A Complication of the Use of Fiber-Reinforced Ribbon-Composite Provisional Fixed Partial Denture in an Adolescent Patient

Duygu Tuncer, Neslihan Arhun*, Derya Merve Halaçoğlu and Burcu Oğlakçı

Baskent University, School of Dentistry, Department of Restorative Dentistry, Ankara, Turkey

Abstract: Treatment of adolescent patients with a missing incisor may be compromising because implants cannot be placed until craniofacial growth is complete. Fiber reinforced ribbon-composite fixed provisional partial dentures can be used for the replacement of the missing teeth. Since the craniofacial growth continues transverse, sagittal and vertical directions, regular control appointments must be managed to check the alveolar ridge/gingival level in the pontic area. This case report describes a clinical complication fiber reinforced ribbon-composite fixed provisional partial denture of an adolescent patient with a trauma originated missing incisor. A 14 years old male patient who had attended to Baskent University in 2010, had a traumatic dental injury in #21 tooth which was extracted. The missing tooth was replaced with a fiber reinforced ribbon-composite fixed provisional partial denture with patient's tooth as pontic until the definitive implant supported single-tooth prosthetic rehabilitation and the family was asked to visit regularly every six months. The patient didn't attend to the control appointments until the provisional denture's failure and the harmony between pontic tooth and the alveolar ridge/gingiva was severely compromised after 4 years. If the goals of treatment planning favors fiber reinforced ribbon-composite fixed provisional partial denture use before skeletal maturation, attention must be given to prosthesis design. Regular control appointments of alveolar ridge and pontic design must be managed and pontic tooth must be re-shaped to accommodate physiological soft and hard tissues in accordance with the skeletal growth to ensure esthetic future single implant supported prosthetic rehabilitation without any need for further augmentation surgeries.

Keywords: Fiber reinforced resin composite, adolescent, skeletal growth, single implant.

1. INTRODUCTION

The loss of maxillary incisors as a result of trauma in adolescents is a clinically challenging situation [1]. The majority of dental injuries occur in children, and luxation of the permanent teeth is the most frequent dental injury in children aged 6 to 12 years [2]. Complications of traumatic experiences such as dental luxation include ankyloses, and local destruction of the periodontal tissues [3]. There are several treatment approaches including reimplantation of the avulsed tooth, auto transplantation, insertion of a fixed partial denture or an implant during adulthood, and substitution of the ipsilateral lateral incisor for the central incisor after space closure [4]. The choice of treatment for a missing maxillary central incisor is based on the specific characteristics of the patient [5]. However, the minimum age of the implant candidate is often a concern for maxillary anterior tooth replacement in terms of skeletal maturation [6]. During the developmental stage, vertical and anteroposterior growth changes are substantial in this area. The vertical growth of the maxilla exceeds all other dimensions of growth in this quadrant; therefore, premature implant placement can result in the repetitive need to lengthen the transmucosal implant connection which leads to poor implant-to-prosthesis ratios and the potential for load magnification [7]. Brahim [8] advised that whenever possible, implant placement must be delayed in girls until they are 15 years old and in boys until they are 18. The edentulous space must be maintained if an implant cannot be placed until facial growth is complete. For provisional restoration, removable prosthesis or a fiber reinforced composite (FRC) bridge fixed prosthesis may be used [9].

FRCs have recently been improved for application in dentistry and various types of fibers have been tested for this purpose [10]. Glass fibers are most frequently used as they are highly suitable for withstanding tensile stress and preventing crack propagation in composite resin. With the addition of fibers to composite resins, high flexural strength, fracture toughness and elastic modulus have been achieved [10]. With the help of these improved physical properties, fiber reinforced ribbon and resin composites can be used to replace a missing tooth, either with the patient's own tooth or with an acrylic tooth. In dental literature, there are various case reports describing the provisional replacement of missing teeth in adults [11-13], with good stability, lasting up to several years [14, 15]. However, to our best knowledge, there is no case report on prolonged use of provisional fiber-reinforced ribbon and resin composite in an adolescent patient with missing teeth until definitive replacement.

This case report describes a complication of tooth replacement in a patient with a missing maxillary central incisor, treated with a fiber reinforced composite bridge.

*Address correspondence to this author at the Baskent University, Faculty of Dentistry, Department of Restorative Dentistry, 11. st. no:26 06490 Bahcelievler-Ankara-Turkey; Tel: + 90 312 215 13 36;
Fax: + 90 312 215 29 62; E-mail: neslihan@baskent.edu.tr

E-ISSN: 2311-8695/15

Figure 1 and 2: The intraoral photographs of the patient.

2. CASE REPORT

A 14-year-old boy was admitted to Baskent University School of Dentistry in 2010 with a traumatic dental injury in tooth #21, necessitating tooth extraction. It was observed that the tooth was ankylosed due to trauma. Following extraction, the missing tooth was replaced with a fiber reinforced ribbon-composite fixed provisional partial denture, with the patient's tooth as a pontic until the definitive implant supported single-tooth prosthetic rehabilitation. The tooth was bonded to the neighboring teeth with a resin composite, (A3,5 TPH Spectrum, Dentsply De trey, Konstanz, Germany), and a two-step etch and rinse adhesive system (Single Bond 2, 3M ESPE, St.Paul, MN, USA) with the help of fiber reinforced ribbon (Ribbond, Ribbond Inc., Seattle, WA). The family and the patient were well satisfied with the immediate rehabilitation of the edentulous space in the esthetic zone. The definitive implant therapy was postponed until skeletal growth was complete. The family was asked to visit the clinic every 6 months for follow-up. However, the patient did not appear for the followup check ups until the provisional fixed partial denture failed in 2014. At that time, the patient's skeletal growth was complete and he was eligible for implant placement; however, the harmony between the pontic tooth and the alveolar ridge/gingiva had been severely compromised in the past 4 years (Figures **1** and **2**).

The alveolar growth of the maxilla in the edentulous zone was obstructed by the pontic tooth, which was bonded to the neighboring teeth; this was likely to result in failure of the single implant. Luckily, the patient was very pleased with the choice of provisional treatment and requested repair of the fiber-reinforced ribbon-resin composite bridge to avoid implant surgery (Figure **3**). Otherwise, it would have been very challenging to place a single-tooth implant within healthy symmetrical gingival margins without further augmentation of the alveolar structures necessitating further surgeries.

Figure 3: Repair of the provisional fiber reinforced resin-ribbon fixed partial denture.

3. DISCUSSION

The treatment of a missing maxillary incisor in an adolescent is difficult, because an implant can only be placed when skeletal growth is complete. However, there are several treatment options for a single missing tooth such as conventional fixed bridges, single-tooth implant, and a resin-bonded denture. Metal–ceramic partial fixed dentures are strongest, but all-ceramic partial fixed dentures are metal-free and more esthetic. Additionally, tooth preparation is more conservative when a resin-bonded fixed partial denture is used [16]. Developments in adhesive materials in dentistry provide dentists with materials suitable for reinforcing resin-based fixed partial denture (FPD) frameworks. A multidirectional, reinforcement ribbon [Ribbond Inc, Seattle, Wash] or preimpregnated unidirectional glass fiber system [Sculpture/FibreKor; Pentron Corp, Wallingford, Conn] is often preferred in resin bonding techniques. The composition of Ribbond is polyethylene fibers with a multidirectional leno weave and it is designed to be used as a reinforcement ribbon. It can be used with all-composite resin systems, and has been shown to be highly biocompatible [17].

Other minimally invasive treatment options are also problematic: removable dentures are rarely accepted by juvenile patients; conventional fixed partial dentures often provide poor esthetic results as the abutment teeth lose their natural translucence because of the metal substructure and the color becomes grayish. Moreover, the alveolar ridge defect makes it easy to identify the prosthesis in the pontic area [18]. This treatment option also requires removal of healthy tooth structures.

This clinical report describes the replacement of a single tooth vacancy using the patient's own natural tooth as a pontic and a fiber reinforced ribbon composite fixed provisional partial denture until definitive implant-supported single-tooth prosthetic rehabilitation could be performed. Unfortunately, the patient did not appear for follow-up checkups and, owing to the growth of the alveolar ridge of the maxilla, the provisional partial denture became incompatible. The alveolar ridge was shaped according to the shape of the pontic tooth. This misalignment of the alveolar structures need to be augmented if an implant is to be placed for the definitive rehabilitation.

When the prolonged use of a provisional fiber reinforced ribbon-resin composite bridge is recommended for an adolescent, care should be taken to reshape the cervical margin of the pontic tooth regularly in order to compensate for alveolar ridge development, and to avoid undesirable outcomes, such as those described in this report.

REFERENCES

[1] Sabri R. Treatment of a unilateral Class II crossbite malocclusion with traumatic loss of a maxillary central incisor and a lateral incisor. Am J Orthod Dentofacial Orthop 2006; 130(6): 759-70. http://dx.doi.org/10.1016/j.ajodo.2005.02.023

[2] Andreasen JO, Bakland LK, Matras RC and Andreasen FM. Traumatic intrusion of permanent teeth. Part 1. An epidemiological study of 216 intruded permanent teeth. Dent Traumatol 2006; 22(2): 83-9. http://dx.doi.org/10.1111/j.1600-9657.2006.00421.x

[3] Breivik M and Kvam E. Histometric study of root resorption on human premolars following experimental replantation. Scand J Dent Res 1987; 95(4): 273-80. http://dx.doi.org/10.1111/j.1600-0722.1987.tb01842.x

[4] Kokich VG, Nappen DL and Shapiro PA. Gingival contour and clinical crown length: their effect on the esthetic appearance of maxillary anterior teeth. Am J Orthod 1984; 86(2): 89-94. http://dx.doi.org/10.1016/0002-9416(84)90300-2

[5] Kokich VG and Crabill KE. Managing the patient with missing or malformed maxillary central incisors. Am J Orthod Dentofacial Orthop 2006; 129(4 Supp l): S55-63. http://dx.doi.org/10.1016/j.ajodo.2005.11.007

[6] Misch CE [Ed]. Dental implant prosthetics. St.Louis, Missouri: Elsevier, Mosby 2005; p. 371.

[7] Cronin RJ and Jr Oesterle LJ. Implant use in growing patients. Treatment planning concerns. Dent Clin North Am 1998; 42(1): 1-34.

[8] Brahim JS. Dental implants in children. Oral Maxillofac Surg Clin North Am 2005; 17(4): 375-81. http://dx.doi.org/10.1016/j.coms.2005.06.003

[9] Uribe F, Meiers JC and Nanda R. Fixed retention of congenitally missing maxillary lateral incisors using a chairside, prefabricated fiber-reinforced composite bridge. World J Orthod 2008; 9(4): 349-54.

[10] van Heumen CC, Tanner J, van Dijken JW, *et al*. Five-year survival of 3-unit fiber-reinforced composite fixed partial dentures in the posterior area. Dent Mater 2010; 26(10): 954-60. http://dx.doi.org/10.1016/j.dental.2010.05.010

[11] Eminkahyagil N and Erkut S. An innovative approach to chairside provisional replacement of an extracted anterior tooth: use of fiber-reinforced ribbon-composites and a natural tooth. J Prosthodont 2006; 15(5): 316-20. http://dx.doi.org/10.1111/j.1532-849X.2006.00125.x

[12] Arhun N and Arman A. Fiber-reinforced technology in multidisciplinary chairside approaches. Indian J Dent Res 2008; 19(3): 272-7. http://dx.doi.org/10.4103/0970-9290.42965

[13] Acar O, Tuncer D, Sahinoglu Z, *et al*. Assessing treatment options of congenitally missing lateral incisors: Shall we create or eliminate space? The Journal of Dentists 2014; 2: 44-55. http://dx.doi.org/10.12974/2311-8695.2014.02.02.2

[14] Kharade P, Sharma S, Banerjee A and Gupta T. Indirect resin-bonded fiber-reinforced composite anterior bridge: A case report. Gen Dent 2012; 60(3): e170-2.

[15] Kermanshah H and Motevasselian F. Immediate tooth replacement using fiber-reinforced composite and natural tooth pontic. Oper Dent 2010; 35(2): 238-45. http://dx.doi.org/10.2341/09-136-S

[16] Corrente G, Vergnano L, Re S, *et al*. Resin-bonded fixed partial dentures and splints in periodontally compromised patients: a 10-year follow-up. Int J Periodontics Restorative Dent 2000; 20(6): 628-36.

[17] Chan DC, Giannini M and De Goes MF. Provisional anterior tooth replacement using nonimpregnated fiber and fiberreinforced composite resin materials: A clinical report. J Prosthet Dent 2006; 95(5): 344-8. http://dx.doi.org/10.1016/j.prosdent.2006.01.017

[18] Weng D, Ries S and Richter EJ. Treatment of a juvenile patient with a maxillary all-ceramic resin-bonded fixed partial denture: a case report. Quintessence Int 2002; 33(8): 584-8.

Received on 03-04-2015 Accepted on 09-04-2014 Published on 31-12-2015

DOI: http://dx.doi.org/10.12974/2311-8695.2015.03.02.2