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Clinical Technique/Case Report

Adapted Three-step Restorative Technique: Recovering Dental Substrate Compromised by Complex Erosive Wear in a Young Patient

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Clinical Relevance

This article presents the dental restoration of a young female patient complaining of erosive dental wear using a three-step restorative technique, an alternative approach with some novel adjustments.

SUMMARY

For successful tooth wear treatment, determining the etiological systemic and local factors is the main priority before deciding on effective and long-term preventive and/or therapeutic restorative approaches. In addition to professional intervention, achieving optimal outcomes requires patients to control their diet and/or gastric issues, thus minimizing the wear process. However, continuous wear constitutes the most challenging scenario, mainly when it affects young patients' dentitions. This article describes the dental restoration of posterior teeth with reestablishment of occlusal vertical dimension before treating the anterior teeth, while educating the patient and providing medical monitoring. The three-step restorative technique seems to be proper-

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ly applicable in cases of significant dental compromise due mainly to erosive wear and is based on direct procedures, which can assure a reliable and feasible approach.

INTRODUCTION

Recently, significant attention has gone toward addressing the prevention and/or treatment of events that cause tooth wear.[1-5] Extrinsic and intrinsic etiologic factors, such as unbalanced diet/unhealthy lifestyle or gastroesophageal reflux disease (GERD), have resulted in clinical oral challenges.[4-9] They are thought to contribute to erosive tooth wear, a multifactorial condition characterized by the irreversible loss of tooth substance by acid exposure not involving bacteria.[3,5,6,10]

In 2018, Resende and others[5] proposed the term "biocorrosion" to define erosive lesions; however, since mechanical wear is also involved, the combination of chemical, biochemical, and mechanical processes still justifies the use of the term "erosion" to describe this complete phenomenon. In this context, frequent acid exposure allows for the partial demineralization of enamel or dentin, causing softening of the superficial surface, which is accelerated through the combined effect of the erosive and mechanical wear (abrasion and attrition) of the tooth surface.[2] Therefore, the severity and progression of dental erosion depend on the combination of these factors and result in erosive tooth wear, leading to surface loss that can be clinically detected.

The enamel surface is involved in the initial stage of erosive lesions. If this process is not stopped, widespread thinning of the enamel layer is observed, reaching the dentin and likely affecting the buccal, palatal, and occlusal dental surfaces. More complicated compromises, including hypersensitivity and occlusal disorders, can occur.[3,11]

The choice of treatment depends on many factors, including location of the lesions, degree of involvement of the dental structure, and the age of the patient.[5,6,12-14] However, gathering an accurate medical history to determine the main etiological reason for dental erosion and manifesting its control must be the first steps in successful treatment. When an accurate medical history is not possible, which occurs when treating patients with special needs, the idiopathic etiology is considered, since no specific monitoring can be performed. This scenario creates uncertainty in terms of treatment and its longevity.

When considering more extensive cases, prior planning and strategies may be essential to avoid subjecting the patient to compromised treatment.[5,12-15] Additionally, these cases require special attention and the involvement of the patient. Direct procedures are always the preferable approach, as they offer a more conservative approach. However, when multiple teeth are affected, rationalization of the management is essential for successful treatment. One interesting strategy was introduced by Vailati and Belser[14,15]; their technique is labeled the "three-step technique." It was first described to be indicated for guiding the treatment of significant erosive lesions. This technique suggests combining laboratory (L) and clinical (C) steps into three phases: step 1 = esthetics (L, maxillary buccal wax up; C, assessment of the occlusal plane); step 2 = posterior support (L, posterior occlusal wax up; C, creation of posterior occlusion at an increased vertical dimension of occlusion [VDO]); and step 3 = anterior guidance (L, maxillary anterior palatal onlays; C, reestablishment of final anterior guidance).

Figure 1. *Compromised dental wear of a 16-year-old patient as a consequence of dental erosion associated with bruxism. Intraoral view highlighting incisal compromise and loss of shiny aspect.*

Figure 2. *Lateral view indicating intense wear and loss of vertical dimension of the left side.*

The aim of this article is to report on the application of this full-mouth adhesive rehabilitation technique, which involves the use of composite resin to reestablish posterior teeth that have been compromised by erosion and that have a reduced vertical dimension. This article will then discuss the recovery of the extensively worn anterior dentition (palatal and buccal surfaces) in a young female patient presenting with constant dental erosion who had been monitored for four years.

DESCRIPTION OF TECHNIQUE

Medical and Clinical Reports

A 16-year-old female patient sought treatment at the Bauru School of Dentistry, complaining of severe esthetic problems. She reported unhappiness about her smile, especially due to the lack of esthetics of her anterior teeth (Figure 1), revealing anxiety and a strong desire to recover an esthetic smile.

Possible dietary causes of the erosion were investigated, since the patient presented with wear on the occlusal and buccal surfaces, commonly attributed to extrinsic factors. Even though the patient did not report high acidic consumption, the clinical evaluation revealed that the overall oral conditions made the patient more prone to erosive wear. Therefore, the next step was based on the analysis of tests regarding the patient's flow and consistency of saliva, which showed apparent normal parameters: unstimulated salivary flow: 0.25 mL/min; stimulated salivary flow: 1 mL/min; and an adequate buffer capacity. This assessment suggested no clinical compromise of the salivary protective properties. Additionally, the patient reported she was taking medication to maintain her thyroid hormone levels (Eutirox 88), which were abnormal due to previously diagnosed hypothyroidism. Eutirox is an international brand of levothyroxine, a synthetic form of the human hormone thyroxine.

The intrinsic causes of erosive wear were also investigated. The patient's parents reported that she did not present any signs suggesting bulimia or anorexia. For a more specific analysis, the patient was referred to a gastroenterologist for an evaluation of the existence of GERD. After some medical tests, including endoscopy and hiatus analyses, a limited esophageal sphincter contraction was observed, which was responsible for causing the reflux of small amounts of stomach acid into the oral environment. Additionally, the patient reported that she used to have a nap after lunch and usually turned to the left side, which likely explained the presence of more lesions on this side when compared to the right side (Figure 2). When analyzing her posterior teeth, occlusal and buccal enamel wear was evident. Other relevant data led to a diagnosis of bruxism, which, when combined with erosion accelerating the wear, contributed to the severity of the effects of bruxism. Excessive attrition due to bruxism, if not controlled, can require significant indirect and invasive approaches, especially when the periodontium is compromised.[16-18]

More detailed oral examination confirmed overall extensive enamel loss, decreased dimension of occlusion, and generalized dental sensitivity. A clinical evaluation and medical questionnaire confirmed increasing dental sensitivity, which was causing episodes of discomfort during drinking and eating. The patient was first referred for temporomandibular joint (TMJ) analysis, with no issues identified. This is essentially the first step, as the technique based on Vailati and Belser[14,15] is not recommended for patients who present with TMJ disorders.

Based on this lack of a TMJ diagnosis, the restorative treatment was started. According to the Vailati and Belser technique,[14,15] it is necessary to initially determine the optimal position of the maxillary incisal edges of the planned final restorations to refer to the correct distribution of interocclusal space gained by the increase in VDO. Limitations will occur in cases involving more severe erosion/wear, which was not the case for the current patient. In situations involving severe wear, adjustments to this technique would be necessary.

Initial diagnosis evaluated the amount of dental wear, and the relationship of the mandibular/maxillary arches was analyzed. As a result, the thickness of restorative material on the occlusal surfaces varied, especially when considering that prior unsatisfactory restorations required replacement. In the present case, less than 1 mm was necessary to return the appropriate VDO.

The diagnosis was first performed for the anterior teeth (using a mockup) and then for the posterior teeth. However, the restorative sequence was switched: the posterior teeth were "arbitrarily" restored, taking the maxillary smile line into account and following the Curve of Spee. Restoring the posterior teeth was recommended to establish occlusal stability. As indicated by the authors, the composite resins can serve as "long-term provisional treatment" for adult patients. These temporary restorations can be helpful to diagnosis as well. Composite resin is more conservative than the use of ceramics and is also repairable. For young patients with the possibility of more frequent appointments, as in the current case, the selection of this material seemed to be appropriate.

When taking into account the likely etiological factors and overall clinical situation, all dental restorations were carefully planned. Even though the patient did not indicate that she consumed acidic food and beverages, the clinical characteristics suggested that they might be involved. As the patient was still an adolescent, the involvement of continuous facial development was considered. Photographs of the patient's face and smile from different perspectives and proportional measurements were taken for analysis, as a harmonious look depends on the balance between the face and smile.

A complementary smile analysis was performed by observing the position of the teeth in relation to the lips and gums. The patient showed discrete upper

Figure 3. *Lateral perspective revealing disproportionate measurements.*

Figure 4. *Lateral view of the bis-acrylic mockup performed for the evaluation of esthetic patterns from the face and smile of the patient.*

teeth when smiling as a result of the compromised wear of the incisal faces of the anterior teeth (Figure 3). Therefore, her flat esthetic frontal plane suggested an older expression that did not correspond to the patient's actual age.

Dental prophylaxis was performed, as the patient was limited in cooperating with oral hygiene. Additionally, her gums presented signs related to an inflammatory process in the absence of plaque, indicating that her hormonal condition might be related to her condition as well.

The facial analysis provided evidence of a compromised vertical dimension. Also, TMJ was analyzed and it was not involved as already reported. Even though the patient was looking for a pleasant smile, recovering the functional characteristics of the posterior teeth was the first step in treating the patient. This was explained to the patient and her parents, who agreed with the presented treatment plan. For the anterior teeth, a combination of a full-mouth adhesive rehabilitation and the three-step technique was performed.

Restorative Procedures

Based on the restorative needs, treatment planning involved the application of the three-step restorative technique.[12-15] As the patient was only 16 years old, composite resin was the selected material for reestablishing the posterior teeth. Additionally, the presence of enamel margins supported this choice, when considering effective bonding along the enamel margins and appropriate marginal sealing.[1,4]

Impressions of both the maxillary and mandibular arches were made using addition silicone (Empress XT, 3M ESPE, St Paul, MN, USA) to obtain casts for completing the clinical analysis. A wax-up was performed on the maxillary anterior teeth for esthetic assessments and was based on the Digital Smile Design (DSD).[19,20] The maxillary anterior wax-up served as the initial parameter for the creation of the bis-acrylic resin mockups for the unprepared anterior teeth (Figure 4). The mockup also allowed for the preview of the static and dynamic aspects of future restorations.

After this first step, the posterior teeth were then diagnostically waxed-up. The initial analysis was performed for anterior teeth (using mockup) and then the posterior teeth in the treatment modality utilized in the current case study. However, the recommended sequence was switched. Therefore, the same casts were used to obtain wax-ups for the posterior teeth. This strategy was relevant for anticipating the height of the composite resin to be used to recover the vertical dimension of occlusion.

Based on the three-step technique, the wax-ups were used to replicate the anatomic characteristics of posterior teeth, allowing for the manufacture of a transparent resin matrix for fabricating and inserting the composite restorations for the posterior teeth. However, Vailati and Belser[13] originally recommended the use of a translucent silicone. In the present case, a clear acetate matrix (Cristal-PET-G-0.75, Bioart, São Carlos, SP, Brazil) was used to restore the posterior teeth, which offers the advantage of allowing the joint insertion of the metal matrix between the teeth and allows for multiple restorations to be performed simultaneously (Figure 5).

The clear plastic matrix was cut along the equatorial line. After inserting the material and placing the matrix, the excessive restorative material was removed. The matrix position was checked based on the buccal and lingual equatorial lines of all involved teeth to ensure its correct position. It was essential to ensure that this matrix was in position before inserting the composite resin since the presence of any gap was considered unacceptable.

The surface of the lower first premolar and first molar were acid-etched with 37% phosphoric acid for 30 and 15 seconds for enamel and dentin, respectively. After washing and drying with absorbent paper, Adper ScotchBond Multipurpose primer and bond (3M ESPE) were applied according to the manufacturer's guidelines. Then the acetate matrix was filled with composite resin (Esthet X, Dentsply/Caulk, Milford, DE, USA). The teeth were separated by a customized metallic matrix and were light-activated for 40 seconds using an Optilight LD (Max Gnatus, Ribeirão Preto, SP, Brazil) at 600 mW/cm^2. The same procedure was used for the second premolar and the second molar. Figure 6 presents the final aspect immediately after the restorative

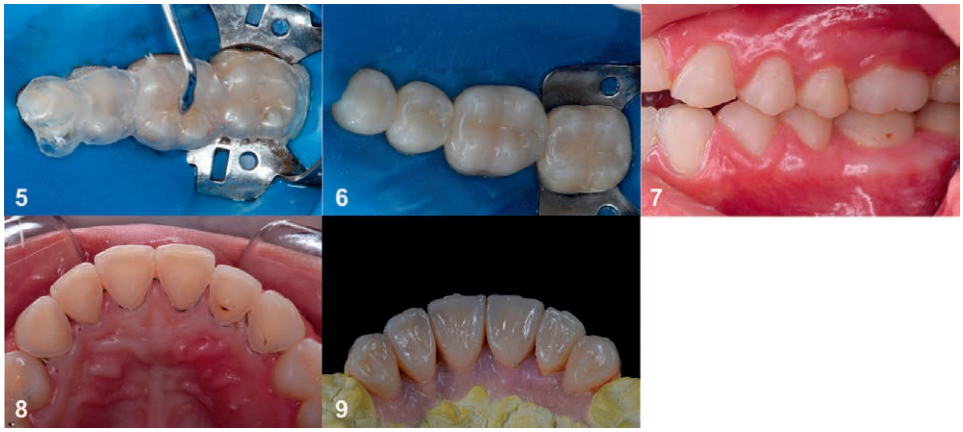

Figure 5. *Prior placement of customized metallic matrix and use of an acetate matrix to restore these teeth using resin composite.*

Figure 6. *Immediate final view of the restorative procedures on posterior teeth.*

Figure 7. *Lateral view at the four-month follow-up of the left posterior restorations.*

Figure 8. *Use of retraction cord on the palatal surface of the maxillary anterior teeth prior to making an impression.*

Figure 9. *Final view of the palatal aspect of the composite resin veneers.*

procedures were completed. After these restorations were cured, finishing diamonds and carbide burs were used to establish the buccal and lingual contours. This restorative sequence was performed in the mandibular right and left quadrants during the same session and in the maxillary right and left quadrants at the next session, recovering a mean height of 1 mm. After the completion of the restorative procedures a minor occlusal adjustment was made to stabilize the occlusion. The patient was monitored monthly to ensure occlusal stabilization for four months. After this time, the patient did not report any discomfort or pain (Figure 7).

Therefore, with a stable and functional posterior occlusion, the next step focused on the anterior teeth. A mixed technique involving indirect and direct composite resin restorations was executed for palatal and labial reconstruction of the maxillary anterior teeth (Figures 8 and 9). Using the wax-up of a dental model, indirect restorations were fabricated from composite resin involving the four maxillary incisors (Empress Direct, A3 dentin, A1 and A2 enamel, Ivoclar Vivadent, Schaan, Lichtenstein).

For tooth preparation, slight smoothing of the enamel was performed using a manual instrument, and no additional preparation was made, to include the lack of a bevel. A rubber dam was placed, and the restorations were carefully tested in their respective positions and individually luted to the palatal surfaces. The internal surface of the composite resin was sandblasted and cleaned using 37% phosphoric acid for 30 seconds, rinsed for the same amount of time, and dried with a stream of air. One coat of silane was applied (Monobond, Ivoclar Vivadent) and was gently evaporated using an air stream before application of the adhesive system, Adper Scotchbond Multipurpose (3M ESPE), which was light-activated for 40 seconds. The dentin surface was cleaned and acid-etched for 15 seconds; Adper Scotchbond was used as already described. Then the dual-cure luting resin cement, All Cem Core, A2 shade (FGM, Joinville, SC, Brazil), was used to cement the restorations, positioning them on the palatal and incisal surfaces. This treatment involved all of the worn maxillary anterior teeth.

Excess cement was removed and minor occlusal/incisal adjustments were completed. In sequence, these restorations were well defined using a rubber dam. The external buccal surface of the anterior restorations was superficially removed using a 3131 diamond bur (KG Sorensen, Cotia, SP, Brazil), and a bevel was prepared (Figure 10). The buccal surfaces of all these restored teeth were removed using a 2135 bur. A 0.8-mm-thick palatal surface was maintained for each tooth. The removal of these buccal surfaces was performed to allow the necessary thickness for the layered resin technique to be utilized. Sandblasting was performed on the internal surfaces of the palatal restorations using aluminum oxide, followed by the application of the Scotchbond Multipurpose adhesive system; no silanization was necessary. These surfaces were restored using the incremental polychromatic composite layer direct technique, as shown in Figure 11 (Empress Direct, A2 dentin, A1 Enamel, Ivoclar Vivadent). All of these procedures were performed in the same day, which dispelled the need for any provisional restorations.

One week later, finishing and polishing were performed using multilaminated burs and abrasive rubber and polishing discs (TDV, Pomerode, SC,

Figure 10. *Luted resin veneers with excess cement removed to allow adequate space for the direct incremental technique.*

Figure 11. *Direct restorative procedure for the palatal luted indirect surface using the stratified restorative technique.*

Figure 12. *View of the buccal surface of the maxillary anterior teeth, demonstrating the reestablishment of anatomic characteristics with a natural appearance and harmony with adjacent soft tissue.*

Brazil). The final aspect of the anterior restorations reestablished the esthetic and functional aspects after one week (Figure 12). Finally, an occlusal splint guard was delivered to prevent wear and fracture of the restorations.

Follow-ups were made after one month, six months, and at three and four years. At the last two appointments continued erosion was detected on the cervical third of the buccal surfaces of the canines and premolars of the left side. On the right side, minor staining was detected. After this time, the patient was still very happy with the final result and did not complain about tooth sensitivity, although continuous erosive wear was still occurring. The patient finally admitted that she consumed cola drinks at the three-year follow-up, which was in agreement with the clinical conditions. Most of the restorative procedures presented good performance, although the analyses indicated continuous progression of wear, especially on the cervical area of the left maxillary premolar, as shown in Figure 13a through d. After the four-year follow-up, some cervical and occlusal areas failed, clearly related to the continuous exposure to erosion, as shown in Figure 14a through d, even though the patient reported abstinence from consumption of cola drinks.

DISCUSSION

Erosion is considered a chronic event that is either a patient behavior–dependent issue or a result of a systemic disorder. When diagnosed, the patient is referred for evaluation and treatment, which does not necessarily yield the complete cessation of erosion. The frequency of appointments depends on severity.[21] Clinical responses are very individual, as erosion is also considered to have a multifactorial etiology.

Clinically, correct diagnosis of the etiology of the lesions is essential for effective treatment. With moderate erosion, several preventive steps are indicated, such as a change in dietary or behavior patterns, the application of desensitizing fluoride therapy, and/or restorative treatment measures. In addition, restoration with glass ionomers or composite resin and composite or porcelain veneers has been examined in previous studies.[3,5,6,11,21]

In the present case, a treatment plan was determined after making the patient and her parents aware of the situation and recommendations regarding reflux control and diet influence. All requested information was provided to the patient, and a referral was established with a physician to minimize the consequences of systemic oral erosion. As the patient was young, she drew special attention in terms of the desire to avoid continuous dental erosion. However, despite the risk of compromising the vertical dimension and causing sensitivity, the patient sought dental care to address her seemingly unpleasant smile. This type of scenario is becoming increasingly frequent and attests to the lack of dental health education.

As a result of the extensive treatment required for this patient, detailed treatment planning was required. The cooperation of the patient was essential for optimizing outcomes, especially when the main complaint (smile) was not primarily addressed.

Figure 13. *Case follow-up after three years. (a) Occlusal view of the maxillary teeth. (b) Occlusal view of the mandibular teeth. (c) View of the maxillary anterior teeth. (d) Lateral view of the left side of the maxillary premolars revealing continued wear of the cervical area of these teeth.*

Figure 14. *Case follow-up after four years. (a) Occlusal view of the maxillary teeth. (b) Occlusal view of the mandibular teeth. (c) View of the maxillary anterior teeth. (d) Lateral view of the left side of the maxillary premolars revealing continued wear of the cervical area of these teeth.*

In complex cases, such as the present case, professionals argue frequently for the best treatment and the starting point, questioning "Starting from where?," "What materials should be selected?," "Is this a case for indirect restorative materials?," etc. All of these points are of critical importance. When these factors are ignored, satisfactory restorative performance can be reduced. A more conservative treatment than what Vailati and Belser proposed in 2008[14] consists of the combination of three laboratory and three clinical stages that are integrated and sequential, allowing for a logical and substantial approach. The main advantage of this technique is that it can help to achieve tooth rehabilitation by restoring the shape and function of a tooth with composite resin with minimal tooth preparation.

Coachman and Calamita[19] described DSD, a technique that is helpful during the diagnostic waxing and mockup steps for achieving more predictability and an esthetically pleasing outcome as it systematically analyzes the relation between the patient's lips, smile, and face. At first this analysis was performed solely on the buccal surfaces of teeth 5-12. After the mockup, however, diagnostic waxing in the posterior areas followed the original technique of Vailati and Carciofo.[12] An articulator was used to monitor the reestablishment of the VDO to recover the natural anatomy of the posterior teeth. At this stage, the final diagnostic waxing was completed, and composite resin was used to restore the posterior teeth to an adequate function.

This three-step technique reproduces the shape and position of the diagnostic wax using transparent silicone.[15] The current authors decided to use a clear plastic matrix vacuum molded to a waxed model. This is a rigid material that does not deform easily. The acetate matrix facilitates the joint insertion of a metal matrix between the teeth and allows multiple restorations to be performed simultaneously. On the other hand, when using a transparent silicon matrix and a metal matrix, the silicone can be easily deformed, causing deformation to the spatial arrangement of the waxed teeth and changes in the shape and strength of the interproximal contacts.

The main advantage of using this plastic and acetate matrix is that it allows one to recover the point of contact and the position of the teeth in the arch with few or no alterations. During the clinical occlusal analysis, minimal adjustments were made. On the other hand, the limitation of this technique is the substantial loss of the anatomical details that the diagnostic wax provided. During the finishing and final polishing, these anatomical details were made using finishing burs and a finishing and polishing system to recover the natural occlusal anatomy of the posterior teeth. The proximal faces were polished using EVA tips and a reciprocating diamond system, which allowed for removing contours and composite excess formed during the restorative process.

Once the VDO was recovered, the next step was to establish anterior esthetics with composite resin restorations using the same Vailati technique. According to the Vailati and Belser[13-15] technique, it is necessary to first determine the optimal position of the maxillary incisal edges of the planned final restorations to determine the correct distribution of

interocclusal space gained by the increase in VDO. Limitations will occur in more severe cases of erosion, which was found in the current case. In these situations, adjustments of this technique are necessary.

During the initial diagnosis, the level of dental wear and the relationship of the mandibular and maxillary arches were analyzed. As a result, the thickness of the restorative material on the occlusal surfaces varied, considering that previously placed unsatisfactory restorations required replacement. In the present case, less than 1 mm was necessary to restore VDO. Additionally, VDO and TMJ health are of great relevance, and their relationship cannot be ignored. Two main reasons guide the recommendation for increasing VDO: 1) When major dental wear accompanies missing teeth, the VDO and TMJ positions can become unbalanced. In these cases, the VDO should be reestablished, especially in more complex cases of rehabilitation. 2) In the second scenario, a slight loss of VDO is presented or insufficient space for restorative material is available for restoring VDO. This situation corresponds to the present case. Therefore, the VDO analysis is essentially simultaneous with the analysis of TMJ, which was not compromised. For both situations, manipulating the VDO following recommended philosophies of occlusion is essentially arbitrary, especially considering the limitations of each case.[22-27]

Follow-ups in the current case revealed no negative impact on the TMJs after the posterior restoration and restoring VDO. After a four-month follow-up, the present patient did not present with any issue related to the TMJs. Additionally, she reported reduced dental sensitivity. Any minor adjustments of the restorative materials were performed during finishing procedures. The anterior teeth were restored only after the VDO was found to be stable.

An occlusal registration was made taking maximum intercuspation position (MIP) into account, as recommended in part 2 of this technique.[15] The dilemma involving the decision of restoring VDO in centric relation (CR) and MIP was considered from the beginning. For this current patient, there was a discrepancy between these two parameters. When the teeth were positioned to CR, the overjet distance increased. According to Vailaiti and Belser's part 2 article,[15] it is necessary to obtain correct anterior guidance. Another concern with this technique was related to the age of the present patient, who was still developing skeletally. Therefore, the VDO was established using MIP, which was considered the most appropriate for these circumstances.

In this present case, the third laboratory stage began using indirect palatal veneers with composite for the six maxillary anterior teeth. The color selection was obtained via cross-polarized photography, and small portions of composite resin were placed on the buccal surfaces. The veneers were luted using direct incremental resin restorations. The stratification technique using a direct composite resin was successful for providing excellent mechanical and esthetic results. At this stage, the current authors avoided the use of indirect ceramic veneers, considering the need for minimally invasive dentistry. We preserved the enamel of the cervical two-thirds of the buccal faces of the teeth as much as possible.

After the sequential appointments for monitoring the patient, some changes were noticed, including the wear and tear of composite resins in specific and localized areas. The point is that even with well-planned and well-executed dental treatment, external factors, such as psychological, idiopathic, or even physiological aspects of the patient, can be a considerable determinant of long-term success. In this case report, the patient was found to have an etiological problem and chronic-based erosion. In the three-year follow-up, the patient finally admitted to the consumption of cola beverages, which she had stopped completely a few months prior to the three-year follow-up appointment.

Even with the presence of localized erosion, the main advantage of the use of composite resin is that it allowed for polishing, making repairs, and replacing an unsatisfactory restoration without the need for removing extra dental structure. After the four-year follow-up, the current authors detected erosive progression, especially around the buccal surfaces of the left maxillary premolars. This scenario was challenging, as the other restored areas performed well, to include minor adjustments (Figure 15). The patient reported that she had recently decided to refrain from the consumption of cola drinks, as she finally was aware of the impact of those progressive lesions.

The present authors conclude that there is a high chance of recurrence when dental erosion is not considered when planning, considering the type of material, and performing the dental treatment in patients affected by erosion, even when treatment occurs jointly with a psychologist and physician. An available strategy, such as full-mouth adhesive rehabilitation, is an excellent technique for allowing

Figure 15. *Views after adjustments at the four-year follow-up. (a) Occlusal view of the maxillary teeth. (b) Occlusal view of the mandibular teeth. (c) View of the maxillary anterior teeth.*

restorative procedures of complex cases. However, monitoring patients with a chronic disease is always mandatory for long-term clinical performance.

Conflict of Interest

The authors of this manuscript certify that they have no proprietary, financial, or other personal interest of any nature or kind in any product, service, and/or company that is presented in this article.

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REFERENCES

1. Reis A, Higashi C, & Loguercio AD (2009) Re-anatomization of anterior eroded teeth by stratification with direct composite resin *Journal of Esthetic and Restorative Dentistry* **21(5)** 304-316.
2. Huysmans MC, Chew HP, & Ellwood RP (2011) Clinical studies of dental erosion and erosive wear *Caries Research* **45(Supplement 1)** 60-68.
3. Fradeani M, Barducci G, Bacherini L, & Brennan M (2012) Esthetic rehabilitation of a severely worn dentition with minimally invasive prosthetic procedures (MIPP) *International Journal of Periodontics and Restorative Dentistry* **32(2)** 135-147.
4. Giacomini MC, Scaffa P, Chaves LP, Vidal C, Machado TN, Honório HM, Tjäderhane L, & Wang L (2017) Role of proteolytic enzyme inhibitors on carious and eroded dentin associated with a universal bonding system *Operative Dentistry* **42(6)** E188-E196.
5. Resende TH, Reis KR, Schlichting LH, & Magne P (2018) Ultrathin CAD-CAM ceramic occlusal veneers and anterior bilaminar veneers for the treatment of moderate dental biocorrosion: A 1.5-year follow-up *Operative Dentistry* **43(4)** 337-346.
6. Magalhães AC, Wiegand A, Rios D, Honorio HM, & Buzalaf MA (2009) Insights into preventive measures for dental erosion *Journal of Applied Oral Science* **17(2)** 75-86.
7. Lussi A, Schlueter N, Rakhmatullina E, & Ganss C (2011) Dental erosion—An overview with emphasis on chemical and histopathological aspects *Caries Research* **45(Supplement 1)** 2-12.
8. Herbella FA & Patti MG (2010) Gastroesophageal reflux disease: From pathophysiology to treatment *World Journal of Gastroenterology* **16(30)** 3745-3749.
9. Bartlett D (2016) A personal perspective and update on erosive tooth wear—10 Years on: Part 2—Restorative management *British Dental Journal* **221(4)** 167-171.
10. ten Cate JM & Imfeld T (1996) Dental erosion, summary *European Journal of Oral Sciences* **104(2(Pt 2))** 241-244.
11. Wang L, Magalhães AC, Francisconi-Dos-Rios LF, Calabria MP, Araujo D, Buzalaf M, Lauris J, & Pereira JC (2016) Treatment of dentin hypersensitivity using nano-hydroxyapatite pastes: A randomized three-month clinical trial *Operative Dentistry* **41(4)** E93-E101.
12. Vailati F & Carciofo S (2016) Treatment planning of adhesive additive rehabilitations: The progressive wax-up of the three-step technique *International Journal of Esthetic Dentistry* **11(3)** 356-377.
13. Vailati F & Belser UC (2010) Classification and treatment of the anterior maxillary dentition affected by dental erosion: The ACE classification *International Journal of Periodontics and Restorative Dentistry* **30(6)** 559-571.
14. Vailati F & Belser UC (2008) Full-mouth adhesive rehabilitation of a severely eroded dentition: The three-step technique Part 1 *European Journal of Esthetic Dentistry* **3(1)** 30-44.
15. Vailati F & Belser UC (2008) Full-mouth adhesive rehabilitation of a severely eroded dentition: The three-step technique. Part 2 *European Journal of Esthetic Dentistry* **3(2)** 128-146.
16. Bartlett DW (2016) A personal perspective and update on erosive tooth wear—10 Years on: Part 1—Diagnosis and prevention *Brazilian Dental Journal* **221(3)** 115-119.
17. Moazzez RV, Austin RS, Rojas-Serrano M, Carpenter G, Cotroneo E, Proctor G, Zaidel L, & Bartlett DW (2013) Comparison of the possible protective effect of the salivary pellicle of individuals with and without erosion *Caries Research* **48(1)** 57-62.
18. Moazzez R, Anggiansah A, & Bartlett DW (2005) The association of acidic reflux above the upper oesophageal

sphincter with palatal tooth wear *Caries Research* **39(6)** 475-478.

19. Coachman C & Calamita M (2012) Digital smile design: A tool for treatment planning and communication in esthetic dentistry *Quintessence of Dental Technology* **35** 103-111.
20. Meereis CT, de Souza GB, Albino LG, Ogliari FA, Piva E, & Lima GS (2016) Digital smile design for computer-assisted esthetic rehabilitation: Two-year follow-up *Operative Dentistry* **41(1)** E13-E22.
21. Bartlett D, Ganss C, & Lussi A (2008) Basic Erosive Wear Examination (BEWE): A new scoring system for scientific and clinical needs *Clinical Oral Investigations* **12(Supplement 1)** S65-S68.
22. Tryde G, Stoltze K, & Morimoto T (1977) Long term changes in the perception of comfortable mandibular occlusal positions *Journal of Oral Rehabilitation* **4(1)** 9-15.
23. Hellsing G (1984) Functional adaptation to changes in vertical dimension *Journal of Prosthetic Dentistry* **52(6)** 867-870.
24. Dawson P (1989) *Evaluation, Diagnosis, and Treatment of Occlusal* Mosby, St Louis, MO.
25. Fernandes PR, de Vasconsellos HA, Okeson JP, Bastos RL, & Maia ML (2003) The anatomical relationship between the position of the auriculotemporal nerve and mandibular condyle *Cranio: The Journal of Craniomandibular Practice* **21(3)** 165-171.
26. Serrano-Hernanz G, Futarmal Kothari S, Castrillón E, Álvarez-Méndez AM, Ardizone-García I, & Svensson P (2019) Importance of standardized palpation of the human temporomandibular joint *Journal of Oral & Facial Pain Headache* **33(2)** 220-226.
27. Okeson JP & de Leeuw R (2011) Differential diagnosis of temporomandibular disorders and other orofacial pain disorders *Dental Clinics of North America* **55(1)** 105-120.