Treatment of Pediatric Patients with Lost Anterior Teeth Due to Trauma: A Report of Two Cases on Alternative, Practical and Temporary Approaches

Travma Nedeniyle Ön Kesici Dişlerini Kaybetmiş Çocukların Tedavisi: Alternatif, Pratik ve Geçici Yaklaşımlar İçeren İki Olgu Sunumu

Ülkü ŞERMET ELBAY,[a]
Mesut ELBAY,[a]
Emine KAYA,[a]
Sinem YILDIRIM,[a]
Serkan SARIDAĞ[b]

Departments of
[a]Pedodontics,
[b]Prosthodontics,
Kocaeli Üniversitesi Faculty of Dentistry, Kocaeli

Geliş Tarihi/*Received:* 09.11.2015
Kabul Tarihi/*Accepted:* 24.02.2016

One of these cases was presented as a poster at 20th Congress of Turkish Pedodontics Association, 7-10 November 2013, Kayseri.

Yazışma Adresi/*Correspondence:*
Ülkü ŞERMET ELBAY
Kocaeli Üniversitesi Faculty of Dentistry, Departments of Pedodontics, Kocaeli, TÜRKİYE/TURKEY
ulkusermet_3@msn.com

ABSTRACT Loss of anterior teeth due to trauma necessitates an immediate treatment because of negative functional, esthetic, phonetic and psychological effects on children. There are several treatment modalities. Fiber-reinforced composite resins (FRC) have become a preferred option, since they offer minimally invasive, esthetic and cost-effective metal-free prosthetic restoration. Elimination of a second visit, easier application procedure, absence of the risk of metal allergy, easiness of cleaning and naturalness feel are the other advantages. Adhesive bridges with FRC to replace missing teeth can be created using extracted tooth, acrylic resin and composite resin material by using direct technique intraorally or indirect technique extra orally. This clinical report presents two cases in which FRC fixed partial prosthesis were successfully used to restore anterior edentulous spaces by using a natural tooth and a composite crown as a pontic by an easier indirect fabricating method in children.

Key Words: Denture, partial, fixed; tooth avulsion; fiberglass reinforced polymers

ÖZET Çocuklarda travmaya bağlı anterior diş kaybının tedavisi, olumsuz fonksiyonel, estetik, fonetik ve psikolojik etkilerinden dolayı aciliyet gerektirir. Böyle durumlar için değişik tedavi yaklaşımları mevcuttur. Fiber ile güçlendirilmiş kompozit rezinler minimal invaziv, estetik ve maliyeti düşük bir metal desteksiz sabit protetik restorasyona olanak sağlamasından dolayı tercih edilen bir seçenek haline gelmiştir. Tek seansta tamamlanabilmesi, metal allerjisi riski bulundurmaması, kolay temizlenebilir olması ve doğallık hissi vermesi diğer avantajlarıdır. Kayıp dişin yerini alacak olan adeziv köprü, hastanın çekilmiş dişi, akrilik veya kompozit rezin materyal kullanılarak direkt yöntem ile ağız içerisinde ya da indirekt yöntem ile ağız dışında hazırlanabilir. Bu olgu raporunda, birinde hastanın kendi dişinin, bir diğerinde ise indirekt yöntem ile kompozit rezinden oluşturulan yapay dişin kullanıldığı fiberle güçlendirilmiş adeziv köprü restorasyonu uygulanan, travma sonucu üst ön kesici dişlerini kaybetmiş iki çocuk hasta sunulmaktadır.

Anahtar Kelimeler: Protez, kismi, sabit; diş avulsiyonu; fiberglas ile güçlendirilmiş polimerler

Turkiye Klinikleri J Dental Sci Cases 2016;2(1):10-5

The majority of dental injuries involve the anterior teeth and loss of these teeth due to trauma necessitates an immediate treatment because of negative functional, esthetic, phonetic and psychological effects on children. Also providing space maintenance and avoidance of masticator problems are the other important reasons.[1-3]

Restoration of a single edentulous space in the anterior maxillary region presents unique challenges to the dental profession and often requires

doi: 10.5336/dentalcase.2015-48209

a coordinated interdisciplinary approach. There are several treatment modalities in the literature. Orthodontic closure of the space, auto transplantation, implants treatment, and prosthodontic rehabilitation are some of these.[4-6] Systemic condition, age and motivation of the patient, location and size of the edentulous space, occlusion, vertical and horizontal lengths should be considered while choosing the most appropriate treatment option.[7] An ideal treatment plan should take into account all of these factors to achieve the esthetic and functional goals with the least-invasive option.

Fiber-reinforced composite resins (FRC) are relatively new to the pediatric dental market and fixed prostheses those are fabricated with them have become a preferred treatment option, since they offer minimally invasive, esthetic, and cost-effective metal-free tooth replacement.[8] Elimination of a second visit, easier application procedure, absence of the risk of metal allergy, easiness of cleaning and naturalness feel are the other advantages.[9] This paper represents two clinical cases of FRC-fixed partial prosthesis, in the first; using natural tooth crown and in the second; a provisional restoration with a composite crown as a pontic using an easier indirect fabricating method in growing children.

CASE REPORTS

CASE 1

A 10 year-old female patient with a dental injury, applied to the dental clinic of Kocaeli University Department of Pediatric Dentistry 2 months after the trauma. Clinical and radiological examination showed a crown and root fracture of the right maxillary central incisor and crown fracture of left maxillary central incisors (Figure 1a, 2a). The vitality test was negative in both teeth. Root canal treatment for left maxillary central incisor was planned. Written consent was obtained from the parent and patient before treatment. Right maxillary central incisor was extracted due to the severe infection and resorption and decided to be used as a pontic to make a FRC- fixed partial prosthesis (Figure 2b). Tooth was cut from the cement-enamel junction. After removing the remnants of pulp tissue, the tooth was stored in sterile saline solution.

Approximately, three months after the initiation of the treatment, the endodontic therapy and coronal restoration of the left central incisor was completed (Figure 1b, 2c). Impression of the maxillary arc was taken with alginate impression material (Tulip, Cavex, Holland). A model was prepared to check the position and size of the pontic. The natural tooth pontic was adjusted as a modified ridge lap design to facilitate oral hygiene and esthetics (Figure 2d). After preparing, etching and bonding procedures of the adjacent teeth (Figure 2e), an appropriate length of FRC (Interlig, Angelus, Brasil) was adapted to the lingual surface with a thin layer of composite resin (Flowable Composite 3M ESPE, USA) then polymerized. After coating with hybrid composite (Kuraray Majesty Esthetic, Japan) as additional fortification in the interdental areas, polishing and finishing was performed (Figure 2f).

CASE 2

A nine-year old boy applied to the clinic of Kocaeli University Department of Pediatric Dentistry, three months after a traumatic injury. Clinical and radiological examination showed that maxillary right central incisor was avulsed because of dental trauma (Figure 3a, 4a). The vitality test was negative in left maxillary central incisor. Apexification treatment was planned with MTA. Written consent was obtained from the parent and patient be-

FIGURE 1: Radiography of maxillary incisors **a)** before extraction and endodontic treatment, **b)** after treatment.

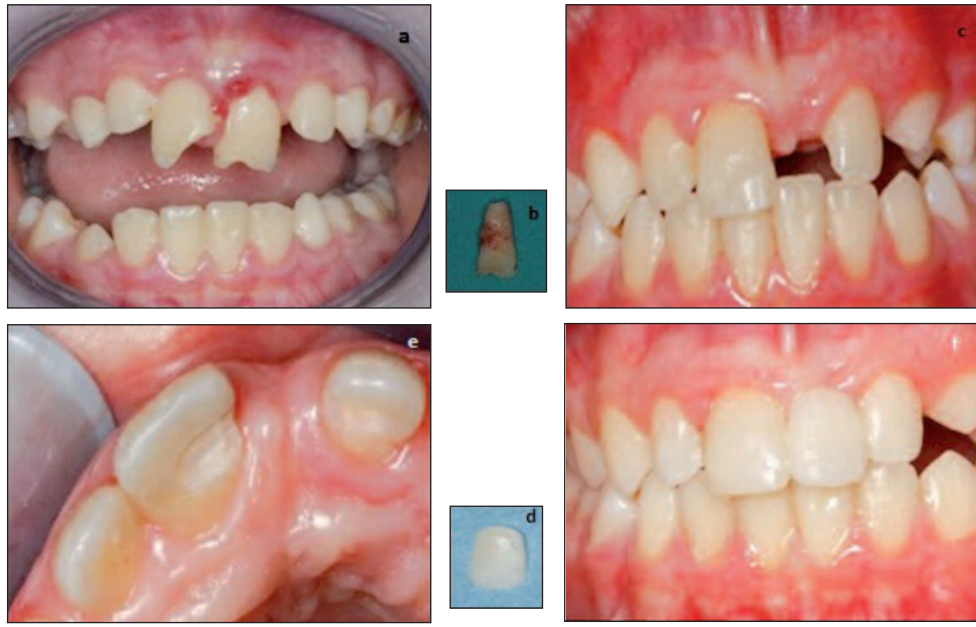

FIGURE 2: a) Intraoral view of the patient before treatment, **b)** extracted tooth, **c)** healing after extraction **d)** natural tooth pontic, **e)** preparation of the adjacent teeth, **f)** after prosthodontic rehabilitation.

fore treatment. Also left mandibular lateral incisor was necrotic and needed root canal therapy (Figure 3b). Approximately, three months after initiating the treatment, endodontic therapy and coronal restoration of teeth was completed and prosthetic rehabilitation was started (Figure 3c, 3d). FRC fixed prosthesis was decided as a treatment until the completion of the development of the child's growth. Due to the loss of the natural tooth, fabricating composite resin crown as a pontic was planned. Indirect technique was chosen to reduce the problems caused by the difficulty of isolation in the oral cavity. An impression was taken with alginate impression material (Tulip, Cavex, Holland) to obtain the negative copy of the symmetric tooth of lost maxillary left central incisor. Appropriate shade composite resin (Kuraray Majesty Esthetic, Japan) was sent in to negative copy of the symmetric tooth with using a hand instrument (Figure 4b). After polymerization (1200 mw/cm^2, Elipar Free Light II, 3M ESPE, USA), the composite resin pontic was removed. A model was prepared to check the position and size of the pontic. The pontic was modified to obtain anatomical form of the left maxillary central incisor (Figure 4c). Also modified ridge lap design was performed to facilitate oral hygiene and esthetics. After preparing, etching and bonding procedures of the adjacent

FIGURE 3: Radiography of maxillary and mandibular incisors **a, b)** before endodontic treatment, **c, d)** after endodontic treatment.

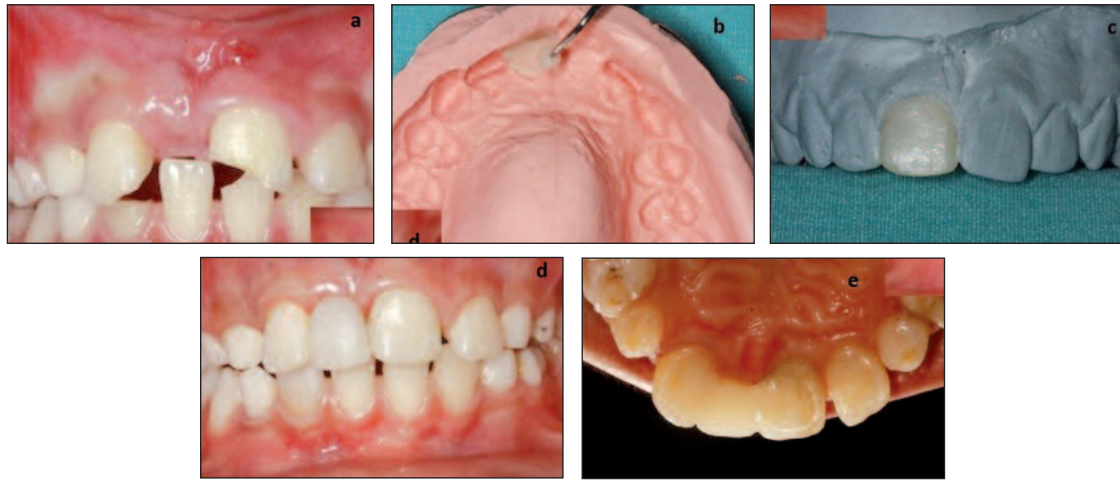

FIGURE 4: a) Intraoral view of the patient before treatment, **b)** alginate impression to obtain composite pontic, **c)** composite pontic on the model, **d, e)** intraoral view after prosthodontic rehabilitation.

teeth to be used as abutments for the resin-bonded bridge, an appropriate length of FRC (Interlig, Angelus, Brasil) was adapted to the lingual surface with a thin layer of composite resin (Flowable Composite 3M ESPE, USA) then polymerized. The finishing and polishing procedures were carried out by using composite finishing discs (Figure 4d, 4e).

DISCUSSION

Removable prosthesis is often recommended for young patients to replace a tooth, but having great difficulty in adapting the prosthesis is a major problem in pediatric dentistry. Also fracture or losses of the prosthesis are other important disadvantages. Since wearing of removable appliances is inconvenient to the patient, fixed provisional restorations were chosen in the present cases.[10]

Different materials and applications have been reported for the replacement of a lost tooth by using fixed dentures.[11-13] FRC offers minimally invasive, esthetic and cost-effective metal-free treatment approach to restore the anterior edentulous space. Eliminating complicated laboratory steps, ease of application, cleaning, and eradication of the metal allergy risk are the other advantages of this technique.[14,15] In the cases presented above, FRC was used to provide more esthetic appearance and also to take advantage of the other properties. Prabhakar et al. reported that, the usage of an orthodontic ligature wire for the replacement of the tooth.[12] Metallic color reflection, preparing larger grooves and roughness of surface that causes patient to adapt the prosthesis more difficultly are the disadvantages of this technique.

Pontic alternatives for tooth replacement with FRC were derived from extracted tooth, acrylic resin and resin composites denture teeth.[14,16-20] Mishra et al. reported using acrylic denture tooth as a pontic with FRC.[18] It has been known that the prefabricated acrylic resin teeth often do not have acceptable color, size and shape matching. Another inherent problem with acrylic pontic is inability to be chemically incorporated into dental resin.[14]

Using extracted or avulsed natural tooth has many advantages such as having bondable and repairable structure which is hygienic and easy to fabricate.[7,13,21] This type of treatment is a relatively non-invasive and reversible provisional procedure, and offers a simple application technique with minimal tooth preparation, cost effectiveness. Also, the positive psychological impact on the patient by using a natural tooth cannot be disputed.[21] In the first case, because of the extraction of the left maxillary central, the natural tooth was used as a pontic.

In the second case, since the natural tooth was lost, composite resin pontic was used. It offers good esthetic results, through the ideal strat-

ification of the natural colors of the tooth, combining different resin shades and viscosities.[22] To prefer a composite pontic can eliminate the incorporation problem and be more advantageous for those patients who are allergic to acrylic too. Chafaie and Portier reported usage of composite resin pontic in their case.[14] They had created a composite resin denture on the patient's diagnostic wax up. In the presented case, the negative copy of the symmetric tooth was obtained from the patient's impression and then, it was adapted to the edentulous space. Since the patient's symmetric tooth copy was used to provide a pontic, more esthetic and natural result was acquired. Also it was reported that fabricating the FRC bridge extra orally, achieve better polish, polymerization conversion rate and adaptation.[23] This was one of the advantages of the chosen method. Moreover, reshaping the pontic was more practical and the laboratory time was shorter in this method. Garoushi et al. created a composite pontic using direct technique intraorally in their case.[9] It was reported that the direct method of incrementally building up a large span restoration has inherent problems including resin depth of cure, adequacy of light curing, incorporation of porosities, pontic contour, surface polish of the pontic fitting surface, and adequate coverage of the fiber component of the bridge.[24] These problems were overcome by using indirect methods in the second case presented above.

Some clinical limitations and disadvantages have been reported for FRC fixed partial prosthesis such as requiring a thorough working, some tooth preparation on the lingual and interproximal surfaces of the abutment teeth, to be remade more than one time before the completion of the growth period and patient compliance with maintenance of meticulous oral hygiene.[3,25] In the present cases, the preparations of the two abutment teeth were performed according to the literature minimally and confined to enamel, it was a non-invasive approach. Further more for deciding the treatment option, the parental cooperation was held and they stated that their children could dislike wearing removable prosthesis and they preferred an adhesive bridge taking in to account the remaking more than one time until the completion of the growth period. Because the main limiting factor with this treatment option was poor oral hygiene in both patients, FRC fixed partial prosthesis was performed after making sure that the compliance with maintenance of meticulous oral hygiene and it caused a bit delay before starting the treatment. Despite the fact that in the earlier studies, limited load-bearing capacity was reported as a disadvantage of FRC fixed partial prosthesis and most common failures in FRC was reported as delamination of veneering composite at pontic area, the recent studies indicates that survival rate is quite high up to five years, which reflects material development and learning of fabricating FRC FPDs.[15,25-27]

This clinical report presented two cases in which FRC fixed partial prosthesis were successfully used to restore anterior edentulous spaces by using a natural tooth and a composite crown as a pontic. Fiber reinforced composite resin bridges can be used for temporary restorations up to the completion of the development and growth in pediatric dentistry as a lead until implant or conventional prosthetic therapy. Using reinforced composite dentures ensured esthetic appearance, ease to place, lowering chair side time and acceptance by the patients in both presented cases. Using patient's natural tooth is a desirable option, but, when the natural teeth is absent, composite resin crowns could be used as an alternative pontic type by using indirect technique which offers practical reshaping and better isolation.

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