

## Rejuvenating and revitalizing non vital traumatized young permanent teeth: A case series

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### Abstract

Treatment of Ellis class IV fracture has been a great challenge. The following case report describes the management of traumatized upper anterior teeth in different patients using revascularization technique. Revascularization is the procedure which promotes apexogenesis in a young immature non vital tooth with limited instrumentation technique. Mineral trioxide aggregate is documented to create a hermetic seal over the coronal opening of the root canal separating the intra-canal clot containing stem cells from the external environment minimizing risk of infection. Revascularization causes continued root growth similar to natural root growth.

**Keywords:** Revascularization, Ellis class IV fracture, Non vital, Revitalization

### Introduction

Young permanent teeth are those recently erupted teeth in which normal physiological apical root closure has not occurred. For many years patient with teeth that were incompletely developed or had open apices with pulpal or periapical pathology offer dentists a great challenge. These patients are usually young and suffered trauma only shortly after eruption, causing discomfort to the child, discolored tooth, mental anguish to the parents and the perplexing attitude to the dentist. The tooth being hard tissue in nature is not as resilient and tends to fracture on trauma.<sup>(1)</sup> Injury to the permanent teeth occurs secondary to sports injuries, accidents and free fall.<sup>(2)</sup> Due to esthetic reasons, anterior teeth demand fast and natural treatment. In this era of smart dentistry various techniques and materials are available to the dentist in order to provide patient with good esthetic and functional result.<sup>(3)</sup> Regenerative endodontics has been designed as biologically based procedure designed to replace damaged structures such as dentine, root structures and cells of pulp dentine complex using stem cells, growth factor and scaffold.<sup>(4,5)</sup> Revascularization is the process of creating a natural environment of scaffold and dental stem cells inside the endodontic system to cause continued root growth.<sup>(5)</sup> The aim of such treatment should be relief from pain and restoration of esthetic demand. The present case series present treatment of traumatized anterior maxillary young permanent teeth with Revascularization using Mineral Trioxide Aggregate.

### Case Report I

A 9 year old patient was referred to outpatient department of I.T.S. Centre for Dental Studies and Research, Ghaziabad with chief complaint of fracture in upper front tooth region since 3 years. Patient had a history of trauma 3 years back. The tooth did not

respond to electric pulp testing. A diagnosis of necrotic pulp with respect to maxillary right central incisor and lateral incisor i.e. 11 and 12 (Ellis Class IV fracture) was made respectively with no extra or intra oral soft tissue swelling and trauma. The radiographic evaluation showed blunderbuss apex in relation 11, 12. (Fig. 1) Due to the presence of thin root canals and wide open blunderbuss apex, revascularization was planned in relation to 11 and 12 using Mineral Trioxide aggregate (MTA). Local anesthesia was administered and 11 and 12 were isolated with rubber dam, access opening was done, working length was determined followed by pulp extirpation and biomechanical preparation using crown down technique was performed. Thorough irrigation was done with 5% Sodium hypochlorite solution. Canals were dried followed by placement of intra-canal medicament i.e., Triple antibiotic paste and temporary filling was done. Patient was recalled after two weeks. At the second appointment, tooth was opened. Antimicrobial medicament was removed and copious irrigation with 5% sodium hypochlorite was done followed by drying of canal after which a small 10 K file was placed a few mm beyond the apical foramen and was moved up and down to cause laceration of apical tissue causing bleeding inside the canal up to 3mm from cement-enamel junction. Bleeding was controlled up till root canal orifice with saline dabbed pressure cotton for 5 minutes leading to formation of clot inside the canal, after which a small colla plug was placed over the clot to restrict the position of MTA till the pulp chamber followed by 3-4 mm of MTA placement. Dampened cotton plug was placed over the MTA to allow it to set and temporary restoration was done. Patient was recalled the next day for removing the intermittent cotton placed and permanent restoration was placed. After 3 months of follow up continued root growth was observed. (Fig. 2)



**Fig. 1: Pre-operative radiograph w.r.t. 11, 12**



**Fig. 2: Post-Operative radiograph w.r.t. 11, 12**

### Case Report II

A 12 year old patient was referred to outpatient Department of I.T.S. Centre for Dental Studies and Research with chief complaint of discolored anterior maxillary tooth since 3-4 years. On detailed dental history patient reported history of trauma and dental treatment at 7 years of age. The radiographic evaluation of the traumatized maxillary left central incisor i.e. 21 shows blunderbuss apex with presence of intra-canal medicament (Fig. 3). A diagnosis of attempted pulp therapy by previous dentist in respect to 21 was made with no soft tissue intra or extra-oral swelling. Due to the presence of thin root canals and wide open blunderbuss apex revascularization was planned in relation to 21 using Mineral Trioxide aggregate (MTA). Similar procedure for revascularization was followed as described earlier. Local anesthesia was administered and 21 was isolated with rubber dam, access opening was done, working length was determined followed by cleansing of the canal to remove the already present medicament using irrigation with 5% Sodium hypochlorite solution and rotary K files. Canals were dried followed by placement of intra-canal medicament i.e. Triple antibiotic paste and temporary filling was done. Patient was recalled after two weeks. At the second appointment, root canal was re-entered. Antimicrobial medicament was removed and copious irrigation with 5% sodium hypochlorite was done followed by drying of canal after which a small 10 K file was

placed a few mm beyond the apical foramen and was moved up and down to cause laceration of apical tissue causing bleeding inside the canal up to 3mm from cemento-enamel junction. Bleeding was controlled up till canal orifices with saline dabbed pressure cotton for 5 minutes leading to formation of clot inside the canal. After that we inserted a small colla plug to restrict the position of MTA till the pulp chamber followed by 3-4 mm of MTA placement over the colla plug. Dampened cotton plug was placed over the MTA to allow it to set and temporary restoration was done. Patient was recalled the next day for removing the intermittent cotton placed and permanent restoration was placed. After 3 months of follow up continued root growth was observed in this case as well. (Fig. 4)



**Fig. 3: Pre-operative radiograph w.r.t. 21**



**Fig. 4: Post operative radiograph w.r.t. 21**

### Discussion

The term revascularization is derived from prefix "re" which means restoration and vascularization that states the vascular system which permits blood to circulate and transport nutrients. Following case series is about analyzing, diagnosing and treating existing diseased vasculature of traumatized, necrotic young permanent anterior maxillary teeth. Affected necrotic pulp contains various aerobic and anaerobic microflora producing toxins causing more tooth damage. Medicament such as triple antibiotic paste is used for effective sterilization and disinfection of necrotic pulp.

Pulp tissue regeneration in vitro, developed by using stem cell, may, in the future, become a reality since the new tissue would be developed in the favorable environment using undifferentiated cells, presenting high potential for differentiated, stimulated by specific growth factors. In the process of revascularization, dental pulp stem cells are artificially brought to colonize inside the root canal by causing laceration of the peri-apical tissue. The success of this process depends on the ability of these stems cells to differentiate into pulp cells, odontoblasts and cementoblasts to cause continued root growth.<sup>(6)</sup> MTA root repair material was introduced by Dr. Mahmoud Torabinejed, and was formulated from commercial Portland cement combined with bismuth oxide powder for radio-opacity. MTA has less leakage property than other Root canal filling materials due to which bacterial migration is less. Other alternative of MTA are also there like CME, which is biocompatible when used in vital pup therapy.<sup>(7-9)</sup> Various other features of CME are good sealing ability, non restorability and minimal leakage around the margins similar to MTA.<sup>(10,11)</sup> In this case series, the two cases depicted good prognosis and continued root growth of traumatized non vital young permanent teeth after revascularization using MTA.

### Conclusion

Treatment of young permanent teeth with incompletely developed root is difficult and challenging. The potential of bioengineering is huge, and work continues to optimize scaffold that may encourage revascularization of the pulp space, and to explore the option of seeding cell population into properly sterilized pulp spaces of immature teeth. Revascularization procedure proves to be an effective method for treatment of teeth involving Ellie's class IV fractures with blunderbuss apex. Collectively, the emerging body of case reports and the series as a rationale for conducting future prospective clinical trials on such cases comparing conventional endodontic treatment procedure with revascularization using different sealing materials is important.

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