A Conservative Approach for Restoring Anterior Guidance: A Case Report

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ABSTRACT

One of the most common dental problems in today's clinics is tooth wear, specifically when related to bruxism. In such cases, the esthetics of anterior teeth may be compromised when excessive wear to the incisal surfaces occurs. Anterior tooth wear resulting from parafunctional bruxism can be conservatively treated with the use of direct resin composite restorations. This restorative approach has the advantages of presenting good predictability, load resistance, acceptable longevity, preservation of healthy dental tissues, and lower cost when compared with indirect restorations. The use of resin composites to solve esthetic problems, however, requires skill and practice. Thus, the present article demonstrates a conservative approach for restoring the esthetics and function of worn anterior teeth with the aid of direct resin composite restorations and selective occlusal adjustment.

CLINICAL SIGNIFICANCE

A conservative approach to restore anterior teeth with excessive wear is possible with direct resin composites.

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INTRODUCTION

Because of access to public health programs, the lifespan has increased at the same time that patients are retaining their natural teeth. Signs of aging can be seen not only in facial and body aspects but in the dental aspect as well. Additionally, more people have been seeking cosmetic and esthetic treatments to restore dentofacial harmony, physical condition, and healthy appearance. This includes dental esthetics. On the other hand, stress and lifestyle changes have resulted in an increase in the incidence of parafunctional habits and the consequent wear of dental hard tissues.

The manifestations of biopsychological imbalances, such as parafunctions of the stomatognathic system, are characterized by clenching and/or grinding teeth repeatedly, ranging from diurnal to nocturnal manifestations.[1,2] Bruxism is a problem for the function of the stomatognathic system because it may alter the behavior and state of the chewing muscles (and/or adjacent muscles), as well as the temporomandibular joint (TMJ). The esthetics of the anterior teeth and the smile are also compromised when severe damage to the occlusal and incisal surfaces occurs. This parafunction can also destroy the teeth required for the occlusal stability, mutual protection, function, and esthetics of anterior guidance.[3,4]

Thus, one of the most common dental problems in today's clinics is tooth wear, specifically when it is related to bruxism. This type of dental structure loss

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may be considered pathological when it compromises normal esthetics and function. Because of the reducing incidence of caries, this abnormal wear of the dental structure undoubtedly represents a major challenge to dentistry.

Although the etiology of bruxism is multifactorial, unclear, and controversial, some possibilities have been suggested, being mainly regulated centrally and influenced peripherally.[5] It has been suggested that oral habits, malocclusions,[6] hypopnea,[7] high anxiety levels,[8] and stress[9,10] could influence the peripheral occurrence of bruxism. These factors could act as a motion stimulus to the central nervous system, which reacts with an alteration in the neurotransmission of dopamine,[11] and the result is the clenching or grinding of the teeth.

It is noteworthy, however, that although the signs, symptoms, and degree of wear may be similar in several patients, the etiological factors could be different, which helps explain why the treatment to be applied must be planned and directed in accordance with the needs of each case. The choice between various forms and sequences of treatment depends on the professional's skills in detecting etiologic factors. It is interesting to observe that mechanical or chemical processes not involving bacteria may cause the loss of dental hard tissue.[12] Mechanical factors include parafunctional habits and abrasion, whereas chemical factors include acid erosion, such as those originating from diet, bulimia, anorexia, or gastroesophageal reflux disease.[4]

The treatment should focus not only on the symptoms or causes but also on the disease as a whole. Therefore, it is necessary for a proper diagnosis of the pathology and extent of the damage to determine the causes, origins, and factors involved. Additionally, individual treatment strategies depend on a correct diagnosis that includes both the patient's stress level and an accurate analysis of occlusion in relation to the condition and the TMJ.[13] The relation between principles of occlusion and restorative procedures should also be considered.[14] Additionally, the use of resin composites to solve esthetic problems requires skill and practice, so the procedure is not too time-consuming.[15] Thus, the aim of this article is to demonstrate a conservative approach to restoring the esthetic and function of worn anterior teeth with the aid of direct resin composite restorations through a layering technique and selective occlusal adjustment.

CASE REPORT

A 26-year-old female patient presented for treatment, complaining of dissatisfaction with her smile, especially with the shorter appearance of the anterior teeth (**Figure 1**). During the anamnesis, the patient mentioned clenching and grinding the teeth during both daytime and nighttime and accentuated in times of increased stress. She did not report any painful symptomatology related to the TMJ, musculature, teeth, or other structures. A clinical examination revealed incisal wear of the maxillary incisors and the slopes of the posterior cusps, without loss of the vertical dimension of occlusion (**Figure 2**). As part of the examination, radiographs, photographs (intraoral and extraoral), and diagnostic casts were obtained.

The patient's casts were duplicated, mounted in centric relation position on a semiadjustable articulator (Articulator A7 Plus, BioArt, São Paulo, Brazil) and waxed-up (it is important to wax-up the cast in order to establish effective communication with the patient through a visual language, as well as to allow the clinician to verify, correct, and test the future format of anterior teeth). Restorations with new lengths, shapes, and incisal edges were planned and projected based on analysis of dentolabial and phonetic tests, evaluation of the anterior guidance (excursive movements), and tooth size (width/length ratios) (**Figure 3**). A silicone guide was fabricated using a putty addition silicone material (Aquasil Soft Putty, Dentsply DeTrey, Konstanz, Germany). An impression of the palatal and incisal third of the teeth surfaces from the waxed-up cast was used as a dimensional guide for composite placement and symmetry.

Vital in-office bleaching was planned and conducted with 25% hydrogen peroxide (Lase Peroxide Sensy II, DMC, São Paulo, Brazil) (**Figure 4**). This procedure was carried out in one section only. At the 1-week follow-up

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FIGURE 1. A–C, Preoperative photographs showing an inadequate incisal display and disharmonic relation with the lips.

FIGURE 2. Initial appearance of the anterior maxillary teeth.

appointment, the patient did not report any tooth sensitivity at any point during the bleaching treatment.

During this period, occlusal adjustment was performed using the ROCA system (Figure 5) and articulating paper (Hanel, Coltène/Whaledent, Langenau, Germany) to improve the functional relationships of the dentition so that the periodontal and dental tissues receive uniform stimulus. The ROCA system consists of plastic wires with various thicknesses developed by Dr. Rafael Roca from Bolivia. It is similar to the leaf gauges proposed by Long[16] and used as an occlusion program changer, also helping with occlusal adjustment, presenting some advantages, such as a circular cylindrical format that provides pinpoint contact, prevents excessive clenching, and induces jaw slippage, facilitating faster positioning of the skeletal musculature, a wide vision of posterior disclusion for anterior guidance, and facilitating observation of midline deviation, as well as evaluation of lateral and protrusive movement, and guidance height.

The selective occlusal adjustment began with the relaxation of the muscles by bringing one of the thicker wires of the ROCA system to the midline between the maxillary and mandibular central incisors (Figure 5).

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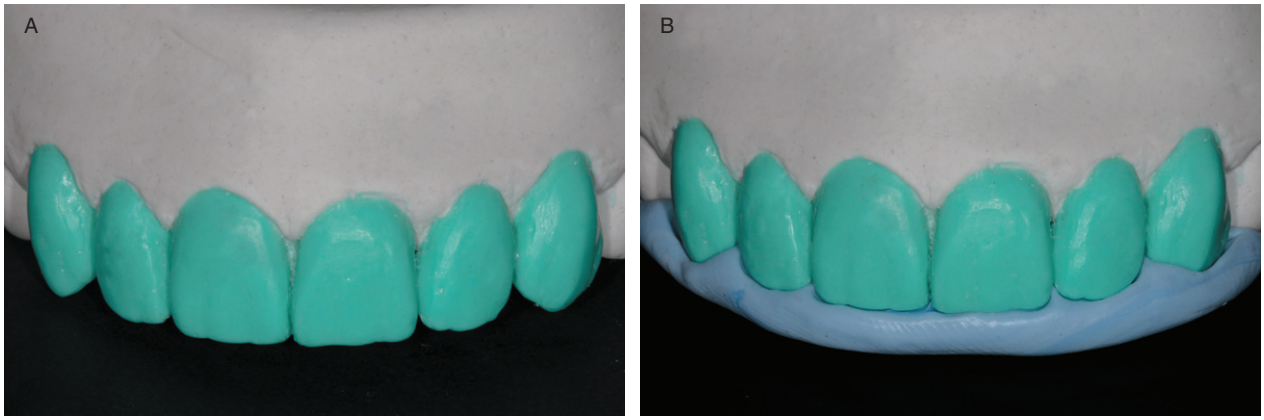

FIGURE 3. A, Diagnostic wax-up to establish the new lenghts, incisal edges, and shape of future restorations. B, The silicone guide was fabricated on the waxed-up cast.

FIGURE 4. In-office tooth bleaching process carried out with 25% hydrogen peroxide.

Thus, the wires were placed in descending order until the patient reported the first contact with one or more teeth. After detection of this contact, occlusal surfaces were air-dried, and contacts were marked with the articulating paper. Occlusal contacts were refined with a football-shaped diamond bur rotating at high speed (Figure 5).

After a period of 3 weeks subsequent to bleaching, resin composite restorations were made. Tooth prophylaxis and rubber dam isolation were carried out. A bevel was created with the aid of a diamond bur (#1112, KG Sorensen, São Paulo, Brazil) and a coarse-gritted disk. Prior to the restorative procedures, the adaptation of the silicone guide was verified. A 35% phosphoric acid was applied for 20 seconds followed by a water rinse and light air-drying. Then, an adhesive (Adper Single Bond 2, 3M ESPE, St. Paul, MN, USA) was applied in accordance with the manufacturer's guidelines (Figure 6). Light-curing was performed with a quartz tungsten halogen-light source.

Using a resin composite instrument, a thin layer of translucent enamel composite (T1, Venus, Heraeus Kulzer, Hanau, Germany) was placed onto the silicone guide as a lingual shelf to establish the palatal contour and the new incisal edge (Figures 7A and B). The excess material was removed and the resin composite was light-cured in position for 20 seconds. The halo effect (i.e., a thin layer along the incisal edge) was sculpted with an opaque A2 (OA2) shade (Venus, Heraeus Kulzer) (Figure 7C). The artificial dentin (Shade OA2, Venus, Heraeus Kulzer) was placed over the facial portion and sculpted in the shape of the lobes and developmental depressions (Figure 7D). To mimic the blue opalescent effect of the natural enamel, a small increment of Blue Effect (4 Seasons, Ivoclar Vivadent, Schaan, Liechtenstein) was applied to the region of the incisal third between the mamelon spaces and extremities (Figure 7E).

The final layer, which corresponded to the artificial enamel, was restored with shade A1 (Venus, Heraeus Kulzer) for the medium third and High Value (4 Seasons, Ivoclar Vivadent) for the incisal third (Figure 8). Composites were carefully applied with a long, narrow, bladed instrument (IPC-L, Cosmedent,

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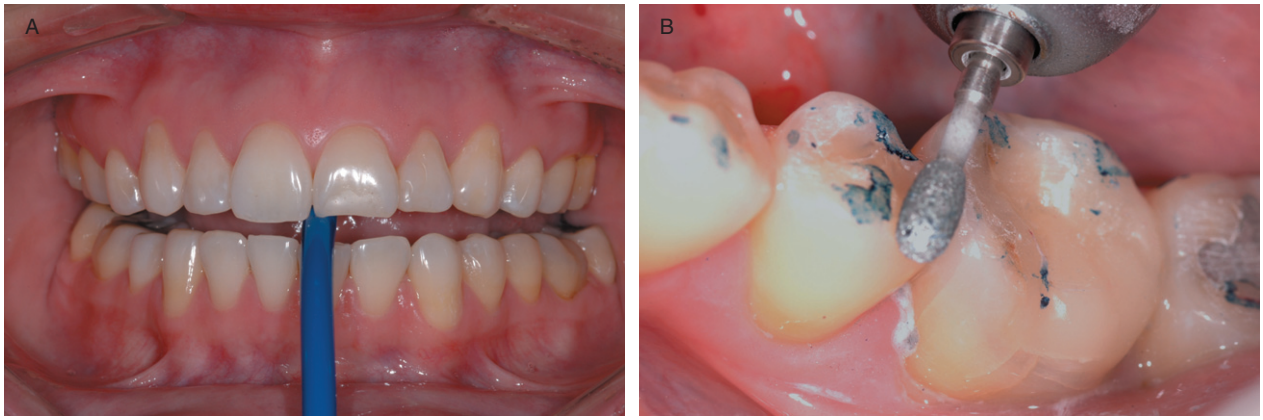

FIGURE 5. A, The root cause analysis system in position for relaxation of the muscles. B, Occlusal adjustment was carried out with a diamond bur.

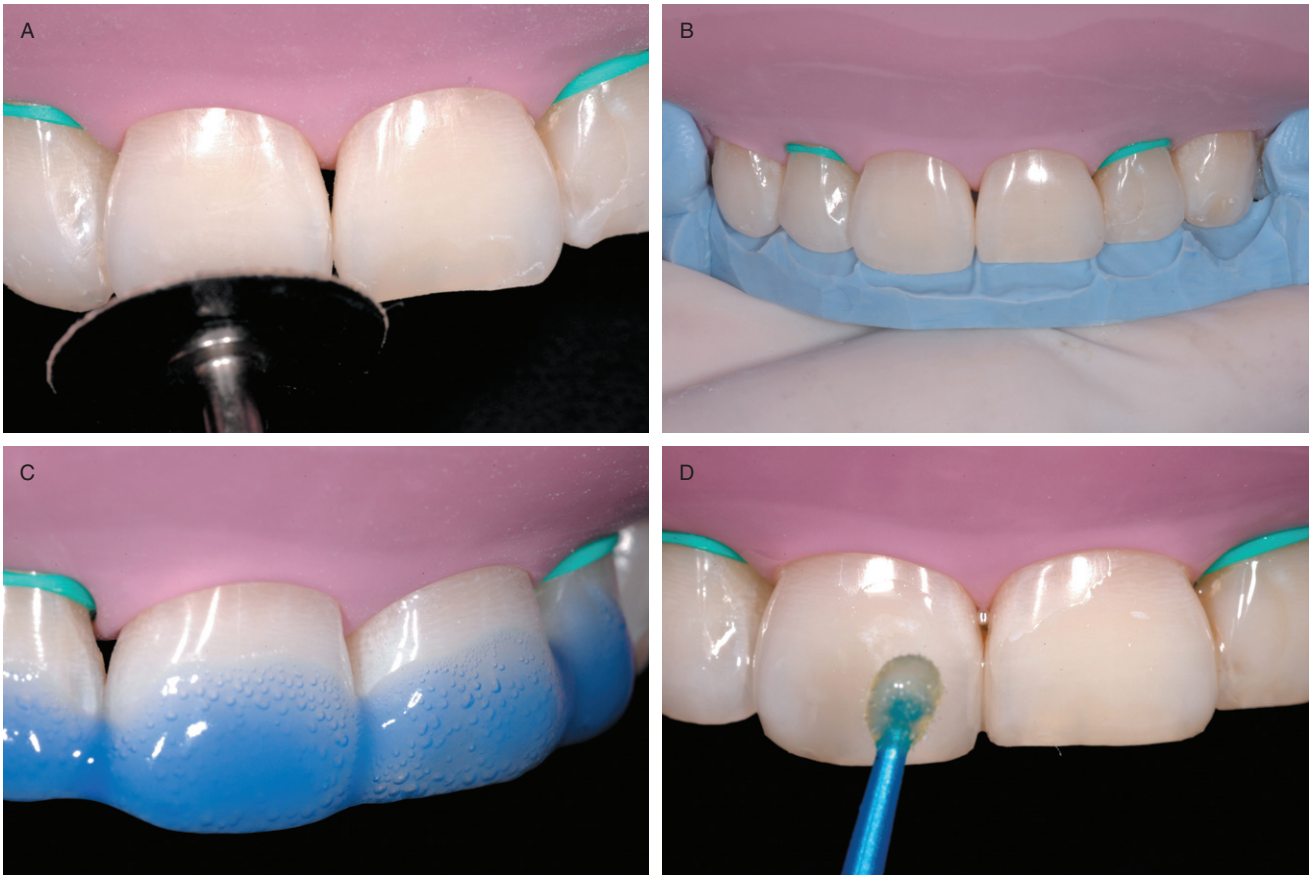

FIGURE 6. A, Preparation of the incisal edge with the aid of abrasive disks. B, Silicone guide in position to verify its position and adaptation. C, Etching with phosphoric acid. D, After rinsing and blotting with an absorbent paper, a bonding agent was applied and light-cured.

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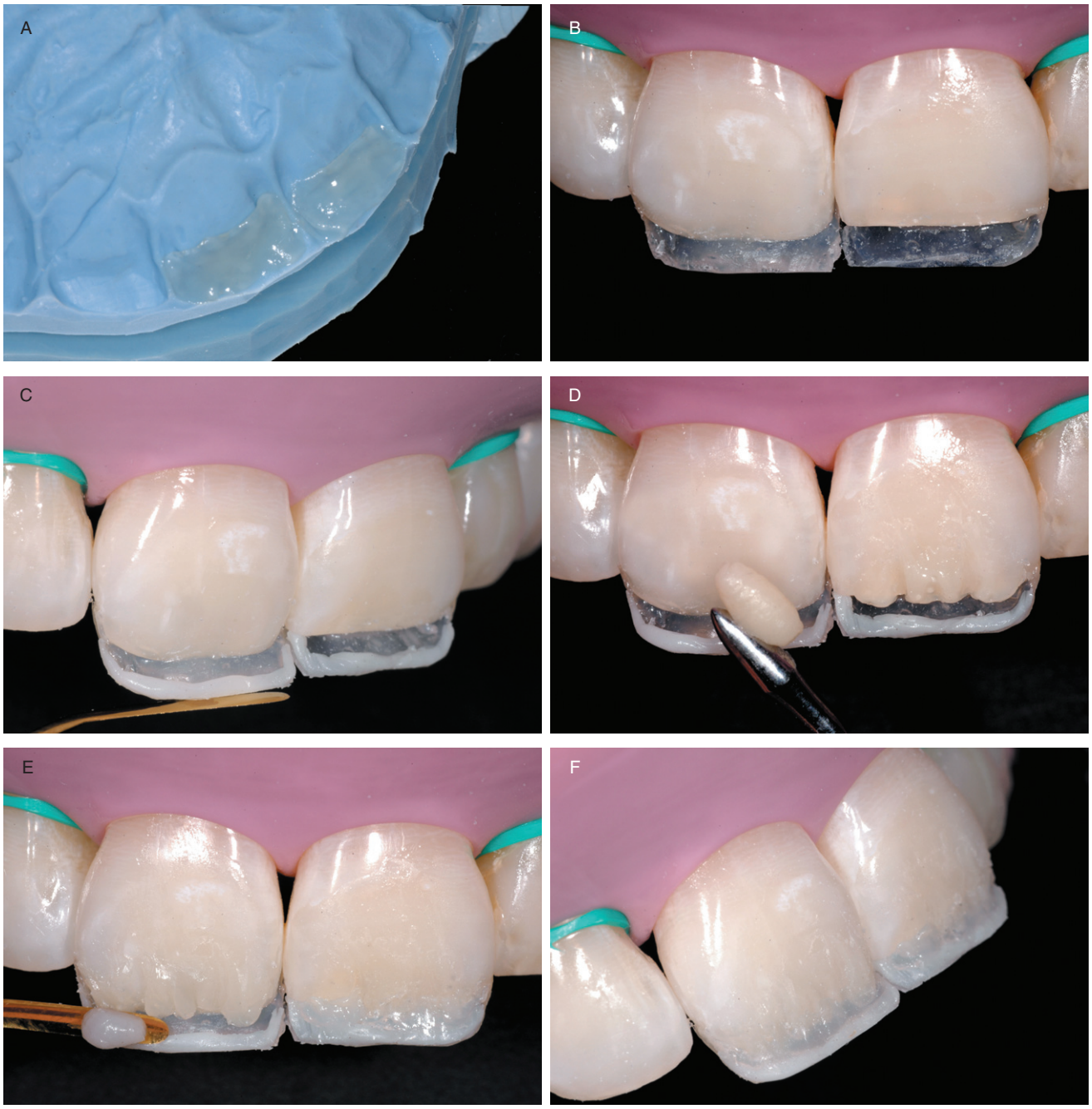

FIGURE 7. A, Application of a thin, translucent resin composite into the silicone guide to reproduce the palatal portion of the teeth. B, Intraoral view immediately after the palatal layer was cured and the silicone guide was removed. C, Dentin shade placed precisely at the future incisal edge. D, Application of dentin shade with Hollenback #6 instrument to create mamelons and reproduce the region that corresponds with the deepest dentin area. E, Blue effect resin placed between mamelons to obtain the opalescence characteristic of this area. F, Facial view showing the characterization of the opalescent area.

Chicago, IL, USA) and smoothed with the aid of a #4 flat-tipped brush (Ivoclar Vivadent). Increments of resin composite were light-cured according to the manufacturer's instructions. A Mylar strip was placed interproximally and pulled through to aid in creating a tight contact point and the correct facial embrasure forms. Finally, both the buccal and palatal surfaces were cured for 40 seconds.

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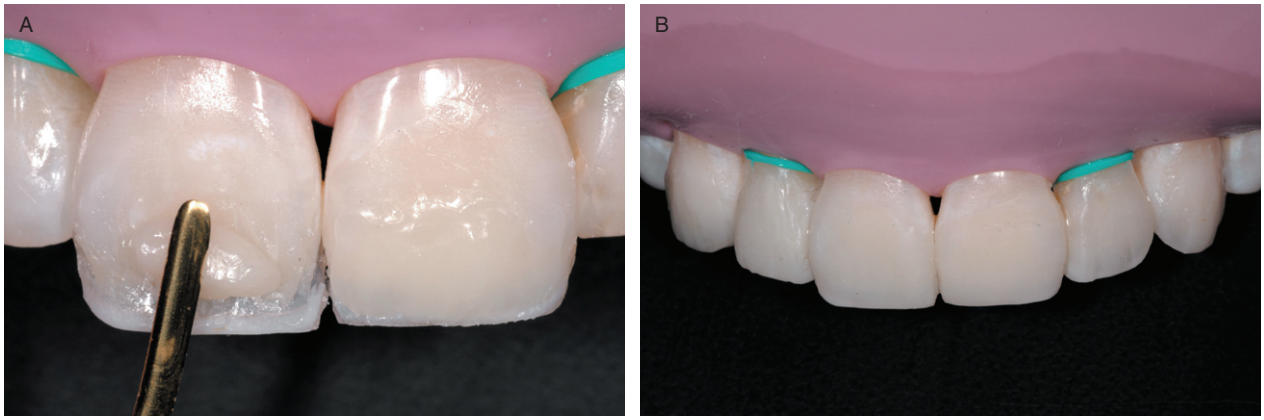

FIGURE 8. A, Application of shade A1 and high-value resin composite for the layer corresponding to the facial surface. B, Facial view of maxillary anterior teeth after restorative procedures.

Before polishing, any excess material at the margins was removed with a #12 surgical scalpel blade (Swann-Morton, Sheffield, England). A coarse-gritted disk (FlexiDisc, Cosmedent) was used to produce the primary anatomy and to achieve symmetry between similar teeth (Figure 9). After reaching the desired cervico-incisal and mesio-distal dimensions, symmetrical light reflection areas and light deflecting zones were outlined with pencil, and the distance was checked with a sharp-ended caliper (Figure 9C).

In sequence, the facial and palatal surfaces were finished with a coarse silicone cup and point (KG Sorensen) to prepare for the macro surface texture. Perikymates and lines along the facial surface were created with the aid of a #1190F fine-grit diamond bur and #9903FF flame carbide finishing bur (KG Sorensen) on a 1:4 increaser contra angle (T2 REVO, Sirona, Benscheim, Germany) for better operative control. Restorations were then buffed with silicon points (KG Sorensen) to eliminate some of the accentuated texture. The restoration's final natural gloss was achieved using the Astrobrush system (Ivoclar Vivadent) and goat hairbrush, followed by a felt wheel (FlexiBuff, Cosmedent), and aluminum oxide polishing paste (Enamelize, Cosmedent) and abrasive strips for refining and polishing the interproximal areas. This procedure is the key factor in the natural integration of the restorations (Figure 10).

After the restorative procedure, the use of an occlusal bite splint was indicated as a temporary protection for the restorations. The splint was indicated for nighttime use during sleep for a period of 6 months. After this period, the patient was reevaluated to verify the persistence of parafunctional habits and situation of the protective bite splint. The adjustment was made in centric relation with the use of articulation paper. Only the points corresponding to contact between the lower buccal cusp and the splint were preserved. Adjustments of the lateral guidance and protrusion were done by eliminating all contacts other than the ones at the lateral and protrusive movements. The patient was instructed about periodic follow-ups and maintenance of restorations and was advised on strategies to manage and reduce daily stress as an aid in preserving the patient's dental health. The final aspect of the teeth and smile may be seen in Figure 11.

DISCUSSION

Pathological tooth wear originating from bruxism represents not only an esthetic problem for the stomatognathic system but a functional one as well. In such cases, bruxism is a parafunction that is extremely important to consider during the stages of diagnosis, planning, and treatment because there is still much discussion related to its etiology. Dawson[17] believed that

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FIGURE 9. A, Finishing of the incisal edge. B, Lines were drawn along the proximo-labial region to determine the light reflecting areas. C, The contour and symmetry of light reflecting areas were established with coarse-gritted disks. D, A flame-shaped finishing bur was used to reproduce micromorphologic facial surface characteristics of the teeth.

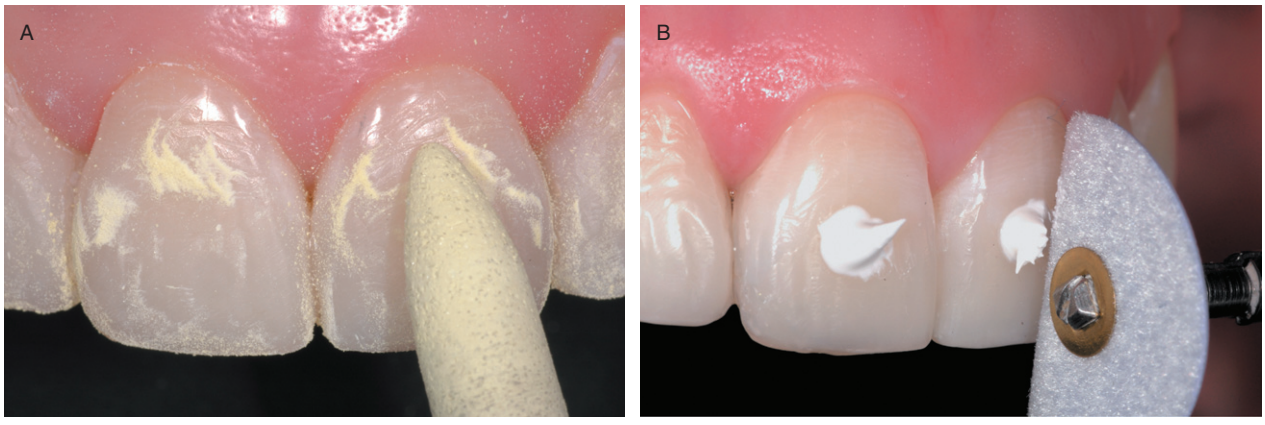

FIGURE 10. A, Polishing procedure conducted with a silicone rubber point to eliminate excessive surface texture. B, Buff wheel used with polishing paste in intermittent, circular, staccato movement to impart a high luster to the resin composite restorations.

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FIGURE 11. A, Postoperative view of the maxillary anterior teeth. Note the optical characterization achieved with the direct resin composite layering technique. B, Facial view exhibits the shade, contour, and texture of the restored teeth. C, Lateral view showing the harmonious integration between restorations, gingival tissues, and lips.

bruxism was a consequence of occlusal interference and premature contacts, and, thus, Ramfjord and Ash[18] considered the occlusal adjustment to be necessary for the treatment of patients with bruxism. According to these authors, the adjustment should be carried out to improve the occlusal pattern.[17,18] Other authors[18,19] also reported the emotional or psychological stress factor and the presence of occlusal interferences as triggering factors of bruxism. Regardless of the etiology, however, the restorations of anterior tooth wear and enamel loss should be considered to regain function and esthetics.[20]

The evolution in adhesive dentistry has increased the indication of esthetic restorative procedures, especially with the use of resin composites,[21–23] which, due to important improvements in the reinforcing filler, which has been purposely reduced in size to produce materials that are more easily and effectively polished and which demonstrate greater wear resistance[23] and which also give a good predictability, load resistance, acceptable longevity, preservation of healthy dental tissues, and lower cost compared with indirect restorations, have been widely addressed in the literature,[15,24–26] so it can now be used in all areas of the mouth.[23] Also, reintervention is relatively easy and inexpensive, and fractures or defects that may appear over time are repairable without the necessity of remaking the whole restoration. This feature provides conservative and financial advantages to patients.[21]

Fracture toughness is another important property, which correlates with intraoral chipping of surfaces and margins.[27] The best current composites have fracture toughness below 2.0 $MPam^{1/2}$, which is similar to amalgam and better than porcelain. Because there are

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differences in fracture-toughness values of composites recommended for anterior restorations, more detailed classification of materials used for anterior restorations would be beneficial for selecting the right material for the right place esthetically and its behavior under functional loads.[28] Hybrid and nanoparticle composites (called "all purpose") have sufficient level of fracture strength for all Classes I, II, III, IV, and V, and even veneers and large build-up restorations, when compared with microfilled composites that exhibit low fracture toughness, so it should be suggested for use in nonstress-bearing areas.[28]

Repair of composites is an important feature, and one that has only recently been investigated in formal studies. The limited body of work in this area was the subject of a recent review.[29] Although the review notes that there is a deficiency in randomized controlled trials of composite repair, it does point out that recent clinical studies of 2- to 3-year duration have shown good outcomes for repairs of resealing of marginal defects in composites.[30] The most recent article describes a 7-year recall and validates the success of this conservative intervention strategy.[31] Additionally, Hemmings and colleagues[32] reported that the use of direct resin composite restorations are a good treatment option for localized anterior tooth wear and that the 30-month survival rate of 104 restorations made using one of two different resin composite systems was 89.4%.

In the clinical situation presented, the advantages of an indirect waxing technique and a direct intraoral approach were combined to provide an esthetic and conservative result. Improved predictability of the treatment may be obtained with the use of a silicone guide obtained from a waxed-up cast.[33] It should be emphasized that there are other types of treatments, such as indirect restorations (ceramic veneers and all-ceramic or metal-ceramic crowns). These procedures feature great esthetics and high success rates, but they need greater involvement of the remaining dental structure and have high costs because of the requirement of a specialized laboratory to help achieve goals and because of the working time.

Some procedures conducted before the restorative procedures should be addressed. Occlusal adjustment and then an in-office bleaching treatment were performed. The occlusal adjustment was employed to homogenize occlusal contacts and eliminate premature ones. A similar procedure was described earlier.[14] According to Dawson, some type of occlusal interference can be found in all patients with bruxism, which can be extremely damaging. With the elimination of interference at the expense of the bite splint or occlusal adjustment, the muscular behavior usually becomes normal.[13] Although many patients continue clenching after occlusal interferences are removed, many notice a marked reduction in muscle activity.[13]

The aim of bleaching in the present case report was to make the tooth surfaces brighter, providing the reference color with less chroma (or saturation) and a more youthful and natural appearance to the patient's smile. In this context, tooth color is one of many factors contributing to a smile's esthetic balance. The restorative procedure was conducted 3 weeks after dental bleaching to avoid possible negative effects of bleaching on bond strength.[34]

Occlusal appliances such as hard occlusal stabilization splints are reversible interventions. The use of occlusal splints should not be considered as a lifetime treatment but may reduce teeth grinding, muscular activity, and myofascial pain.[35,36] Holmgren and colleagues[37] speculated that the therapeutic mechanism of a splint must at least in part be related to factors that modify and reduce parafunctional activity and/or redistribute the overload in the masticatory system. Also, it is important to consider other types of support, such as relaxation to control stress, psychotherapy, meditation, and biofeedback,[38] as well as physical medicine (cardiovascular toning programs, transcutaneous electrical nerve stimulation, acupuncture, manual massage)[39,40] and alternative/naturopathic medicine that can help improve the quality of life of patients and thus obtain a long-term success of treatment.[41]

Dental composites as anterior restoratives are the material of choice for most restorations. Clinical studies show good outcomes with few limitations or

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problems,[23] so the patient should be aware that the shade and texture of the material will change over time. Restorations also require periodic maintenance. Additionally, the patient was advised about diet and environmental factors. One important factor is related to superficial staining (e.g., that caused by tobacco), which especially increases when surface texture is created during the polishing procedure.[42] The dentist, on the other hand, should be aware that repolishing a stained surface reduces the staining, but it may not return the restoration to its original color.[42]

In dentistry, achievement should not be measured solely by immediate results or esthetic appearance but rather by good stability and harmony of the stomatognathic system and the long-term results of the treatment, which directly depends on a number of variables, including proper maintenance of restorations (periodic controls, use of occlusal bite splint), the increase or decrease of etiologic factors (stress), as well as the use of other types of treatment that help improve the patient's lifestyle.

CONCLUSION

Anterior tooth wear resulting from parafunctional habits can be conservatively treated with the use of direct resin composite restorations, as demonstrated in this clinical report. In addition to occlusal adjustment and bleaching, the technique described provides advantages, such as low-cost treatment and the ability to repair and/or modify it.

DISCLOSURE

The authors do not have any financial interest in the companies whose materials are included in this article.

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