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Clinical case

Minimally Invasive and Additive Rehabilitation in a Patient with Loss of Vertical Dimension

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ABSTRACT

Introduction: Rehabilitation of tooth wear is a continuing challenge in dentistry. Various techniques and materials have been developed to achieve aesthetic and functional results, with composite resins as an effective option. These allow the restoration of vertical dimension and improve dental function and aesthetics in a conservative manner, preserving the remaining dental structure. **Objective:** To present a clinical case demonstrating the use of composite resins to attain significant improvement in function and aesthetics, highlighting their effectiveness as a conservative option in the treatment of tooth wear. **Case presentation:** A 59-year-old female patient presented to a university dental clinic in Lima, Peru. Clinical examination revealed tooth wear on the anterior teeth, affecting aesthetics and masticatory function. With a detailed

treatment plan that included composite resins and vertical dimension modification, dental function and aesthetics were restored, preserving the natural teeth and reaching occlusal aesthetic balance. **Conclusions:** Composite resin rehabilitation is an effective, conservative and economical method for treating tooth wear.

Keywords: Tooth wear, vertical dimension, composite resin, dental prosthesis, oral rehabilitation.

INTRODUCTION

Tooth wear is the loss of tooth structure due to non-carious processes, caused by intrinsic and extrinsic factors that cause erosion, abfraction, abrasion, and attrition[1]. Many patients present with combined aetiologies, which makes diagnosis difficult and requires a comprehensive therapeutic approach and multidisciplinary management. This condition is common in patients of all ages and represents a rehabilitation challenge, requiring the patient's active participation in controlling the aetiological factors. Restoring the balance of the stomatognathic system is key to reducing tooth decay and increasing the longevity of restorations[2]. This involves evaluating and correcting functional parameters such as the vertical dimension of occlusion (VDO), whose timely treatment is essential to avoid problems such as sensitivity, pain, loss of quality of life and aesthetics. Alterations in the VDO can affect important components such as the temporomandibular joint (TMJ), muscles and teeth[3].

The relationship of the anterior teeth, centric relation (CR) and VDO are crucial factors to consider during treatment. Properly addressing your problem allows for the restoration of function and aesthetics, following the principles of minimal intervention and preserving the integrity of the final restorations[4,5]. For minimally invasive rehabilitation, materials such as ceramics and composite resins are used, along with auxiliaries such as polyethylene fibre, which offers properties such as compressive strength and biocompatibility, facilitating the preservation of hard tissues[6]. There are established protocols for rehabilitation with composite resins, and the case presented applies the Aesthetic-Occlusal Rehabilitation Treatment (A.R.T.)[7], using a sequential approach by sectors, also restoring the edentulous segments through the placement of a Removable Partial Prosthesis of chromium-cobalt. Therefore, the objective of this clinical case presentation is to demonstrate the use of composite resins to accomplish significant improvements in function and aesthetics, highlighting their effectiveness as a conservative option for the treatment of tooth wear.

CLINICAL CASE PRESENTATION

A 59-year-old female patient in good general health visited a university dental clinic in Lima. During the clinical examination, she presented competent lips, a 1 mm midline deviation to the left, no TMJ pain, and reported having lost multiple permanent teeth at an early age. Moderate tooth wear was observed, with smooth and shiny surfaces, loss of enamel and visible dentin, especially in anterior teeth. She was diagnosed with attrition wear (TWI 2), acid erosion (BEWE 3) and loss of posterior teeth due to cavities and consumption of acidic foods (Figure 1). Impressions and records were taken in centric relation, and the models were mounted in a semi-adjustable articulator. The occlusal-maxillary line was drawn using the Fox Plane, and a

planning wax-up was created to define the anatomy of the teeth. A 1.5 mm increase in the vertical dimension was planned, organising the increments sequentially in: mandibular anterior, maxillary anterior, maxillary posterior and mandibular posterior teeth. The planning followed the guidelines of the A.R.T. (Figure 2).

Figure 1. Initial intraoral photographs.

Figure 2. Sectioning of the work according to the A.R.T.

The treatment began in sector I (mandibular anterior) with compound resin restorations placed directly under absolute insulation. Discs were utilised (3M™ Sof-Lex™ XT, 3M ESPE Deutschland GmbH, Seefeld, Germany) to form the area and a hydro-enhancer with 50 microns aluminium oxide to optimise adhesion. The enamel was recorded with 37% phosphoric acid (Condac 37, FGM Dental Group, Santa Catarina, Brazil) for 30 seconds, then rinsed and dried. Universal adhesive (ALL-BOND UNIVERSAL®, BISCO Inc., Schaumburg, USA) was applied with a micro -application, dried with air for 5 seconds and polymerised with a LED lamp (VALO™ Series, Ultradent Products Inc., South Jordan, USA) for 20 seconds.

For compound resin increases WE shade (PALFIQUE LX5, Tokuyama Dental Corporation, Tokyo, Japan) a silicone matrix (Hydrorise Series, Zhermack SpA, Badia Polesine, Italy) based on the waxed was employed. At the end, polishing was carried out with 3M™ Sof-Lex™ XT discs, silicon carbide brushes (Astrobrush®, Ivoclar Vivadent AG, Schaan, Liechtenstein) and resin rubbers, and a mock-up of A1 shade bis-acryl resin (Visalys® Temp, Kettenbach GmbH & Co. KG, Eschenburg, Germany) was left on the maxillary (Figure 3. A-D).

Figure 3. Direct restorations. A. Initial situation. B. Absolute isolation. C. Direct composite resin restorations in mandibular anterior teeth (Sector I) using a silicone matrix. D. Provisionalisation with bis-acryl resin in maxillary anterior teeth.

In Sector II (palatal), semi-direct composite resin veneers were created on the palatal surfaces of the maxillary anterior teeth under relative isolation. A transparent silicone matrix (Elite glass, Zhermack SpA, Badia Polesine, Italy) and #00 retraction cord (Ultrapak™, Ultradent Products Inc., South Jordan, USA) were made. The enamel was conditioned with phosphoric acid, two coats of universal adhesive were applied, dried, and polymerised with a VALO™ LED lamp for 20 seconds. Composite resin, A2 body shade (3M™ Filtek™ Z350 XT Universal Restorative, 3M ESPE Deutschland GmbH, Seefeld, Germany) was utilised through the matrix and polymerised. The occlusion was adjusted with articulating paper (AccuFilm® Occlusal Articulating Film, Parkell, Inc., Edgewood, USA) and the surfaces were polished with resin brushes and erasers.

In sector II (vestibular), vestibular veneers were elaborated with direct composite resin by freehand polychromatic stratification, under absolute isolation. 3M™ Sof-Lex™ XT discs and a hydro-blaster with 50 micron aluminium oxide were employed. The enamel was etched with

37% phosphoric acid, washed, dried, and silane and universal adhesive applied. Then, a silicone matrix (Zetalabor, Zhermack SpA, Badia Polesine, Italy) was used and layers of composite resin, A3 shade dentin, A2 shade enamel and PALFIQUE LX5 resin WE shade were applied. Upon completion, the surfaces were polished, and an acrylic Provisional Removable Prosthesis was installed to maintain vertical dimension and occlusal stability (Figure 4. A-F).

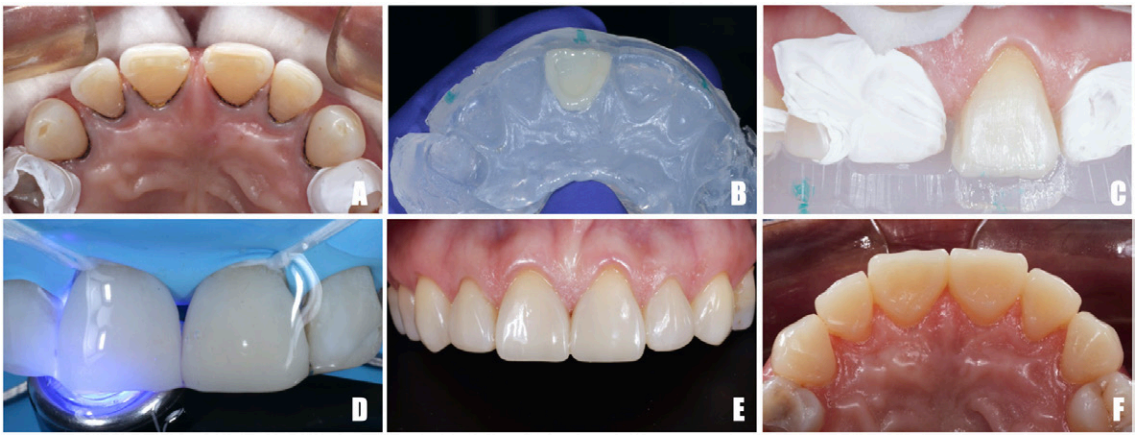

Figure 4. Approach to Sector II (maxillary anterior). A. Relative isolation. B-C. Transparent silicone guide for the semi-direct technique. D-E. Direct restorations with composite resin using the polychromatic technique. F. Completed Sector II treatment.

Stamped restorations were placed on teeth 14, 15, and 24 of sector III (maxillary posterior) under absolute isolation, without sacrificing healthy tooth tissue. On tooth 24, abutment of a Removable Partial Denture, a polyethylene mesh biobase (InFibra® Ribbon, Bioloren s.r.l., Saronno, Italy) and high-load flowable resin (Reflectys, ITENA, Villepinte, France) were collocated to improve strength. The cervical areas were restored using the direct-indirect technique with Ultrapak™ #00 retraction thread and 3M™ Filtek™ Z350 XT A2 body shade composite resin and polymerised with a VALO™ LED lamp (Figure 5. A-F). The enamel was etched with 37% phosphoric acid; universal adhesive was applied and cemented with fluid resin. After finishing and polishing, tooth 28 was restored with composite resin, A3 shade dentin (IPS Empress® Direct, Ivoclar Vivadent AG, Schaan, Liechtenstein) and 3M™ Filtek™ Z350 XT A2 body shade, cemented with UD2 shade thermo-modified resin (ENA® HR*i*®, MICERIUM S.p.A., Avegno, Italy).

Sector IV (mandibular posterior) was treated in absolute isolation, removing the old restorations and replacing them with direct composite resin (A3 shade dentin and A2 shade enamel), finishing with polishing with resin rubbers. Biostatic preparations were realised on the abutment teeth and impressions were taken for the Removable Partial Denture. After the metal base and the ridge were approved, the tooth shade was determined and the fitting trial was performed, followed by taking an impression for a rigid occlusal plate (Figure 6). Finally, the Removable Partial Denture and occlusal splint were installed to protect and maintain the long-term treatment.

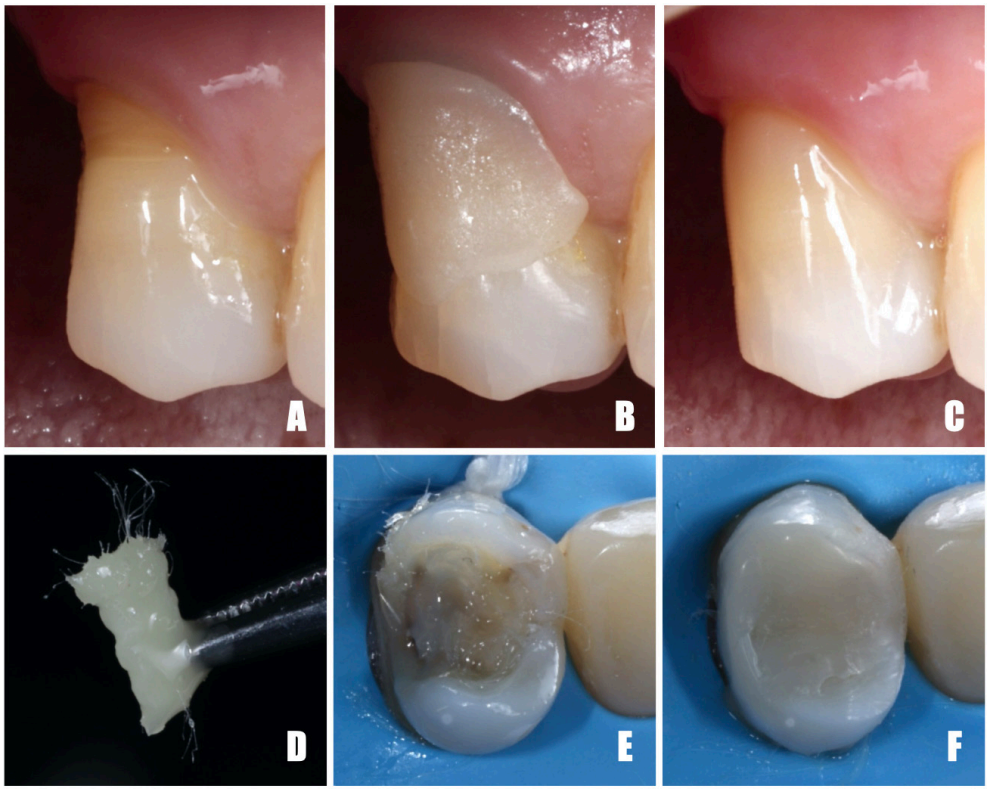

Figure 5. Approach to Sector III. A-C. Direct-indirect technique with composite resin. D. Hydrated polyethylene fibre. E-F. Biobase preparation.

Figure 6. Final intraoral photographs of the treatment.

DISCUSSION

A.R.T. is a macro concept that encompasses adhesive oral rehabilitation using composite resins. This involves both individual tooth restorations (direct, semi-direct, semi-indirect, or indirect), such as incisal edge restorations, palatal veneers, veneer lays, overlays, and table tops, as well as a detailed methodology to rehabilitate, if necessary, the entire mouth in a total of 4 to 6 appointments. With A.R.T., we adjust the occlusal planes and modify the vertical dimension according to the restorative needs, allowing us to treat dentitions affected by attrition, erosion, abrasion, or problems in dental formation (moderately or severely worn dentition) in the most conservative and even non-invasive way possible[7]. This method offers multiple advantages, including harmonizing dentofacial aesthetics, providing adequate space for the planned restorations, and improving incisal–occlusal relationships as well as the guides[8].

The patient's main complaint had been the appearance of her teeth, so we should always keep in mind that dental erosion lesions have several characteristics: initially, the enamel loss occurs, and as the lesion progresses, the dentin becomes more translucent[9]. Since an individual's diet and behaviour are risk factors, it is important to comprehensively screen the patient to learn more about their consumption of foods and/or beverages with high acidity levels. Effective management of dental erosion begins with early detection of the signs and causes[10].

Treatment alternatives will vary depending on the extent of damage to the dental structure. Therefore, the selection of restorative options requires analysis of the remaining tooth structure, the location of tooth loss, and the occlusion[3]. The treatment recommended by the authors for this case was a composite resin restoration and a removable partial prosthesis, with an additive, reversible, and minimally invasive approach, which reduced the biological cost.

Among the most commonly used restoration options are direct and indirect composite resin restorations[11]. Additive, preventative, and interceptive methods are increasingly popular for preventing the progression of tooth wear. It is logical that the direct composite resin technique will be the primary therapeutic option for the future, thanks to its simplicity and reduced cost[2,12]. Scientific evidence indicates that direct resin restorations with increased vertical dimension can last up to 10 years, showing greater survival with more pronounced increases in the vertical dimension of occlusion. However, these restorations may present frequent technical complications, such as fractures and premature wear, which require constant clinical monitoring to maintain their functionality. Compared to ceramic materials, composite resin stands out for its good adaptation and less invasiveness, in addition to being more economical and repairable, although its long-term resistance may be limited in cases of severe tooth wear or under high occlusal loads[5].

CONCLUSIONS

The minimally invasive approach protects teeth affected by pathological tooth wear, preserving the remaining tooth structure and restoring its shape and dimensions. The technique is limited to the preparation of peripheral enamel, causing no alterations. It also offers the possibility of repair, modification, or removal without compromising the teeth. It was the preferred treatment option compared to other more invasive options, performed in fewer appointments and with excellent aesthetic results.

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