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Reattachment of Coronal Fragment Using Fiber-Reinforced Post: A Case Report

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ABSTRACT

Coronal fractures of permanent dentition are the most frequent type of dental injury. If the original tooth fragment is retained following fracture, the natural tooth structures can be reattached using adhesive protocols. The development and use of fiber-reinforced composite root canal posts make possible of the reattachment of the crown esthetically. This case report presents a clinical technique to reattachment maxillary lateral incisor tooth after trauma using direct fiber-reinforced post systems. At the 1-year follow-up, a slightly marginal discoloration, but no recurrent decay or composite clefts were detected and the resultant appearance was acceptable to the patient. (Eur J Dent 2007;1:174-178)

Key words: Reattachment; Trauma; Fiber-reinforced post.

INTRODUCTION

Traumatic crown fractures, which are caused from dental injuries, are a serious dental public health problem.[1] A majority of the crown fractures involve the maxillary incisors.[2]

Today's dental patients are demanding a youthful, attractive smile.[3] Single-appointment direct restorations should ideally be restricted to small to medium-sized intracoronal lesion.[4] Alternatively, large multisurface defects can best be restored with indirect laboratory-processed restorations.[5] However, the higher cost of indirect restorations, patients' desire to maintain remaining sound tooth structure, and unfavorable anatomical conditions may render the direct restoration the first choice in many clinical situations.[6,7]

Restoring a number of missing teeth is usually a difficult problem for the clinician.[8] The reattachment of the crown fragment to a fractured tooth is the best method to reinstate the natural shape, contour, surface texture, occlusal alignment and color of the fragment, which offers excellent esthetic and functional results and less chair time.[7] Recent developments in restorative materials and techniques facilitate restoration of fractured teeth.

Endodontically treated teeth often have extensive loss of coronal tooth structure as a result of endodontic treatment procedures, carries or previous restorations. Besides, the success of root canal treatment of teeth, a successful final restoration is also important for long-term clinical

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success. Spear[9] reported that the endodontically treated teeth must have 3 mm healthy tissue complex to maintain functional longevity.

Resin based restorative materials are frequently used in restoration of the fractured teeth. Because of the poor mechanical resistance of these materials, different approaches developed to strengthening resistance of composite resin,[10] such as fiber posts. Tooth-colored fiber posts were introduced in the 1990's and have several advantages, such as esthetic, bond to tooth structure, have a modulus of elasticity similar to that of dentin, but still require dentin preparation to fit into the canal.[6,11]

The purpose of this report is to describe the reattachment of a crown fragment of anterior tooth after trauma with utilizing clinical approach and present the 1 year follow-up.

CASE REPORT

A 29-year-old man referred to our clinic, because of fracture of the crown in the left maxillary lateral incisor. The patient's medical history was unremarkable. There was no apparent trauma to the soft tissues in the extra oral and intraoral examination. Clinical and radiographic examination revealed that there was a horizontal fracture in the cervical region of the left maxillary incisor. It was tender to percussion, and there was a temporary restoration of the palatal region of the tooth. Dental history of the patient revealed that an endodontic treatment was started nine months ago, but incompleted because of the patient's anxiety from dentists. The crown was mobile but attached to the gingiva. In radiographic examination, the fracture line was below the cement-enamel junction (Figure 1). There was no evidence of abscess formation. There was no sign of trauma to the adjacent teeth and they were vital. It was explained to the patient that the placement of a dental implant could be indicated if an unfavorable crown-to-root ratio would result after completing crown reattachment. The patient expressed the desire to maintain tooth and restore it with a direct resin based composite restoration, due to the lower cost compared to an indirect restoration. A detailed explanation about the treatment plan was given to the patient, which included completion of the endodontic treatment, then reattachment of the tooth crown with using a fiber post. The treatment plan was accepted by the patient.

Local anesthetic was administered and the segment was removed (Figures 2a and 2b) with minimal force from its soft tissue attachment and recovered and stored in sterile distilled water to prevent discoloration and dehydratation. The working length was determined with an electronic apex locater (Root ZX, J.Marita Corp., Kyoto, Japan) and confirmed with radiography. The gates glidden drills (Mani Inc, Japan) were used for coronal segment of the root canal. The root canal was

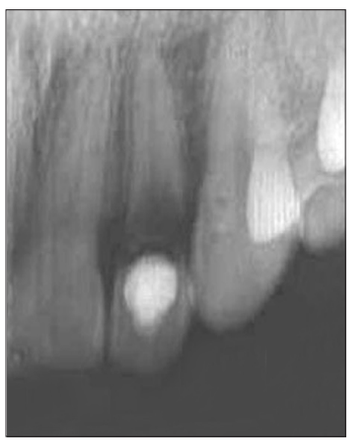

Figure 1. Before the operation.

Figure 2a. The fractured portion of the tooth was removed.

Figure 2b. Fractured tooth crown.

enlarged to ISO size 60 at working length. 2.5% Sodium hypochlorite was used during the preparation. The root canal was dried with paper points (Spident, Hand Rolled, Korea) and obturated using endodontic sealer (Sealapex, Kerr, USA) and laterally condensed with gutta perca technique (Spident, Hand Rolled, Korea) (Figure 3). The coronal portion of the root canal obturation was removed with a heat carried instrument for the placement post-system. The root canal was obturated with a temporary restoration (Cavit G, 3M-ESPE, Germany). The day after completion of the endodontic treatment, the root were prepared for the post placement by removing the sealing material with Gates Glidden burs and manual files. The post space was prepared with the Cytec Fiber Glass Post drill. The parallel sided glass-fiber post system (Cytec Blanco, Hahnenkraat, Germany) was placed into the root canal (Figure 4). Glass ionomer luting system (Vitremer, 3M-ESPE, USA)

Figure 3. Endodontic treatment was finished with gutta-percha and endodontic sealer.

Figure 4. Parallel sided post was placed.

Figure 5. Decay was removed from inner part of the crown.

Figure 6. Final restoration.

Figure 7. 1 year follow up with radiographically.

Figure 8. 1 year follow-up.

was used for cementation. Decayed portion of the fractured crown's internal dentin surface was removed with a tungsten carbide bur, with care taken to preserve peripheral margin (Figure 5). Additional tooth preparation was not required. The fragment and tooth were subsequently cleaned with a 2% chlorhexidine solution, rinsed and lightly air dried. Two steps etch & rinse system (Vococid, Voco-Germany, Single Bond, 3M-ESPE, USA) was utilized for the bonding of tooth structure. A flowable composite (Filtek Flow, 3M-ESPE, USA) was selected to be adhered with post of the fragment. Then composite resin (Valux Plus, 3M-ESPE, USA) was placed incrementally and cured for 40 seconds using soft-start technique (Elipar Freelight II, 3M-ESPE, USA). The residual excess at the restorative margin was finished with a series of finishing burs. Then polished to a high luster using aluminum oxide discs (Sof-Lex, 3M-ESPE, USA) (Figure 6).

Following restoration, any necessary occlusal equilibration was accomplished with an egg shaped bur and the final polishing was repeated, no prescription was given to the patient. At the 1-year follow-up, there was a little marginal discoloration, but no recurrent decay or periapical or gingival abscess were detected (Figures 7 and 8).

DISCUSSION

Reattachment of the crown fragment to a fractured tooth influences esthetic by retaining natural translucency and surface texture and is first choice for crown fractures of anterior teeth. Esthetics can be obtained in a single appointment. Also, this procedure is relatively simple, atraumatic and inexpensive.[12]

Today, we have a lot of different approaches in treatment of fractured teeth depending on the location of the fracture.[13] The fractured teeth, especially where fracture line extends below the marginal bone level, exists various problems in restoration.[14] Orthodontic extrusion or surgical extrusion has been recommended before the treatment of such fractured teeth.[15,16] Orthodontic extrusion is more closely to natural way of tooth eruption, than surgical extrusion. However, orthodontic extrusions required longer time than surgical extrusion.[14,17] In the present case the fracture line was below the gingival contour, however above the marginal alveolar bone crest. Therefore we did not apply any extrusion technique.

Hayashi et al[18] indicated that, the best restorative methods needed to be identified for teeth with extensive loss of structure, and reinforcing pulpless teeth. However, when a tooth has more than 50% of its coronal structure missing, the use of a post-and-core foundation is recommended prior to restoration.[19] In recent literature reviews, it has become clear that posts do not strengthen endodontically treated teeth, and their use is justified only for retention of the coronal restoration.[2,20] The most common complication in post and core system is debonding.[21] Root fracture is another reason for failure of the post-and core system.[22] Restoration with cast metal posts can cause wedging forces coronally that may result in irreversible failure because of fracture of an already weakened root.[23]

Fiber-reinforced composite resin post has demonstrated negligible root fracture. Studies have indicated that dentin-bonded resin post-core restorations provide significantly less resistance to failure than cemented custom cast posts and cores.[24,25] In addition, the fiber-reinforced posts can be used with minimal preparation because it uses the undercuts and surface irregularities to increase the surface area for bonding. Thus, it reduces the possibility of tooth fracture during function or traumatic injury.[26]

CONCLUSIONS

This case presents the progress in adhesive technology. Fiber reinforced resins allow not only creation esthetic restoration but also for the preservation and reinforcement to tooth structure. At the 1-year follow-up, the resultant appearance was acceptable to the patient. However, before recommending a similar treatment on a regular basis, a longer follow-up period is required.

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