

## Ceramic laminate veneers: A 3-year clinical follow-up

### Revestimentos laminados cerâmicos: Um acompanhamento clínico de 3 anos

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## ABSTRACT

Ceramic laminate veneers have been widely used in esthetic restorations, with advantages such as color stability, resistance to degradation, and excellent esthetic results, all of which contribute to long-term stability. The gold standard technique consists of bonding a thin ceramic laminate veneer to enamel. The present paper describes a clinical case with 3-year follow-up. Six ceramic laminate veneers were planned, fabricated and bonded to six sound anterior maxillary teeth showing diastema, thereby improving shape and size. The procedure followed a laminate veneer treatment protocol, using a mock-up, shade selection, and an adhesive system. The case was followed for 3 years. In conclusion, minimally invasive restorations with ceramic laminate veneers remained stable after 3 years of follow-up and are a good option for patients with diastema or microdontia and requires only a minimum amount of sound tooth tissue removal.

**Keywords:** Dental, Laminate Veneers, Esthetic, Mock-Up, Bonding.

## RESUMO

As lâminas laminadas cerâmicas têm sido amplamente utilizadas em restaurações estéticas, com vantagens como estabilidade de cor, resistência à degradação e excelentes resultados estéticos, tudo isso contribuindo para a estabilidade a longo prazo. A técnica padrão ouro consiste na colagem de uma fina camada de cerâmica laminada ao esmalte. O presente trabalho descreve um caso clínico com seguimento de 3 anos. Seis facetas de cerâmica laminada foram planejadas, fabricadas e coladas a seis dentes maxilares anteriores sadios mostrando diastema, melhorando assim a forma e o tamanho. O procedimento seguiu um protocolo de tratamento de facetas laminadas, utilizando uma maquete, seleção de tonalidades e um sistema adesivo. O caso foi seguido por 3 anos. Em conclusão, restaurações minimamente invasivas com facetas laminadas de cerâmica permaneceram estáveis após 3 anos de acompanhamento e são uma boa opção para pacientes com diastema ou microdontia e requerem apenas uma quantidade mínima de remoção de tecido dentário sólido.

**Palavras-Chave:** Dental, Facetas Laminadas, Estética, Maquete, Colagem.

## 1 INTRODUCTION

Esthetic dentistry has been playing an increasingly relevant role in dental clinical practice and teaching. New materials, techniques and procedures emerge every year, but studies designed to assess the long-term behavior and clinical survival of innovative procedures are lacking. Esthetic restorative treatment with the use of indirect laminate veneers has always been a good option for patients with shape alterations, darkened teeth, and several restorations. Veneers started to be used in mid-1928, when the “Hollywood veneer” technique was created to temporarily modify the smile of actors.<sup>1</sup>

With the evolution of techniques and materials, in 1979 the mastic-caulk sealant was released – the first system of veneers commercially available in large scale, with pre-selected shapes.<sup>2</sup> Adhesion of acrylic resins to enamel had been already possible for a

long time using acid etching.<sup>3</sup> However, with time, acrylic veneers started to show poor adhesion<sup>4</sup> and color stability.<sup>5-7</sup> Eventually, ceramic laminate veneers for indirect restorations became available, promising increased color stability and improved esthetics.<sup>8,9</sup> Indirect porcelain laminate veneers, when conditioned with hydrofluoric acid, cleaned, treated with silane, and bonded to the tooth surface, have a great potential to survive in the harsh environment of the oral cavity. This type of treatment should be the first choice in many cases that would earlier be treated using full crown restorations.<sup>10</sup>

Current advances in dentistry have focused on developing techniques that cause minimum damage to the tooth structure. In line with this goal, ceramic veneers have evolved to minimum thickness laminates,<sup>11-13</sup> especially after the advent of lithium disilicate glass ceramic.<sup>14</sup> With this new technology of resistant ceramics, indirect restorations with extremely thin ceramic laminate veneers (contact lens effect) have become possible and accessible, combining esthetic and functional rehabilitation. However, the success of this type of procedure is highly dependent on the correct execution of all procedural steps, from planning to adhesive cementation. Many cases require incisal coverage to obtain the expected esthetic effect without affecting ceramic/dental resistance.<sup>15</sup>

Thin ceramic laminate veneers are indicated in the following cases: microdontia,<sup>16</sup> peg-shaped teeth, undersized lateral and central incisors, teeth that lost volume due to wear, and teeth requiring increase of buccal volume.<sup>17</sup> Regardless of tooth preparation, laminate veneers offer excellent psychological and social benefits<sup>18</sup> and treatment success depends of biological preservation of tooth structure.<sup>19</sup>

The present paper describes two clinical cases followed for 3 years in which six “contact-lens-type” ceramic laminate veneers were planned, fabricated and bonded to six sound anterior maxillary teeth showing diastema with the aim of improving tooth shape, color and size.

## **2 CASE REPORT**

An 18-year old white male patient sought esthetic and functional treatment for his maxillary anterior teeth. The main complaint was a large diastema between the incisors and canines and slightly short teeth (patient self-report). Clinical examination confirmed the presence of diastema and revealed short a clinical crown of the maxillary right canine

compared to the left canine, misaligned gingival zenith of maxillary central incisors, and mispronunciation of sibilant consonants during phonetic testing. The patient would like to have the cervicoincisal lengths of his teeth increased by 1-2 mm. After molding, photographic and study-model analyses were conducted, and a multidisciplinary treatment plan was developed (**Figure 1**). The present case report and related documentation for publication were approved by the research ethics committees of the local institutions.

The case was referred to esthetic periodontal planning, which consisted of clinical crown lengthening without osteotomy. At the first treatment session, local anesthesia was used (3% mepivacaine with vasoconstrictor 1:100,000; DFL, Rio de Janeiro, RJ, Brazil); clinical crown length and width were assessed using a millimeter probe (Hu-Friedy, Ipanema, RJ, Brazil); the gingiva was marked to delimitate the area of tissue to be removed; an incision was made using a #15 scalpel (Swann-Morton, England, UK), and the gingival collar was removed (**Figure 2**) using a Gracey 3/4 curette (Hu-Friedy, Chicago, IL, USA). Following completion of periodontal surgery, the patient was prescribed analgesic medication (paracetamol 500 mg every 4 hours for 2 days) and a chemical agent for biofilm control (chlorhexidine gluconate 0.12%, oral rinse with 10 ml twice daily for 7 days).

After 21 days, the patient returned for postoperative evaluation, gingival bleeding and visible plaque assessment, showing very favorable results. Then, a new mold was made, followed by photographs and diagnostic wax-up restorations in the laboratory. A mock-up was created by filling the mold vessels with bisacryl (Structur 2, Voco, Indian Land, SC, USA); the mold was placed in the patients' dental arch, allowed to set, and removed; excess bisacryl was also removed. The patient approved the new shape of the teeth, and the bisacryl mock-up was removed.

The mock-up model approved by the patients was then referred to the laboratory for ceramic laminate veneer fabrication (IPS e.max/Ivoclar Vivadent, Schaan, Liechtenstein). Following ceramic application, veneers were analyzed under a microscope to assess the presence of microfailure or air bubbles, and cleared for cement shade selection (shades A1 and A2; Variolink Esthetic Try-in, Ivoclar, Schaan, Liechtenstein). At this point, it was possible to predict color results and determine the shade to be used in the definitive cementation (**Figure 3**).

The ceramic laminate veneers were subjected to chemical preparation with 9% hydrofluoric acid (Porcelain etch, Ultradent, South Jordan, USA) for 90 seconds on their internal surface, so as to increase ceramic retention.<sup>9</sup> The acid was removed by rinsing with water, the intaglio of the veneers was cleaned using an ultrasonic bath, air-dried and treated with silane (Silane, Ultradent, South Jordan, USA) for 60 seconds. Teeth were subjected to an adhesion protocol consisting of slight roughening of enamel using a #297 diamond bur (Dental Burs, Chicago, IL, USA), followed by application of 37% phosphoric acid (N Etch, Ivoclar, Schaan, Liechtenstein) for 15 seconds, followed by thorough rinsing with water, air drying, and adhesive application (Tetric N Bond Universal, Ivoclar, Schaan, Liechtenstein). Under complete rubber dam isolation, the cementation was performed in anterior-posterior direction, starting with the two maxillary central incisors, followed by the two maxillary lateral incisors, and finally the two maxillary canines. The resin cement (Variolink LC, Ivoclar, Schaan, Liechtenstein) was applied first to the internal surface of the veneer, and finally the veneer was gently seated on the tooth surface with finger pressure. Excess cement was removed using a brush and dental floss. Light curing application (Valo, Ultradent, South Jordan, UT, United States) was performed for double the time recommended by the cement manufacturer, to avoid loss of light intensity while passing through the porcelain layer. Following cementation

of the six veneers (**Figure 4**), occlusal adjustment was performed. The patient have been followed for 3 years, and have so far maintained treatment results (**Figure 5**).

### 3 DISCUSSION

Esthetic treatment of anterior teeth using veneers requires careful observation and execution of a sequence of steps, all of which will contribute to successful treatment of diastemas, teeth with microdontia, and/or slightly smaller teeth.<sup>16,20</sup> Briefly, clinical application of ceramic laminate veneers can be divided into five steps that are key to ensuring the clinical success expected by both patient and dental professional. The first of these steps is correct diagnosis and thorough technical laboratory analysis of study models. These models are highly useful, especially for the analysis of habitual, centric, balanced, and eccentric occlusions<sup>21</sup> so as to ensure correct distribution of masticatory stress on the veneers. The second key moment is a thorough analysis of the patient's smile, position of gingival zenith, tooth size and color, color stratification, surface microtexture, and sometimes the presence of stains resulting from hyper- or hypocalcification. The third step is correct laboratory fabrication of ceramic laminate veneers, from the diagnostic wax-up used to create the bisacryl mock-up up to veneer fabrication and stratification. At this point, the importance of performing surface textures on the wax-up and accurately determining the new size of teeth, in both height and width, should be highlighted. Also, ceramic veneers should be stratified so as to allow the effects of increased translucency at incisal edges and reduced translucency at cervical regions. The fourth key step is veneer cementation, which requires extreme care on the part of the dental professional to ensure treatment success.<sup>13</sup> The professional should test different resin composite shades using a try-in paste and accurately choose the composite color – failure to choose the right color can compromise the final result.<sup>22</sup> As a fifth, final step, finishing and polishing are considered key factors for long-term maintenance of treatment results.<sup>13</sup>

Other relevant measures include control of oral humidity, correct and effective application of adhesives, and appropriate use of resin cement, managing excess material, especially in proximal and cervical areas. Whenever excess cement is present at these regions, it should be removed with extreme care, avoiding the use of burs so that the veneers are not damaged. All these steps and measures combined are likely to lead to successful treatment and both patient and dental professional satisfaction, especially due

to the absence of tooth wear.<sup>23</sup> Ceramic laminate veneers are likely to remain in the oral cavity for a long time, adequately performing both esthetic and phonetic functions.

#### **4 CONCLUSION**

Minimally invasive restorations with ceramic laminate veneers presented esthetic stability over 3 years of follow-up. Using this type of restoration in patients presenting with diastema or slightly smaller teeth is a stable option and requires only a minimum amount of sound tooth tissue removal.

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## ANEXOS

### Figure legends

Figure 1. Initial picture obtained for case.



Figure 2. Slight esthetic gingival correction.



Figure 3. Resin cement shade selection.



Figure 4. Photograph taken at baseline.



Figure 5. Photograph taken at 3 years of follow-up.

