Case Report

Ceramic Laminate Veneers Luted with Preheated Resin Composite: A 10-Year Clinical Report

Abstract

Resin cement and preheated restorative resin composite may be used for luting laminate veneers. The main advantage of resin composite is increased wear resistance, which could lead to better marginal performance in long term. This article reports a clinical treatment with feldspar laminate veneers luted to the maxillary teeth with preheated resin composite in a private practice. Case was finalized in May 2009 and followed by 10 years. Excellent clinical service and remarkable long-lasting marginal integrity were observed after 123 months. Scanning electron microscopy analysis showed no wear, gaps, or ditching at the margins. Restorative margins showed a smooth transition between ceramic and tooth with no signs of degradation. Preheated resin composite for luting ceramic laminate veneers may be considered an excellent clinical option.

Keywords: *Dental porcelain, dental veneers, longevity, resin composites, scanning electron microscopy*

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Introduction

Ceramic laminate veneers are widely used for esthetic restorations. Clinical studies report survival rates above 80% in up to 20 years of follow-up.[1-3] In addition to ceramic cracking, chipping and fractures, the main reported reasons for failures of ceramic laminate veneers are related to marginal adaptation, integrity, and/or discoloration.[1-3] It is known that patient-specific risks and variables influence the success of laminate veneers. For instance, smoking and the presence of endodontic treatment have been associated with increased marginal discoloration.[1,4] Marginal failures also could be associated with the resin-based luting agent used. A recent prospective trial of laminate veneers up to 11 years reported low rates of marginal failures.[4] It is speculated that such a finding is explained by the use of preheated resin composite to lute the laminate veneers, but that was not the focus of the study. The report by Friedman[5] is likely the first on the use of restorative resin composite as a luting agent, but no preheating was described by the author. Preheating is necessary to reduce viscosity and film thickness,[6] which are of particular importance for thin restorations. As compared with resin cements, restorative composites have the advantage of increased filler loading, wear resistance, and mechanical strength. Less marginal ditching has also been suggested.[7] These characteristics, in the long term, could reflect in less marginal problems and staining. The objective of this article is to report a clinical treatment in which ceramic laminate veneers were luted to the maxillary anterior teeth with preheated resin composite and showed excellent clinical service and remarkable marginal integrity after 123 months of follow up.

Clinical Report

The CARE guideline was used for this report.[8] A 28-year-old female patient had a complaint about esthetics in her maxillary anterior teeth. The six maxillary anterior teeth had complete or partial resin composite veneers including a diastema closure [Figure 1a]. Restorations had problems of chipping and minor fractures, staining, surface roughness and texture, and loss of surface gloss [Figure 1b and c]. The anamnesis appointment took place in May 2009. The patient reported that the treatment had been finalized 6 months

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before and asked for longer-lasting restorations. The use of ceramic laminate veneers was proposed for eight maxillary teeth to widen the buccal corridor and because the first premolars had a gingival recession. Potential risks were discussed with the patient, who agreed with the treatment. A double impression technique with polyvinylsiloxane (PVS) (Panasil Putty and Light, Kettenbach, Eschenburg, Germany) was made for obtaining stone cast models, from which the occlusion was analyzed on articulator and a diagnostic waxing was created. Tooth preparation was carried out with K0082 Magne bur system (Brasseler, Georgetown, GA) over the direct resin composites with little (if any) extension into the underlying enamel. Refining was carried out ultrasonically with diamond tips (T9 and T10; Sonicflex, KaVo, Biberach, Germany). Figure 1d shows the definitive teeth preparations. A double impression with PVS (Panasil) was made. Mockup and provisional restorations were created with acrylic resin (New Outline; Anaxdent, Stuttgart, Germany).

Feldspar laminate veneers (IPS d.SIGN; Ivoclar Vivadent, Schaan, Liechtenstein) with thicknesses between 0.2 and 0.4 mm were created using a layering technique [Figure 2a and b]. For luting, the intaglio ceramic surfaces were etched with 9.5% hydrofluoric acid for 60 s (Porcelain Etchant; Bisco, Schaumburg, IL, USA), cleaned with phosphoric acid for 15 s (Ultra Etch; Ultradent, South Jordan, UT, USA), silanated (Bis-Silane; Bisco), and filled adhesive from a 3-step system (OptiBond FL; Kerr, Brea, CA, USA) was applied. The operative field was isolated using a modified rubber dam technique. Enamel was etched with phosphoric acid gel for 30 s and the same adhesive used. Compules of resin composite Filtek Z250, shade A1 (3M ESPE, St. Paul, MN, USA) were preheated to 68°C for 10 min (Calset warmer; AdDent, Danbury, CT, USA) and used as luting material. The composite was applied to the veneers with Centrix syringe, restorations were positioned on prepared teeth, and seating hand pressure applied. Excess resin composite was removed and photoactivation was carried out for 60 s with a LED unit (Radii 2; SDI, Bayswater, Australia). Finishing was carried out with scalpel blades and polishing with diamond polishers (D.Fine; Clinician's Choice, New Milford, CT, USA). Figure 3a and b show clinical pictures after luting (same day).

Figure 1: (a) Patient had complete or partial resin composite veneers in maxillary anterior teeth including diastema closure. Restorations had problems including chipping, fractures, staining, surface roughness and texture, and loss of surface gloss. (b) The patient smile with lips and cheeks retracted. (c) Maxillary teeth with a black background. (d) Low-invasive teeth preparations

After 21 days, occlusion was rechecked and the treatment was finalized. The patient returned for follow-up appointments after every 18–24 months. The last follow-up visit was in June 2019, i.e. 123 months after the treatment was finalized. Pictures and a PVS impression were made (Elite Putty and Regular; Zhermack, Badia Polesine, Italy). The mold was poured with epoxy resin (Fiberglass, Porto Alegre, Brazil) for observation of the restorations using scanning electron microscopy (SEM) (JSM6610; Jeol, Tokyo, Japan). The biological, esthetic, and mechanical success of the treatment was clinically evident [Figure 4a ,b and c]. Figure 5 presents an overlapping between clinical and SEM pictures to show that the restorative margins had no gaps nor signs of deterioration, marginal ditching, wear, or staining. SEM images of the laminate veneer bonded to the maxillary right central incisor [Figure 6a and b] show the integrity of tooth-composite-ceramic interface after 123 months of clinical service. No wear, gaps, or any signs of degradation were observed at the margins, which showed a smooth transition between substrates. A cone-beam computed tomography image of the same tooth [Figure 6c] showed excellent adaptation of the laminate veneer; one can also notice the thickness of resin composite layer at the bonded interface. Both patient and dentist were well satisfied with the excellent, long-lasting results. The patient signed an informed consent term to allow reproduction of images.

Discussion

Reports on the use of preheated resin composite as luting agent for laminate veneers are available, but this is the first with a clinical follow-up time longer than 5 years and with a close analysis on marginal integrity. Exceptional long-term biological, esthetic, and mechanical results were observed, notably regarding the absence of any marginal deterioration and maintenance

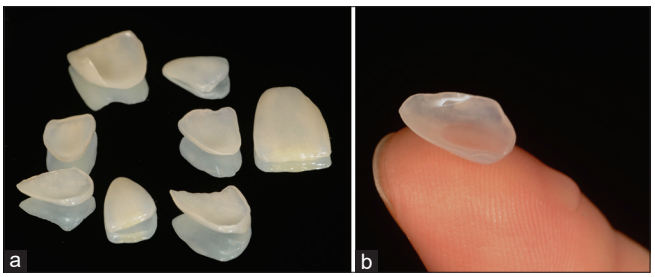

Figure 2: (a) Laminate feldspar ceramic veneers (IPS d.SIGN) with thicknesses between 0.2 and 0.4 mm were created using the layering technique. (b) Translucent, thin aspect of restoration

of a smooth ceramic-tooth transition. The same could happen for other restoration types, provided that the restoration allows adequate light transmission for photopolymerization. Benefits of resin composites over resin cements as luting agents include more shades available, lower polymerization shrinkage/stress, and improved mechanical strength.

The main shortcoming usually reported for preheated resin composites is higher film thickness. A recent study showed that selection of resin composite should consider its response to preheating since viscosity, flowability, and even the reinforcing effect provided to thin ceramic structures are material dependent.[6] Since that information was not available at the time the present treatment was conducted, perhaps the resin composite used was not the best in terms of response to preheating. That did not preclude an excellent marginal and internal adaptation, and a long-lasting clinical service. One should note that an optimal preheating temperature (68°C) and time (10 min) were used, different preheating approaches could lead to distinct results. Maintaining the temperature and gained flowability is a challenge because heat dissipation occurs fast after preheating is ceased. Heating devices also offer the possibility of warming up the ceramic laminate veneers, which could reduce heat dissipation. In addition, up-to-date clinical luting approaches with preheated resin composite include an ultrasonic activation step to further increase flowability and reduce film thickness. Taking all into account and considering the excellent long-term clinical service reported here, preheated resin composite may be considered an excellent clinical option for luting ceramic laminate veneers.

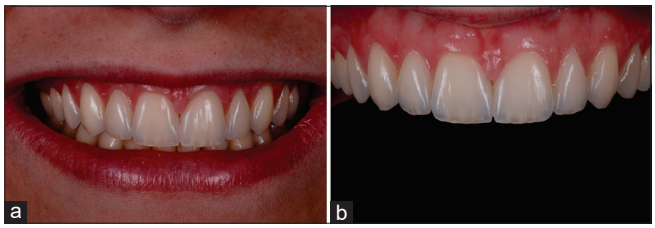

Figure 3: (a) Clinical aspect of ceramic laminate veneers after luting to prepared teeth with preheated resin composite (same day of luting). (b) Maxillary teeth with black background

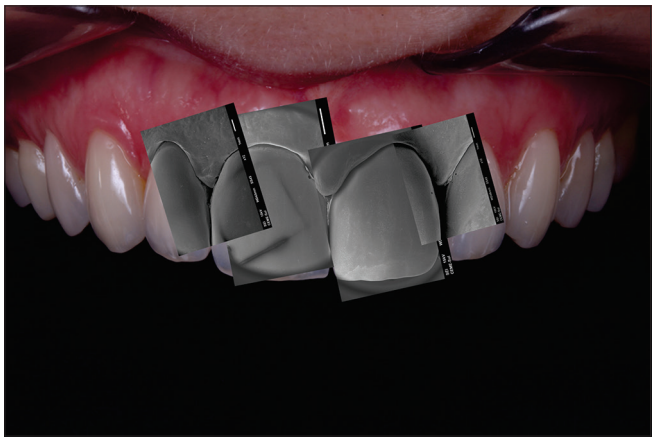

Figure 5: Overlapping between clinical and scanning electron microscope images (×12). Restorative margins showed no gaps nor signs of deterioration, wear, ditching, or staining during 123 months of clinical service

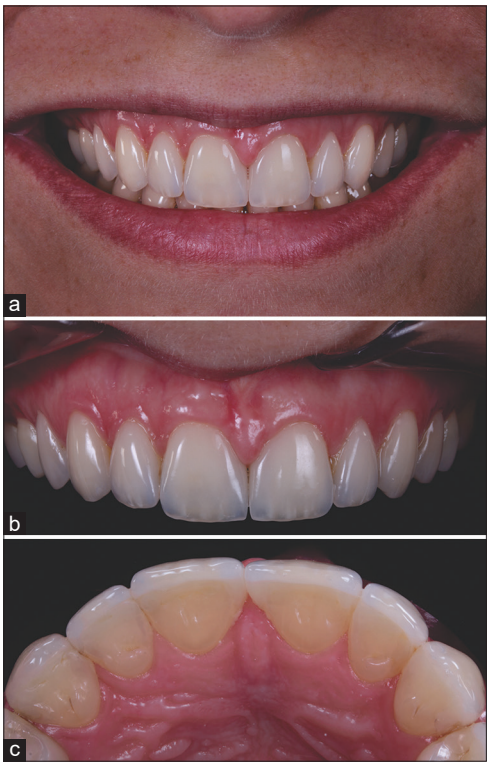

Figure 4: (a) Ceramic laminate veneers showed remarkably good clinical performance and aspect after 123 months of clinical service, with no signs of marginal deterioration, marginal ditching, or staining. (b) Maxillary teeth with a black background. (c) Palatal view of maxillary anterior teeth

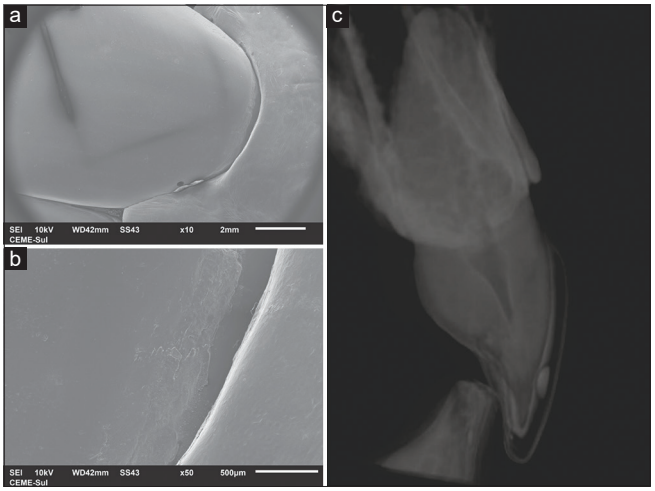

Figure 6: (a) Scanning electron microscope images of ceramic veneer bonded to maxillary right central incisor after 123 months of clinical service. (b) Tooth-resin composite-ceramic interface had no wear, gaps, or any sign of degradation, with a smooth transition between substrates (a) ×10; (b) ×50. (c) Cone-beam computed tomography image of same tooth showing excellent adaptation of ceramic veneer

Conclusion

Preheated resin composite for luting ceramic laminate veneers may be considered an excellent clinical option since no signs of marginal degradation or staining was observed after 10-year of clinical service. The smooth marginal transition between ceramic, luting agent, and tooth and the absence of marginal gaps and ditching indicate that the restorative resin composite was able to withstand the abrasive and surface challenges imposed by the oral environment in the long term.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understands that name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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