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Case

Esthetic rehabilitation with ultra-thin ceramic veneers and direct mock-up in the treatment of dental erosion – case report.

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Abstract: Dental erosion is a high prevalence condition characterized by the loss of dental substance due to chemical agents. It can also be associated with physical wear, affecting function and aesthetics. Ceramic veneers can provide effective solutions to patients affected by erosive disorders, by means of an indirect approach and minimal intervention. Recent advances in cementation techniques and ceramic materials have allowed their use in reduced thicknesses, known as "dental contact lenses" or "ultra-thin veneers". They contribute significantly to the preservation of the dental structures, having excellent mechanical properties and providing satisfactory aesthetic solutions. Their manufacture requires rigorous planning and the use of three-dimensional models or mock ups in order to preview the final outcome. Case: The aim of this report is to communicate the use of this technique for the treatment and successful 12-months follow-up of a patient affected by dental erosion of the maxillary central incisors. Special interest was placed on direct mock-up, which is a simple technique not requiring laboratory steps. Luting of the lithium disilicate veneers was carried out with a light-curing resin cement and try-in pastes, yielding a very satisfactory result. Conclusion: Diagnosis and early treatment of this disorder allows the application of conservative techniques, such as ultra-thin veneers, which are seen as a promising alternative treatment to full coverage restorations and traditional ceramic veneers.

Keywords: Ceramic veneers; dental erosion; mock-up; lithium disilicate.

INTRODUCTION.

Adhesive dentistry has supported conservative therapies in the treatment of patients affected by various kinds of dental wear. Dental erosion is one of the common causes of wear, especially in young patients, being often dismissed by clinicians, which makes intervention in early stages difficult.[1,2] It is defined as the loss of dental substance due to a chemical process and is caused mainly by the consumption of fruit juice, carbonated and isotonic drinks or by digestive disorders. Many patients have a combined etiology of erosion and attrition, resulting in a relatively rapid impact on tooth structure.[3] In advanced stages, in addition to its negative aesthetic impact, it can seriously affect function.[4]

An early intervention prevents tooth loss and allows the use of additive procedures, in many cases not even requiring tooth substance removal. These direct or indirect adhesive techniques replace the missing structure and protect the patient from further damage.[2] Ceramic veneers can help in the treatment of patients affected by

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erosive disorders, using an indirect approach with minimal intervention. Their use, long been considered just a aesthetic treatment, has recently expanded, mainly due to the superior mechanical properties of new glass-ceramics and to the improvement of the cementation strategies. The significant improvement in the fracture strength of glass-ceramic veneers has enabled their use in very reduced thickness.[5] These features, in addition to a continuous demand for more aesthetic solutions, have strongly contributed to the increasing popularity of minimally invasive ceramic veneers (also known as dental contact lenses) among clinicians. Edelhoff *et al.,* point out[5] that their use enables restorative procedures even avoiding the need of a previous tooth preparation. Lithium disilicate based ceramics are preferred as they combine aesthetics and high strength. Alencar *et al.,*[6] described ceramic veneers as thin as 0.6 millimeters, whereas Savi *et al.,*[7] and Clavijo *et al.,*[8] reported even lower thicknesses (down to 0.2 millimeters) by using refractory and pressing techniques. Specialized laboratory, a skillful clinician, and meticulous planning are essential to achieve successful results. Design and manufacture of such thin structures requires an appropriate determination of their morphology and size by the clinician, long before the laboratory stage. The use of prototypes or mock-ups, which rely on a previous diagnostic wax-up and are transferred by different techniques to the patient,[9,10] offer an excellent alternative to preview the expected outcome. A variation of this technique is the direct mock-up, where a temporary restoration of the lost volume is directly applied to the tooth using polymeric materials and avoiding in this way the need of a laboratory wax-up.

The aim of this report is to present the clinical case of a 31-year-old patient affected by dental erosion, treated using ultra-thin ceramic veneers in association with a direct mock-up technique. Immediate results and the 12-month recall were thoroughly documented.

CASE REPORT.

General profile of the patient

A 31 year-old female patient, who reported dissatisfaction with her smile, with no relevant systemic medical history, was treated in the Adhesive and Aesthetic Dentistry Advanced Training Program at the University of Concepción, Chile.

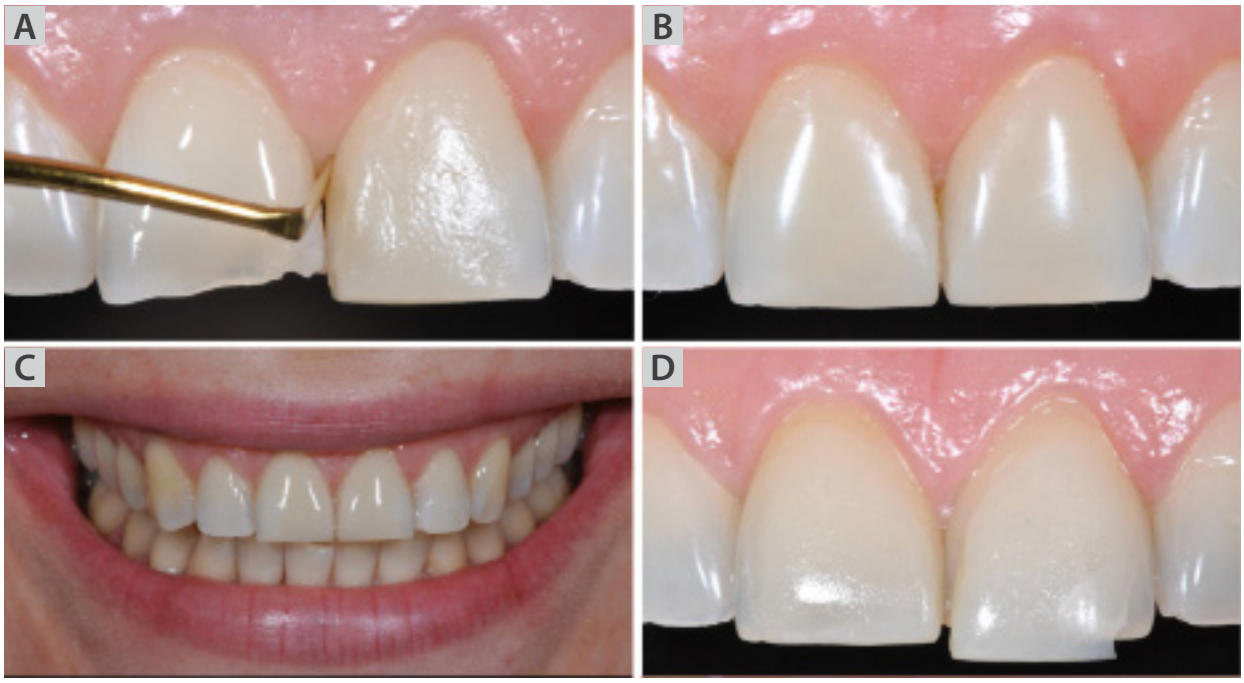
Clinical findings

Extra-oral examination of the patient revealed a symmetrical commissural plane and smile alterations (Figure 1A). The intraoral examination showed stable

Figure 1. Initial clinic presentation.

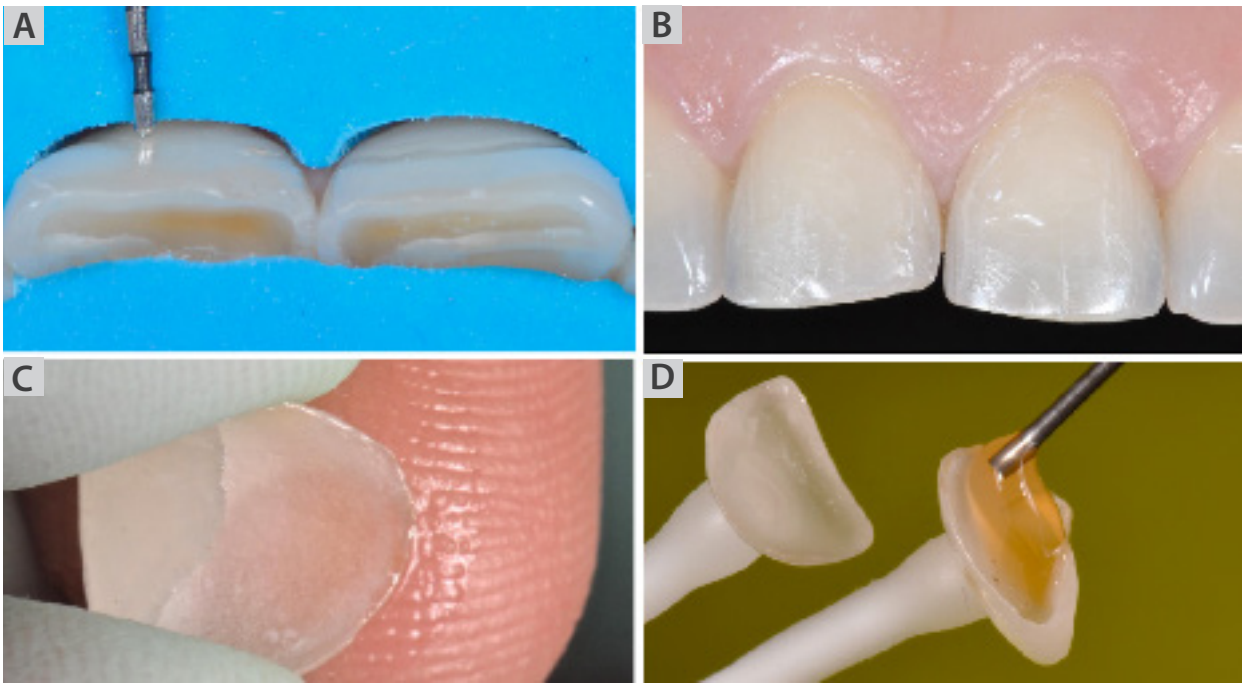
1A. Extra-oral evaluation of altered smile line. **1B.** Intraoral view during occlusion. **1C.** Close-up of upper central incisors. **1D.** Palatal view of maxillary central incisors with wear compatible with erosion and attrition.

Figure 2. Direct mock-up.



2A. Application of composite resin for Direct mock-up. **2B.** Finished direct mock-up in maxillary central incisors. **2C.** Extra-oral view of direct mock-up, showing a recovered smile line. **2D.** Disassembly of the mock-up from mouth.

Figure 3. Clinical procedure.



3A. Silicone index test prior to tooth preparation. **3B.** Conservative tooth preparations. **3C.** Ultra-thin ceramic veneers **3D.** Conditioning of ceramic laminates with 10% hydrofluoric acid.

occlusion, slight anterior-lower crowding and wear of the edges of the maxillary central incisors, compatible with dental erosion. During anamnesis, the patient reported the habit of chewing lemons, a behavior that she had already abandoned. In addition, resin restorations and mild attrition were observed in the lateral incisors (Figures 1B, C and D).

Diagnostic evaluation

After clinical examination, photographs, radiographs and stone dental models, it was concluded that the

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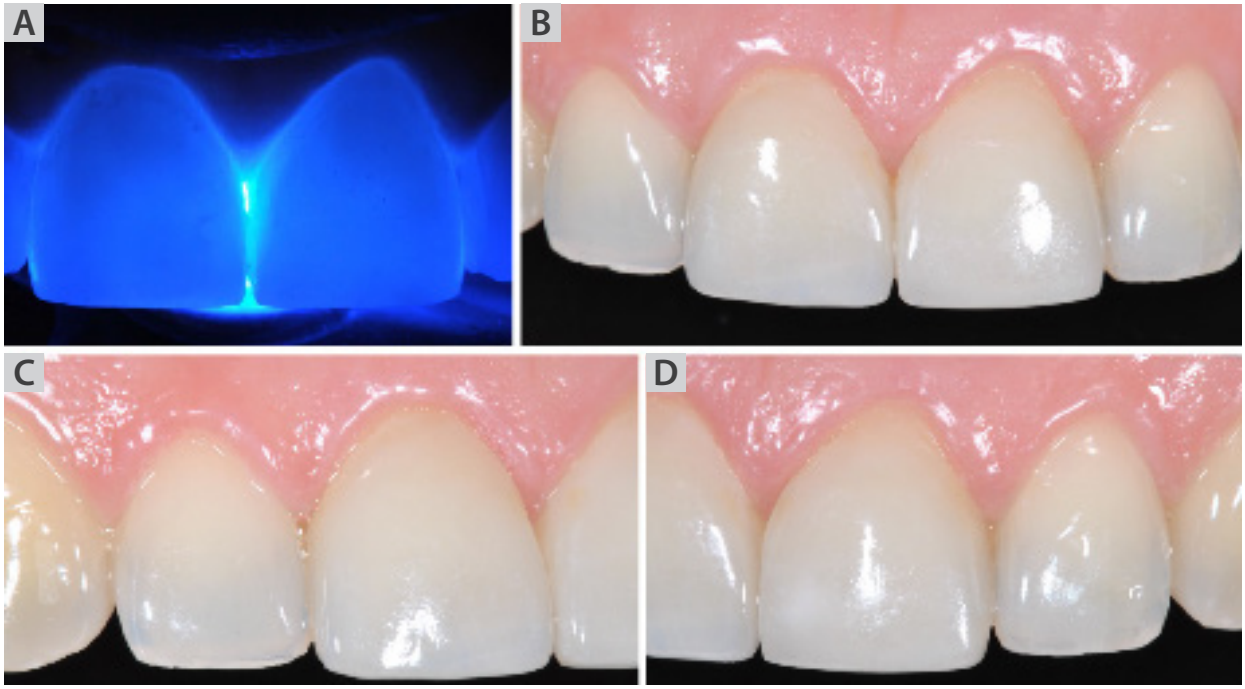
Figure 4. Cementation of ceramic laminates.



4A. Polymerization of photoactivatable resin cement with high power lamp. **4B.** Cemented ceramic laminates that correct function and aesthetics. **4C.** Right frontolateral view-12 months follow-up. **4D.** Left frontolateral view -12 months follow-up.

patient had dental erosion at the initial stage, with an reverse smile line, as a result of this condition.

Therapeutic intervention

The rehabilitation treatment consisted of the application of ultra-thin ceramic veneers in teeth 1.1 and 2.1, after direct mock-up with resin composite, given the moderate loss of dental structure. The lithium disilicate glass-ceramic IPS e.max® Press (Ivoclar Vivadent) was selected due to its widely documented clinical performance[11,12] and a minimally invasive approach was followed.[13] The teeth were prepared only after the volume to be replaced was determined. Here, the use of the direct mock-up technique resulted fundamental, allowing clinical projection of the results and avoiding an unnecessary tooth reduction. Resin composite TPH3 (Dentsply Sirona), shade A2, was used for this purpose. The mock-up was prepared by freehand modeling using a dental composite modeling instrument (Figure 2A), after previous application of the XP Bond adhesive system (Dentsply Sirona) to selectively etched enamel at the center of each tooth. Despite its temporary function, the prototype received a neat finishing. This was achieved by fine polishing with rotating elements and by subsequent application of a sealing agent (PermaSeal, Ultradent Products, Inc.) (Figure 2B).

After approval by the patient (Figure 2C), the mock-up was maintained in the mouth for a week, in order to favor a progressive adaptation of phonetic functions and to observe its impact on the patient´s social environment. After this period, silicone indexes, tooth preparation and functional impressions were obtained during a second clinical session. The prototypes were removed from each tooth with a sharp instrument (Figure 2D) and the extension of tooth preparations was estimated using a putty silicone index (Precise, Dentsply Sirona), previously obtained from the mock-up. It was thus observed that the tooth preparation would be restricted to some areas (Figure 3A). The preparations for the ultra-thin veneers were made with fine and ultrafine diamond burs and abrasive discs. The brittle incisal enamel was removed and a barely noticeable proximal and cervical termination lines were defined. Given the excellent translucency of this ceramic system, a supragingival cervical margin could be prepared (13) (Figure 3B). Temporary restorations were fabricated using a bis-acrylic based resin (Protemp 4, 3M ESPE). Complementary to the silicon impressions (Panasil Putty and Initial Contact Light, Kettenbach GmbH & Co.

KG) and color selection, photographic sequences were taken. This allowed the dental technician to observe details and individual optical characteristics.

Taking into account the high aesthetic relevance of the treatment for the patient and the proposed approach, the laboratory manufactured very thin ceramic veneers (0.3 millimeters), whose high light transmission favored mimicking of the restoration with the underlying substrate (Figure 3C). This high translucency required special considerations during the cementation phase of the restorations.[14-16]

After final clinical adjustment and color check, comparing the outcomes of the veneers with the mock up photographs, the final color was simulated with Variolink Veneer Try-In pastes (Ivoclar Vivadent), shade +1. The veneers were then conditioned with 10% hydrofluoric acid (Figure 3D) for 20 seconds (Porcelain Conditioner, Dentsply Sirona). Following post-etching cleaning, the veneers were silanized with a silane coupling agent (Ultradent Products Inc.). The photopolymerizable resin cement Variolink Veneer (Ivoclar Vivadent), specially designed for this purpose, was applied to the intaglio surface of the veneers, which were then positioned in the mouth. The cement was polymerized with a high power lamp, and all excess was removed (Figure 4A). After occlusal adjustment, manual polishing was carried out to recover the brightness at the margin areas using the Optrafine® system (Ivoclar Vivadent) according to the manufacturer´s instructions. An adequate aesthetic outcome was obtained and the patient reported to be very satisfied with her appearance (Figure 4B, C and D).

DISCUSSION.

The number of patients affected by dental wear has significantly increased in the last two decades, inducing dental health providers to reconsider their treatment protocols and to point towards early diagnosis and intervention.[4] At present, adhesive procedures are the treatment of choice for this type of patients due to the important advances in the available restorative materials and in the adhesion techniques. Although several authors, such as Negrao *et al.,*[18] point out that direct restoration techniques are feasible and low cost, strong clinical evidence support the safety and longevity of adhesively cemented ceramics, with survival rates up to 95% after 10 years and around 80% after 20 years.[5,12,19] The advent of new technologies in the manufacturing and cementation of ceramic restorations has allowed continuous improvement of their aesthetics and natural appearance, expanding their indications towards implant and restorative dentistry.[20] However, the use of ultra-thin veneers is a relatively recent technique, still requiring long-term clinical evaluation.[6] Their application must be carefully planned and for this, the mock-up stage is essential. Just as architects and engineers use plans for the design of their projects, the clinician must use three-dimensional guides, not only to preview the final result of the treatment, but also to favor dental structure preservation.[10] The reported direct mock-up technique seems to be an interesting treatment alternative for aesthetic rehabilitation of single teeth. Its rapid application, low cost and a very positive impact on the patient contrast with the traditional indirect mock-up technique,[11] which involves longer and more expensive laboratory steps.

CONCLUSION.

The use of ultra-thin ceramic veneers in association with direct mock-up seems to be a promising alternative for the treatment of dental erosion, compared to traditional veneers and full coverage restorations. The direct mock-up technique allows a rapid preview of the final outcome, contributing to the predictability of this minimally invasive treatment.

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