

Smile Enhancement with Ceramic Veneers: A Case Report

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Abstract

Nowadays, the aesthetics of patients' teeth take great importance. Since the patient's smile has an important impact on facial aesthetics. Having an unpleasant smile will certainly be a problem for the patient's social life.

Ceramic veneers have been considered as the best minimally invasive treatment for patients thanks to their high abrasion resistance, color stability, excellent aesthetic results, excellent biocompatibility, chemical stability and durability, they are indicated to improve color, restore shape, or closing diastemas

This clinical report describes a treatment approach for esthetic Rehabilitation of anterior diastemas associated to Peg-Shaped Lateral Incisor with a lithium disilicate veneer.

Keywords: Diastemas; Shape Teeth; Esthetics; Minimally Invasive; Porcelain; Veneer

Introduction

Nowadays, the aesthetics of patients' teeth take great importance. Since the patient's smile has an obvious impact on facial aesthetics. Having an unpleasant smile will certainly be a problem for the patient's social life.

Several factors affect dental esthetics, such as the tooth color, shape and dental diastemas, especially the anterior teeth.

A wide variety of aesthetic treatments in the anterior dentition, from the less invasive to the more invasive following the therapeutic gradient given by Gil Tirllet and Attal in 2009 [1]; are available, such as teeth whitening, direct composite restorations, ceramic veneers or full coverage crowns.

Recently, ceramic veneers have been considered as the best treatment alternatives for patients due to their high abrasion resistance, color stability, excellent aesthetic results, excellent biocompatibility, chemical stability and durability. Porcelain veneers require minimal tooth preparation [2].

This clinical report describes a treatment approach for an esthetic Rehabilitation of anterior diastemas associated to Peg-Shaped Lateral Incisor with a lithium disilicate veneer.

Case Report

A 30-year-old female patient attended our prosthodontic department at the dental clinic in Monastir for an aesthetic rehabilitation to her anterior diastemas associated to the rizziform shape of the lateral.

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



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

Intraoral examination reveals anterior diastemas in maxillary teeth and a rizziform shape of the lateral (Figure 2).



Figure 2: Intraoral examination from a front view and profile view.

After discussing and concerting the treatment options with the patient, it was decided to restore the teeth and close the diastemas with 4 ceramic veneers with zirconia-reinforced lithium silicate (ZLS) (from lateral #12 to lateral #22).

A wax-up was made by the prosthetist.



Figure 3: The diagnostic wax-up.

After an esthetic analysis and an impression of the initial situation, a prosthetic project is modelled in the laboratory.

The new morphology is then materialized on the teeth before preparation using silicone and autopolymerizing resin.

Finally, we obtain a mock-up (Figure 7).

At this point, the patient can assess the feasibility of his treatment plan and decide whether or not to pursue it.

What's more, the treatment is still reversible: the patient can modify it and make touch-ups.

Once validated, this mask will guide the preparation, which must be non-homothetic according to the prosthetic project.

Minimal reduction is guaranteed, while respecting the principle of tissue economy.



Figure 4: The mock-up obtained directly on the unprepared teeth and made with resin.

The Preparation of the vestibular surface begins with the creation of horizontal grooves that follow the vestibular convexity of the tooth, using a depth-cutting bur. (figure 5).

The cervical margin is prepared using a long-cone ball bur: in our case, the margin is juxtagingival to increase the size of the convergence profile (figure 6).

Then , 2 or 3 vertical grooves are made at the free edge with a depth-cutting bur.(figure7).

We Mark the bottom of the grooves with a pencil.

This shell is then removed to visualize the areas to be retouched and the areas to be respected on the underlying hard tissue.

The rest of the enamel is prepared with a large-diameter conical bur to homogenize the depth of preparation. (Figure 8).

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.



Figure 5: Preparation of the vestibular surface begins with the creation of horizontal grooves.



Figure 6: Preparation of the cervical margin.



Figure 7: Preparation of the free edge.



Figure 8: Preparation of the rest of the enamel.

The design of a butt margin preparation was chosen for central incisors and a incisal overlap for laterals . (Figure 9).

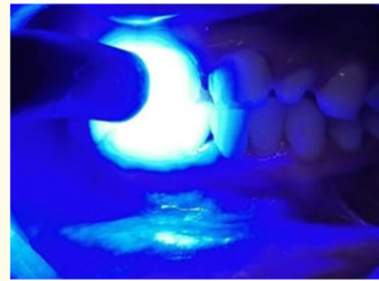


Figure 9: The preparation finalized.

In the case of dentine exposure, a hybrid layer is created with the adhesive system in the same session as the preparation and before the impression. (Figure 10).



Figure 10: Immediate dentin sealing with adhesive + photopolymerization.



This technique prevents post-operative sensitivity and improves bonding during the bonding session.

The impression was performed using additional silicone with the simultaneous double mixing technique, and sent to the laboratory (Figure 11).

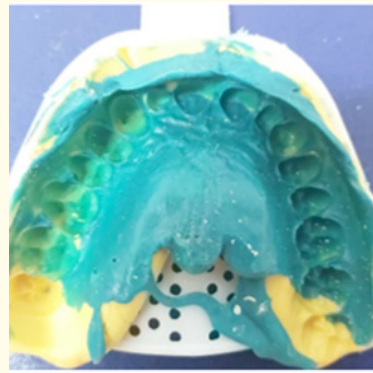


Figure 11: Master Impression

Once the ceramic veneers are received, they are tried on the teeth (Fig 13). During this step, ceramic veneers are checked for the fit, marginal adaptation, integrity, shade, and occlusion. Then different try in paste were used to select the suitable shade of the resin material.



Figure 12: The ceramic veneers.



Figure 13: The veneers try in.

The final step in our treatment is the bonding protocol. We start with by ensuring proper isolation using rubber dam before treating the dental surfaces (Figure 14a). They are etched with 37% orthophosphoric acid gel for 30 seconds (Figure 14 b,c), then rinsed and dried (Figure 15). After that, dental adhesive agent is applied. (Figure 16)

The ceramic veneers are initially etched using the 9% hydrofluoric acid followed by the application of a coupling agent; silane (Figures 17,18).

They are bonded in pairs, starting with the central incisors to ensure the symmetry of the result. A dual bonding resin, with a transparent shade is used (VARIOLINK, IVOCLAR®).

Light cured first, for 5 seconds to remove easily the excess then for 60 seconds at least.

The final porcelain veneer shade was in harmony with the surrounding dentition.

At the end of the treatment, the patient was pleased with the results and no longer hides his smile.



Figure 14: The bonding protocol: a-The proper isolation using the rubber dam b,c-The treatment of dental surfaces (acid etching with orthophosphoric gel).



Figure 15: Rinsing and drying.



Figure 16: Application of the adhesive system.



Figure 17: Etching 9% hydrofluoric acid for 20s.

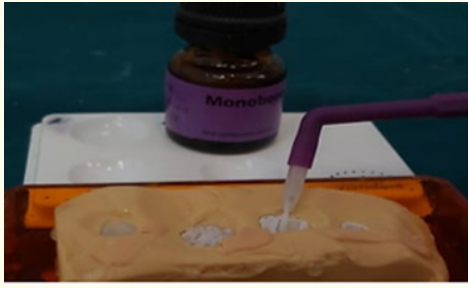


Figure 18: Application of a silane.



Figure 19: Bonded veneers.



Figure 20: Final result.

Discussion

Several factors affect dental esthetics, such as dental diastemas which are, increasingly, a common concern in clinical practice. The tooth shape defects also frequent anomalies particularly the conoid incisor known as peg-shaped” incisors.

According to a July 2013 study in the «American Journal of Orthodontics and Dentofacial Orthopedics», the overall prevalence of conoid permanent maxillary lateral incisors was estimated at 1.8% [3].

In fact the aesthetics of patients' teeth take great importance. Since the patient's smile has an obvious impact on facial aesthetics.

A wide variety of aesthetic treatments in the anterior dentition are available, from the less invasive to the more invasive following the therapeutic gradient given by Gil Tirlet and Attal in 2009 [1] such as teeth whitening, direct composite restorations, ceramic veneers or full coverage crowns.

Therefore, nowadays dentistry requires more conservative approaches.

Direct and indirect laminate veneers, as esthetic approaches, have become treatment alternatives for closing diastemas but also for correcting and improving the teeth morphology [4].

Resin veneers are very popular among clinicians because they are easier to manipulate and repair. In some situations, they can be a temporary solution when a definitive treatment cannot be indicated [4].

It also costs lesser for patients compared with indirect techniques. The treatment with direct veneer remains reversible with no need for an additional adhesive cementing [2].

Although the scientific literature is more extensive for ceramic laminates, a clinical trial published in 2013 (with a 3-year follow-up) reported no significant difference in the survival rate of composite (87%) and ceramic (100%) veneers [5].

But presently, they have limited longevity because they are susceptible to alterations of the surface gloss, staining at margins, discolorations and fragility compared to porcelain veneers [6].

Recently, ceramic veneers have been considered as the best treatment alternatives for patients due to their high abrasion resistance, color stability, excellent aesthetic results, excellent biocompatibility, chemical stability and durabilidadPorcelain veneers require minimal tooth preparation [7].

Ceramic veneers are known to provide greater patient satisfaction than composite veneers [8].

The different treatment options must be carefully explained to the patient, including the advantages and limits of each technique.

That's why, study cast models and diagnostic wax-up will help the patient in the choice of the most appropriate treatment.

The new morphology is then materialized on the teeth before preparation. The main objective of the mock-up is to visualize the prosthetic project and validate it clinically from an esthetic, functional and phonetic point of view, simply and quickly.

At this stage, the patient can assess the feasibility of his treatment plan and decide whether or not to pursue it. What's more, the treatment is still reversible: the patient can modify it and make touch-ups. Once validated, this mask will guide the preparation, which must be non-homothetic according to the prosthetic project [9].

Minimal reduction is guaranteed, while respecting the principle of tissue economy [2].

There are several types of veneer preparation in the scientific literature: Window preparation, butt margin and incisal overlap [10].

The window preparation is the first generation of veneer preparations: a homothetic preparation of the vestibular surface, limited mesially and distally by a thin enamel border, without crossing the proximal contacts.

This technique is currently being abandoned, since occlusal stress is highly concentrated in the 1/3 incisal edge, leading to a risk of fracture and detachment during propulsion movement.

The butt margin preparation is similar to the previous type, with a 1.5mm reduction of the incisal edge.

The incisal overlap preparation is similar to the butt margin, but with the addition of a palatal return with a mini-congé [11].

According to the 2017 review of the literature by Hong, *et al*, the analysis of 415 articles revealed no difference between Butt margin and Incisal overlap, and the latter increases the risk of fracture [12].

The success of ceramic veneers is greatly depending on the strength and durability of the bond performed between the three different components of the bonding complex: the tooth surface, the ceramic, and the luting resin composite.

There are many types of ceramic materials that can be used for porcelain veneers such as feldspathic porcelain, feldspathic porcelain reinforced with leucite, lithium disilicate, and lithium disilicate reinforced with zirconia [13].

In this clinical case, the veneers are made with lithium disilicate reinforced with zirconia.

According to the study in 2022, authors showed that [14].

Lithium disilicate vitreous ceramic has a higher percentage of crystalline phase (around 65%) whose crystals are 1.5 µm in size compared to zirconia-reinforced lithium disilicate (40-50%) whose crystalline structure is more homogeneous with a finer crystal size (0.5µm).

This characteristic gives us several advantages

optical properties have improved: since: The crystals are spaced further apart, enabling better light transmission while increasing mechanical strength. The dilution of ZrO₂ in the glass phase prevents crystallization, giving the material translucency and opales-

cence. These results were confirmed by the *in vitro* study conducted by Mohammadjavad Shirani and colleagues in 2021 [15].

An increase in the number of pores, resulting in a larger surface area available for bonding, and therefore greater bond strength than lithium disilicate-enriched glass-ceramics.

According to the 2016 study by Shaymaa Elsaka and colleagues, the data collected proves that: The addition of zirconia in glass ceramics is the primary reason for having such interesting fracture resistance high hardness, superior mechanical properties compared to lithium disilicate glass ceramics [16].

The crystallization treatment appears to be an asset in enhancing the material's mechanical properties.

A study by Efe Çetin Yılmaz conducted in 2020 wear tests reported that Vita Suprinity exhibited significantly higher two-body wear resistance than IPS e.max CAD lithium disilicate glass-ceramic and other composite resins after mastication tests [17].

Zirconia-doped vitreous ceramics have made it possible to combine the advantages of glass-ceramics, and zirconia seems to be a promising material that could be the solution for any clinical situation. However, the lack of clinical experience means that further research and studies are needed to better understand the benefits and limitations of this new glass-ceramic [18].

To optimize the bonding of all these parts, it is essential to follow a strict operating protocol.

To ensure proper bonding and avoid contamination by moisture, saliva, blood and bacteria, the field is essential, using a dam sheet, studs and even ligatures made from Teflon den-wire to improve insulation.

M and R III adhesive systems are still the best performing and least sensitive to installation techniques. They also appear to provide the most durable bonding over time. Pre-treatment with phosphoric acid remains the most effective way of achieving optimal bonding to enamel [19].

For treatment of the ceramic intrados, Application with hydrofluoric acid: creates an anfractuous relief in the ceramic intrados, dissolving part of the vitreous matrix and increasing adhesion between the adhesive and the ceramic. Application of silane enables the adhesive resin to spread evenly over the part, creating an adherent, watertight interface.

Light curing resin cement was chosen since the thickness of the veneer is low [20].

According to a retrospective study conducted in 2018, The survival rates of ceramic veneers were 97.8% and the success rate of these veneers was 92.4% at five year evaluation [21].

Conclusion

Ceramic veneers are a less invasive restorative approaches, but case selection and careful treatment planning is essential.

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