



A 7-Year Follow-up of a Fractured Endodontically Treated Incisor Restored with a One-Piece Post and Core Laminate Veneer

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ABSTRACT

To achieve natural-appearing aesthetic results and for the conservation of tooth structure, it is important for practitioners to be aware of technological advances in materials science as well as the proper use of aesthetic dental techniques. This clinical report describes the restoration of a left maxillary lateral incisor using a one-piece post and core laminate veneer. This proposed restoration technique represents an alternative to traditional restoration procedures, such as metal-ceramic restorations, all-ceramic crowns, and conventional porcelain laminate veneers. It also conserves the remaining tooth structure, reestablishes function, and offers satisfactory aesthetics with the use of adhesive bonding techniques.

Keywords: Endodontically-Treated Tooth; Dental Laminate; Esthetics; Conservative Treatment

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INTRODUCTION

The restorative material and the technique used for restoration of severely damaged teeth can be particularly important for endodontically treated teeth, which frequently need coronal prosthetic restorations [1,2]. Prior to the development of adhesive techniques, metal-ceramic restorations were thought to be the only valid approach for the prevention of fractures in endodontically treated teeth [1,2]. However, restoration of anterior teeth with metal-ceramic crowns can lead to compromised aesthetics due

to the limited translucency of metal-ceramic and opaque metal substructures [3]. Metal substructures may also show through the thin gingival tissue in cervical areas [4] and because of their corrosion, the corroded material can deposit on gingival tissues [5].

All-ceramic restorations are considered as alternative solutions to aesthetic problems that may arise with metal-ceramic restorations [3,6]. Preparation for ceramic crowns and metal-ceramic restorations is more time-consuming and involves more tooth reduction compared

to laminate veneer restorations. Currently, the use of adhesive techniques fulfills the need for adequate retention, preserving maximum remaining tooth structure [7]. However, it has been reported that a porcelain laminate veneer requires at least 50% of the intact enamel surface area to maintain adequate resistance and retention [8]. Sorensen et al [9] stated that when more than 50% of the intact enamel surface area has been lost due to excessive decay or access cavity preparations for endodontic treatment, laminate veneer restorations may have some limitations regarding retention and resistance. As a result, coronal posts were introduced to provide additional retention in such clinical situations [7]. Coronal posts consist of a single-unit porcelain laminate veneer and a short ceramic post that extends into the root canal orifice [10]. Some studies suggest that contraindications for the coronal post technique are a combination of parafunction, large areas of exposed dentin, and insufficient dental tissue [11-14].

This clinical case report describes the restoration of an endodontically treated anterior tooth using a single-unit all-ceramic coronal post and laminate veneer.

CASE REPORT

A 26-year-old man, who had a car accident resulting in bone and tooth fractures, referred for treatment. Clinical and radiological examinations revealed loss of periodontal support, extrusion of the left maxillary central incisor, and fracture of the middle third of the left maxillary lateral incisor crown (Fig. 1).



Fig. 1. Patient's intra oral condition after an accident

The central incisor had to be extracted, and the lateral incisor needed root canal therapy due

to the loss of vitality. Implant placement and modified laminate veneer restoration were chosen as definite treatments for the central and lateral incisors, respectively.

The stages of the treatment plan for the central incisor were as follows:

After tooth extraction, periodontal surgery was performed to provide an appropriate amount of soft and hard tissues in the aesthetic zone. Figure 2 shows the difference in soft and hard tissues after periodontal surgery. After eight weeks, an implant was placed at the site of the central incisor.



Fig. 2. Difference in soft and hard tissue after the periodontal Surgery

The stages of the treatment plan for the lateral incisor were as follows:

A week after root canal therapy of the lateral incisor, 2 mm of the coronal segment of gutta-percha as well as the excess endodontic cement were removed with #4 and #5 Gates Glidden drills (Mani, Tochigi, Japan).

After shade selection using the VITA Toothguide 3D-MASTER, the tooth structure was prepared for a resin-bonded one-piece post and core porcelain laminate veneer restoration. A 0.2- to 0.5-mm-thick layer of the enamel on the labial surface was removed using a round end diamond bur (Tizkavan, Tehran, Iran) mounted on a high-speed, water-cooled handpiece.

The preparation of the distal aspect of the tooth was elbow-shaped; therefore, the distal contact would not open. The mesial preparation extended to the palatal surface but the contact of the opposing tooth was kept on enamel and did not involve the finishing line or the porcelain structure. Finally, all the sharp angles were slightly rounded (Fig. 3).



Fig. 3. Preparation of right lateral incisor for one-piece feldspathic coronal post and laminate veneer restoration

The coronal part of the root canal was reshaped to be parallel with the path of insertion of the laminate veneer. The final impression was taken using a polyvinyl siloxane material (Panasil; Kettenbach GmbH & Co. KG, Eschenburg, Germany), while the impression of the opposing arch was made using an irreversible hydrocolloid material (Viralgin; Zeus S.r.l., Prodotti Dentari S.p.a., Moncalieri, Italy).

The access cavity was temporarily filled with non-eugenol Cavit (3M ESPE, Seefeld, Germany); there was no need for an interim prosthesis due to the minimal tooth reduction and short waiting time prior to restoration placement. Feldspathic porcelain (Ceramco-III; Dentsply, Burlington, NJ, USA) was used to fabricate the restoration. The final restoration was tried-in for shade, fitness, marginal adaptation, and contacts. The restoration was cemented (Choice 2 veneer cement. Bisco Inc., Schaumburg, IL, USA) according to the manufacturer's guidelines. The inner surface of the ceramic restoration was etched with 9.5% hydrofluoric acid (Porcelain etchant; Bisco Inc., Schaumburg, IL, USA) for 90 seconds, rinsed with an ultrasonic device for 3 minutes (Tecno-Gaz S.p.A., Parma, Italy), and thoroughly air-dried. A layer of silane (Bis Silane; Bisco Inc., Schaumburg, IL, USA) was applied for 30 seconds and then air-dried. Unfilled resin (porcelain bonding resin; Bisco Inc., Schaumburg, IL, USA) was then applied with a brush and was subsequently thinned with air.

The prepared tooth surfaces were etched for 15 seconds with 37% phosphoric acid (Uni-Etch; Bisco Inc., Schaumburg, IL, USA), and

were then rinsed thoroughly and lightly dried. Then, 1-2 coats of All Bond 2 (Bisco Inc., Schaumburg, IL, USA) were applied to dentin and enamel, air-dried for 10 seconds, and then cured with light-emitting diode (LED) curing light (Guilin Woodpecker Medical Instrument Co., Ltd., Guangxi, China) at the light intensity of 900 mW/cm² for 10 seconds. A dual-cure cement (Duolink; Bisco Inc., Schaumburg, IL, USA) was placed on top of the coronal post, and a translucent light-cure cement (Choice 2 veneer cement; Bisco Inc., Schaumburg, IL, USA) was applied to the inner surfaces of the restoration. The restoration was then inserted and cured for 5 seconds, and then, the excess cement was removed. Polymerization of the luting agent was completed by light-curing each surface of the restoration for 60 seconds. Finally, the occlusion was checked (Fig. 4 and 5).



Fig. 4. Reshaped natural tooth



Fig. 5. Bonded central incisor natural tooth crown and one-piece post and core laminate veneer for lateral (Labial view)

Silicone-based polishing points (Composite Polishing Kit; Shofu Dental GmbH, Ratingen

Polishing Kit; Shofu Dental GmbH, Ratingen, Germany) were used to polish the marginal areas while finishing strips (Sof-Lex 1954N-1956; 3M ESPE, Seefeld, Germany) were used in interproximal areas.

After extraction, the central incisor was placed in normal saline until the healing of the site of periodontal surgery. An implant (XiVE®, DENTSPLY Friadent, Mannheim, Germany) was placed at the site of the central incisor in two stages. Then, the root of the natural tooth was cut, and its crown was reshaped to be used as a provisional long-term restoration as well as a gingival former to shape the papilla in the aesthetic zone (Fig. 6). The natural tooth crown was bonded to the adjacent central incisor using resin composite (Premise, Kerr Corp., Orange, CA, USA).



Fig. 6. Palatal view of the bonded central incisor natural tooth crown and the one-piece post and core laminate veneer for the lateral incisor

Six months after implant placement, the natural tooth crown was removed, and the prosthetic crown of the implant was delivered (Fig. 7 and 8).



Fig. 7. Patient's smile before treatment



Fig. 8. Patient's smile after treatment

After seven years of follow-up, there was no marginal discoloration in the laminate veneer crown, and color stability was satisfactory. There were no debondings or abrasions in the mandibular teeth and no recession in the soft tissue around the implant. The level of the periodontium was preserved in a good position (Fig. 9).



Fig. 9. Patient after 7 years follow-up

DISCUSSION

Several treatment options have been proposed to restore the aesthetic appearance of the dentition. New developments on all-ceramic systems and adhesive bonding techniques have resulted in enhanced aesthetics and have created new means of looking at resistance and retention properties of the final restorations [15]. Moreover, the importance of conserving the remaining tooth structure has become an advocated concept [8].

Bonded porcelain veneers have a number of significant advantages over metal-ceramic and all-ceramic crowns [16]. One of the most important advantages is that they are extremely conservative in terms of tooth structure. Metal-ceramic crowns require a reduction of 1.2 mm of tooth structure on the labial surface and 1 mm on the lingual surface. Most all-ceramic restorations require 1.5 mm of reduction circumferentially around the tooth. Bonded veneers require only 0.2 to 0.5 mm reduction on the labial surface and usually none on the gingival two-thirds of the lingual surface [17]. It has become increasingly apparent that conservation of tooth structure is a major factor in determining the long-term prognosis of any restorative procedure and that the extensive reduction of tooth structure required for conventional restorations is a major contributing factor in the rather high long-term failure rate often experienced [18]. Another remarkable advantage of porcelain veneers is their durability [14] as shown in this case with a 7-year follow-up. A significant number of long-term clinical studies confirm the excellent durability of porcelain laminate veneer restorations [19]. As long as sufficient tooth structure remains to provide adequate support for the bonded porcelain and sufficient enamel remains for retentive purposes, the incidence of fracture is very low. This may well be a result of the tooth's ability to resist flexure because of the minimal tooth reduction required; more research is necessary in this respect [20].

An additional major advantage of this treatment plan is the outstanding response of the periodontium [21,22]. This is primarily

because the restorations can blend indiscernibly with the cervical tooth structure, thereby allowing the cervical margins to be kept in a supragingival position [23].

It is important that the clinician understand the limits of the porcelain veneer restoration in improving aesthetics with extremely dark stained teeth, such as in severe tetracycline staining. With less severe staining, good results with porcelain veneer restorations can be obtained with slightly more aggressive tooth preparations. It is important to keep in mind that porcelain laminate veneers have definite limitations [12,13]. They should not be used when insufficient enamel remains to provide adequate retention. The prognosis for veneers in bruxing patients has been the subject of much speculation. Certainly, bruxing patients should be instructed to use a night guard after the final restoration [24].

Resin composite veneers also can be used to mask tooth discolorations and/or to correct unaesthetic tooth forms and positions. Although composite resins are aesthetic and easy to manipulate, such restorations have limited longevity because of their undesired properties such as staining, microleakage, low abrasion resistance, and plaque accumulation, while porcelain veneers have a high abrasion resistance and color stability [25]. The coronal post in this case, in addition to increasing the mechanical retention, eliminates the post and its complications. As previous studies reported an increase in the failure rate for porcelain veneers placed over existing resin composite restorations [26], the use of a coronal post, in this case, omitted the improper bond between laminate and composite in the access cavity.

CONCLUSION

The fabrication of a one-piece post and core laminate veneer restoration provided this patient with satisfactory longevity (7 years), aesthetics, and function. This procedure suggested an alternative treatment modality by conserving the remaining tooth structure of the endodontically treated teeth and achieving an excellent result in replicating the natural state of the dentition.

CONFLICT OF INTEREST STATEMENT

None declared.

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