

SHORT COMMUNICATION

Restoring crown fractures by direct composite layering using transparent strip crowns

Ece Eden¹, Engin Taviloğlu²

¹Department of Pedodontics, School of Dentistry, Ege University, İzmir; ²Av Süreyya Ağaoğlu Sokak, İstanbul, Turkey

Key words: crown fracture; permanent dentition; treatment

Correspondence to: Ece Eden, Department of Pedodontics, School of Dentistry, Ege University, Bornova, İzmir 35100, Turkey.
Tel.: +90 232 388 64 31
Fax: +90 232 388 03 25
e-mail: eceeden@yahoo.com

Accepted 9 September, 2015

Abstract – Traumatic dental injuries are mostly seen at childhood and adolescence. The most common fracture in permanent anterior teeth is crown fracture. Esthetic and easy rehabilitation of these anterior teeth is possible using layering techniques and direct composite resin restorations. Shape, color and surface texture are the most important factors in restoring crown fractures esthetically. This article illustrates how to perform an esthetic composite resin restoration of crown fractures using strip crowns. The technique suggests using a strip crown as a mold for direct resin composite restoration. This provides a cost-effective treatment with operator friendly approach where most outstanding advantage is the minimum chair-side time with a single visit that is very important for young trauma patients.

Children are prone to trauma, and mostly permanent incisors are affected (1–5). The fractures in permanent incisors possess several problems in relation to function and esthetics. Therefore, a functional and esthetic rehabilitation of the crown fractures are very important. Several methods have been proposed for better esthetics and long-lasting restorations. Studies and case reports showed that esthetic and functional rehabilitation of crown fractures are possible with direct restorations and reattachment of the fracture fragment with minimal healthy tissue loss (6–8). Layering techniques provide better esthetical results and with the improvements in composite resin materials it is becoming easy to mimic the natural tooth structure in direct composite restorations (9–13).

All the steps that need to be carried out to produce esthetic composite restorations require too much time where several visits may be needed and they are operator dependent. (13, 14). The operator's skills and his/her familiarity with the restorative material and the composite resin brand are important factors for success. The short chair-time for dental procedures for all ages is appealing where the most outstanding problem in treating children is the restricted patience of the young patient. Therefore, an easy and fast treatment option is usually the most preferred treatment of choice in restoring fractured permanent incisors in children and adolescents. This article illustrates a rapid and easy technique for producing esthetic direct composite

restorations for traumatized anterior teeth using transparent strip crowns.

Step-by-step Technique

The technique involves using transparent strip crown as a mold for restoring a crown fracture. A suitable bonding agent and all composite materials in the market may be used. It should be noted that bonding steps preferably be carried out before placing the strip crown.

There are different sized strip crowns for permanent incisors available in the dental market for producing temporary crowns. It is also possible to find strip crowns or so-called pill off crowns for restoring primary dentition. The strip crowns are made up of thin plastic where the dentist contours by cutting using scissors. The procedure is easier when curved scissors are used.

First step is to choose the right size of the strip crown for the fractured tooth. This may be done by measuring the size of the tooth and match it with the strip crown size (Fig. 1).

The second step is to adapt the strip crown to the cingulum of the anterior tooth by cutting the gingival margin using scissors. The strip crown should sit on the cingulum tightly. The vestibular surface of the strip crown is cut as a window according to the fracture line on the tooth. The margins that are left after cutting the vestibular surface should be covering the approximal surfaces like a matrix band and ending just at the edge of

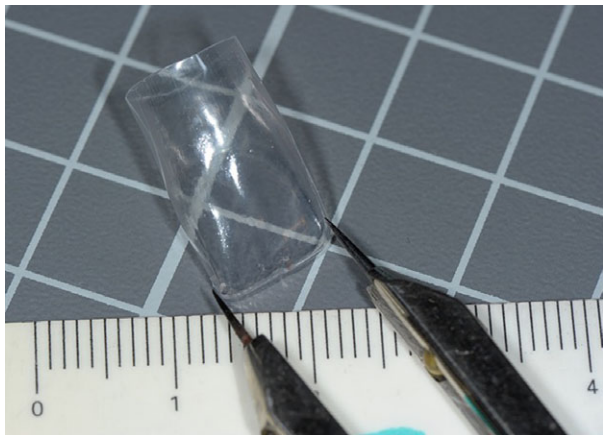


Fig. 1. Measuring the size of the fractured tooth and right sized transparent strip crown (Strip Off Crowns, Henry Schein, Melville, NY, USA).

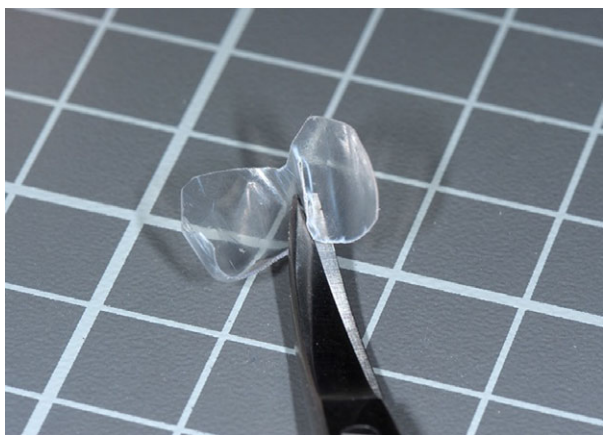


Fig. 2. The gingival margin at the palatine and vestibular surface of the strip crown is cut by scissors. The vestibular surface is cut as a window where the margins are at the vestibular edge of the distal aproximal surface and incisal edge. The vestibular surface of the crown is left attached to the mesial surface to be used as a handle.

the vestibular surface of the tooth. The incisal edge that is symmetric to the neighboring tooth should be cut at the edge of the vestibule surface. The vestibular surface of the strip crown that is cut away from one of the aproximal edge and the incisal edge produces a wing attached to the other aproximal surface. This part of the strip crown is used as a handle. If the tooth has an oblique fracture, then the handle should be left attached to the sound aproximal side of the tooth. The dentist may prefer to cut away all of the vestibular surface of the strip crown like an open face, but the handle will help to hold the crown easily until providing fixation. The open face may be removed later, whenever preferred, by cutting the handle from the attached edge.

In the presented case, the margins of the window lay at the vestibular edge of the distal aproximal surface and incisal edge. The vestibular surface of the strip crown that is still left attached to the mesial surface is used as a handle (Figs 2 and 3).



Fig. 3. The adaptation of the prepared transparent strip crown on the tooth.



Fig. 4. The palatal side of the strip crown is fixed using a gingival protection light cure resin (Beyond Blue Seal, USA).

The strip crown is adapted on the tooth surface from the palatal side making sure that the incisal edge is in the same position as the neighboring tooth and fixed either using a gingival protection (Beyond Blue Seal, Stafford, Tx, USA) which is used for bleaching (Fig. 4) or using appropriate sized wedges on both sides such as when stabilizing a matrix band.

After providing proper fixation, the layering of composite material is performed starting from the palatal wall over the strip crown.

A thin layer of composite resin for enamel is placed over the palatal surface of the strip crown. An injectable or heated composite resin, which is more flowable than a standard composite material for the first enamel layer on the palatal surface of the restoration, may be preferred to provide a proper seal with the tooth enamel on the fractured surface (Fig. 5). The composite resin is cured from both sides. At this step, the vestibular surface that was used as a handle for holding the crown may be removed by cutting from the proximal margin. The strip crown may be removed after modeling the palatal shell or left in place.



Fig. 5. Thin layer of injectable composite resin is applied as a palatal enamel shell (Beautiful Flow Plus, Shofu Dental Corporation, Kyoto, Japan).



Fig. 6. Dentin layer with mamelons is placed over the enamel shell (Beautiful II, Shofu Dental Corporation, Japan).



Fig. 7. The handle over the strip crown is cut away and the vestibular enamel layer (Beautiful II, Shofu Dental Corporation, Japan) is modeled using a brush.

The dentin layer using composite resin is placed over the palatal enamel shell mimicking the adjacent tooth mamelons and cured (Fig. 6).



Fig. 8. The strip crown is removed before finishing and polishing.

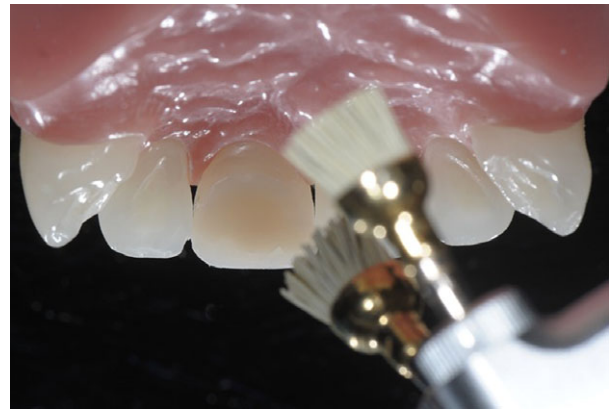


Fig. 9. The palatal view of the final restoration.

The facial enamel layer is placed using appropriate instruments such as thin spatulas and brushes for better esthetics (Fig. 7). Notice that the handle is cut away before modeling the facial enamel and the strip crown is removed after placing the enamel composite layer facially (Fig. 8).

Finishing with carbide burs, diamond-impregnated silicon brushes and polishing steps with pastes are carried out on the palatal surface (Fig. 9) and facial surface giving the surface texture (Fig. 10).

Case 1

A medically healthy 9-year-old female patient had trauma 10 days earlier on her 11 and 21. The 11 and 21 had uncomplicated crown fractures. The 11 was restored with free hand layering composite while a strip crown was cut to fit 21 as a mold (Fig. 11). The 21 was restored using enamel and dentin composite layers. The palatal surface needed minimal finishing after removing the strip crown (Fig. 12).

Case 2

A medically healthy 50-year-old male patient had trauma to his 11 more than 15 years earlier and it was



Fig. 10. Final restoration after finishing and polishing steps.



Fig. 13. Adaptation of the strip crown on 11 of a 50-year-old trauma patient.



Fig. 11. Adaptation of strip crown on 21 of a 9-year-old trauma patient.



Fig. 14. Palatal enamel shell (Estelite Asteria, Tokuyama Dental, Vicenza, Italy).



Fig. 12. Palatal view of the final restoration on 21 (Filltek Ultimate, 3M ESPE, USA).



Fig. 15. Palatal view of the final restoration on 11 (Estelite Asteria, Tokuyama Dental, Italy).

restored with a composite restoration. Just before a business trip, he traumatized the same tooth while eating something hard and needed an urgent restoration. The tooth responded to pulp sensibility tests. The

extensive fracture was restored using a strip crown as a mold (Fig. 13). A palatal enamel shell was performed (Fig. 14), and tooth was restored (Fig. 15).

Discussion

The esthetics is related to the shape, color, and surface texture of the restoration in relation to the adjacent teeth. The different color and optical characteristics of the composite resin materials used for dentin and enamel provides an aid for the dentist to mimic the color and translucency of the tooth in direct restorations. It is imperative to produce a similar surface texture, and several finishing instruments and burs must be used to provide resemblance to natural enamel. Polishing and providing enamel shine is the last step in esthetics (9–13, 15, 16).

Dentists may produce a wax-up and a silicon mold to copy the shape of the neighboring tooth and use layering techniques for matching the color. The silicon palatal guide helps to control the palatal contours and the thickness of composite layers. Previously waxed-up model will aid the dentist in three-dimensional perception of the restoration (15, 17). Many dentists worldwide are using that technique where the only disadvantage is the necessity of several steps that are needed to prepare the mold. The dentist needs to take the impression of the tooth in question, obtain a cast model, and prepare a proper wax-up by himself or by the help of a technician that will require two visits. The proposed technique provides an easy-made mold from a standard transparent strip crown to perform an esthetic restoration. The mold is easily modified according to the fracture line only by cutting the strip crown appropriately without any further steps. The occlusion contacts can be arranged before fixing the strip crown, and it is also possible to restore two or more teeth one by one, at the same visit. After removing the strip crown, the palatal contours of the restoration only need a minimal finishing that does not interfere with the composite thickness. The technique provides both the possibility of using thin layers of composite resin and the advantage of curing from all sides avoiding un-polymerized resin.

The facial surface of the strip crown that is cut to provide access to the palatal wall of the restoration is suggested to be in use as a handle to carry it until providing a fixation and avoid the risk of swallowing in young children where rubber dam may not be applied easily. It is important to note that rubber dam is not a restriction for the technique and even provides an advantage.

Conclusion

Using the standard transparent strip crowns as a mold for restoring crown fractures in permanent dentition is time saving, cost-effective, and a very practical technique providing successful and esthetic direct restorations in trauma patients.

References

- Lauridsen E, Hermann NV, Gerds TA, Kreiborg S, Andreassen JO. Pattern of traumatic dental injuries in the permanent dentition among children, adolescents, and adults. *Dent Traumatol* 2012;28:358–63.
- Francisco SS, Filho FJ, Pinheiro ET, Murrer RD, de Jesus Soares A. Prevalence of traumatic dental injuries and associated factors among Brazilian schoolchildren. *Oral Health Prev Dent* 2013;11:31–8.
- Cetinbaş T, Yildirim G, Sönmez H. The relationship between sports activities and permanent incisor crown fractures in a group of school children aged 7–9 and 11–13 in Ankara, Turkey. *Dent Traumatol* 2008;24:532–6.
- Kovacs M, Pacurar M, Petcu B, Bukhari C. Prevalence of traumatic dental injuries in children who attended two dental clinics in Targu Mures between 2003 and 2011. *Oral Health Dent Manag* 2012;11:116–24.
- Al-Khateeb S, Al-Nimri K, Alhajja EA. Factors affecting coronal fracture of anterior teeth in North Jordanian children. *Dent Traumatol* 2005;21:26–8.
- Patel N, Patel K, Venkataraghavan K, Madan S. Utilization of different management concepts in fractured tooth fragment reattachment: a report of three cases. *J Contemp Dent Pract* 2013;14:973–9.
- Pamir T, Eden E, Sebahtin Ahmed S. Shear bond strength of restorations applied to un-complicated crown fractures: an *in vitro* study. *Dent Traumatol* 2012;28:153–7.
- Nayak UA, Khandelwal V, Nayak PA, Thakur JS. Restoration of fractured anterior permanent teeth using reference guide technique. *BMJ Case Rep* 2013;doi 10.1136/bcr-2013-010257: 1–4.
- Manauta J, Salat A, Putignano A, Devoto W, Paolone G, Hardan LS. Stratification in anterior teeth using one dentine shade and a predefined thickness of enamel: a new concept in composite layering—Part II. *Odontostomatol Trop* 2014;37:5–13.
- Dietschi D. Layering concepts in anterior composite restorations. *J Adhes Dent* 2001;3:71–80.
- Villaruel M, Fahl N, De Sousa AM, De Oliveira OB. Direct esthetic restorations based on translucency and opacity of composite resins. *J Esthet Restor Dent* 2011;23:73–87.
- Devoto W, Saracinelli M, Manauta J. Composite in everyday practice: how to choose the right material and simplify application techniques in the anterior teeth. *Eur J Esthet Dent* 2010;5:102–24.
- Dietschi D. Optimising aesthetics and facilitating clinical application of free-hand bonding using the 'natural layering concept'. *Br Dent J* 2008;204:181–5.
- Mackenzie L, Parmar D, Shortall AC, Burke FJ. Direct anterior composites: a practical guide. *Dent Update* 2013;40:297–9, 301–2, 5–8 passim.
- Manauta J, Salat A, Putignano A, Devoto W, Paolone G, Hardan LS. Stratification in anterior teeth using one dentine shade and a predefined thickness of enamel: a new concept in composite layering—Part I. *Odontostomatol Trop* 2014;37:5–16.
- Fahl N. A polychromatic composite layering approach for solving a complex Class IV/direct veneer/diastema combination: part II. *Pract Proced Aesthet Dent* 2007;19:17–22.
- Fahl N. A polychromatic composite layering approach for solving a complex Class IV/direct veneer-diaestema combination: part I. *Pract Proced Aesthet Dent* 2006;18:641–5; quiz 6.