Case Report

Fiber- Reinforced Composite for Orthodontic Anchorage Technique

Mahboobe Dehghani[1], Farzin Heravi[2]

[1]Assistant Professor of Orthodontics, Dental Research Center, Mashhad University of Medical Sciences, Mashhad, Iran.

[2]Professor of Orthodontics, Dental Materials Research Center, Mashhad University of Medical Sciences, Mashhad, Iran.

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Abstract

Introduction: In orthodontic treatment, adequate anchorage is necessary to move the intended teeth. In some cases, just anterior teeth are malaligned, while posterior occlusion is acceptable. Therefore, the posterior teeth could be integrated by fiber-reinforced composite (FRC) to provide a rigid anchorage. This method proved advantageous since brackets are bonded just to anterior segment, while posterior segments remain intact.

Case description: The current article presents the orthodontic treatment of an adolescent girl with malalignment and rotation of upper incisors and canines. Posterior occlusion was admissible. Posterior anchorage was provided by FRC bars, while anterior teeth alignment was performed by routine fixed orthodontic appliances. Orthodontic treatment was completed within six months. It is worthy to note that the posterior occlusion was maintained as before treatment.

Keywords: FRC, Orthodontics, Anchorage procedures

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Introduction

Fiber-reinforced composite (FRC) is developed based on the method of polymers reinforcement with long continuous fibers (1, 2). It is a mixture of fibers with different physical properties and shapes in a Bis-GMA matrix (3). It has been recently introduced in dentistry as an esthetic metal-free alternative which can be used for different treatments. Since the tone of FRC is the same as natural dentition, it is appealing to patients who demand inconspicuous appliances (4). In the orthodontic view, FRCs have considerable advantages, such as the rapid and simple method of bonding, biocompatibility, esthetic improvement, as well as reduced need for bands, brackets, and wires (1,5). The applications of FRC in orthodontics include bonded lingual retainer, and integration of posterior segments (creating anchorage unit) (4,6,7).

Some case reports have been published in the literature about the various application of FRCs in orthodontics. The present article presented the orthodontic treatment of a case who underwent orthodontic treatment with maxillary incisor alignment using fiber-reinforced composite (FRC) to provide a completely rigid anchor unit.

Case Presentation

The patient was a 15-year-old girl with a complaint of malaligned maxillary anterior teeth admitted to the Department of Orthodontics, School of Dentistry, Mashhad University of Medical sciences. She had undergone cleft lip surgery in infancy and had an average smile display and flat smile arc. Anterior maxillary teeth at the cleft lip side were malaligned, and space was observed between lateral and canine teeth. Left central maxillary tooth had labial tipping; moreover, the left lateral and canine teeth were slightly rotated. She had class I skeletal and dental patterns with a minimal overbite. It is noteworthy that the occlusal contacts between posterior teeth were good (Figure 1).

Figure 1. Initial facial and intraoral photographs

The main treatment objectives were to correct dental tipping and rotation and close spaces in an attempt to establish functionally and esthetically good occlusion. Upper buccal segments were in good contact with mandibular molars and bicuspids and it was preferred not to alter this relationship.

To achieve an integrated posterior buccal segment, Ribbond FRC (Ribbond Inc, Seattle, Washington)was bonded in upper posterior teeth from canine to the first molar on the right side and from the first premolar to the first molar on the left side (Figure 2) (8). The exact length of the FRC bar was measured in the mouth and the ribbon fiber was cut with scissors directly from the package. The buccal surfaces of the teeth were etched with 37% phosphoric acid for 30 sec; thereafter, they were rinsed with distilled water and dried for another 30 sec. A bonding agent (Excite, Vivadent, Switzerland) was applied with a small brush and the area was light-cured with a low power program (LPP) of Astralis 7 for 20 sec. Subsequently, a thin layer of Tetric Ceram (Ivoclar, Vivadent Inc, Schaan, Liechtenstein) was applied to the enamel surface and the FRC bar was positioned and pressed into place with a hand instrument. Thereafter, the entire fiber bundle was covered with a layer of Tetric Flow (Ivoclar, Vivadent Inc, Schaan, Liechtenstein), and the area was light-cured with a high power program (HPP) of Astralis 7 for 40 sec.

Figure 2. Intraoral photographs during orthodontic treatment

Standard edge-wise steel brackets with a 0.018-inch slot (Dentarum, Ispringen Germany) were bonded on upper incisors, canines, and left first premolar. After preliminary alignment with 0.14 and 0.16 NiTi arch wires, a 0.16 steel arch wire was inserted for final tooth movements. The space between left lateral incisor and canine was closed using elastomeric chains.

During the 6-month orthodontic treatment, anterior teeth were aligned and the rotation of lateral incisor and canine teeth were corrected (Figure 3). The occlusion of buccal segments was intact and maintained as before starting orthodontic treatment. A simple Hawley retainer was considered for retention, and the patient was advised to wear it until six months after debonding. A one-year follow-up demonstrated good results with a negligible relapse (Figure 4).

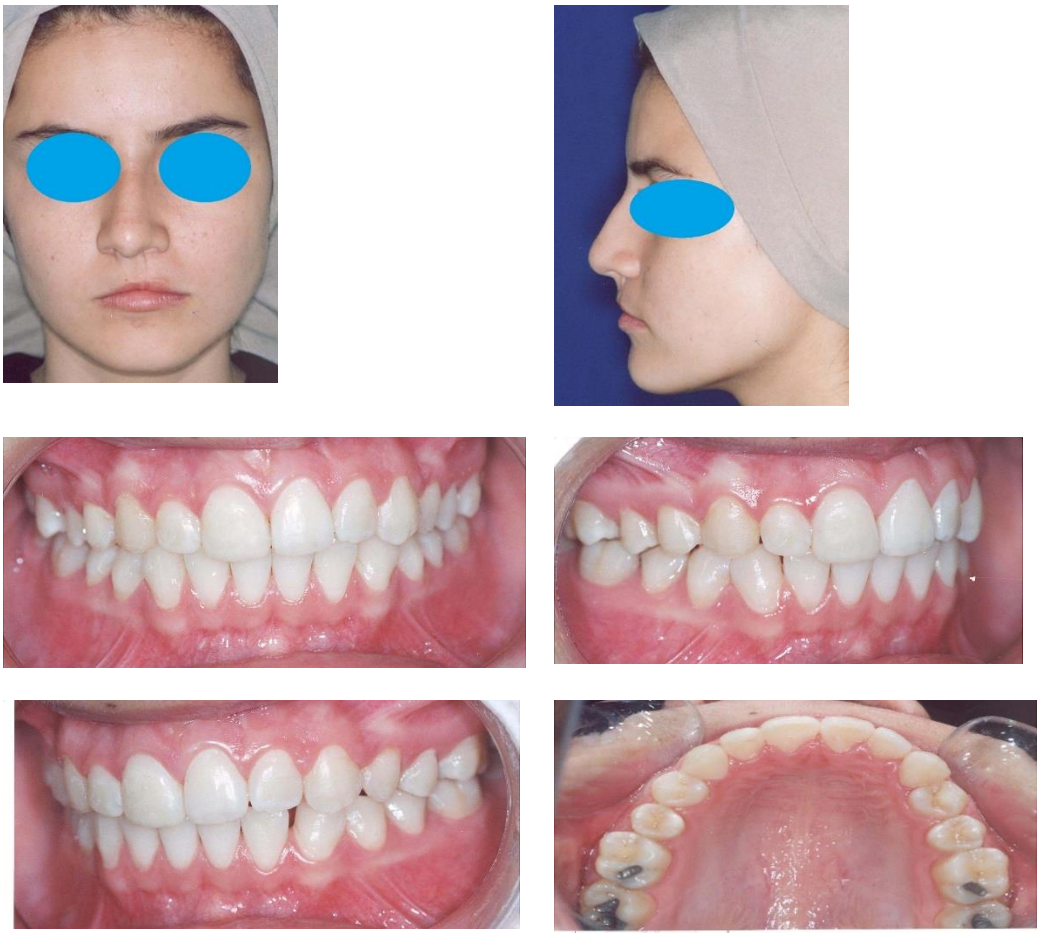

Figure 3. Final facial and intraoral photographs

Figure 4. Intraoral photographs one year after orthodontic treatment

Discussion

The present study investigated the use of fiber-reinforced composite (FRC) in the provision of a completely rigid anchor unit for alignment and space closure of the active unit (anterior teeth). Since the buccal segments were aligned and the posterior occlusion was acceptable, there was no tendency to change this relationship. Therefore, posterior teeth were rigidly integrated and the well-aligned buccal segments were maintained in ideal occlusion.

In the orthodontic mechanics of tooth movement, active and anchor units are two distinct entities. An anchor unit consists of multiple teeth, creating the effect of a large, multi-rooted tooth that resists displacement. FRC provides an ideal means to achieve anchorage control. From an esthetic point of view, the translucent FRC can be utilized as an alternative to other clear orthodontic appliances with better integrating anchor teeth.

The integration of dental resins with FRCs that can be embedded in composites has gained popularity. Ribbon FRC was used instead of metallic brackets, band, and wires on posterior teeth. The ribbon is a biocompatible and esthetic material made from a high-strength polyethylene fiber (5). The ease of adaptation to dental contours and manipulation during the bonding process are among the advantages of this material. Moreover, procedures can often be completed in a single appointment since it is a relatively easy and fast technique (no need for laboratory work). It also has acceptable strength due to the good integration of fibers With composite resin; in addition, it meets the patients' esthetic expectations.

It has been argued that reinforced fibers have the disadvantage of a rigid splint which limits physiologic tooth movement (9). This may be a matter of concern in periodontal splints or orthodontic fixed retainers in which the FRC should be in place for an indefinite time. Nevertheless, treatment duration is relatively short and the limitation of physiologic tooth movement is not a serious concern in orthodontic treatment.

Conclusion

FRCs can connect posterior teeth into the integrated anchorage unit in patients with good buccal occlusions. Therefore, they can be used as an effective esthetic alternative to troublesome bracket and band placement for patients who need orthodontic correction of teeth only in the anterior segment.

Conflict of interests

The authors declare that they have no conflict of interest regarding the publication of the current article.

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Corresponding Author
Mahboobe Dehghani
Assistant Professor of Orthodontics, Dental Research Center, Mashhad University of Medical Sciences, Mashhad, Iran
Email: Dehghanimm@Mums.ac.ir