

## Case Report Article

# Ultra-thin porcelain laminates to restore esthetics of anterior teeth: case report

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### Abstract

**Introduction:** The ultra-thin porcelain laminates provide the esthetic harmony to the smile compromised by the presence of diastema between maxillary incisors. **Objective:** To report the dental aesthetic recovery with ultra-thin porcelain laminates, so-called “contact lenses”. **Case report:** Patient sought treatment reporting presence of diastema between the anterior teeth. After the clinical examination, impressions were made to obtain study models and diagnostic wax-up. Home bleaching was conducted using 10% carbamide peroxide for 21 days. Next, the mock-up with bisacrylic self-curing composite resin and the functional impression were conducted. For cementation, dental surfaces were etched with 37% phosphoric acid followed by applying the adhesive system. The resin cement was inserted within internal part of the contact lenses previously treated with hydrofluoric acid and silane, and the prosthetic samples were positioned over the labial surfaces of the anterior teeth. After light-curing, the finishing procedure was performed. **Conclusion:** Ultra-thin porcelain laminates (contact lenses) were viable, efficient, and conservative procedures for recovering dental esthetic, with no need of invasive procedures.

## Introduction

The increasing patients' interest in better smile appearance leads to an important evolution in cosmetic Dentistry [23]. Tooth color, shape, and size alterations are aspects negatively interfering in oral esthetics [1, 22]. In this context, the presence of diastemas between maxillary teeth compromised the balance and harmony of smile [11].

Diastemas can be closed by orthodontic treatment and direct and indirect veneers [11]. The search for reestablishing the smile esthetic by closing interdental spaces should ideally employ procedures that preserve tooth structure at most [18]. Thus, ultra-thin porcelain laminates, so-called "contact lenses" are an esthetic and conservative alternative for diastema closure through little or none tooth structure weariness [6, 15, 20].

The contact lenses are ultra-thin porcelain veneers, measuring 0.2 to 0.5 mm in thickness, applied onto tooth surface [23]. The lenses execution consists in replacing the visible part of enamel by ceramics, which is strongly bonding to tooth surface through resin cements, providing optical, mechanical, and biological properties similar to those of tooth enamel [10, 23].

Ultra-thin porcelain laminates has the following advantages: tooth structure preservation because of minimum or none prepare; thermal expansion similar to that of enamel, appearance similar to that of tooth [4, 8], color stability, biocompatibility with periodontal tissues, resistance to wear, reinforcement of tooth structure, gloss retention, longer clinical longevity than that of resin composite veneers [5, 8].

Additionally to the professional's technical expertise, the materials employed, and prosthetic quality of the veneers, the success of contact lens procedure also depend on the correct case selection [19]. The porcelain laminates can be used in cases presenting small teeth, diastema, teeth with lingual inclination and mild color changes [3]; abrasions, erosions, and to replace resin composite restorations and to mask tooth pigmentation [6, 9, 10]. All the aforementioned conditions can be associated.

Considering the esthetic quality of "contact lenses", the fast ending of the procedure and the preservation of tooth structure integrity, the lenses can be an option to reestablish the smile harmony in cases requiring the closure of anterior-superior diastemas. Thus, this study aimed to report the case of esthetical-functional reestablishment of the smile through "contact lenses".

## Case report

The patient, male, aged 20 years, attended the Dental Clinics of the University of Ribeirão Preto (Unaerp) complaining about his smile appearance (figure 1). At clinical examination, it was observed that the patient presented diastemas among the maxillary and mandibular anterior teeth, with misalignment of long axes and incisal edges of the incisors, and teeth #14, #15, #24, and #25 showing axial inclination towards palatal direction.

After clinical examination and case study, it was verified that the correction of the deficiencies that provide the esthetic impairment of the smile could be achieved through "contact lenses" on the teeth #11, #12, #14, #15, #21, #22, #24, and #25 associated with ceramic fragments on teeth #13 and #23, without tooth structure weariness. To close the mandibular diastemas, resin composite restoration was chosen.



Figure 1 - Frontal view of the initial condition of teeth

The impressions of the maxillary and mandibular arches were obtained with the aid of irreversible hydrocolloid (Dencri gel, Pirassununga, SP, Brazil) to obtain dental casts that were used to construct bleaching trays and diagnostic wax-up (figure 2). Following, the patient was submitted to tooth scaling through ultrasound, tooth polishing with the aid of prophylactic paste and rubber cups, and the register of initial tooth color (shade A3) (figure 3).



Figure 2 - Study cast showing diagnostic wax-up



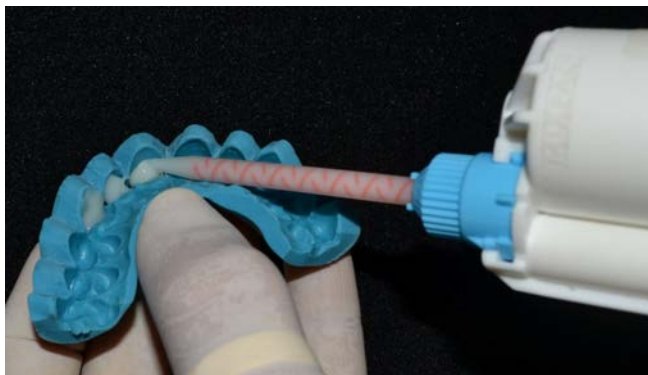
**Figure 3** - Register of initial tooth color

The home-bleaching technique was used with the aid of 10% carbamide peroxide (Whiteness Perfect, Joinville, SC, Brazil) for 21 days. The patient was instructed to use both the maxillary and mandibular trays all night long and avoid intake of food with pigments. After tooth bleaching procedure, the final color of the teeth was shade A1 (figure 4).



**Figure 4** - Color register after bleaching

On the study cast with the wax-up, a matrix was constructed with the aid of o condensation silicone (Speedex, Rio de Janeiro, RJ, Brazil), for mock-up purpose. The mock-up was performed with bisacrylic resin (Protemp, 3M-ESPE, St. Paul, MN, USA) inserted inside the matrix and placed on the labial surface of the teeth to be restored (figure 5). The restorative mock-up enabled that the patient predicted the final aspect of his smile (figure 6).



**Figure 5** - Insetion of bisacrylic resin inside silicone matrix for mock-up



**Figure 6** - Tooth aspect after mock-up

To obtain the working cast, an impression of the maxillary arch was obtained with condensation silicone (Speedex, Rio de Janeiro, RJ, Brazil). The cast was duplicated in refractory cast (Duravest, Cotia, SP, Brazil) for ceramic stratification (Creation CC, Koblacherstrasse, Meiningen, Australia) of the “contact lenses” (figure 7).



**Figure 7** - Aspect of contact lenses and porcelain fragments

After the adaptation of the laminates on the teeth, their labial surfaces were etched with 35% phosphoric acid (3M ESPE, St. Paul, MN, USA) for 30 seconds, followed by copious washing and drying with absorbent paper. Next, the bonding agent (Adper Single Bond, 3M, ESPE, St. Paul, MN, USA) was applied and light-cured for 20 seconds (Ultraled, Dabi Atlante, Ribeirão Preto, SP, Brazil). The color of the cement was selected after the test through the system provided by the cement's manufacturer (Try In system from Variolink II, Schann, Liechenstein, Germany) (figure 8A). The internal surfaces of the contact lenses were etched with 15% hydrofluoric acid (Angelus, Londrina, PR, Brazil) for 5 minutes, followed by the application of silane agent (Variolink II, Schann, Liechenstein, Germany) for 1 minute. The resin cement was inserted inside the internal part of contact lenses (figure 8B), which were placed onto the tooth surfaces. The excesses of resin cement were removed. The cement was light-cured for 40 seconds, on every contact lens. The polishing procedure of the margins was carried out through ceramic polishers.



**Figure 8** - A - Tooth color shade guide employed to select the cement; B - Cement insertion on the internal part of the lens

After the cementation of the laminates on the maxillary teeth (figure 9), the mandibular teeth were restored with resin composite (Filtek Z350 XT, 3M-ESPE, St. Paul, MN, USA) to close the diastemas among the incisors, following the procedures for adhesive restorations.



**Figure 9** - View of the smile after cementation of contact lenses

At the ending of the treatment, all diastemas were closed and teeth were aligned (figures 10A, 10B, 10C, and 11).



**Figure 10** - Final aspect immediately after the cementation of laminates on the maxillary teeth and direct restoration on mandibular teeth. A -Frontal view; B - Right lateral view; C - Left lateral view



**Figure 11** - Extraoral view after the case finalization

## Discussion

In this case report, the patient complained about his smile esthetics, with presence of diastema among maxillary and mandibular incisors and unsatisfactory alignment of maxillary pre-molars. The treatment possibilities comprised either resin composite restorations or porcelain laminates. Although resin composite can be considered as a minimally-invasive procedure, its longevity is limited because of greater susceptibility to discoloration, weariness and marginal defects, which could compromise the long-term esthetic outcome [17]. On the other hand, ultra-thin porcelain laminates are considered as conservative and lasting restorations with higher esthetics because of the advancements in both ceramic and adhesive materials and have been indicated for treatments searching balance and harmony of the smile [19, 25].

This study aimed to report the recovering of the smile esthetics through the closure of diastemas and realignment of the teeth through ultra-thin porcelain laminates (contact lenses), porcelain fragments, and resin composite restorations.

According to Meijering *et al.* [12], no significant difference was seen in patient's satisfaction after either porcelain or resin composite veneers, immediately after the ending of the treatment. However, after two years, the patients mostly satisfied were those receiving porcelain veneer.

Because contact lenses have a very small thickness, they have been indicated for the smile harmonization in cases of mild alterations [4, 23]. Considering that the final color of porcelain laminate is the result of the interaction among the ceramics, tooth substrate, and cement [13], home bleaching technique was chosen. Bleaching agents at low concentration promotes less side effects, such

as tooth sensitivity and gingival irritation [7, 14], in addition to less damages on superficial enamel topography and to the mechanical properties of tooth structure [21].

Attempting to achieve the color compatibility among the porcelain, tooth, and cement, the cement shade was chosen. This was achieved through shade guides and hydrosoluble pastes whose shades are equal to those of the cements and enable the evaluation of the color onto the tooth [25].

Previous to the definitive procedure to close the diastemas, restorative mock-up was executed. The prediction of the final result by the patient is an important step that leads to reliance [19] and aims at patient's compliance with the treatment [7].

In this present study, the laminates were constructed with feldspathic ceramic. Unlikely the ceramics with low silica amount, feldspathic ceramics have high silica amount, potassium and sodium feldspar [16], and have been used to recover metallic structures and to obtain pure ceramic laminates, through stratification [23]. When these porcelains are etched by hydrofluoric acid, they underwent significant micro-morphologic alteration because of the affinity of hydrofluoric acid and silica within glass matrix. The consumption of the silica by hydrofluoric acid consequently leads to the formation of the microporosities that account for the differences observed in the optical properties of these esthetic restorations [23, 24]. With the superficial corrosion of the glass portion, the superficial defects (e.g.: microcracks) formed during the cooling process are removed, thus preventing crack propagation responsible for the occurrence of early fractures of porcelain restorations [5].

During the cementation procedure of the laminates, the used ceramics required the application of hydrofluoric acid followed by silane application because the latter promotes the surface wettability, greater strength and durability to the adhesion of resin cements [2]. The satisfactory adhesion between the laminate and tooth structure, achieved through the cement, is a basic, mechanical, and biological requirement favoring the resistance of the laminate to fracture, the retention of the laminates, better marginal adaptation and reduced risk of microleakage [9].

The use of ultra-thin porcelain laminates has been a procedure commonly indicated to restore tooth esthetics. Notwithstanding, caution should be taken during treatment planning associated with the use of materials and techniques suitable for the case [4].

## Conclusion

Considering the final result of this present case report, it can be concluded that ultra-thin porcelain laminates (contact lenses) and porcelain fragments provided satisfactory esthetic and functional outcome to close diastemas and realign the teeth.

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