

Case Report

The aesthetic management of diastema closure treatment with indirect veneer using lithium disilicate: A case report

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ABSTRACT

Background: Diastema is a space between two or more adjacent teeth that can interfere with the patient's aesthetic appearance. Various aesthetic treatments can be performed for diastema closure on anterior teeth, one of which is through the installation of veneers. The lithium disilicate ceramic material produces the thinnest veneer and has better properties than other materials, and is able to cover the anterior diastema with a fairly large width. **Purpose:** To describe the aesthetic procedure for closing the diastema of anterior teeth using indirect lithium disilicate ceramic veneer. **Case:** A 29-years-old male patient came with a complaint of dissatisfaction with her smile because of a gap between teeth 12 and 13. The teeth are in vital condition with normal overjet and overbite, and there are no systemic health problems. **Case Management:** The management of diastema closure on teeth 12 and 13 was carried out with indirect lithium disilicate veneer treatment. Lithium disilicate veneer has promising aesthetic results due to its enamel-like nature, minimally invasive because it requires minimal tooth reduction, good strength, and did not cause gingival irritation. As a result, this treatment could increase self-confidence of the patient. **Conclusion:** Diastema closure treatment using indirect lithium disilicate veneer is an effective treatment, gives satisfactory results and can increase the patient's confidence.

Keywords: diastema closure; anterior teeth; indirect veneer; lithium disilicate; human and health

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INTRODUCTION

Dental diastema is a space between two adjacent teeth in the same dental arch, and one of the most common cases. Dental diastema is also defined as a space formed more than 0.5 mm between the proximal surfaces of adjacent teeth caused by multifactorial factors.¹ Anterior diastema or multiple diastema that occurs in adults can have an impact on the aesthetics of the smile and facial harmony.² Teeth are part of the overall facial profile that greatly affect facial esthetics, facial symmetry, and alignment of the midline of the face. This is an important aspect for achieving alignment and balance of facial structures, and can also affect function and phonetics in the stomatognathic system.³ Often cases of this diastema can be managed effectively with orthodontic treatment. But sometimes it is also used only as a treatment of choice, as this solution may not be sufficient to treat cosmetic defects. In cases of diastema associated with dental malformations, this treatment requires additional procedures.⁴

In the development of technology, one of the biggest challenges in aesthetic dentistry is restoration of anterior teeth. The goal of any procedure used in dentistry is to

provide successful dental care with a conservative and aesthetic approach. Currently, the use of veneers has increased in recent years due to better aesthetics and minimal invasiveness.⁵ Dental veneers have been widely used as a solution to improve aesthetic problems and protect teeth. Indications for veneers are tooth discoloration that is resistant to vital whitening procedures; teeth with an unpleasant shape or contour and requiring morphological modification; diastema closure with a distance greater than 0.5 mm; teeth with small alignment and local enamel malformations; fluorosis with spots on the enamel; teeth with minimal cracks and fractures; and deformed teeth. Contraindications to the use of veneers should also be considered such as placement of veneers with smaller interocclusal distances; deep anterior vertical overlap without horizontal overlap; poor bruxism or parafunctional activity. Severe dental malposition, factors from soft tissue disease, and extensive dental restorations can be factors that prevent veneer placement.⁶

Ceramic veneer is a material used in treatment with an aesthetic approach because it can maintain the presence of almost all of the enamel intact before the veneer is

placed.⁶ Veneers can also be made from different ceramic materials, the main ones being feldspathic ceramics and lithium disilicate. The use of all-ceramic dental restorations has advantages such as obtaining high-performance aesthetic results, biocompatibility and integration in the oral environment which have proven to be quite good due to low material solubility, can produce a thin veneer layer of 3 mm thick with good transparency, even less than 3 mm. mm, also reduces plaque accumulation properties, and satisfactory marginal fitting.⁷

The lithium disilicate ceramic material consists of a glass matrix filled with lithium silicate with micron-sized lithium disilicate crystals, allowing the same flexural strength as enamel.⁸ Therefore, this material is preferred to replace lost enamel. Lithium disilicate ceramic materials can produce thin layers due to their greater ability to fracture resistance and biaxial strength than other materials. Despite the high concentration of crystals, at this level of transparency, this material allows it to achieve a natural finish on the cervical portion of the restoration. This capability provides lithium disilicate with better properties and aesthetics. In addition, it can also simplify adhesive procedures and allow for more conservative tooth preparation.^{5,7}

The following case report describes a detailed set of clinical steps; from treatment planning to cementation of lithium disilicate ceramic indirect veneers. The lithium disilicate ceramic material was used in this case due to its

mechanical properties, high aesthetic, produce a thin veneer layer with good translucency, non-irritating cervical and abrasion compatibility with opposing natural teeth, and a less invasive procedure.⁷

CASE

A 29-years-old male came to the Dental Hospital of Airlangga University with chief complaints of dissatisfaction with her smile. The intraoral examination showed diastemas between the right maxillary second incisor and canine about 2 mm. The tooth had been filled before about 2 years ago but the filling was broken. The patient said he had no systemic health problems.

The results of intraoral examination of the patient showed the posterior cusp with normal fossa and anterior relation with overjet 2mm and overbite 2mm. Salivary test results showed that the quality and quantity of the patient's saliva were still within normal limits (Table 1). Diastema was found on teeth 12 and 13 (Figure 1). There was no complaint on pressure and percussion tests.

EPT vitality test of teeth 12 and 13 showed vital teeth. Based on the objective examination, the clinical diagnosis of teeth 12 and 13 were normal pulp and normal apical tissue. The restoration treatment plan was indirect veneer lithium disilicate. The prognosis of treatment was good.

Table 1. Salivary test results in patients

Hydration	24 sec	•
Viscosity	watery	•
pH	7	•
Quantity	5.5 ml/ 5 minutes	•
Buffer Capacity	10	•



Figure 1. The condition of diastema teeth before the treatment.

CASE MANAGEMENT

On the first visit, a subjective examination was acquired from the patient's history. Dental health education was performed to the patient, and the patient signs the consent form as approval for the treatment. The impression was taken in order to obtain the working model and wax up model on teeth 12 and 13, the suitable tooth color was selected through Vita 3D Master Shade Guide 1M2 (Figure 2b).

The second visit, the mock up was inserted (Figure 3a), made a preparation guidance on the labial of tooth with mock up using depth cutting bur (Figure 3b). Marking with a pencil on the tooth surface as a marker of the depth of the area to be prepared (Figure 4a). Preparation using round end tapered fissure diamond bur with a chamfer-shaped final preparation on the labial surface parallel to the gingival margin (Figure 4b), incisal edge was

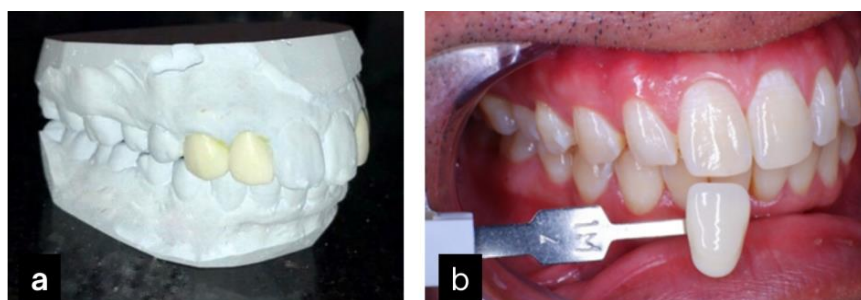


Figure 2. a) Wax up model; b) Selected tooth color with Vita 3D Master shade guide 1M2.

cut approximately 1 mm and proximal preparation was extended onto the interproximal contact, then the resulting preparation was smoothed using a fine finishing bur (Figure 4c).

The amount of reduced tooth tissue was regularly controlled with the silicon guide (Figure 5a) then followed by gingival management to prepare the tooth area before imprinting the preparation results to obtain an ideal restoration (Figure 5b). The gingival sulcus was managed using the retraction cord size number 000. The impression was taken using a two-step technique using an elastomeric

impression material, followed by making a bite registration using polyvinyl siloxane. Temporary veneer using bis acryl was inserted (Figure 6).

On the third visit, the temporary veneers were in good condition and the surrounding gingiva was normal. Temporary veneers were removed and the porcelain veneer trial was conducted. The relationship between the teeth and the veneers were observed like color matching, occlusion and articulation, proximal contact, and adaptation of the restoration to the surrounding tissue. Then a rubber dam was placed on teeth 12 and 13 to isolate the working area.



Figure 3. a) Mock-up; b) Depth cutting bur preparation.



Figure 4. a) Depth marking results; b) Veneer preparation; c) Finishing preparation.

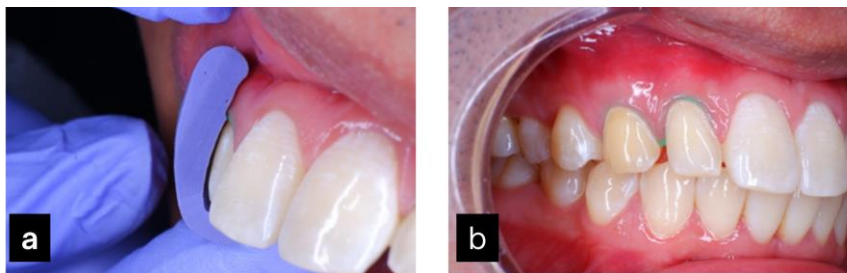


Figure 5. a) Silicone guide; b) Gingival management.



Figure 6. Temporary veneer.

The inner porcelain veneers etched with 9% buffered hydrofluoric acid for 10 seconds, rinsed and dried, then applied silane for 60 seconds. The prepared teeth were etched with 37% phosphoric acid for 20 seconds, rinsed and dried, self-etch adhesive 8th generation bonding was applied (Figure 7b). Then all porcelain veneers were inserted with light cure resin cement, veneers were cured for 2 seconds and excess cement was removed using an explorer, veneers were cured for another 20 seconds on all aspects (Figure 7c).

The fourth visit, the patient said there were no complaints, no extraoral abnormalities, and on intraoral examination, the result of percussion and bite test were negative (-), the temporary veneers were in good condition and the surrounding gingiva were normal (Figure 8).

DISCUSSION

Lithium disilicate is a structured glass ceramic material with a high concentration of ceramic crystals about 70% of the total substrate. This lithium disilicate structure has the ability to produce a flexural strength that is almost the same as that of enamel in the range of 360-400 MPa and also a

biaxial flexural strength that is three times greater than that of feldspathic ceramics.⁷ In addition, lithium silicate glass ceramic can also scratch and adhere to enamel and dentin, also 9% hydrofluoric acid solution is used for microetching bonding surfaces to improve the bonding strength of the material. Lithium disilicate ceramics are widely used for highly aesthetic but minimally invasive restorations. In vitro studies have shown that this material applied to a thin layer resulting in good translucency. Lithium-silicate reinforced glass ceramics are characterized by a low index of refraction and thus the material becomes highly translucent despite its high crystalline content.⁹ Applications in different clinical conditions are recommended for lithium silicate ceramics through veneer placement, anterior and posterior single crown placement, or can also be placed on anterior fixed dental prostheses.¹⁰

In this case report, we describe diastema closure with the impact of loss of tooth structure and severe defects that can affect dentin. The use of porcelain veneer restorative material is considered as the most appropriate treatment option, so we use lithium disilicate veneer with consideration of its good aesthetic potential. In addition, tissue preparation in indirect veneer restorations is minimal, about 0.5-0.7 mm.¹¹ Manufacture of veneered gingival margins with a definitive



Figure 7. a) Veneers on models; b) Etching application; c) Veneer insertion; d) Clinical photos after treatment



Figure 8. Clinical photos after post control treatment

chamfer 0.3-0.4 mm deep. The thickness of the porcelain preparation was 0.5 mm at the gingival margin, 0.7 mm in the middle and about 1 mm at the incisal third to prevent visible dentin shine and to hide the visible silhouette of the preparation under the porcelain.¹² Therefore, we prepared full veneers on teeth 12 and 13 to improve diastema and tooth shape, reduce tooth sensitivity and strengthen teeth, as well as improve aesthetics. Full veneer preparation was carried out using the incisal lapping technique because it adjusted to the condition of the defect in the center of the labial surfaces of teeth 12 and 13 which almost reached the incisal edge, so that the preparation extended to the incisal edge. In determining treatment using indirect porcelain veneers, various types and depths of preparation are important and must be considered. Indirect porcelain veneer was chosen because it has advantages over composite resin veneers such as better aesthetic appearance, color stability, high abrasion resistance, biocompatibility, so that plaque accumulation and other side effects can be minimized.¹¹

In achieving the best outcome in treatment procedure, the cementation process is highly dependent on the preparation of the teeth, the conditioning of the ceramic veneers and the structure of the teeth, as well as the materials used for cementing the veneers.¹³ Nano-adhesive is the 8th generation bonding material that contains nanofillers. These ingredients can strengthen the enamel and dentin, absorb stress, and have a longer storage time. In addition, this material also contains nano-sized silica particles and silane, 10-Methacryloyloxydecyl dihydrogen phosphate which is a hydrophilic acid. The bonds formed from the carboxylate and/or phosphate groups of MDP with calcium hydroxyapatite form MDP-calcium compounds with an adhesive strength of >30 MPa so that they can attach resin cement materials to ceramic/porcelain, metal, and zirconia well.^{14,15} The 8th generation bonding agent can be applied by using the technique of self-cured, light cured, dual cured one-step, and self-etch. In addition, universal adhesives containing MDP, Biphenyl dimethacrylate (BPDMD), Dipentaerythritol penta-acrylate phosphate (PENTA), and polyalkenoic acid copolymers can be used with etch and rinse, self-etch, selective-etch, or without etching techniques.^{15,16}

In addition, prevention of saliva contamination should be avoided in an effort to reduce the energy on the enamel surface. The internal surface conditioning of ceramic veneers is carried out using hydrofluoric acid and silane. The duration of application varies greatly depending on the use of the ceramic composition.¹³ In this case of diastema closure, the restoration was successfully performed with an indirect veneer technique and with very satisfactory results for the patient. In conclusion, diastema closure using an indirect veneer technique with lithium disilicate provides good esthetic results, a thin film with good translucency and minimally invasive procedures. After 1 month, the veneer treatment was clinically evaluated, the results showed that the veneers were in good condition and there was no difference in discoloration, and most importantly the patient was satisfied with the results.

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