufficient sound coronal and radicular tooth structure. The flared canal arising as a result of carious extension, trauma to immature tooth, pulpal pathosis, iatrogenic or endodontic misadventure or idiopathic causes, can present a difficult restorative problem to the practising dentist [1]. Trauma to dentition is most common in the age group of 9-10 years [2]. During this period, the roots are still in the process of maturing hence there is less intraradicular dentinal thickness and the tooth and root are more prone to fracture. In case of a blunderbuss, canal maintaining the proper apical barrier with the three dimensional seal becomes difficult [3]. Previously calcium hydroxide was the material of choice to induce calcific barrier, however calcium hydroxide shows certain limitations like the length of time, the number of dressings, the role of infection caused in the canal in between the appointments and the fracture resistance of the tooth [4]. MTA has the advantage over calcium hydroxide that it can be done in a single visit procedure. Apexification using MTA has several advantages as it neither gets resorbed nor weakens the root canal dentin and also sets in wet environment [5].
The choice of Posts has evolved from very rigid material to a material that closely resembles the properties of dentin, so as to produce a mechanically homogeneous unit and result in reduction of stresses in the root structure. For many years, cast post were most commonly used for the treatment of endodontically treated teeth with flared canal. It resulted in catastrophic root fracture with reduced remaining dentinal thickness, shadowing and graying of root and discoloration at the tooth's gingival margin [6, 7].
During the last decades or so, fiber-reinforced posts have gained popularities. The main advantage of fiber post is the uniform distribution of forces in the root, which results in fewer catastrophic failures than occur with metal posts if adequate ferrule is present. Along with its superior esthetics and good mechanical properties, these posts are commonly used in aesthetically demanding areas. When the weakened root is internally rebuilt with suitable adhesive dental materials, the root is dimensionally and structurally reinforced to support and retain a post and core for continued function of [8] the tooth. Teeth restored with intraradicular composite resin restoration have been shown to be [9] 50% more resistance to fracture.
The objective of this case report is to describe a step by step approach of rehabilitating a fractured anterior tooth with flared root canal using MTA, composite resin and fibre post.

2. Case report

A 24 year male patient complained of an unaesthetic smile. Patient gave history of trauma 10-12 years back. Clinical examination revealed discoloured and fractured maxillary right central incisor. Intra oral periapical radiograph revealed incompletely formed apex as well as thin dentinal walls in apical region in relation to right maxillary central incisor (Fig. 1). Tooth elicited negative response on thermal as well as electric pulp testing. So diagnosis of Ellis class IV fracture leading to pulpal necrosis.

On first visit root canal treatment was initiated, cleaning and shaping was done with circumferential filing upto #110 K file and calcium hydroxide dressing was placed for disinfection of root canal. Patient was recalled after 1 week. On second visit the calcium hydroxide dressing was removed. An apical barrier of 4-5mm was established using MTA. A moist cotton pellet was placed over the MTA and access cavity was sealed with IRM. Patient was recalled the next day. On third visit the setting of MTA was confirmed using finger plugger and the root canal reinforcement was carried out as the remaining dentinal thickness of the canal was very less. 2mm of gutta percha was filled using thermoplasticized technique. Butt end of the fiber post was used in canal to build it with nanohybrid composite. Fiber post along with composite was taken out and cured and it is bonded into the canal using dual cure resin cement.

Fig 1: Preoperative radiograph showing blunder buss canal and thin radicular dentin.

Fig 2: 5 mm MTA apical plug was placed

Fig 3: Butt end of fiber post was placed

Fig 4: Fiber post along with composite was cemented using dual cure resin cement

Fig 5: fiber post cemented using dual cure resin cement

Fig 6: Tooth preparation done.

Fig 6: All ceramic crown cemented

Next, the tooth was prepared to receive a porcelain fused metal crown and impression was done with vinyl polysiloxane impression material and temporary crown was given. Patient was then recalled after 7 days to receive permanent crown

3. Discussion

During long apexification procedure, the root canal is susceptible to reinfection and the canal is susceptible to fracture during treatment [10]. Hence, single step apexification was planned for this case. MTA had been proved to show good sealing ability, good marginal adaptation and a high degree of biocompatibility [11, 12]. In the restoration of traumatized anterior teeth, both esthetic and mechanical considerations should be taken into account. Teeth that have been endodontically treated often have little coronal tooth tissue remaining and as such require a post to retain the core and restoration [13]. The introduction of materials capable of bonding to dentinal structure has created potential for reconstitution and rehabilitation of lost dentinal tissues to salvage severely damaged teeth that would otherwise be extracted. To restore the lost dentin, in 1987, Lui *et al.* advocated the use of composite resin as a lining of the root canal surface to reinforce the weakened canal walls [14]. The modulus of elasticity of composite resin approaches that of dentin. The replacement and reinforcement of intra-radicular tooth structure with a material that is elastically compatible with dentin is far better than morphologic dowel [15], which has higher modulus of elasticity and hence higher potential to transfer and concentrate applied stresses to the surrounding compromised root structure. The post length used in this case was 10 mm and placed above the alveolar crest of the bone to avoid the concentration of stresses. So, the rationale for use of all these materials is well established. Hence, even a mutilated tooth need not be extracted and clinical success of such teeth is on rise.

4. Conclusion

Management of a structurally weakened root through conservative approach by reinforcement with composite and fibre post can be a simple and efficient procedure for the treatment of immature anterior traumatized teeth with excellent esthetic & functional Results.

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