CASE REPORT

Restoration of fractured anterior teeth using thermoformed templates - A Case Report

Firoza Samadi*, J.N. Jaiswal**, Sunil Pandey***, Neha Bansal****, F Samadi*****

Abstract

Anterior crown fractures are common form of injury that mainly affects children and adolescents. The position of maxillary central incisors and their relative eruptive pattern carries a significant risk for trauma. Case report of a 14 year old boy is presented here with complicated crown fracture and endodontically treating the tooth followed by restoration with composite resin using transparent thermoform templates. The template was then used as crown formers to reconstruct the fractured endodontically treated teeth clinically using appropriately matching composite shade.

Key words: Thermoform templates, composite restoration, anterior tooth trauma, fiber post.

Introduction

Facial trauma that results in fractured, displaced, or lost teeth can have significant negative functional, esthetic, and psychological effects on children.

Simultaneous with the growing up process, children are more prone to accidents especially accidental injuries to the oro-facial region, in particular dental trauma1. Traumatic injuries to teeth and their supporting tissues usually occur in young people and damage may vary from enamel fracture to avulsion, with or without pulpal involvement or bone fracture2. Uncomplicated and complicated crown fracture is the most common traumatic dental injury to the permanent teeth and the teeth most commonly affected by trauma are the maxillary incisors with a report shared of 96% of all the crown fractures.(80% central incisor and 16% lateral incisor)3. This is attributable to their anterior position and protrusion caused by eruptive pattern. This kind of injury mainly affects children and adolescents with boys considered at being at higher risk than girls mainly because of increase in participation of children in dangerous activities4. These injuries end up being treated endodontically but restoration of endodontically treated teeth is a common problem in restorative dentistry, related to the fractures6. In the past, fractured teeth were restored with using acrylic resins or complex ceramic restorations associated with metals. These restorations did not promote adequate long term esthetics, required a significant tooth reduction and were quite time consuming3,5.

This case report describes the restoration of fractured teeth in a young patient with direct composite restorations using thermoformed templates which not only act as crown formers to re-establish the anatomical contour of the defective teeth but also control the amount of restorative material used and minimize the patient’s chair side time.
Case report

A 14 year old boy was reported to the department of Pedodontics and Preventive Dentistry, S.P.P.G.I.D.M.S with a history of fall from the bicycle 1 year back. The child complained of discolored broken upper anterior teeth (Fig.1).

Fig 1: Pre-operative view showing complicated crown fracture of maxillary central incisors

Complete history was recorded. On examination both the maxillary central incisors were found to be fractured. The right and left central incisors had undergone Ellis class IV fracture. No significant hard or soft tissue injury other than tooth fracture was noted. The teeth were broken from the cervical third of the crown structure. Intra-oral periapical radiograph of maxillary right central incisors revealed radiolucency involving enamel, dentin and pulp following 2/3 rd crown fracture. A diagnosis of complicated crown fracture involving both the maxillary central incisors was made. An immediate single visit endodontic treatment was performed for both the central incisors. It was planned to insert fiber post inside both the teeth followed by direct composite restoration with the help of thermoformed plates.

Fig 2: Pre-operative stone cast

Following root canal treatment, an alginate impression of both the dentitions was taken and stone casts were made (Fig. 2). The fractured central incisors on the stone casts were filled with and reconstructed anatomically using modeling wax (Fig. 3).

Fig 3: Mock wax- build up of fractured teeth on maxillary stone cast

After crown build up, another alginate impression of the upper cast was taken followed by formation a new stone cast. In this cast the tooth with full normal anatomy got duplicated (Fig. 4). The reconstructed cast was send to the laboratory for the fabrication of transparent thermoform “Essix” templates that conform to the anatomical shape of the reconstructed crowns. A 1.0 mm thickness transparent thermoforming dics made of copolyester was heated up to 170 degree Celsius for 50 seconds and once the discs softened it was pressed on to the stone casts7.

Fig 4: Duplicated stone cast revealing accurate anatomic contours of fractured teeth

The pressed templates were allowed to cool and later removed and trimmed. The template was then used as crown formers to reconstruct the fractured endodontically treated teeth clinically using appropriately matching composite shade. (Fig. 5).
Fig 5: Appearance of heat pressed “Essix” thermoform disc on maxillary stone cast

The patient was recalled and fiber posts were inserted into the canal of both the central incisor, after removal of gutta percha from two third of the canal (Fig. 6).

Fig 6: Fibre post inserted in both the maxillary central incisors

The affected tooth surfaces were pumiced, etched with 35% phosphoric acid (Multilink System Pack, Ivoclar Vivadent, Liechtenstein) light cured. No tooth structure was removed and, only structural grooves were used as retentive element to aid in adhesion of restorative material. A try-in of the template was done to ensure adequate fittability. (Fig. 7)

Fig 7: Try-in of the thermoform templates

Adequate volume of composite material was packed in to the template that corresponds to the desired area of teeth to be restored. The template was then placed over the affected teeth and light cured (Fig. 8).

Fig 8: Light curing of composite filled thermoformed templates.

Upon curing, template was removed from the teeth and the restored area was examined for any defectiveness. The composite restorations were polished and contoured using a combination of rotary discs (Sof-Lex, 3M ESPE) of various grades of polishing burs to create esthetically pleasing restorations (Fig 9). The patient was reviewed 6 months later and only minimal adjustments to the restoration necessary were made.

Fig 9: Post-operative view showing crown build up.

Discussion

Trauma with accompanying fracture of a permanent incisor is a tragic experience for young patient and creates psychological impact on both the parents and children. If the injury involves the loss of extensive tooth structure, it alters the child’s appearance and makes him the target for teasing and ridicule by other children

Management of patient’s with anterior tooth fracture provides great challenge to the clinicians both from a functional and an esthetic perceptive. Treatment objectives may vary depending on the age of the patient, socioeconomic status of the
There are various treatment modalities for restoration of fractured teeth like composite restoration, orthodontic extrusion, surgical extrusion, crown lengthening and reattachment of the fracture fragment (if available) followed by post and core supported restorations. In the present case, since patient could not afford prosthetic rehabilitation, thermoform plates were used to build up fractured teeth as this method is simple, quick and economic when compared to other more invasive procedures. Composite restorative material is the selected as a suitable replacement of the fractured structures because of its esthetics and high sustainability and because it provides excellent conservative transitional treatment for protection of weakened teeth.

Fiber posts were bonded to the tooth utilizing an etchant, primer, adhesive and resin composite technique. With the post bonded to the tooth, the low modulus of elasticity of the post could afford the fiber post and the tooth to flex together, dissipating any forces placed on the tooth thereby greatly reducing the risk of root fractures. In this case both the fractured maxillary central incisor were restored simultaneously as compared to the conventional ‘free hand technique’ where the time spent to restore a single tooth is prolonged and each restored tooth needed more trimming and polishing. The usage of the templates allowed direct light curing of the composite, accurate reproducibility of the anatomic contours of the fractured teeth, reduced chair side time and easy contouring and placement of homogenous thickness of composite.

**Conclusion**

Endodontically treated teeth require an appropriate coronal restoration in order to provide functional as well as esthetic durability. Crown build up using thermoform templates and composite resin material offers a suitable restorative option as it is reduces chair side time, is cost effective and minimally invasive when compared to other conventional options.

**References**