Minimally Invasive Adhesive Treatment of Dental Wear with Feldspathic Ceramic Restorations – A Case Report

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Abstract: Nowadays non-carious dental lesions are a frequent pathology that affects teeth by irreversible losing the hard non-carious dental tissues. That can affect patients by damaging the aesthetic and functional aspects. A clinical trial case of adhesive restorations was the approach for patients affected by dental abrasions. All the patients are systematically and exclusively treated with adhesive feldspathic ceramic restorations in the frontal area. In this article, one of full-mouth rehabilitation through adhesive restorations was presented. The tooth structure was not sacrificed; some thin veneers made of feldspathic ceramic was bonded directly on the teeth. At the end of this non-prep therapy was an achieved esthetic and functional outcome for all cases with maintaining the teeth vitality.

Keywords: Tooth wear, Adhesive restorations, Non-carious dental lesions, Feldspathicporcelain.

INTRODUCTION

A non-carious dental lesion is an abnormal mechanical process that results in irreversible loss of hard non-carious dental tissues that can affect patients by damaging the aesthetic effect, dental sensitivity, loss of central stops, occlusive interference, impaired dental guidance, and even masticatory dysfunction. This can occur due to the interaction between teeth and other materials, vicious habits and the incorrect use of hygiene tools (toothbrush, dental floss) [1, 2].

Prosthetic restorations that preserve hard dental tissues represent the treatment of choice for these conditions nowadays [3]. These treatments can change the size, shape, and color, even in the case of dental abrasions of patients where the esthetic demand is high [4, 5].

Although over time, traditional metal-ceramic restorations have been shown to have predictable strength and an acceptable aesthetic effect [6], full-ceramic crowns have been reported to have better optical properties and a superior gingival response [7], regarding the aesthetic demandings, which, at the present moment, have increased. Non-prep prosthetic restorations made from feldspathic ceramic are applied on the external surface of the anterior teeth without any preparation of hard dental tissue, representing an ideal method of aesthetic restoration, which gives a great appearance with a small thickness and can be obtained through close communication between patient, dentist and dental technician [8]. These are used in the frontal area because they offer a superior aesthetic quality; preserve the hard dental tissues [3], while having high survival rates [9]. All-ceramic systems and core materials, such as lithium disilicate, aluminum oxide, and zirconium oxide have been developed to obtain the most pleasing aesthetic effect and to have more variants depending on each case [10].

Lithium disilicate is a monolithic ceramic material based on silica, which was introduced in 2005 under the name of IPS e.max –Ivoclar Vivadent. It has been improved by having considerable physical properties and translucency [11] while having a considerable fracture resistance [12].

Minimally invasive or non-prep prosthetic restorations using materials such as lithium disilicate or feldspathic ceramic lead to the possibility of minimizing overall crown tooth preparations of the enamel tooth structure which has a significant role in stress redistribution and in the resistance of enamel crack propagation [13], thus offering acceptable longevity compared to conventional restorations such as metal-ceramic crowns [14].

The goals of the treatment are to restore the intermaxillary relationships of the teeth, essential for occlusal harmony [15], considering that these restorations are capable of providing true accurate reproduction of the natural teeth, with great color stability even with thicknesses between 0.2 and 0.5

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mm, while also offering periodontal biocompatibility and may be the answer to the aesthetic needs of patients when used correctly in appropriate cases [16]. It must also be borne in mind that intermaxillary relationships will have to reproduce a stable and correct centric relationship in such a way as to fully respect the principle of mutual protection without any deflective occlusal contacts or interferences during function [17].

CASE PRESENTATION

A 43-year-old man was referred to the first author's clinic stating that he was unhappy with the appearance of his teeth and he experienced difficult in chewing. On the clinical examination of the patient the teeth were revelated with no caries and dysfunctional occlusion. The patient was in good general health and his oral hygiene was good. Clinical oral examinations revealed severe tooth surface loss on the maxillary and mandibular anterior teeth. Other teeth had incorrect fixed restorations and crown destructions (Figure **1**). The patient has no periodontal problems with no mobility and no parafunctional habits. No symptoms were found in the temporomandibular joints.

First, all the pre-prosthetic procedures were made by cleaning and removing all old restorations, caries and old fillings (Figure **2**). The endodontic treatments and retreatments were made on the other teeth especially on the posterior zone. Where the teeth can't be saved, the dental implants were placed. The positions of the implants were on the first and second molar, in the right side on mandibular place. It was proposed to increase the incisal length of the maxillary anterior incisors, together with alteration of the VDO (vertical dimensions occlusion). These modifications were made on a diagnostic wax-up (Figure **3**). The wax-up simulated teeth of a normal shape and configuration and this was evaluated with a clinical mock-up (Figure **4**). The patient evaluated the esthetic and functional mock-up for 3 weeks. After that, the minimal invasive preparations were made on the endodontic treatment teeth in the posterior zone. Local anesthesia was administered in the gingiva before placing the retraction cords (Ultrapack; Ultradent). The 2 cords technique was used to conditioning the gingiva. On the non-prep teeth on the frontal zone, the teeth were cleaned after the mock-up was removed. The final impression was taken with polyvinilsiloxane, double-mixing impression technique was adopted. Then, an intraoral facebow and bilateral centric relation

Figure 1: Clinical aspect of pacient before treatment: **a** – maxillary occlusal view; **b** – mandibular occlusal view.

Figure 2: Oral cavitation prep, removing all old restorations and cleaning: **a**, **b** - upper and lower arches.

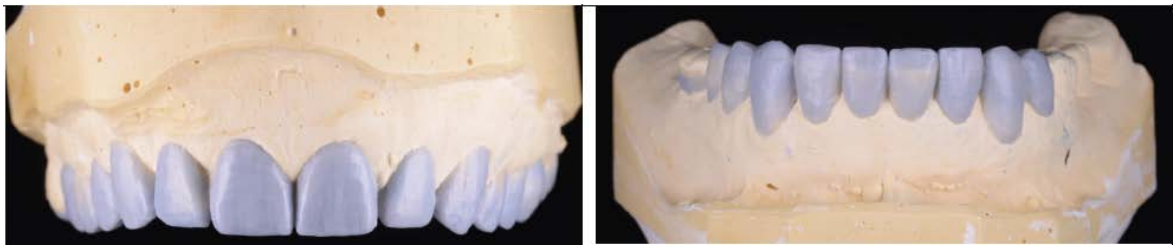

Figure 3: Design of final restorations through upper and lower Wax-up for VDO and teeth shape growth: **a**, **b** - upper and lower arches.

Figure 4: Test drive the wax-up, through mock-up direct in the oral cavity.

records by using 2 points on posterior and an anterior Jig (Figure **5**).

Some feldspathic restorations were made in the frontal zone. Due to the increase of VDO on the maxillary arch, it was chose to have double veneers, one veneer for the buccal part and one on the palatal part (Figure **6**). On the posterior zone was made lithium disilicate on the both sides on maxillary arch. On mandible, in the posterior zone on the implant, was choose zirconia restorations (in the right side) and on the left side on the teeth was chose fixed partial metal-ceramic restorations. The try-in phase was made by using Variolink Esthetic Try-in (Ivoclar/Vivadent) for all restorations.

The feldspathic ceramic veneer was adhesively cemented on the natural tooth. Composite resin Variolink Esthetic (Ivoclar/Vivadent) was used for cementation. The isolations was made using a rubber dam. First, the feldspathic veneers was rinsed with water, then acid-etched with IPS Ceramic etching gel HF 3% to <7% for 60 seconds (IPS Ceramic; Ivoclar/Vivadent). After that, allceramic restorations were rinsed with water, and then applied etching with 37% ortho-phosphoric acid (Total Etch; Ivoclar/Vivadent) for postetching cleaning for 60 seconds. The surface was silanized for 60 seconds (Monobond Plus; Ivoclar Vivadent) (Figure **7**).

The surface of the tooth was sandblasted with aluminum oxide, then etched with 37% ortho-phosphoric acid (Total Etch; Ivoclar/Vivadent) for 45 seconds for non-prepared teeth area. After raising and dried the surface, it was conditioned with Adhesive Universal (Viva Pen, Ivoclar Vivadent) and brushed 20 seconds on the area. After a good dried of the bonding area, it was photopolymerized for 10 seconds. The veneers were cemented with Composite resing cement (Variolink Esthetic LC, Ivoclar Vivadent), the excess was removed with a dried brush. 20 seconds for each side the cement was polimerized. After cemented the margins, there comes polishing, finishing and checking the occlusion (Figure **8**).

At the recall period, all restorations were intact without any chipping, discoloration, or other complications (Figure **9**).

DISCUSSION

Minimally invasive treatment with feldspathic ceramic or lithium disilicate is increasingly being used, as a way to preserve tooth structure, especially in young patients, considering the fact that aesthetic is very important in these cases.

The planning of each clinical case using a photographic protocol and an appropriate treatment plan offers better predictability in the final result, in

Figure 5: Impressions and intermaxillary bite registrations: **a** - upper and lower arches prepared for impressions; **b** – impressions of both arches, **c** – occlusal bite registration with anterior Jig and bilateral silicone bite material.

addition to the aesthetic analysis, wax-up (aesthetic, functional), mock-up, all to establish correct values in regarding the symmetry, proportion, arrangement, and individualization of the new smile [18-21].

It is suggested a selection of cases regarding the most suitable choice of a type of material or a suitable ceramic system, and in these situations we will have to make decisions according to each case. The choice of a suitable ceramic system, whether metal-ceramic or all-ceramic, the location, type of the restoration, design of the marginal finish line, the color of the tooth to be prepared and the restoration to be inserted must be considered [22].

The aesthetic and functional needs declared by the patient and the severity of the dental wear must be taken into account in making the decision to rehabilitate the severely worn tooth [23]. Another method of treating dental abrasion is composite restorations. In this situation, in time, the composite does not retain its color [24] and its abrasion is much higher than in the

Figure 6: Final restorations on the upper and lower models. Double veneers were made in the upper frontal zone.

Figure 7: Steps for feldspathicceramic veneers conditioning.

case of ceramic restorations, and when brushing the teeth it must be done carefully [25]. From the literature it was known that the increase of the interocclusal space by modifying the vertical dimension of the occlusion (VDO) was not a commonly used treatment modality since it was previously believed that the resting position of the mandible was fixed and cannot be modified [26, 27].

Increased VDO requires less removal of the tooth structure and allows the creation of an interocclusal space that can be used depending on the material from which the restoration will be performed. Maintaining the remaining tooth structure and enamel should provide sufficient strength, even in the presence of a reduced thickness of restorative material [22], considering that evaluating glass-ceramic crowns have shown similar success rates to conventional metal-ceramic crowns 94% over 10 years [28].

When the teeth were prepared for ceramic and metal crowns, approximately 63% to 72% of the

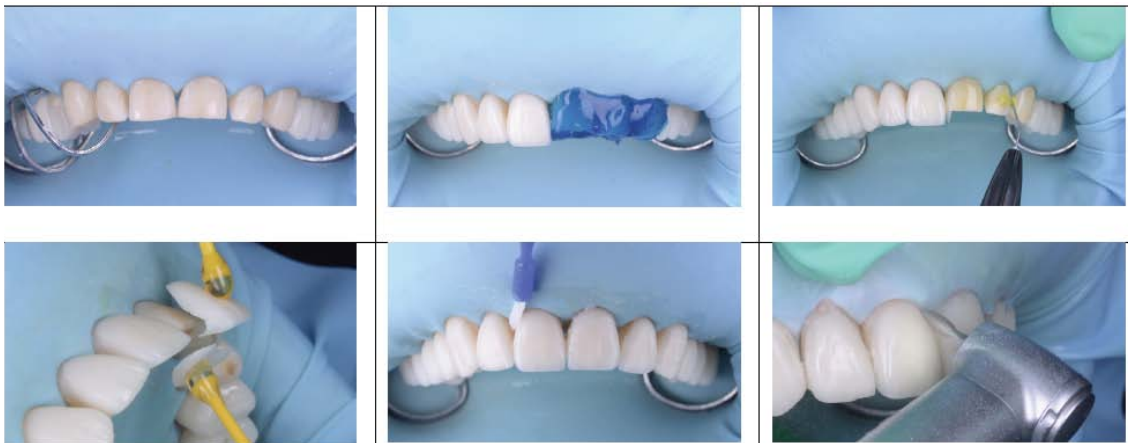

Figure 8: The steps of cementation thefeldspathic restorations. Intraoral conditioning of the teeth for fixing the veneers: **a** - blasting the teeth and preparing them for fixation; **b**- acid etching with ortho-phosphoric acid; **c** - applying the bonding; **d** - cementation of the feldspathicveneers; **e** - removal of excess cement; **f** - finishing the marginal closure for 1/1 with the tooth.

Figure 9: Recall after cementation: **a** – smile; **b** – intraoral clinical aspect.

coronary structure of the teeth was routinely removed. The new innovative methods of preparation [29] studied aim to preserve significant quantities of hard dental tissue, offering a better prognosis for the remaining tooth [30].

CONCLUSION

The minimally invasive adhesive treatment was proposed in this case of severely worn dentition, with the aim of replacing teeth structure with non-prep restorations. The increase in VDO requires less tooth removal and permits the creation of more interocclusalspace that can be used for the restorative material. The preservation of tooth structure and remaining enamel should provide sufficient resistance strength, even in the presence of reduced thickness of the ceramic feldspathic material.

CONFLICTS OF INTEREST

The authors do not have any financial interests, either directly or indirectly, in the products or information listed in the paper.

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