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CASE REPORT

Restoration of Anterior Tooth Fractures Using Silicone Key Method: 3 Case Report

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Sema YAZICI AKBIYIK[1,*], Dilan AYLUÇTARHAN[2], Elif Pınar BAKIR[3], Şeyhmus BAKIR[4]

[1] Research Assistant, Department of Restorative Dentistry, Faculty of Dentistry, Dicle University, Diyarbakir, Turkey; ORCID: 0000-0002-2134-7746

[2] Research Assistant, Department of Restorative Dentistry, Faculty of Dentistry, Dicle University, Diyarbakir, Turkey; ORCID: 0000-0001-9822-4739

[3] Asistant Professor, PhD, Department of Restorative Dentistry, Faculty of Dentistry, Dicle University, Diyarbakir, Turkey; ORCID: 0000-0003-4011-5091

[4]Asistant Professor, PhD, Department of Restorative Dentistry, Faculty of Dentistry, Dicle University, Diyarbakir, Turkey; ORCID: 0000-0003-2048-3065

Abstract: *The most important problem encountered after dental caries is undoubtedly injuries to primary and permanent teeth. Trauma affecting the oral cavity can affect the soft tissues of the lips, cheeks, tongue and floor of the mouth and the structures that form the temporomandibular joint. Luxation injuries are the most common traumatic tooth injury in primary dentition, while crown fractures are more frequently reported in permanent teeth. Traumas cause functional and aesthetic problems in the patient, and this aesthetics, making an ideal restoration to prevent loss of function is extremely important for the patient's psychology. Composite restorations provide conservative solutions in young individuals compared to veneer or other prosthetic restorations. Although composite restorations of permanent incisors with crown fractures are not seen as complicated cases, attention should be paid to the tooth contours that will facilitate function and aesthetics. In this study, restoration of three clinical cases with crown fracture by direct composite resin applications is described.*

***Key words**: Silicone key method, tooth fractures, composite resin*

Corresponding author: E-mail: semadis86@gmail.com Phone : +90-0412-241 10 17 Fax : +90-0412-248 81 00

Introduction

The most important factor that causes the loss of dental tissue after caries is trauma (1). Although dental traumas are frequently seen in humans, they constitute 5% of all injuries that require treatment (2). Among the most common causes of dental trauma are falling in the preschool period, fighting during puberty and traffic accidents, and sports activities in adolescence (1). The teeth most affected by these traumas are the maxillary incisors due to the protrusive positioning of the teeth (3). While crown fractures are the most common traumatic dental injury in permanent teeth, luxation injuries are more common in primary teeth (2). Injuries caused by dental traumas vary from enamel cracks to maxillofacial fractures. There are different treatment alternatives for the rehabilitation of these injuries (4, 5). When deciding on the treatment procedure, many factors such as the root development status of the traumatized tooth, the age of the patient, the time after the trauma, the degree of displacement or mobility, and whether the fracture line includes pulp should be evaluated together (6, 7).

There are many indirect and direct treatment options for anterior tooth crown fractures, both prosthetically and conservatively. Composite resin restorations (direct and indirect) are thought to be the best option for these treatments because they are applied with the principle of minimal tooth tissue removal (8). It can be applied using methods such as direct composite resin restorations, transparent matrix bands, ready-made strip crowns and free modeling technique (9). Although the use of transparent tape is considered to be a simple and fast technique, obtaining an anatomical form is quite difficult, and more time is required for finishing and polishing (10). Strip crown method; It is a form of restoration made through ready-made transparent crowns. The disadvantage of this method is that the anatomical form cannot be fully formed and sufficient contact cannot be provided with the adjacent tooth depending on the thickness of the strip crown (10). Free modeling technique is a form of restoration where composite resin is applied as layering and no matrix system is used. However, in order to achieve an ideal restoration in this application, good hand manipulation and many applications are required. In order to facilitate this method of application and make it more applicable, it has been suggested to use the silicone guide technique, in which the palatal contour can be obtained by mock-up method (10, 11). It is possible to obtain the color harmony and contour of the restoration as close to nature by using the incremental method through the special matrix impression obtained from silicon (9).

The aim of this case report is to describe the rehabilitation of an uncomplicated crown fracture with direct composite restoration using a silicone key.

Case Reports

Case 1: A 19-year-old female patient applied to the Dicle University Faculty of Dentistry Restorative Dentistry Department, five days after the trauma she suffered due to a crown fracture. It was learned in the medical history of the patient that she did not have any systemic disease and her primary complaint was the impaired aesthetic appearance of her tooth in the area exposed to trauma. No findings were found in the soft tissues in the external examination. In the oral examination, fractures were found in the left upper central and lateral teeth (Figure 1a). It was determined that the relevant tooth was vital, not sensitive to percussion and palpation, and was not mobile. No periapical pathology, root fracture or alveolar fracture was detected in the radiological examination. The patient was offered ceramic laminate veneer, porcelain crown, and indirect composite resin restoration treatment alternatives. However, due to the patient's socioeconomic status and her desire to be treated in a short time, it was decided to be restored using direct composite resin. It was explained that we could apply the treatment to the patient with the help of a silicone key in order to provide a better aesthetic appearance and harmonize shape and contact formation of the fracture tooth with the symmetrical tooth in the arch.

After the consent of the patient, impression was taken from the patient's upper jaw with silicone impression material and a plaster model was obtained. On the plaster model, the fracture tooth was restored, it was adapted to the adjacent teeth, and a silicone key was obtained by measuring on the plaster. Before starting the treatment, composites of different shades were placed in the middle third of the central tooth and polymerized using the button technique. After choosing the appropriate composite color, isolation was provided with a rubber dam. The carious areas at the interface of the upper right and upper left central teeth of the patient were cleaned and restoration was planned together with the fractured area. Minimally invasive beveling was performed. Etching was done with 37% orthophosphoric 8acid (Scotchbond; 3M ESPE, USA) and teeth were isolated from acid with teflon tape. After the universal adhesive agent (3M ESPE, Single Bond Universal, Germany) was applied, a thin layer of A2E (Enamel) composite resin (3M Filtek Ultimate, USA) was placed on the silicon key to form a palatal wall, placed on the tooth and polymerized (Figure 1b). Restoration was performed using dentine layering with medium A2B (Body) (3M Filtek Ultimate, USA) color to imitate natural tooth tissues, and A2E for enamel layering. Temporary surface macro-morphology was drawn on the surface of each tooth and surface macro texture was created using a yellow banded diamond bur at low speed and dry conditions. Interdental polishing was done with interface abrasives of different grades from thick to thin (Epitex, GC, Japan). Marginal

roundings and line angles were created using polishing discs in different grades from thick to thinest (Sof-Lex, 3M ESPE, USA). The surfaces were roughly polished with a spiral, rubber polishing disc. Surface micro-texture was created with a red banded diamond bur at very low speed, in one direction and in dry conditions. The rubber dam was removed and occlusal relationships were checked (Figure 1c). It was found that the treatment result was satisfactory for both the patient and the physician.

Figure 1a: Intraoral view of Case 1 before treatment

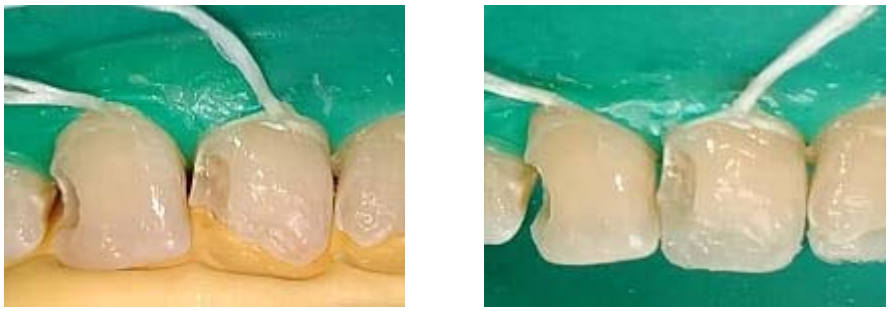

Figure 1b: Placing a silicone key and forming a palatinal wall (Case 1)

Figure 1c: Intraoral view of Case 1 after treatment

Case 2: A 20-year-old male patient applied to Dicle University Faculty of Dentistry Restorative Dentistry department for a crown fracture one week after his trauma. It was learned in the medical history of the patient that he did not have any systemic disease and his primary complaint was the impaired aesthetic appearance of his tooth in the area exposed to trauma. No findings were found in the soft tissues in the external examination. In the oral examination, fractures were found in the upper central teeth (Figure 2a). It was determined that the relevant tooth was vital, not sensitive to

percussion and palpation, and was not mobile. No periapical pathology, root fracture or alveolar fracture was detected in the radiological examination. Treatment options in Case 1 were presented to the patient. However, due to the patient's socioeconomic status and his desire to be treated in a short time, it was decided to be restored using direct composite resin. It was explained that we could apply the treatment to the patient with the help of a silicone key in order to provide a better aesthetic appearance and the compatibility of the fracture tooth with the symmetrical tooth in the arch (shape harmony and contact formation). The closure of the diastema was not included in the restoration planning because the patient thought it gave a natural appearance and did not approve of the treatment. After patient consent, the silicone key was obtained as described in Case 1. Before starting the treatment, composites of different shades were placed in the middle third of the central tooth and polymerized using the button technique. After choosing the appropriate composite color, isolation was provided with a rubber dam. The color of the composite resin used, treatment stages, finishing and polishing procedures were performed as described in Case 1 (Figure 2b). The rubber dam was removed and occlusal relationships were checked (Figure 2c). It was found that the treatment result was satisfactory for both the patient and the physician.

Figure 2a: Intraoral view of Case 2 before treatment

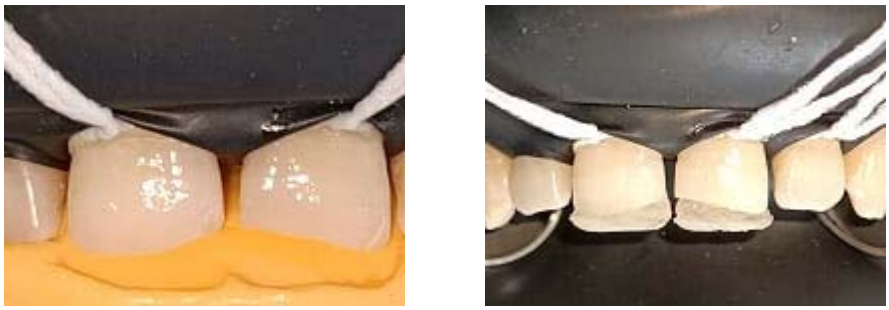

Figure 2b: Silicon key placement and creation of palatinal wall (Case 2)

Figure 2c: Intraoral view of Case 2 after treatment

Case 3: A 23-year-old female patient applied to Dicle University Faculty of Dentistry Restorative Dentistry department for a crown fracture one week after the trauma. It was learned in the medical history of the patient that she did not have any systemic disease and her primary complaint was the impaired aesthetic appearance of her tooth in the area exposed to trauma. No findings were found in the soft tissues in the external examination. In the oral examination, a fracture was found in the right upper central tooth (Figure 3a). It was determined that the relevant tooth was vital, not sensitive to percussion and palpation, and was not mobile. No periapical pathology, root fracture or alveolar fracture was detected in the radiological examination. Treatment options in Case 1 were presented to the patient. However, due to the patient's socioeconomic status and her desire to be treated in a short time, it was decided to be restored using direct composite resin. With the consent of the patient; While planning the restoration of the tooth, an acceptable gap was left between the teeth due to the possibility that the mesiodistal size being wider than normal may adversely affect the appearance and the metal-supported porcelain crown in the adjacent tooth could not be changed. It was explained that we could apply the treatment to the patient with the help of a silicone key in order to provide a better aesthetic appearance and harmonize shape and contact formation of the fracture tooth with the symmetrical tooth in the arch. After patient consent, the silicone key was obtained as described in Case 1. Before starting the treatment, composites of different shades were placed in the middle third of the central tooth and polymerized using the button technique. After choosing the appropriate composite color, isolation was provided with a rubber dam. The color of the composite resin used, treatment stages, finishing and polishing procedures were performed as described in Case 1 (Figure 3b). The rubber dam was removed and occlusal relationships were checked (Figure 3c). It was found that the treatment result was satisfactory for both the patient and the physician.

Figure 3a: Intraoral view of Case 3 before treatment

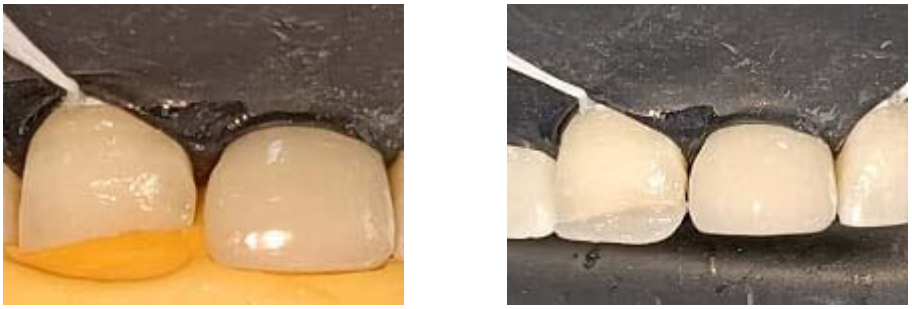

Figure 3b: Silicon key placement and creation of palatinal wall (Case 3)

Figure 3c: Intraoral view of Case 3 after treatment

Discussion

Any trauma that affects the head and face can cause various damage to the teeth and their supporting tissues. The severity of the trauma and the type of injury determine the degree of harm (12). Dental traumas mostly affect the upper middle incisors and this is followed by the upper lateral incisors. Luxation and crown fracture are more common types of dental trauma. While crown fractures are frequently observed in the 11-14 age range, luxation is observed in the 7-10 age range (13).

In crown fractures, the type of treatment and the prognosis afterwards depend on the amount of fracture and the amount of dental tissue it contains. The prognosis of crown fractures that do not involve pulp opening depends primarily on the condition of the periodontal ligament and the surface area of the opened dentin (14). In a study conducted on the prognosis of enamel dentin crown fractures, it was reported that 99% of the tooth was vital in these fractures without luxation injury,

and there was canal obliteration in 1% and no necrosis (15). Different treatment methods can be applied in uncomplicated crown fractures. The choice of treatment method depends on the location of the fracture line. Treatment of uncomplicated crown fractures can be restored prosthetically or conservatively. Many types of treatment have been used in uncomplicated crown fractures until today. In conservative treatment methods, if the pulp is not exposed, the farcture piece can be placed or if there is no farcture piece, direct restoration can be done with composite resins of the appropriate color (16). If it contains 2/3 or more of the fracture crown, it is recommended that the restoration be restored with radical support with a post (17). Restoration with composite resin is a conservative treatment method that replaces the lost tissue without touching the healthy tooth tissue. The use of current composite resins with the incremental method enables the creation of all surface properties of the tooth (18).

In the incremental method, it is easier to create the shape and contour of the tooth and to harmonize the color with the use of silicone keys. Although the time spent for silicone guides seems to be a disadvantage, the color harmony and contour of the restoration can be obtained as close to nature (9).

Porcelain crowns are another treatment option for crown fractures, depending on the location of the fracture and the amount of missing teeth. Today, it has become easier to make with CAD / CAM technology. However, the disadvantages include the difficulty of repair, the inability to change color after bonding, and the inability to polish easily such as composite filling materials when their brightness is lost (19).

Conclusion

Long-term clinical and radiological follow-up is important in terms of early diagnosis of dental injuries in the form of crown fractures in teeth, application of the correct treatment procedure and possible complications that may occur. Direct composite restorations are a type of treatment with lower cost compared to prosthetic treatments and providing patient satisfaction in terms of functionality and aesthetics. In these cases, it has shown that composite resin restorations can be a simple and effective procedure for the treatment of anterior traumatized teeth with promising aesthetic and functional results.

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