Conservative Management of Complicated Crown-Root Fracture: An Immediate Esthetic Rehabilitation

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Abstract

Among the various types of dental trauma, crown-root fractures are one of the most challenging to treat and require a multidisciplinary approach. This paper reports a case of a complicated crown-root fracture of the maxillary left central incisor with esthetic, functional complications. An 18-year-old male patient presented to the department immediately after suffering trauma with a complicated crown-root fracture on tooth 21. As per the treatment, the patient had undergone endodontic therapy followed by flap reflection. Post flap reflection, a glass fiber post was luted, and the fractured fragment was reattached. By this approach, in the same appointment, the cervical margin can be exposed with appropriate isolation followed by a reattachment procedure. Reattaching the fragment is a viable option as it can be done immediately, provides better esthetics, restores function, and is less complicated than the conventional approach. A good prognosis is dependent on patient cooperation with the understanding of the treatment limitations. The article discusses a successful case of complicated crown-root fracture treated with the reattachment of a tooth fragment.

Eighteen months of clinical and radiographic evaluation revealed that the clinical protocol was effective, as the tooth was functional, asymptomatic, and esthetic.

Introduction

An increased incidence of traumatic dental injuries occurs as a result of recreational activities such as sports, where the crown fracture is the most common. This can range from simple enamel-dentin fractures to complicated crown-root fractures or root fractures [1]. A total of 25% of the population under the age of 18 years is estimated to suffer an anterior tooth fracture due to traumatic injury [2]. Of which, 80% are central incisors, whereas 16% are lateral incisors, as a result of their position and protrusion, which is due to the eruption process. Most traumatic injuries involve enamel and dentin fractures, whereas crown and root fractures that expose pulp constitute only 5-8% of all fractures. Based on a published case series, 85% of the fractures run obliquely from the buccal to the lingual, with the fracture line progressing apically [3]. The type and location of fracture vary depending on the patient’s age, the amount of force applied, and the direction of the blow [4]. To restore the fractured tooth, different methods and techniques are recommended. In the late 1960s, the temporary, as well as permanent, restorations of traumatized teeth in young patients were difficult. Various methods of restoration such as resin crowns, stainless steel crowns, inlays with pin-retention, and complex ceramic restorations were used [5]. In addition to jeopardizing the tooth structure, these techniques were also esthetically unacceptable. Furthermore, in case of esthetic emergencies, these methods cannot be utilized [6]. In the 1970s, the adhesive composite restorations became almost a gold standard for the crown fracture treatment in children, adults, and at times even in older individuals.

Additional treatment alternatives that are available as well are porcelain laminate veneers, porcelain fused to metal crowns, and all-ceramic crowns. The management of complicated crown-root fracture in young patients is challenging as the fracture line is below the bone crest and the pulp is exposed. Various treatment options include crown lengthening, orthodontic extrusion, and intentional replantation. In recent years, advancing technologies in acid-etching techniques and dentinal adhesives have led to an increase in minimally invasive approaches among dentists, so as in tooth reattachment procedures [7]. This can be achieved by preserving and retrieving traumatized tooth fragments. In comparison with conventional composite restoration, tooth fragment reattachment offers conservatism, a favorable wear mechanism, color matching with the remaining crown portion, preservation of incisal translucency, preservation of the same occlusal contacts and natural tooth contours, the color stability of the enamel, as well as ease of treatment and cost-effectiveness [8]. Reattachment serves as an interim restoration for young individuals who may need definitive procedures like direct adhesive veneer or crown if it fails. This article describes the successful treatment of fractured maxillary central incisor by reattachment procedure.

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Case Presentation
An 18-year-old male came to the department with a chief complaint of a fractured tooth in the upper front region of the jaw for two days. He reported that he had a sports injury in the upper front region of the jaw and experienced a fracture in the upper tooth. The fractured fragment was mobile and was associated with intermittent pain. Medical and dental history was not relevant. An extraoral clinical examination revealed well-coordinated temporomandibular joint (TMJ) movements. The intraoral examination revealed an oblique fracture with tooth 21 extending subgingivally. The fracture margin on the palatal surface was approximately 1.5 mm from free gingival margins. Fragment or part of the tooth was grade III mobile but was supported and intact palatally. Gingival tissue secured the fragment of the tooth (Figure 1).

FIGURE 1: Preoperative clinical image of tooth 21

On radiographic examination, there was an oblique fracture line going subgingivally with associated pulp exposure running labially to the palatal in an apical direction. No periradicular changes were observed (Figure 2).
The diagnosis was irreversible pulpitis with tooth 21 exhibiting oblique complicated crown-root fracture. Several treatment options were explained to the patient, with their pros and cons, the associated cost, and the prognosis. The decision for reattachment was made only after inspecting the fragment condition and its fit on the fractured tooth. A single-visit root canal treatment was planned for tooth 21, followed by reattachment of fragment by fiber post reinforcement.

Under local anesthesia, temporary reattachment of the fractured fragment was done by flowable composite on the buccal aspect of tooth 21 (Figure 3).
FIGURE 3: Temporary reattachment of the fractured fragment of tooth 21 by flowable composite

Access opening was prepared with minimal tooth structure removal, and a complete root canal was performed (Figure 4).
FIGURE 4: Complete root canal treatment of tooth 21

After completion of single-visit root canal treatment of tooth 21.

The fractured segment was separated (Figure 5) and kept in normal saline (Figure 6).
FIGURE 5: Clinical picture after removal of the fractured fragment from tooth 21

FIGURE 6: After removal of the fractured fragment, the segment was kept in normal saline to prevent dehydration till the reattachment

A palatal flap was raised to ensure proper attachment of the fragment, as it was fractured subgingivally from the palatal aspect. After local anesthesia, the palatal and buccal envelope flap was raised by giving a crevicular incision from distal of 11 to distal of 22 and reflecting using a periosteal elevator (Figure 7).
FIGURE 7: Periodontal flap reflection using the periosteal elevator in relation to tooth 21

Image showing raised palatal and buccal envelope flap by giving crevicular incision from #11 to #22 and reflecting using a periosteal elevator.

The canal was etched (etching gel, Prime Dental, Maharashtra, India) for 20 seconds, followed by rinsing with water and air-dried. The Prime & Bond NT adhesive and self-cure activator (Dentsply, Charlotte, North Carolina) were mixed and applied, and the teeth were light-cured for 20 seconds. The same applied to the post. The canal was injected with dual-cure resin (Calibra, Dentsply) followed by insertion of glass fiber post (size 1, ReForpost, Angelus, Londrina, Brazil) and final light curing for 20 seconds. The fractured fragment was reattached to the remaining tooth structure by using dual-cure resin (Calibra, Dentsply). The restorative margins were finished by using diamond burs and Sof-Lex Discs (3M ESPE, Seefeld, Germany), and diamond polishing paste was used for polishing (Figures 8, 9). The patient was instructed not to apply heavy pressure to these teeth and to follow proper oral hygiene practices.

FIGURE 8: Immediate postoperative clinical picture after fractured fragment reattachment with tooth 21
On the 18-month follow-up with tooth 21 reattached, the tooth fragment showed a proper adaptation as well as good periodontal health with intact lamina dura and no evidence of root resorption (Figures 10, 11). However, a good prognosis is only possible when patients cooperate and understand the limitations of the treatment.
FIGURE 10: Clinical evaluation of tooth 21 after 18 months of fragment reattachment
FIGURE 11: Radiographic evaluation of tooth 21 after 18 months of fragment reattachment

Discussion

In a young individual, trauma to the anterior teeth is a tragic experience requiring immediate attention, as it can damage the patient’s dentition as well as affect the patient’s psychology. An immediate restorative technique for a fractured anterior tooth is to reattach the fractured tooth segment. The procedure restores the morphological, esthetic, and functional aspects of the dentition.

For reattachment to be successful, a number of factors must be considered, including the site of the fracture, the size of the fractured remnant, pulpal involvement, root maturity, periodontal status, biological width invasion, occlusion, and the material used for reattachment. The longer the fragment remains dehydrated, the tooth strength will be impaired. By rehydrating the fragment of the tooth, tooth resistance can be improved. Since dentin dehydration causes the collapse of collagen fibers, this results in inadequate penetration of resin monomers, which will lead to poor adhesion between the dentin and composite. The patient presented to the department immediately post-trauma with an intact fractured segment. Thus, the fractured segment was much less likely to become dehydrated.

The direction of the fracture line is a key consideration in restorability, as it directly influences the tooth’s
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