Clinical and Experimental Health Sciences

Direct Composite Restoration of Anterior Diastemas with Multidisciplinary Approach

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ABSTRACT

It was aimed to present an illustrative clinical case report with an accurate treatment protocol for the esthetic rehabilitation of a patient through the combination of orthodontic and restorative therapy. After intraoral and radiographic examinations of the patient with no systemic disease, it was revealed that there was a midline spacing between maxillary central incisors. Following orthodontic treatment, direct esthetic partial composite laminate veneers as build-ups for both maxillary incisors were considered. For the restorative procedure, it is planned to restore teeth 12, 13, 22, and 23 with direct universal composite resin. To simulate a natural outlook, the shades DA2, and EA1 (Vittra APS Essential, FGM, Brasil) were decided to be used together as layers. Recalls were arranged for 1 week, 6 months, and 18 months. Restorations were evaluated according to modified USPHS Criteria, 18 months follow – up, there was no evidence of any fracture, surface defect, or discoloration. Composite resin restorations might be considered as a simple treatment option with patient satisfaction in diastema cases. It was thought that the correct positioning of diastemas with orthodontic treatment increases the success of composite restorations.

Keywords: Diastema, composite resin, aesthetic restoration, aesthetics, braces

1. INTRODUCTION

Diastema, the space between two teeth, has a multifactorial etiology. The differences in the size of the teeth are smaller compared to the space in the arch, as well as tooth loss, impacted teeth, and congenital tooth deficiency can cause diastema. Abnormal labial frenulum attachment is the leading cause of midline diastema (1-4).

With the increasing importance given to aesthetics, the number of patients who apply to dentists with aesthetic complaints such as diastema and deformities in the teeth is increasing day by day. Depending on the width of the diastema, the patient's expectation, socioeconomic level, and living standards, treatment options in these cases can be listed as orthodontic treatment, minimally invasive direct composite resin applications, porcelain lamina restorations, and full ceramic crowns (5).

Orthodontic tooth movement should be the first treatment option for teeth with misalignment as a more conservative option (6, 7). However, teeth with have defects in color or shape will already be subject to a more invasive restorative treatment for cosmetic aesthetic rehabilitation (8). Restorative and orthodontic treatments can be combined to obtain a better aesthetic and conservative result. In some cases, short-time orthodontic treatment with the use of brackets has allowed the repositioning of the teeth for minimally invasive preparation and better adhesive bonding (9, 10).

Patients with midline diastema on central incisors are usually restored with direct or indirect restorations. However, in the presence of a wide major diastema, a multidisciplinary approach including orthodontic short-term treatment followed by direct restorative treatment may support the restorative treatment planning by providing more ideal tooth proportions and emergence profiles regarding the smile aesthetics (11). Therefore, it is always better to think in a multidisciplinary way and taking the pre-restorative treatment options into account during the restorative treatment planning (12). This case report presents the direct aesthetic restoration of a wide major diastema between the central incisors in a conservative and multidisciplinary way.

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2. CASE PRESENTATION

A 37-years-old male patient was admitted to the Marmara University, Faculty of Dentistry, Department of Restorative Dentistry with the complaint of esthetic disappointment in the upper front tooth region. As a result of intraoral and radiographic examinations of the patient with no systemic disease, it was revealed that there was a midline diastema between maxillary central incisors (3 mm) (Figure 1).



***Figure 1** . Preoperative intraoral view of the patient and the midline diastema*

After orthodontic treatment, direct composite restorations as build-ups for maxillary lateral incisors and canines were planned.

Since the patient presented with a Class I dental relationship and there is no crowding on the lower teeth, orthodontic treatment is planned for just the upper teeth. Aim for upper orthodontic treatment is closing midline diastema and distributing 3 mm spaces mesial to upper lateral teeth. Treatment began by bonding standard edgewise brackets (Mini Master Series Diagonal Twin .022 Bracket; American Orthodontics, Sheboygan, WI, USA) from 24 to 14 and alignment start with 0.012" Nitinol wire (Figure 2). The patient was checked every 4 weeks and the wire changed to in sequence 0.018" Nitinol and 016" × 0.022" stainless-steel wire. Closing midline diastema was started by putting elastic chain to 11 and 21 on the stainless-steel wire. The elastic chain was renewed every 4 weeks and after closing spaces between 11 and 21. After root parallelism was checked by panoramic x-ray and consultation was done by the Restorative Department, braces were removed and fixed by 0.0215-inch five-stranded lingual retainer wire (PentaOne; Carlsbad, CA, USA) applied to 11 and 21 (Figure 3).

The restorative procedure was planned to restore the mesial surfaces of teeth 12, 13, 22, and 23 with direct universal composite resin without surface treatment (Figure 4). Wax-up models were created on a stone cast and a silicone guide was generated before the restoration appointment. At the restorative appointment, the shade selection was considered with the button technique. To select the dentinal shade, round button composite samples, in different shades, are placed on the middle third of the right upper central incisor, and to select the enamel shade, round enamel composite shades placed on the incisal third of the same tooth, and cured with LED light source (Smart Lite Focus; Dentsply Sirona, Charlotte, NC, USA). The shade selection was performed in 2 minutes to keep teeth hydrated. To simulate a natural outlook, the shades DA2, and EA1 (Vittra APS Essential; FGM, Joinville, SC, Brasil) were decided to be used together with polychromatic layering. Following the shade selection, the teeth were isolated with a rubber-dam (NicTone; Zapopan, Jalisco, Mexico), and upper incisors were retracted by using the floss tie retraction. No surface treatment was performed before the restorative procedure. 37% phosphoric acid (Condac 37; FGM, Joinville, SC, Brasil) was applied for 15 seconds to the enamel surfaces, rinsed for 20 seconds, and dried with air slightly. Universal adhesive (Ambar APS; FGM, Joinville, SC, Brasil) was applied and rubbed for 10 seconds, treated with a gentle air stream for 10 seconds to evaporate the solvent, and polymerized with LED light source with an irradiance of 1250 mW/cm^2 (Smart Lite Focus; Dentsply Sirona, Charlotte, NC, USA) for 10 seconds. A thin layer of EA1 shade composite resin was used palatinally as enamel by using the silicon guide. After removing the silicon guide, proximal walls were restored with a thin layer of EA1 shade composite resin. A thin layer of DA2 shade was placed as the dentin layer. Finally, a thin layer of EA1 shade was used as the top layer.



***Figure 2.** First session of orthodontic treatment, placing brackets with 0.012" Nitinol wire*

A 12-bladed flame-shape carbide bur (Dia-Tessin; Gordevio, Switzerland), polishing discs (Soflex; 3M, St. Paul, MN, USA), interdental strips (Kerr Dental; Brea, CA, USA), and spiral wheels (Twist DiaComp Plus; EVE, Keltern, Germany) were used for detailed finishing and polishing procedures respectively from coarse to superfine grits (Figure 5). After restorations were completed, the patient's upper teeth were fixed with a clear aligner. Control appointment was arranged for 1 week and recall appointments were arranged for every 6 months. The final restorations were evaluated according to the Modified United States Public Health Service (USPHS) criteria for 6th and 18th month-recalls (Table 1). While no recurrens were observed in the midline diastema in the 6th month recall, it was observed that the recurrens in the midline diastema began in the 18th month follow-up session (Figures 6, 7).

Table 1. *Modified USPHS (Modified United States Public Health Service) scores of 6 and 18 month recalls*

Category	Score	Criteria	Recall (Month)	
			6	18
RESTORATION	Alpha (A) Bravo (B) Charlie (C)	Restoration is present Restoration is partially lost Restoration absent	A	A
MARGINAL INTEGRITY	Alpha (A) Bravo (B) Charlie (C) Delta (D)	Resin-enamel interface is excellent No crevice is visible at margins Crevice at margin, enamel exposed Restoration is mobile, fractured or missing	A	A
MARGINAL DISCOLORATION	Alpha (A) Bravo (B) Charlie (C) Delta (D)	No discoloration on the margin between restoration and the tooth surface Slight staining can be polished away Obvious staining can not be polished away Gross staining	A	A
ANATOMICAL FORM	Alpha (A) Bravo (B) Charlie (C) Delta (D)	Restoration continuous with existinganatomical form and margins Restoration is slightly overcontoured or uncontoured Restoration is undercontoured, dentin or base exposed Restoration is missing	A	A
SECONDARY CARIES	Alpha (A) Bravo (B)	No evidence of carious contagious with the margin of the restoration Caries evident contagious with the margin of the restoration	A	A
SURFACE TEXTURE	Alpha (A) Bravo (B) Charlie (C) Delta (D)	Smooth surface Slightly rough or pitted Rough, cannot be refinished Surface deeply pitted, irregular grooves	A	A
SHADE MATCH	Alpha (A) Bravo (B) Charlie (C) Delta (D)	Restorations matches the shade and translucency of adjacent tooth structure Discoloration between restoration and tooth structure within the normal range of tooth Discoloration between restoration tooth structure outside the normal range of tooth Unacceptable color, shade and translucency	A	A
POSTOPERATIF SENSITIVITY	Alpha (A) Bravo (B) Charlie (C)	No postoperative sensitivity Postoperative sensitivity Postoperative sensitivity with treatment need	A	A
RESTORATION	Alpha (A) Bravo (B) Charlie (C)	Restoration is present Restoration is partially lost Restoration absent	A	A
MARGINAL INTEGRITY	Alpha (A) Bravo (B) Charlie (C) Delta (D)	Resin-enamel interface is excellent No crevice is visible at margins Crevice at margin, enamel exposed Restoration is mobile, fractured or missing	A	A
MARGINAL DISCOLORATION	Alpha (A) Bravo (B) Charlie (C) Delta (D)	No discoloration on the margin between restoration and the tooth surface Slight staining can be polished away Obvious staining can not be polished away Gross staining	A	A
ANATOMICAL FORM	Alpha (A) Bravo (B) Charlie (C) Delta (D)	Restoration continuous with existinganatomical form and margins Restoration is slightly overcontoured or uncontoured Restoration is undercontoured, dentin or base exposed Restoration is missing	A	A
SECONDARY CARIES	Alpha (A) Bravo (B)	No evidence of carious contagious with the margin of the restoration Caries evident contagious with the margin of the restoration	A	A
SURFACE TEXTURE	Alpha (A) Bravo (B) Charlie (C) Delta (D)	Smooth surface Slightly rough or pitted Rough, cannot be refinished Surface deeply pitted, irregular grooves	A	A
SHADE MATCH	Alpha (A) Bravo (B) Charlie (C) Delta (D)	Restorations matches the shade and translucency of adjacent tooth structure Discoloration between restoration and tooth structure within the normal range of tooth Discoloration between restoration tooth structure outside the normal range of tooth Unacceptable color, shade and translucency	A	A
POSTOPERATIF SENSITIVITY	Alpha (A) Bravo (B) Charlie (C)	No postoperative sensitivity Postoperative sensitivity Postoperative sensitivity with treatment need	A	A



Figure 3 *. After alignment and spaces were organizated mesial to upper lateral teeth.*



Figure 4. *Prerestorative intraoral view of the patient after orthodontic treatment*



Figure 5. *Final restoration*



Figure 6. *The view of the restorations at 6 months recall*



Figure 7. *The view of restorations at 18 months recall*

3. DISCUSSION

Many adult patients who expect an aesthetic appearance on their teeth may experience several problems. The size differences between the teeth can negatively affect the patients in terms of function and speech, and cause aesthetic problems, especially when it causes crowding or diastema (13-15). Also, sometimes the lateral teeth can be very small or peg-shaped due to genetics (16). Restoration of such deformities provides long-term retention when performed by evaluating the patient's remaining growth potential and occlusion.

Aesthetic rehabilitation of these cases, clinical crown length and size, and the position of the teeth should be evaluated. The ideal treatment of these cases involves an interdisciplinary approach (17-19). Restorative treatment specialists and orthodontists should work together to achieve the desired clinical result, especially in cases of diastema due to arch length and tooth size mismatch or in cases where the anterior teeth are crowded (8, 20). In the presence of large diastema, closure of the space with direct restoration may change the normal length-width relationship of the teeth, causing the anterior teeth to look too wide and unnatural. Restoration of large diastemas may result in an overly contoured outlet profile in the interproximal areas. This can lead to dental plaque retention and inflammation of the gums (7). A combined treatment with orthodontics allows, small tooth movements, to distribute large diastema spaces, repositioning teeth and creating optimal spaces for correct restorations (11, 21, 22). In this case report, with orthodontic treatment, the large midline diastema was distributed between the lateral and central teeth, and the small lateral teeth were restored to provide a normal size and close the diastema spaces. Although orthodontic treatment prolonged the treatment period, teeth axes were corrected, teeth were restored in the proper form, and smile symmetry was achieved.

Adhesive dentistry ensures the preservation of healthy tooth tissue while creating aesthetics. Composite resins

allow a long-term aesthetic restoration when applied by the application protocol of adhesive resins (23).

Restorations were evaluated according to Modified USPHS Criteria, at the 6th and 18th months of recall, there was no evidence of any fracture, surface defect, and discoloration on the teeth and the restorations. The general outlook of the restored teeth was considered natural and aesthetical. The restorations were scored as "Alpha", based on clinical examination, and there was no diastema between the restorations and adjacent teeth at the 6th and 18th month recall session (Figures 6, 7). There were no recurrences of midline diastema at the 6th month recall. At the 18th-month follow-up session, it was observed a recurrence of midline diastema despite the patient still wearing the fixed retainer. However, it was learned from the patient's history that he did not use his clear aligner regularly. The patient was motivated to use the clear aligner and 24-month follow-up appointment was arranged.

Closure of diastemas with direct composite resin restorations is a very common practice in today's dentistry. One of the most important advantages of composite restoration is the correction of the shape, color, and position of the teeth by performing the restoration in a single session. Compared to laboratory-produced indirect restorations, direct composite restorations are advantageous as they are minimally invasive. This treatment option is inexpensive for patients as it does not require laboratory work (24, 25). The fact that there is a repair option in composite restorations makes this restoration type superior to alternative applications such as porcelain lamina and ceramic crowns.

In conclusion, the patient's aesthetic problem was resolved with a conservative way including direct composite restorations after orthodontic treatment. At 18 month recall the modified USPHS scores of the restorations were considered as acceptable. Multidisciplinary approach in diastema cases increases the aesthetics and durability of restorations.

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