

## Diastema Closure with Ceramic Veneers: To Master the Procedure

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### Abstract

### Case Report

The increasing demand for aesthetics has resulted in the development of several techniques in dentistry, mainly to restore anterior teeth. Meanwhile, conservative treatments should always be the first therapeutic option for any type of restoration. Thus, the solution of aesthetic problems involving morphological changes or diastemas should respect the minimally invasive dentistry's standards. In this context, ceramic veneers represent the best choice providing great reproduction of natural appearance, a color stability and periodontal biocompatibility. However, they have to be properly indicated by the dentist. Besides, the clinical procedure is still considered as complicated and requiring a high level of proficiency. This paper reports a clinical case where anterior diastemas were aesthetically corrected using ceramic veneers.

**Keywords:** Veneers, Ceramic, diastemas, aesthetics.

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## INTRODUCTION

Anterior dental restorations have always been a challenge among our daily practice. In fact, patients are becoming more concerned about the aesthetic of their smile. These restorations involve ceramic veneers that became, nowadays, an established conservative treatment option for some dental defects such as fractures, misalignments or diastemas. This option is increasingly indicated due to the qualities of ceramics; biocompatibility, mechanical properties, and aesthetic outcome. In addition, ceramic veneers are in perfect harmony with the principle of minimally invasive treatments.

However, the ceramic veneers could not be fulfilled without an accurate planning. This one should be conducted in a way to develop a completely new smile. Therefore, the treatment must follow a multidisciplinary protocol to achieve higher clinical success rates. Hence, it is crucial to make every step in the appropriate way in order to reach the most satisfying aesthetic result.

In this paper, we aim to describe, gradually, the interest of a multidisciplinary treatment for anterior teeth, through a clinical case.

## CASE REPORT

The 27-year-old female patient attended our prosthodontic department for an aesthetic reason, namely anterior diastemas associated to morphological issues and a non-uniform shade. Radiographic and clinical examinations were performed:

*Extraoral examination* reveals, in the front view, an equality of the floors with parallelism of the bi-ophriac and bi-commissural lines, (Fig 1a), as well as a slightly convex profile, a normal nasolabial angle and a slightly marked labial groove, in the profile view (Fig 1b).

*Intraoral examination* reveals anterior diastemas in maxillary teeth and disto-vestibular rotation of #13 and #23 (Fig 2).



**Figure 1 : Clinical examination of the patient:  
(a) The front view, (b) The profile view**



**Figure 2: Intraoral examination from a front view**

The radiographic findings revealed in a panoramic X-ray complete dentition and the absence of any pathology (Fig.3). On the lateral tele radiography, the cephalometric examination was carried out and revealed a skeletal class I ( $ANB = 2^\circ$ ) with facial norm divergence and a slight upper and lower proalveolus.



**Figure 3: The panoramic X-ray of the patient showing complete dentition**

After discussing and concerting the treatment options with the patient, it was decided to restore the teeth and close the diastemas with six ceramic veneers (from canine #13 to canine #23). However, before starting the treatment, some pre-prosthetic procedures were performed to ensure a better result:

- A descaling and inducement for better hygiene
- An orthodontic pre-prosthetic treatment
- A digital Smile Design
- A mock-up confection

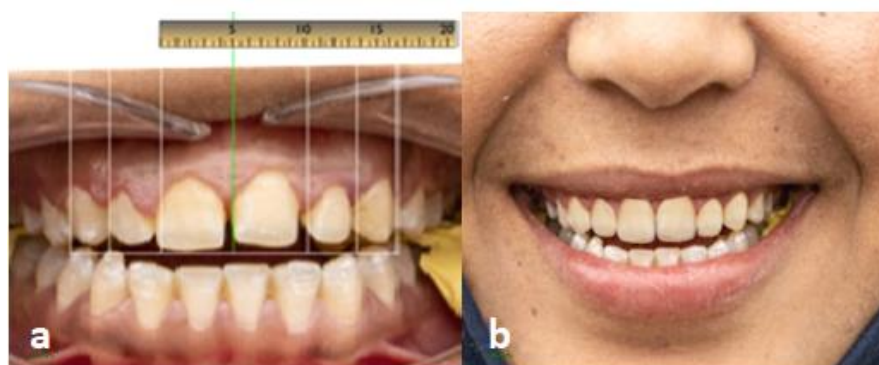
The aim of the orthodontic treatment was to move the teeth in a way that the distribution of diastemas become more equal between them. An elastomeric chain was used to move the #12 away and thus gain space to correct the position of the #13. Then a space between the two central incisors was opened to properly portion the spaces (Fig 4).



**Figure 4: The orthodontic treatment carried out as pre-prosthetic procedure**

The Digital Smile Design (DSD) protocol is a digital tool for an aesthetic study leading to a new smile based on high quality static photos in addition to dynamic videos. It also allows simple and effective communication with the laboratory technician as well as the patient.

In fact, for our clinical case, we followed the DSD protocol and numerous measurements were made, with the help of calibration tools. Facial analysis was done using reference lines from which uniform parameters are developed. Many changes were made by increasing or decreasing the width or the length of the teeth, depending on the aesthetic result and the individual needs of the patient (Fig 5).



**Figure 5: The DSD protocol (a) The calibration tools enabling the measurements (b) The digital visualization of the new smile**

After the new smile was designed, it was digitally presented to the patient to seek out her approval and her feedback. Then, a wax-up was made following the measurements brought from the DSD (Fig 6).



**Figure 6: The diagnostic wax-up made following the DSD**

Silicone plates, which were obtained from this diagnostic wax-up, were filled with restorative material (resin) and then introduced on the teeth before preparation. Finally, we have a mock-up (Fig 7). This pre-prosthetic device allowed the visualization of the esthetic project directly in the patient's mouth. This one will be able to evaluate the aesthetic result and the functions. At the end, the patient approved our project and the new smile suggested.



**Figure 7: The mock-up obtained directly on the unprepared teeth and made with resin**

The first step of the treatment protocol was the selection of the color of ceramic, before any dehydration of the teeth, using a digital shade guide and

after approval of the patient. This led to a 2M2 (Vita 3D Master®) shade restorations.

The mock-up made was used to guide the preparation. The horizontal and vertical grooves were made directly through this mask (Fig 8). Thus, a minimally invasive preparation was guaranteed. The design of a butt margin preparation was chosen. The proximal limits were placed in the proximo-palatal transition in order to be able to close easily the diastemas later with the ceramic. All angles have been rounded off with careful polishing of the preparation.

The impression was taken using additional silicone with the simultaneous double mixing technique, and sent to the laboratory (Fig 9).



**Figure 8: The preparation grooves made through the mock-up**



**Figure 9: The preparation finalized and the gingival deflection done preparing the impression**

Once the ceramic veneers (E-MAX Press) were received, they were tried on the teeth (Fig 10). During this step, ceramic veneers were checked for the

shade, marginal adaptation and integrity, fit and occlusion.



**Figure 10: The ceramic veneers received from the laboratory**

The final step in our treatment was the bonding protocol. We started by ensuring proper isolation using rubber dam before treating the dental surfaces (Fig 11a).

They were etched with 37% orthophosphoric acid gel for 30 seconds, then rinsed and dried (Fig 11b). After that, dental adhesive agent was applied. The ceramic veneers were initially etched using the 9% hydrofluoric acid followed by the application of a coupling agent; silane (Fig 11c). They were bonded in pairs, starting with the central incisors to ensure the symmetry of the result. A dual bonding resin, with a transparent shade was used (VARIOLINK, IVOCLAR®).



**Figure 11: The bonding protocol: a-The proper isolation using the rubber dam  
b-The treatment of dental surfaces (acid etching with orthophosphoric gel) c- The surface treatment of ceramic veneers (application of silane)**



**Figure 12: Final appearance showing the harmonious smile**

directly in composite resin [2]. However, their longevity is lower than the ceramic ones. In addition, many authors such as Nathanson *et al.*, Van Dijken, and Höland and all, have confirmed that composite restorations undergo time action and require regular maintenance. That is why the decision of ceramic veneers was retained, allying the economy of dental tissues to aesthetic appearance [3-5].

They represented an excellent option not only for closing diastemas but also for correcting and improving the teeth morphology.

At this point, the Digital Smile Design (DSD) is mandatory since it helps patients to visualize the expected result enhancing the predictability of the treatment. In fact, the clinician is able to motivate and inform his patients about the benefits of the treatment. Furthermore, the DSD is a tool for making clinician diagnosis and treatment plan through the direct visualization of patient's problem concerning facial, gingival and dental parameters. Moreover, it facilitates the communication between the clinician and his patient. In our clinical case, the DSD should have been done before starting the orthodontic treatment as it represents an irreversible step. Fortunately, this treatment was necessary to equalize the diastemas and to ensure the success of the final aesthetic result via the ceramic veneers [6].

A diagnostic waxing was performed before tooth preparation, enabling the preparation of a mock-

## DISCUSSION

Dental diastemas are, increasingly, a common concern in clinical practice. In fact, patients are becoming more demanding in term of aesthetic. Thus, in order to respond to their demands and to respect the tissue economy, practitioners should follow the therapeutic gradient given by Gil Tirlet and Attal in 2009 [1].

The orthodontic treatment only is the first option for diastemas closure offering a non invasive solution. Yet, it can't bring any modification shape to the morphology or the dimensions of the teeth. In the case presented earlier, the patient expressed her need for a whole change in her smile appearance. Thus, the orthodontic option would not be sufficient.

If we progress on the therapeutic gradient, we immediately find the veneers. Which could be stratified

up. This versatile tool has numerous benefits in a way that it became essential for aesthetic restorations. First of all, the mock-up allows a full visualization of the future esthetic outcome. Besides, it guides the removal of the minimum amount of dental tissue necessary for the veneers. Finally, it might also be used as a surgical guide when a gingivectomy is indicated [7].

The success of ceramic veneers is greatly depending on the strength and durability of the bond formed between the three different components of the bonding complex: the tooth surface, the ceramic, and the luting resin composite. The ceramic used for laminated veneers is a feldspathic one, which is characterized by numerous advantages. Indeed, it has the ability to reproduce the appearance of natural teeth thanks to its high translucency. Besides, its resistance is improved after it is adhesively bonded to the tooth [8].

In order to ensure the success of the bonding protocol and to control moisture, total isolation should be carried using a variety of ways from the use of a retractor such as OptraGate (Ivoclar Vivadent Inc.) to a sectoral rubber dam associated to specific clamps. As for the choice of the luting composite, a light-curing one is preferred. This is related to the dark color, under veneers, appearing with time when a dual polymerised resin is used [9, 10].

The surface treatment of the tooth and the ceramic should follow the standard procedure. In fact, an “MR2” or “MR3” as the adhesive system is usually used since they are showing the best results. Etching the ceramic with hydrofluoric acid is mandatory to create a microscopically rough surface. Then, a silane-coupling agent should be applied to enhance bonding to the resin cement by increasing ceramic wettability [9].

Finally, the ceramic veneers are characterized by a high rate of success. D’Arcangelo *et al.*, reported that over 119 of porcelain veneers had a survival rate of 97.5% at a 7-year evaluation. Moreover, another study conducted by Beier and all, stated that those restorations represent a predictable and a successful treatment with an estimated survival rate of more than 10 years [11-13].

In conclusion, the ceramic veneers constitute a minimally invasive solution for anterior teeth. However, a precise case selection and a good planning of the treatment are crucial for the success. Besides, the mastery of the clinical procedure, mainly the cementation step, is the key for a high survival rate.

**Conflict of Interests:** The authors declare that there is no conflict of interests regarding the publication of this paper.

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