

Minimally Invasive Restoration of Fractured Maxillary Central Incisors with Partial Laminate Veneers- A Case Series

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ABSTRACT

Porcelain laminate veneers are one of the most preferred treatment methods today, due to the increasing interest in minimally invasive approach and their superior aesthetic properties. With the appreciation of the minimally invasive approach and the developing adhesive procedures, the partial laminate veneers have become more popular in the dental field. In this case series including three cases, the teeth were restored with partial laminate veneers by only intervening in the fractured area. In this case series, the teeth that were restored with partial laminate veneers were prepared with different techniques. Preparation was performed without bevel in enamel margin in case 1, with incisal overlap and bevel to create more natural transition on tooth surface in case 2. In case 3, preparation with incisal overlap was performed with preparation of the palatal surface of the tooth. The optical impression was made with the digital camera of the Chairside Economical Restoration of Esthetic Ceramic (CEREC) acquisition unit (Omnicam CEREC Sirona, Bensheim, Germany), in the first case. In the other cases, impression was taken with elastomeric impression materials. In addition, restorations were fabricated from feldspathic porcelain and lithium disilicate porcelain. In all the cases, restoration was cemented with resin cements. The following cases present the minimally invasive treatment of maxillary central incisors with partial laminate veneers fabricated from different ceramic materials. New materials, procedures, and techniques provide patients an improved quality of life and a greater self-esteem with creating a confident aesthetic smile.

Keywords: Aesthetic, Conservative dentistry, Minimal invasive, Partial veneer

INTRODUCTION

In recent years, minimal invasive treatment modalities have become more attractive in the dental field. Conventional restorations require preparation techniques to acquire mechanical retention. On the other hand, bonded restorations do not require extensive preparations [1]. Ceramic materials have high fracture resistance and colour stability. Due to these positive properties, ceramics are often preferred in clinical routine. Composite materials have excellent mechanical results too, but in comparison to ceramic restorations they have poor aesthetics [2].

Porcelain laminate veneers present improved aesthetics with minimal invasive approach. They can be indicated to correct tooth form, position, close diastemas, repair fractures or abrasions, and correct discolourations [3]. In addition to their excellent aesthetic properties, porcelain laminate veneers have good biocompatibility and low fracture rates. Consequently, it brings patient satisfaction over a long period of time [1]. This case series presents and discusses the minimally invasive treatment of single maxillary central incisor with porcelain partial veneer restorations.

CASE SERIES

Case 1

A 73-year-old male patient was referred to the Department of Prosthetic Dentistry. His complaint was the unaesthetic and fractured appearance of his maxillary right incisor due to dental trauma in September, 2018 [Table/Fig-1]. According to clinical and radiographic examination, the tooth was not cariously involved, had no lesions and enlarged periodontal spaces. According to dental trauma guidelines [4], the fracture was uncomplicated crown fracture which had not involved the pulp. Periodontal examination revealed that the patient's oral health was good. The treatment alternatives which include direct composite restorations, partial laminate veneers, laminate veneers, and full crown restorations were

discussed with the patient. It was decided to give partial laminate veneer treatment with ceramic materials.

The preparation was performed with chamfer shaped diamond bur (Hager & Meisinger GmbH, Neuss, Germany). Preparation was performed without bevel in enamel margin integrity in the facial surface. The incisal finish line reduction was performed with butt joint preparation design. Proximal reduction was kept just short of breaking the contact. The preparation was extended to smile line [Table/Fig-2].

After the preparation, the digital impression was taken with CEREC Computer-Aided Design and Computer-Aided Manufacturing (CAD/CAM) Systems (Sirona Dental Systems GmbH, Bensheim, Germany). Tooth shade was recorded with Vita 3D-Master (3D; Vita Zahnfabrik, Bad Sackingen, Germany) and transferred to digital system.

The restoration was fabricated with lithium disilicate porcelain (Ivoclar Vivadent, Schaan, Liechtenstein). Intaglio surface of the laminate veneer was etched with 9.5% hydrofluoric (HF) acid (Ultradent) for one minute and it was washed, and dried. Silane (Monobond N, Ivoclar Vivadent, Liechtenstein) was applied to the surface with microbrush for one minute. A thin layer of bonding (Heliobond, Ivoclar Vivadent, Liechtenstein) was applied and polymerised for 20 seconds.

The etching on the tooth surface was performed with a 35% phosphoric acid solution, ultra-etch (Ultradent); the tooth was rinsed with water for 40 seconds and dried. The bonding agent (Peak Universal Bond, Ultradent) was applied for 10 seconds. The restoration was cemented with Variolink N light cure. Residual cement was removed and polymerisation was completed with application of additional 40 seconds of curing light.

The restorations were finished and polished with a no.12 surgical blade and interproximal strips. The occlusion was adjusted with laminate tungsten carbide burs, rugby-ball 40 µm diamond burs, and silicon polishers [Table/Fig-3]. The patient had recall session two weeks after cementation. On 2-weeks follow-up, no changes in the restoration and cementation line were seen.



[Table/Fig-1]: Presents fracture at the incisal area at tooth 11; **[Table/Fig-2]:** Preparation of 11 for veneers; **[Table/Fig-3]:** Final view of partial laminate veneer.
Case 1: (Images from left to right)

Case 2

A 32-year-old female patient was referred to the Department of Prosthetic Dentistry, with complaint of fractured maxillary central incisor [Table/Fig-4]. The clinical and radiographic examination revealed that there was no caries lesion. Periodontal examination revealed that the patient's oral health was good. The treatment alternatives which include direct composite restorations, partial laminate veneers, laminate veneers, and full crown restorations were discussed with the patient. Non invasive advantages of partial laminate veneers were presented to the patient and were chosen as the treatment option.

The preparation was performed with chamfer shaped diamond bur (Hager & Meisinger GmbH, Neuss, Germany). Chamfer finish line of 0.4 mm maximum depth were made in facial surface. 1.5 mm of incisal reduction was done with palatal chamfer design which included incisal overlap reduction to improve translucency and to provide positive seat for luting. All the internal line angles were rounded to reduce stress in the margins of the veneers. The appropriate tooth reduction was verified with the use of silicone matrix [Table/Fig-5].

After the completion of the preparation, the impression was taken via additional type elastomeric impression material (Elite H-D, Zhermack, Germany). The restoration was fabricated with feldspathic porcelain (Ivoclar Vivadent, Schaan, Liechtenstein). Intaglio surface of the laminate veneer was etched with 9.5% HF acid (Ultradent) for 20 seconds, washed, and dried. Silane (Monobond N, Ivoclar Vivadent, Liechtenstein) was applied to the surface with microbrush and waited for one minute. A thin layer of bonding (Heliobond, Ivoclar Vivadent, Liechtenstein) was applied and polymerised for 20 seconds.

The etching on the tooth surface was performed with a 35% phosphoric acid solution, ultra-etch (Ultradent); the tooth was rinsed with water for 40 seconds and dried. The bonding agent (Peak Universal Bond, Ultradent) was applied for 10 seconds. The restoration was cemented with Variolink N light cure. Residual cement was removed and polymerisation was completed with application of additional 40 seconds of curing light.

The restorations were finished and polished with a no. 12 surgical blade and interproximal strips. The occlusion was adjusted with laminate tungsten carbide burs, rugby-ball 40 µm diamond burs, and silicon polishers [Table/Fig-6]. The patient had recall session

two weeks after cementation. At 2-weeks follow-up, no changes in the restoration and cementation line were noted.

Case 3

A 21-year-old male was referred to Department of Prosthetic Dentistry. The main complaint of the patient was the white spotted and flecked appearance of the central incisor tooth [Table/Fig-7]. This was because the patient had dental fluorosis. Two main sources of fluoride that likely lead to the increased occurrence of dental fluorosis are greater than 1 ppm in drinking water and dental products containing fluoride (e.g., toothpastes and mouthrinses if swallowed or fluoride supplements) [5]. The clinical and radiographic examination revealed that there was no caries lesion. Periodontal examination revealed that the patient's oral health was good. The treatment alternatives, which include direct composite restorations, partial laminate veneers, laminate veneers, and full crown restorations, were discussed with the patient. It was decided to give partial laminate veneer treatment with ceramic materials.

The preparation was performed with chamfer shaped diamond bur (Hager & Meisinger GmbH, Neuss, Germany). Chamfer finish line of 0.4 mm maximum depth were made in facial surface. Incisal reduction was done with incisal overlap to improve translucency and to provide positive seat for luting. All the internal line angles were rounded to reduce stresses in the margins of the veneers. The appropriate tooth reduction was verified with the use of silicone matrix [Table/Fig-8].

The restoration was fabricated with lithium disilicate porcelain (Ivoclar Vivadent, Schaan, Liechtenstein). Intaglio surface of the laminate veneer was etched with 9.5% HF acid (Ultradent) for 20 seconds, washed, and dried. Silane (Monobond N, Ivoclar Vivadent, Liechtenstein) was applied to the surface with microbrush and waited for one minute. A thin layer of bonding (Heliobond, Ivoclar Vivadent, Liechtenstein) was applied and polymerised for 20 seconds.

The etching on the tooth surface was performed with a 35% phosphoric acid solution, ultra-etch (Ultradent); the tooth was rinsed with water for 40 seconds and dried. The bonding agent (Peak Universal Bond, Ultradent) was applied for 10 seconds. The restoration was cemented with Variolink N light cure. Residual cement was removed and polymerisation was completed with application of additional 40 seconds of curing light.



[Table/Fig-4]: Presents fracture at the incisal area at tooth 11; **[Table/Fig-5]:** Preparation of 11 for veneers; **[Table/Fig-6]:** Final view of partial laminate veneer.
Case 2 : (Images from left to right)



[Table/Fig-7]: Presents fracture at the incisal area 21; **[Table/Fig-8]:** Preparation of 21 for veneers; **[Table/Fig-9]:** Final view of partial laminate veneer in Case 3. Case 3: (Images from left to right)

The restorations were finished and polished with a no.12 surgical blade and interproximal strips. The occlusion was adjusted with laminate tungsten carbide burs, rugby-ball 40 µm diamond burs, and silicon polishers [Table/Fig-9]. The patient had recall session two weeks after cementation. The restored teeth was healthy at 2-weeks follow-up.

DISCUSSION

The complaints of all the patients were same. Following different treatment plans were created for the patients requesting to have aesthetic smile with a minimal invasive treatment, a) Filling with a composite resin; b) Restoration with partial laminate veneers; c) Restoration with laminate veneer; d) Restoration with crown. The treatment options, which were restoring the tooth with conventional laminate veneer or crown were abandoned due to the need for more preparation of healthy structure of enamel [3]. The filling with composite resin would meet the short-term (instant) expectation of the patients, but it was not preferred due to the disadvantages such as short-term colour stability of the composite resins, loss of brightness due to low resistance to abrasion and the increase in the plaque accumulation due to the deterioration of the surface texture [6-8].

According to a study by Farias-Neto A et al., 180 samples of veneers (direct and indirect resin and porcelain) were cemented on anterior teeth, and after 2 years, the most satisfying treatment option was porcelain laminate veneers [9]. The minimal invasive treatments such as partial laminate veneers should be considered as the first treatment option as they allow preservation of dental tissue while providing highly satisfactory aesthetic results [9]. Laminate veneers are one of the minimal invasive treatment options. In the laminate veneer preparation, more enamel tissue is reducted compared to the partial laminate veneer preparation. In addition, preparation for crown restoration is not one of the minimal invasive treatment options. Therefore, in this case series, crown restoration was not suggested as a treatment option [1].

Feldspathic ceramics and lithium disilicate are two of the most used indirect restorative materials [10]. Lithium disilicate ceramics, besides the functional and aesthetic characteristics, have benefits such as greater fracture resistance when compared to feldspathic ceramics, providing their clinical longevity. In case 1, the lithium disilicate material was preferred, due to the patient's parafunctional habit, such as bruxism [11,12]. In addition, feldspathic ceramics are a good treatment option due to their biocompatibility with adjacent tissue, excellent aesthetics, high translucency, and colour stability. In case 2, the feldspathic ceramic material was preferred, due to its high translucency [13,14]. These two materials have wide colour variety, ability to mimic translucency and dental fluorescence, colour and brightness stability [15,16].

The results of an in-vitro study showed that increasing the IPS Empress porcelain thickness from 0.5 to 1.5 mm had no adverse effect on the light-cure and dual-cure resin cements. Thus, these cements can be used as luting agents for porcelain veneers with upto 1.5 mm thickness [17].

Besides, avoiding the need for anaesthesia and using the retraction cords for partial laminate veneers preparation is an advantage as it reduces the working time. Also, the necessary working time for positioning the restorations and removing the excess cement was conveniently shortened at the discretion of the clinician [2].

On the other hand, the cementation line between the dental structure and restoration may be visible. It is still discussed in the dental literature that the biggest downside of partial laminate veneer treatment is that the border may be unaesthetic. Therefore, partial laminate veneers can be one of the treatment options for the elderly who have been reported to present a low smile line, hence, preventing this border from being visible. Thanks to the considerable improvement of the aesthetic properties of the materials up-to-date, it allows to eliminate the disadvantage of unaesthetic appearance of cementation line in young patients who have high smile line [18].

CONCLUSION(S)

In these case presentations, the fractured half of maxillary central incisors were restored with porcelain laminate veneer restorations. Despite the aesthetic limitations of horizontal finish line in the middle of the clinical crown, the successful results can be achieved with the application of up-to-date highly aesthetic materials by experienced clinicians. This type of restoration can be used as an alternative to direct composite, laminate veneer, and full crown restorations in the anterior area for the restoration of a limited defect.

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