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Ceramic Full Veneer: A Possible Restorative Option for Anterior Teeth

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Abstract | **Case Report**

Restoring the anterior dentition remains a clinical challenge that requires aesthetic solutions to achieve optimal results. Traditionally, full-coverage crowns have been the go-to approach, despite their invasiveness and potential harm to the pulp due to substantial tooth substance removal. Fortunately, recent advancements in ceramics and adhesive techniques have paved the way for more conservative alternatives. Ceramic full veneers, combined with precise bonding techniques, emerge as a compelling, aesthetic, and highly durable option. Although enveloping the entire tooth, this approach is considered minimally invasive compared to conventional ceramic crowns. However, its successful implementation requires meticulous planning and adherence to the treatment steps. This article highlights the potential of ceramic full veneers within a conservative and aesthetic paradigm and offers precise planning to obtain the most gratifying results, through a clinical situation.

Keywords: Anterior dentition, ceramic restoration, conservative, aesthetic outcome.

INTRODUCTION

Various solutions have been suggested to restore anterior teeth and to meet the aesthetic expectations of our patients.

Full-coverage crowns, long considered as a standard, are effective but invasive. This is due to the substantial removal of sound dental tissue and potential effects on the pulp.

Fortunately, recent advances in ceramics and adhesive techniques have introduced more conservative alternatives. Within this context, ceramic full veneers, when paired with precise bonding techniques, stood out as an intriguing, aesthetic, and exceptionally durable option. Despite enveloping the entire tooth, they present a minimally invasive option compared to traditional all-ceramic crowns.

This article aims to explore the indications and characteristics of full veneers. Through a step-by-step clinical case report, it underscores the importance of meticulous planning to achieve optimal outcomes.

CASE REPORT

A 45-year-old female patient, with no significant medical history, attended our prosthodontic department to restore her central maxillary incisors (#11 and #21), traumatically fractured.

Clinical examinations revealed discoloration of #21, class IV composite fillings, and numerous micro-cracks in both teeth. They had proper endodontic treatment, with a satisfactory X-ray crown-to-root ratio and no evidence of root or alveolar fracture (Fig 1). Occlusal examination indicated functional incisal guidance and no signs of parafunctions.

Figure 1: Clinical and radiographic examinations of the initial state; (a) Several micro-cracks under transillumination; (b) Discoloration of tooth number 21; (c) Proper endodontic treatment, with a satisfactory X-ray crown-to-root ratio and no root or alveolar fracture

Two bonded lithium disilicate full veneer were selected to restore the maxillary incisors. Pre-prosthetic procedures, including scaling and polishing, and internal tooth whitening were deemed necessary.

To begin the preparation, a spherical diamond bur was used to create three horizontal reduction grooves on the buccal surface. These were leveled with a cylindrical, tapered, round-ended diamond bur, following the axial inclination of the tooth. Then, reduction of the palatal surface is performed. Subsequently, a thin tapered diamond bur was used to create a proximal slit from the facial to palatal surfaces. These maneuvers established a prosthetic space measuring 0.3mm cervical and 0.8mm incisal. Finally, an incisal reduction of 1.5mm was performed. Post-reductions, extra-fine finishing burs, and rubber points were employed to eliminate sharp angles and achieve a refined preparation (Fig 2).

Figure 2: Final crown preparation

Then, a double-mixing impression technique was performed (Fig 3), using polyvinyl siloxane (Elite HD+ Putty Soft & Light Body Normal Set - Impression Tray Material, Zhermack).

Figure 3: Simultaneous double mixing impression technique

Two lithium-disilicate full veneers were received. They were tried on, assessed for shade, marginal adaptation, integrity, fit, and occlusion. Then, the bonding procedure was initiated under proper isolation. The ceramic surfaces were initially etched using 9% hydrofluoric acid (Ceram Etch 9%, ITENA), followed by a 90-second wash (Fig 4). Then, a coupling agent—silane— (Monobond N, IVOCLAR VIVADENT) was applied and slowly dried using warm air (Fig 5).

Figure 4: Application of hydrofluoric acid

Figure 5: Application of silane

A 3 steps adhesive system was utilized. Dental surfaces were etched with 37% orthophosphoric acid gel (Meta Etchant, METABIOMED) for 30 seconds (Fig 6), then rinsed and dried. The dental adhesive agent (Syntac primer, Syntac adhesive, Heliobond, IVOCLAR VIVADENT) was applicated (Fig 7).

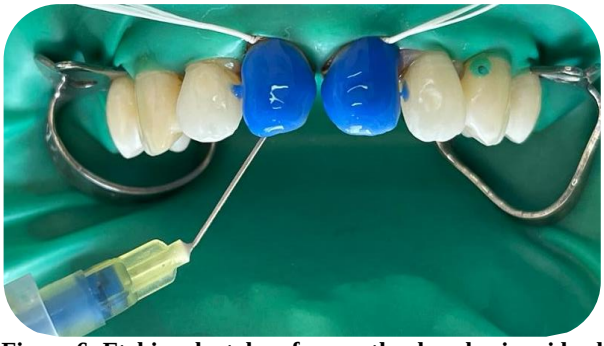

Figure 6: Etching dental surfaces orthophosphoric acid gel

Figure 7: Application of the adhesive system

The ceramic restorations were bonded individually with a dual bonding resin (VARIOLINK N, IVOCLAR VIVADENT), using an appropriate shade (Fig 8). Initially, a 5-second tact cure was done to ensure stabilization of the full veneers then the residual cement on the interproximal side was removed with a microbrush. Subsequently, a full light curing of 40 seconds per side was performed after the application of a glycerin gel along the entire margin.

Figure 8: Application of the luting resin followed by bonding the restorations and light curing

Following the removal of the rubber dam, excess cement was eliminated using a no 12 surgical blade. Occlusion was checked one week after the bonding procedure to ensure complete curing of the bonding resin. The Figure 9 shows the outcome after 1 year follow-up.

Figure 9: Result after 1 year

DISCUSSION

Full veneers are warranted in cases of peg-shaped lateral incisors, moderate crown fractures, extended proximal restorations, discoloration, and teeth requiring endodontic access. However, the effectiveness of these restorations is closely tied to the patient's occlusal context. In fact, optimal outcomes were observed in cases of light occlusal forces and minimal parafunction [2, 4].

Failure can occur due to bonding onto existing composite restorations, inadequate enamel support over large dentin areas, inexperienced placement, parafunction, and poor oral hygiene. Longevity is compromised in older patients too, as enamel thickness diminishes over time and root dentin exposure are more frequent, leading potentially to increased microleakage [6, 12].

In this case report, full veneers were selected to protect endodontically treated and structurally compromised teeth. They were strategically placed over existing restorations to ensure optimal marginal adaptation. The patient exhibited light occlusal forces, with no contact during lateral mandibular movements, thanks to canine-guided occlusion.

Apart from indications, the preparation is a key factor in the prognosis. Actually, various designs have been described for traditional veneers. The incisal overlap method stands out for its ability to evenly distribute occlusal forces, thereby enhancing restoration longevity, which is also true in the case of full veneers [7]. As an aesthetic option, the design of these restorations not only hides margins but also takes advantage of the thicker band of enamel in the interproximal area, without extensive dentin exposure [6]. In fact, the veneer preparation should be confined primarily within the enamel or should display a substantial (50–70%) enamel area, especially at the preparation margins that seems crucial to enhance retention of such restorations [2].

However, even when this condition is fulfilled, these restorations can encounter a common issue over time such as the gingival recessions, which are frequently associated with existing finish lines. A novel solution to this challenge is provided by the biologically oriented preparation technique (BOPT), which entails a vertical tooth preparation to establish a new finish area. It aims to provide immediate support to the gingiva with an appropriate prosthetic restoration. Although representing an advancement in prosthetic dentistry, further clinical and biological studies are required to validate its efficiency [5].

Regardless of whether the preparation is vertical or not, the challenge remains the same: striking a delicate balance between preserving enamel thickness, ensuring sufficient strength to withstand occlusal forces, and preparing the abutment adequately for the selected restorative material [12].

Moreover, choosing the appropriate ceramic material is pivotal for achieving both aesthetic and functional objectives. Leucite glass-ceramic (IPS Empress CAD, Ivoclar Vivadent), lithium-disilicate glass-ceramic (IPS e.max CAD, Ivoclar Vivadent), and translucent zirconia are among the options available. Lithium disilicate ceramic, renowned for its mechanical properties, high aesthetics, and favorable adhesion is often preferred for the full veneers [4]. In recent years, translucent zirconia is increasingly utilized in various clinical applications, including veneers. In vitro studies have demonstrated its superior fracture resistance compared to lithium disilicate and feldspathic veneers. Despite these advantages, bonding to zirconia remains challenging. Thus, further long-term research is needed to validate this treatment approach [8].

After choosing the ceramic system, selecting the precise color shade for tooth restoration is a critical step to achieve the desired aesthetic outcomes. Both visual color selection methods and instrumental techniques such as shade guides, colorimetry, spectrophotometry, and computer analysis of digital images, should be employed to ensure optimal results [10].

The success of ceramic full veneers relies also on the strength and the durability of the bond formed among three distinct components in the bonding complex: the tooth surface, the ceramic, and the luting resin composite [11].

First of all, thorough isolation is essential to minimize contamination from saliva, blood and bacteria thus improving the quality and longevity of the restoration. A recent clinical in-situ study by Falacho *et al*., indicated that even moisture from exhaling can compromise bond strength to enamel [3].

Subsequently, meticulous decontamination and surface conditioning represent essential pretreatments. Proper chemical preparation of the restoration, including hydrofluoric acid etching and silanization, is crucial for a long-term success [13]. Hydrofluoric acid conditioning partially dilutes the ceramic's glazing and crystalline phases, creating the necessary surface micro roughness. Silanization prior to adhesive and resin application significantly enhances bond formation. It promotes surface wetting, increasing contact area, while forming siloxane bonds with both the ceramic's silicon oxide compounds and the resin's organic matrix [1, 3]. Despite recognized benefits, there is still no consensus on the optimal acid concentration and etching time. In fact, numerous ceramic fractures have been observed, especially related to high acid concentrations and prolonged exposure times. Studies indicate that a maximum of 10% hydrofluoric acid concentration and an

exposure time ranging from 20 to 40 seconds yield optimal results [14]. In order to facilitate this protocol, a self-etch silane primer was suggested containing the acid and the silane at the same time. Nonetheless, Dimitriadi *et al*., demonstrated in their study that lithium disilicate ceramic surfaces exhibit higher roughness values when first etched with 5% hydrofluoric acid compared to using self-etch silane primer alone. Additionally, bond strength values increase when the ceramic primer is applied to the hydrofluoric acid-etched surface, contrasting with self-etch silane primers [11].

Various adhesive protocols can achieve a hybrid layer. In etch-and-rinse systems, phosphoric acid with a concentration between 30% and 40% removes the smear layer, demineralizing dentin up to 3–5 µm depth and exposing collagen fibrils for adhesive and resin infiltration. This process facilitates mechanical interlocking of resin tags within the acid-etched surface, promoting favorable bond to the dental substrate. However, to make the protocol simpler, the self-etch adhesives were introduced. Besides, they seem to control the sensitivity of etch-and-rinse techniques to humidity. Although self-etch systems have benefits, etch-and-rinse adhesives remain "the gold standard" due to their superior performance [9, 16].

As for the cement choice, light-cured ones are preferred for their immediate final polymerization and aesthetic properties. Moreover, they offer ample working time, easy excess cement removal, better color stability, and quick margin sealing compared to self- and dual-cured resins. However, in areas with limited access or where curing light penetration is hindered, dual-cure resin cements may be used [13].

In addition, conventional resin cement, requiring prior application of an adhesive system, are preferred. They offer predictable bond strength to enamel with proven long-term clinical success. It achieves bonding to dentin through resin penetration into exposed collagen fibrils, potentially providing high bond strength if proper steps are followed. However, the numerous steps involved in traditional resin cements and the moisture content of dentin could potentially undermine its efficiency. Self-adhesive resin cements provide a simplified procedure and demonstrate sufficient bond strength to dentin and enamel, though notably lower compared to conventional types [14].

Finally, the improper removal of excess cement after luting can result in increased surface roughness around margins, promoting bacterial adhesion and potentially leading to caries, gingivitis, or periodontitis. The use of a brush and dental floss before polymerization can lead to higher accumulation around the margin. Alternatively, tack-curing for 1 to 5 seconds, followed by careful removal with a probe and dental floss, minimizes excess material. Notably, the choice of removal technique does not seem to influence failure or microleakage occurrence at the veneer-tooth interface [15].

CONCLUSION

Ceramic full veneers can be defined as a continuum of design between traditional veneers and all-ceramic crowns.

In some cases, those crafted from lithium disilicate ceramic can potentially serve as a reliable alternative to full crown restorations on anterior teeth. Success depends on various patient-related factors and a thorough understanding of the restorative process. Neglecting any step, especially during cementation, may compromise the final result.

However, further clinical studies are essential to assess long-term clinical outcomes.

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