Case Report

Intraradicular rehabilitation of fractured maxillary anterior teeth with an open apex: A case report

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ABSTRACT

Traumatic injuries in the oral and maxillofacial region occur frequently and comprise 5% of all injuries for which people seek treatment. The highest incidence of dental traumatic injuries is seen in the early childhood. Esthetics plays an important role on psychological perspective of an individual. The fracture of an anterior tooth in young individuals requires rehabilitation of the affected tooth. This article presents a clinical case of an 18-year-old patient with a structurally compromised, fractured maxillary central and lateral incisor with a short root and an open apex with relatively thin root dentinal walls, which was managed by apexification using Mineral trioxide aggregate, Intra-oral periaoical radiograph and root canal reinforcement or intraradicular rehabilitation done using light transmitting fiber post and flowable composite.

Key words: MTA, MTA apexification, intraradicular rehabilitation, light transmitting fiber post

INTRODUCTION

Trauma to dentition occurs most commonly in the age group of 9-10 years. During this period, the roots are still in developing stage and there is less intraradicular dentinal thickness.[1]

Incomplete root development presents an endodontic and restorative challenge and also affects psychological behavior and personality of an individual.[2] The divergent apical foramen architecture in the affected immature necrotic teeth makes complete debridement and control of the obturation material nearly impossible.[2]

The most common fracture site for immature teeth occurs along the cemento-enamel junction. In addition, loss of water content in dentin after endodontic therapy can reduce tooth resilience and can subsequently increase the probability of fracture.[3]

There are various conventional methods of restoration of such teeth like cast post, prefabricated post, and placement of pins, but all of these are unsatisfactory and may result in extraction of weakened tooth.[4] Restoring such weakened teeth with cast post may cause wedging forces, resulting in vertical root fracture.[5]

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The weakened roots can be successfully managed by reinforcing the remaining root structure with light-cured or dual-cured composite resin followed by the placement of the prefabricated posts for the retention of crown or fixed partial denture.[6] This reestablishes form, function, and esthetics of the tooth.

Composite resin absorbs and distributes forces in a more uniform manner as compared to metals, and increases resistance to fracture, thus providing improved prognosis. An adhesive bonding system with micromechanical retention has an added advantage for a weakened root.[7] This case report describes step-by-step management of an immature fractured maxillary central incisor and lateral incisor.

CASE REPORT

An 18-year-male patient was reported to the Department of Conservative Dentistry and Endodontics, Modern Dental College and Research Centre, Indore, with the chief complaint of an unesthetic smile. As per history, patientfaced trauma 9-10 years back. Clinical examination revealed discolored and fractured maxillary right central and lateral incisor. Maxillary and mandibular anterior teeth were protruded with increased overjet and an insufficient lip closure.

Radiographic examination revealed incompletely formed apex and thin dentinal walls. There was no evidence of resorption. Teeth elicited negative response on thermal and electric pulp testing. Hence, a diagnosis of Elli's class IV fracture leading to pulpal necrosis was made.

The treatment planning was done. Apexification with MTA was planned followed by reinforcement of the thin dentinal walls with dual-cured flowable composite resin. In the first visit, root canal treatment was started. Working length was established and root canal was cleaned and shaped with circumferential filing. The main purpose was the debridement of the canal without further thinning down of the delicate dentinal walls. Calcium hydroxide dressing was placed for the disinfection of root canal for 1 week.

In second visit, an apical barrier of 3–5 mm was established using MTA. In third visit, the MTA plug was confirmed using finger plugger and the reinforcement of the root canals with thin dentinal walls was initiated. Since esthetics was the major concern, Luminex esthetic post system (Dentatus Dental Products, New York, USA) was selected.

The canal was etched with 37% phosphoric acid (Dentsply, Ultra-Etch, South Jordan, UT, USA) for 15 s, thoroughly rinsed with water, and gently air dried. A dual-cure adhesive was applied (Prime and bond NT mixed with self cure activator, Dentsply) and light cured for 20 s. A dual-cured flowable composite resin (Paracore, Coltene/Whaledent Products, Cuyahoga Falls, Ohio, USA) was placed into the canal. The plastic light transmitting post was centered, and the resin was cured for 40 s. The post was removed. An identical diameter fiber post was coated with a silane coupling agent followed by cementation into the canal with dual cure resin cement, which was cured for another 40 s. Core build-up was done using hybrid composite resin (3M ESPE, Z100 Restorative, Toronto, Ontario, Canada) in an incremental pattern.

Both teeth received the metal ceramic crown. Patient was recalled after 2 months. Follow-up radiographs and photographs show uneventful healing.

DISCUSSION

MTA reacts with tissue fluids to form a hard apical barrier. MTA is used for one-visit apexification in immature necrotic tooth. MTA also offers several advantages as an apical barrier such as immediate apical seal, induce api cal hard tissue formation, and less potential to weaken the tooth structure as compared to $Ca(OH)_2$.

Immature teeth having large canals are difficult to restore with metal posts, as these well-adapted custom cast post and cores lead to shadowing and graying of the root surface, which lead to the discoloration of the tooth's gingival margin. In addition, undesirable wedging effects may lead to vertical root fracture. Various studies have found that glass ionomer and light-polymerized composite resin is effective in strengthening weakened root and provides better prognosis for severely damaged teeth. Teeth restored with intraradicular composite resin restoration have been shown to be 50% more resistance to fracture.[8] Modulus of elasticity of composite resin approximates to that of dentin. So, the reinforcement of intraradicular dentin with the composite resin that is elastically compatible with dentin is much better than the morphologic dowel, which has higher modulus of elasticity and hence higher potential to transfer and concentrate applied stresses to the surrounding compromised root structure.[9]

Luminex light transmitting posts are made up of translucent, white, or tooth-colored materials. These posts increase the light transmission within the root and overlying gingival tissues, thereby eliminating or reducing the dark appearance, often associated with nonvital abutments and cast metal posts and cores.[3]

Clinical trials with fiber posts have demonstrated clinical success and over a 7-11-year period with the placement of 985 fiber posts, the fiber posts showed 92% survival rate.[10] When a fiber reinforced post is bonded within the root canal, it transfers and concentrate applied stresses to the surrounding compromised root structure reducing the stress on the root and prevents vertical root fracture of weakened root [Figures 1-13].

Figure 1: Preoperative clinical view.

Figure 2: Intraoral occlusal view.

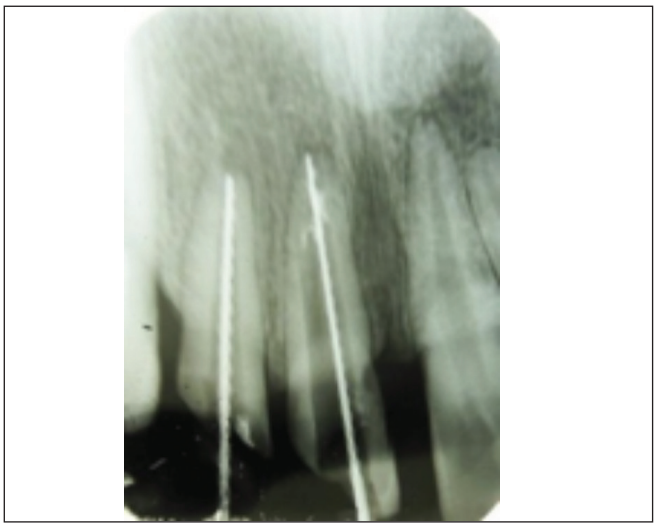

Figure 3: Working length IOPA.

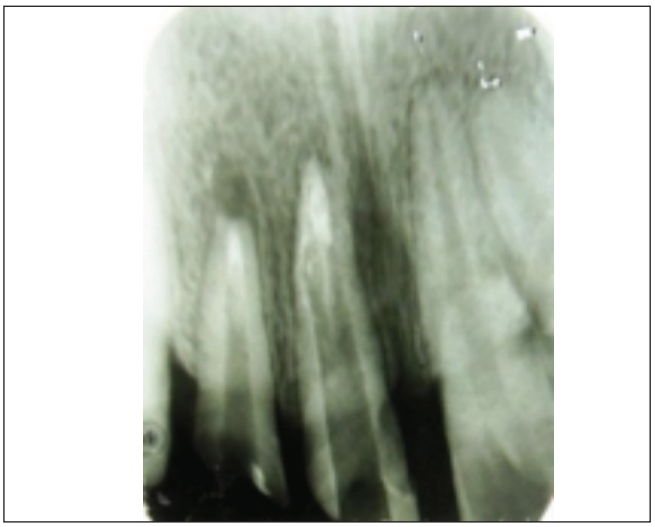

Figure 4: Apexification done with MTA in 11 and 12.

Figure 5: Fiber post selection with 11 and 12.

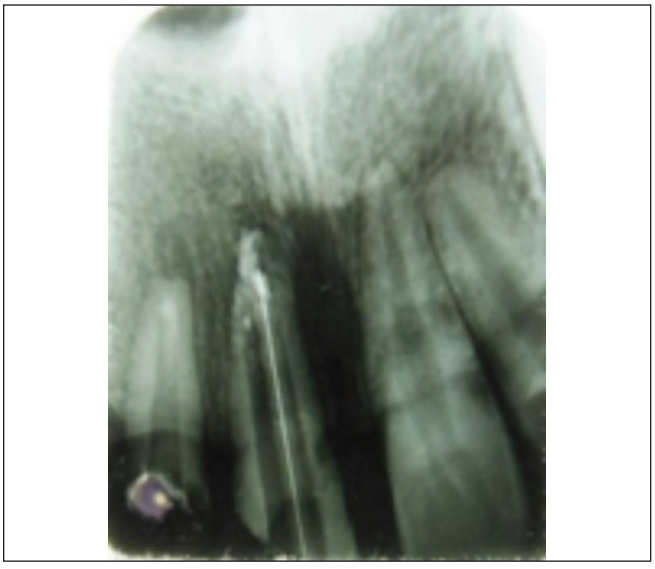

Figure 6: Fiber post selection IOPA with 11 and 12.

Figure 7: Fiber post placed and core buildup completed with 11 and 12.

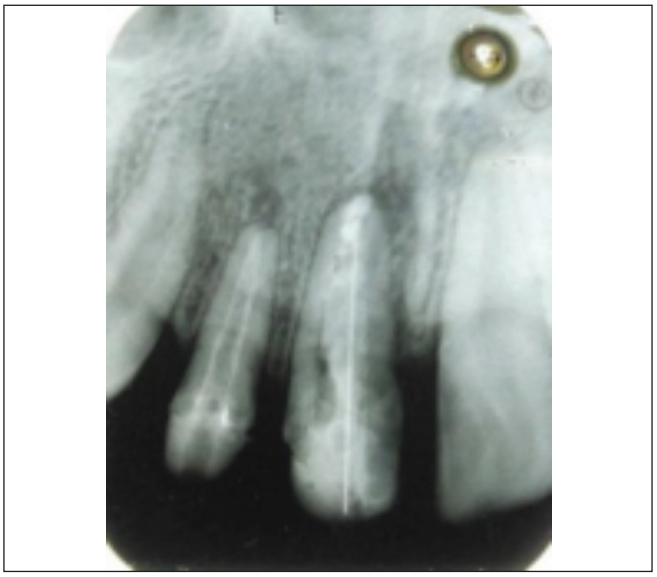

Figure 8: IOPA showing post and core build up with 11 and 12.

Figure 9: Crown cemented with 11 and 12.

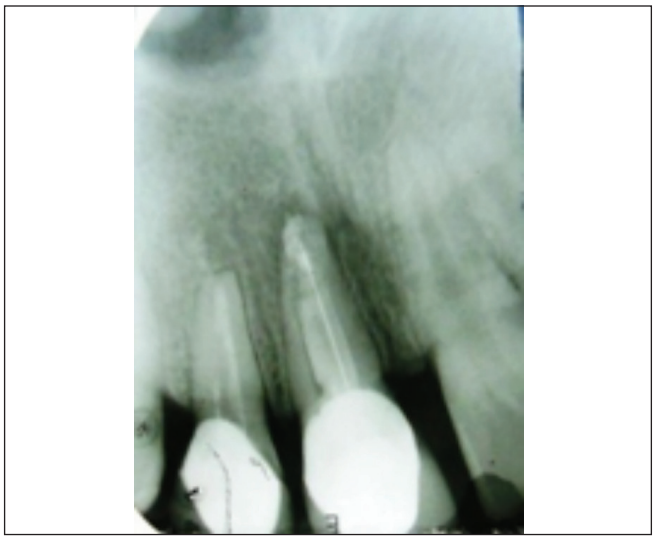

Figure 10: IOPA after crown cementation with 11 and 12.

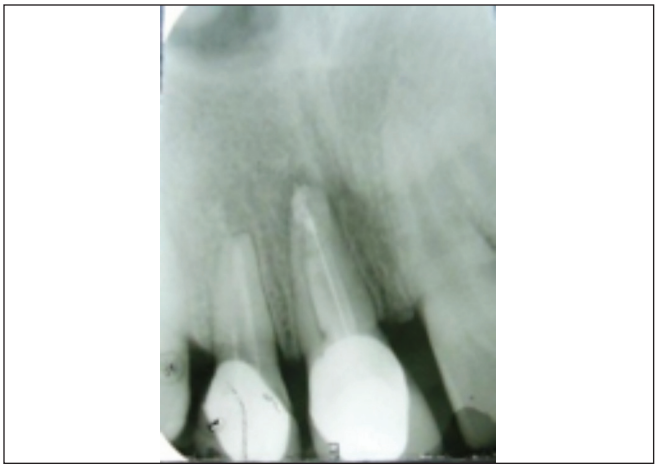

Figure 11: 2 months follow-up IOPA.

Figure 12: 6 months follow-up clinical view.

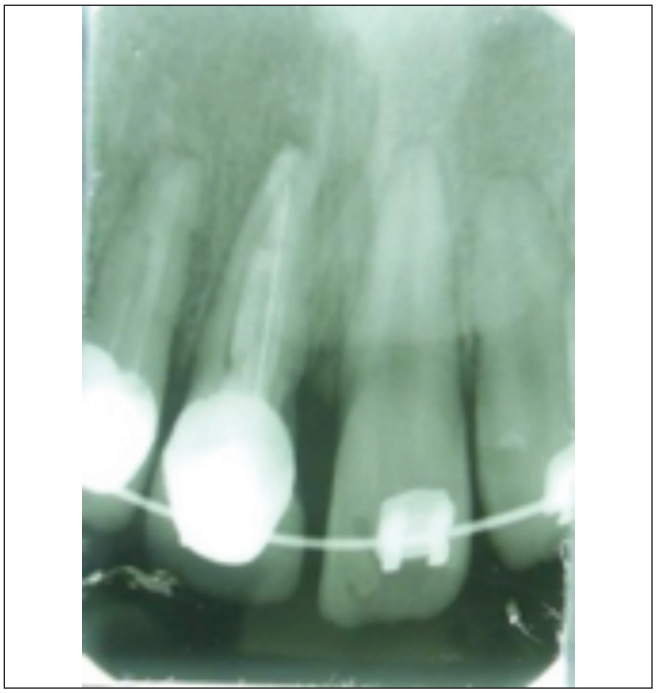

Figure 13: 6 months follow-up IOPA showing complete signs of healing.

CONCLUSION

The management of a structurally weakened root through conservative approach by reinforcement with flowable composite resin and light transmitting post can be a simple and an efficient procedure for the treatment of immature traumatized anterior teeth with excellent esthetic and functional results.

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Conflicts of interest
There are no conflicts of interest.

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