

Apexogenesis in an Immature Permanent Right Central Incisor with Pulpal Exposure using MTA Plus- One Year Follow-Up

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Abstract

Trauma to young immature permanent tooth may result in fracture of thin dentinal walls. This will prevent the further root development and result in a tooth with an open apex. In such situation proper treatment plan can be developed after assessment of the status of the pulpal and the degree of tooth development. In such situations treatment should be aimed at preserving the pulp vitality for the further root development and tooth maturation. For the proper regulation of cellular differentiation and tissue regeneration, a thorough knowledge of the structure and function of cells within their environment is necessary. Local environment regulates the dominant cells to repopulate an open apex. Vital pulp therapy procedure that is performed to encourage physiological development and formation of the root end is called apexogenesis.

Keywords: Apexogenesis; Right Central Incisor; Pulpal Exposure; MTA Plus

Introduction

Mostly the dental trauma occur at the age of 7 - 10 year which results in incomplete apical root formation [1,2]. After eruption the permanent tooth takes around 3 years for the complete root development and closure of the root apex. Traumatic dental injuries during this phase may jeopardize pulp survival in affected teeth. Difficulties are encountered in providing endodontic treatment as dentine formation and tooth maturation ceases. It is important to preserve the vitality of pulp in such teeth for continued dentine formation and root development. Thus, treatment strategies for the immature young dentition should aim at preserving pulp vitality for root development which is important for the long-term prognosis of teeth. The long-term prognosis in immature permanent teeth with pulp necrosis and bacterial infection is related to the stage of root development and the amount of root dentine present at time of injury. For such traumatized immature teeth with pulp exposure vital pulp therapy is the treatment of choice [3,4]. Continuation of root development leading to apical closure and strengthening of the root structure can be seen in such teeth after vital pulp therapy [5]. Pulp diagnosis is decisive for appropriate treatment and long-term prognosis.

Many different materials have been used for pulpal wound dressing however an alternative standard pulp-capping biomaterial mineral trioxide aggregate (MTA), has been introduced for vital pulp therapies. There are evidences emphasizing the biocompatibility and sealing ability of MTA [6]. Several animal and human studies have shown that MTA is capable of inducing hard tissue formation adjacent to pulp tissue [7,8]. MTA induce dentine bridge formation more frequently, caused less pulp inflammation and resulted in a significantly thicker dentine bridge when compared to calcium hydroxide [7,9].

This case report presents a case of traumatized, immature tooth that showed further root development after vital pulp therapy. Apexogenesis is carried out with the aim to preserve the vitality of remaining pulp tissue so that continued root development with apical closure may be achieved.

Case Report

A 8-year-old boy reported with pain on the anterior region of maxilla with a history of trauma one day back. Medical history was found to be non-contributory. Clinical examination showed Ellie’s Class III crown fracture of maxillary right central incisors. A large pulpal exposure was present. Right central incisor showed sensitivity to palpation and percussion. The tooth showed positive response to cold thermal test. Left central incisor showed signs of vitality to thermal tests. On radiographic examination immature apex was seen with right central incisor (Figure 1). Completion of the endodontic treatment at this stage would result in a weak tooth with poor prognosis so vital pulp therapy was planned for immature left central incisor.



Figure 1: Pre-operative radiograph.

Under local anesthesia and rubber dam isolation an access cavity was prepared on right central incisor. A high-speed sterile long shank round diamond bur (Diatech) under copious water spray was used to remove the coronal pulp tissues. Vital pulp tissue with normal bleeding was recorded when the cervical third of the canal was accessed. Associated bleeding indicated pulp vitality. Haemostasis was achieved by irrigating with sterile normal saline along with gentle application of sterile moistened cotton pellets for 15 min. Mineral Trioxide Aggregates (MTA Plus, Prevest DenPro, Jammu, India) powder was mixed and placed without pressure over the exposed pulpal wound upto a thickness of approximately 5 - 6 mm. Tooth was temporarily filled with cavity after placing a small piece of moist cotton pellet over it (Figure 2). Next day the temporary cement and moist cotton pellet was removed and access cavity was restored with composite resin to ensure the maximum long-term seal.



Figure 2: Radiograph showing MTA placement.

The case was followed-up and the radiographic examination was performed after one month (Figure 3), three months (Figure 4), six months (Figure 5) and one year (Figure 6) which showed that there was continuation of the root formation with thickening of the dentinal walls and formation of apical constriction. Pulp necrosis was not evident and there were no signs of root resorption or periapical pathosis. Clinical examination showed that the tooth was functional with no signs/symptoms.



Figure 3: Follow-up radiograph of one month.



Figure 4: Follow-up radiograph of three months.

Discussion

Various defense and repair responses can be seen after traumatic injuries due to interference with the pulpal neurovascular supply ranging from localized or generalized pulpal inflammation, tissue regeneration and reparative dentine formation. New tissue formation occurs replacing the damaged tissue by reorganization. Formation of new blood vessels and recruitment of pulp progenitor cells occurs at the injured area [10]. Progenitor cells of pulpal origin or from periodontal tissues or from a combination of the two may initiate tissue regeneration. If the damaged pulp tissue is renewed by stem cells of pulpal origin then formation of reparative dentin takes place but if the periodontal stem cell invade the root canal it may results in collagen and hard tissue formation.



Figure 5: Follow-up radiograph of six months.



Figure 6: Follow-up radiograph of one year.

Apexogenesis is the common method used for the treatment of inflamed pulp with open apex teeth. A hard tissue barrier is normally established if the inflamed pulp from the root canal is extirpated and the pulp exposure site is covered with a biocompatible capping material that limits or prevents the bacterial contamination [11]. Bacterial tight seal was established in this case by MTA Plus as several studies have shown favorable outcomes for MTA in human teeth [12,13]. As the radicular pulp tissue is vital the continued root development after apexogenesis should be considered to be a normal physiological process.

The success of vital pulp therapy depends on the presence of healthy pulp [14,15]. Pulp removal should be extended apically to ensure the complete removal of inflamed pulp tissue if the time between exposure and treatment is more [16]. In the present case as the pulp exposure was large, chances of contamination of the pulp with microorganisms was more. Considering the long period between the time of injury and therapy and large pulpal exposure, coronal pulpotomy was carried out for the right central incisor.

Apexogenesis with MTA Plus was quite evident in the present case which was followed up for a period of one year.

Conclusion

Apexogenesis therapy is an appropriate treatment for immature teeth with inflamed and exposed dental pulp. The present case showed continuation of complete root formation by maintaining the vitality of the remaining pulp tissue. Apexogenesis was performed with MTA Plus. This case report shows very well the repair potential of an immature permanent tooth, when traumatized. It also shows that the

tooth still has the capacity for continued root development after traumatic injury. Proper treatment plan and regular follow-up are of utmost importance in the treatment of these type of case.

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