Prefabricated Composite Veneers: Historical Perspectives, Indications and Clinical Application

Didier Dietschi, DMD, PhD, Privat-docent
Senior lecturer, Department of Cariology & Endodontics,
School of Dentistry, University of Geneva, Switzerland
Adjunct Professor, Department of Comprehensive Dentistry,
Case Western University, Cleveland, Ohio
The Geneva Smile Center clinic and education center, Geneva, Switzerland

Alessandro Devigus, DMD
Private practice and education center, Bülach, Switzerland

Correspondence to: Didier Dietschi
Dept. of Cariology & Endodontics, School of Dentistry, 19 Rue Barthélémy Menn, 1205 Geneva, Switzerland;
tel: +41.22.38.29.165/150, fax: +41.22.39.29.990; e-mail: ddietschi@medecine.unige.ch

Abstract

Veneering anterior teeth is a well-established technique, which was brought to Dentistry by Dr Pincus as early as 1937. From the mid nineteen-seventies, boosted by the development of composites and adhesive techniques, various concepts emerged including direct composite restorations, prefabricated composite veneers and of course, individualized porcelain indirect veneers. The prefabricated composite veneer option was however quite soon abandoned due to former technological limitations. Recently, the creation of a new shade guide comprising enamel shells revitalized this "old idea", and in combination with a high pressure and temperature molding process followed by a laser surface vitrification, a novel, improved composite prefabricated system (Venear, Edelweiss-dentistry) was born. This paper overviews the potential indications and clinical protocol of this original veneering technique.

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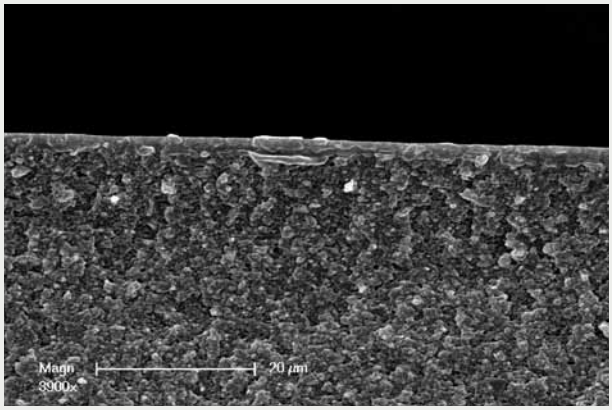


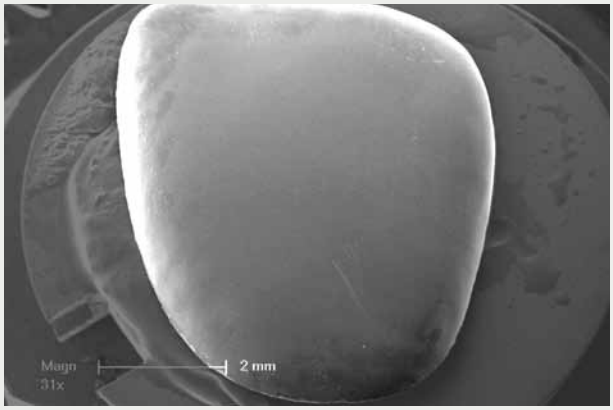


Fig 1 and 2 Section (1) and surface (2) of the Edelweiss veneer showing the inorganic vitrified restoration surface, providing optimal surface gloss.

Historical perspectives and development

While the "invention" of veneering anterior teeth by Dr. Pincus[1] was presented in 1937, it became more popular in the mid-seventies, using three different approaches: direct bonding using resin composites, prefabricated composite veneers and indirect, custom-made porcelain veneers.[2-4] The pre-fabricated composite veneer (Mastique®, Caulk) was then explored about 35 years ago, using a methyl-methacrylate matrix and large glass fillers, such as used in resin composites[3-4] but with limited success due to technological limitations and poor surface qualities.[5] The breakthrough in porcelain veneering techniques happened with the development of ceramic etching and true adhesive cementation as developed by Rochette (1975)[6] and thereafter improved by Calamia and Simonsen (1983).[7] From there, this technique underwent considerable success and development over the following years until today. The rapid loss of surface gloss and surface degradation of prefabricated resin veneers linked to some interfacial defects led the system to be soon abandoned and definitely replaced by porcelain veneers, which also had the advantage of an individual fabrication process.

More recently, an innovative shade guide was developed to allow the combination of all dentin and enamel shades in the context of the "natural layering concept";[8] this concept is based on a two layer incremental technique, mimicking the anatomy of natural teeth.[9] The shade guide consists of enamel shells into which the dentin samples are inserted, and then allow the practitioner to foresee the result produced by the combination of any selected dentin-enamel shades. When a proper match between the shade guide and contra-lateral or reference tooth is obtained, a predictable esthetic result and restoration optical

integration is ensured. Based on a technology comparable to the one used to produce the enamel shells of this shade guide, the concept of pre-fabricated composite veneers was recently revitalized taking advantage of new technologies.[10] The so-called Direct Venear® system (Edelweiss-dentistry, Hoerbranz, Austria) was recently launched and is based on high pressure molding and heat curing processes, followed by laser surface vitrification (Figs 1 and 2). This enables the veneers to exhibit a hard and glossy surface, with a texture to fit the majority of dentitions. The system is actually aimed to facilitate the esthetic restoration of decayed or discolored single and multiple anterior teeth.

Indications

The aforementioned direct composite veneer system does not aim to systematically replace the well established individualized porcelain veneer technique; but rather offers an alternative to directly (or free hand) built up composite veneers, which is a delicate and time consuming technique (Figs 3-5). Composite prefabricated veneers present an obvious potential in the following indications:

1) Single facial restorations:

- large restorations/decays with loss of natural tooth buccal anatomy/color
- non vital, discolored teeth
- traumatized, discolored teeth (without endodontic treatment)
- severe/extended tooth fracture
- extended tooth dysplasia or hypoplasia.

Fig 3 Preoperative view of a patient showing moderate to severe front tooth wear; despite the significant tissue destruction, a micro-invasive treatment approach was selected using prefabricated composite veneers.

Fig 4 Set of prefabricated composite veneers featuring a vitrified inorganic surface with high gloss.

Fig 5 Post-operative view showing the good esthetic and functional integration of cemented restorations.

2) Full smile facial rehabilitations:

- moderate to severe discolorations (i.e.: tetracycline staining and fluorosis)
- generalized enamel hypoplasia/dysplasia (i.e: amelogenis imperfecta IIIA, …)
- large serial restorations/decays with loss of natural tooth buccal anatomy/color
- attrition of incisal edges (after proper occlusal and functional management)
- financial limitations
- young patients with immature gingival profile.

In fact, the aforementioned indications cover the accepted application field of "classical" veneers, while other mere cosmetic indications are to be considered really controversial with this technique. The whole spectrum of esthetic procedures embraces four different types of treatments:

Table 1 The whole spectrum of esthetic procedures embraces four different types of treatments.

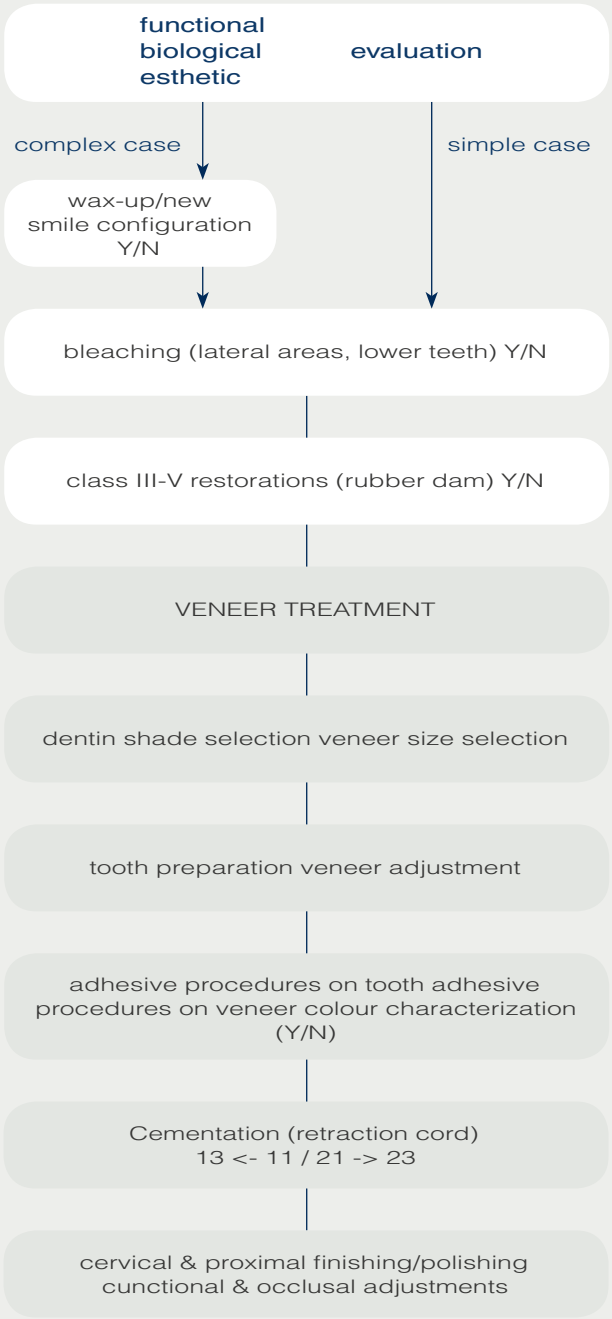
Treatment approach	Usual procedures
Non-invasive	Bleaching, microabrasion, orthodontics
Minimally-invasive	Direct composites, enamel recontouring
Micro-invasive	Veneers, inlays and onlays
Macro-invasive	Crowns and bridges

Then, non-invasive or minimally-invasive techniques such as orthodontics, bleaching and direct bonding show their best potential when an esthetic enhancement of virgin and healthy teeth is considered; here, veneering techniques have to be considered sub-optimal, especially when treating young patients.[11] The other major advantage of this "different" veneering approach is the relatively cost-effective and straight-forward solution featuring a "one appointment" treatment; however, this should not be considered as there are arguments which would over-rule proper bio-mechanical judgment or the relative "drawbacks" of indirect, custom-made ceramic veneers. In fact, this new, alternative treatment option falls fully in the aforementioned "bio-esthetic concept".[11]

Comprehensive clinical protocol and treatment sequence

The case preparation for prefabricated composite veneers does not differ from other functional and esthetic treatments. Actually, as soon as initial therapy was completed and proper prophylaxis measures engaged, the treatment approach and sequence will develop as depicted in the following chart:

Table 2 Treatment approach and sequence.



Preliminary evaluation of fatigue resistance of prefabricated composite veneers

An SEM evaluation of marginal and internal adaptation of Edelweiss composite veneers was conducted to evaluate the resistance to mechanical loading of the vitrified surface and adhesive interfaces (restoration to luting composite and luting composite to enamel or dentin). For this purpose, minimally invasive veneer preparations were performed (n = 5), which approximately corresponded to the dimensions of medium, maxillary central incisor prefabricated veneers (Veneer Upper Size Medium); the preparation was about half in enamel and half in dentin. After cementation, the samples were stored in saline for 24 h before the stress test was carried out. All specimens were submitted to 1,000,000 cycles with 100 N occusal loading force, applied on the occlusal restoration margin. The axial force was exerted at a 1.5 Hz frequency following a one-half sine wave curve. These conditions are taken to simulate about four years of clinical service.[12,13]

Results have shown overall an excellent performance of the restorations, under simulated functional loading. Almost no defect was observed either before or after loading at both enamel and dentin margins. The most relevant demonstration of the satisfactory behavior of tested prefabricated veneers was obtained with the evaluation of restoration internal adaptation. Actually, there was no defect found at the interface with enamel or in-between luting cement and the veneer, which confirms the excellent bond strength at either composite-enamel

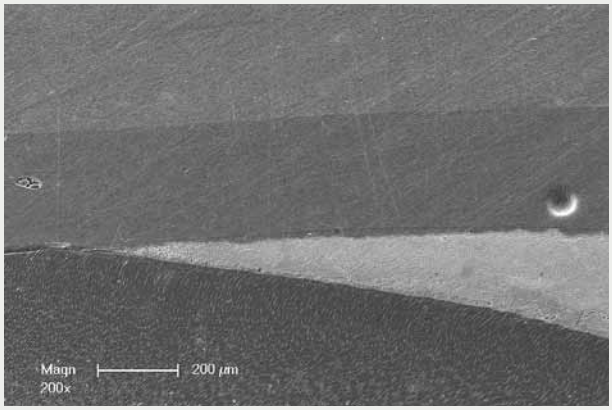
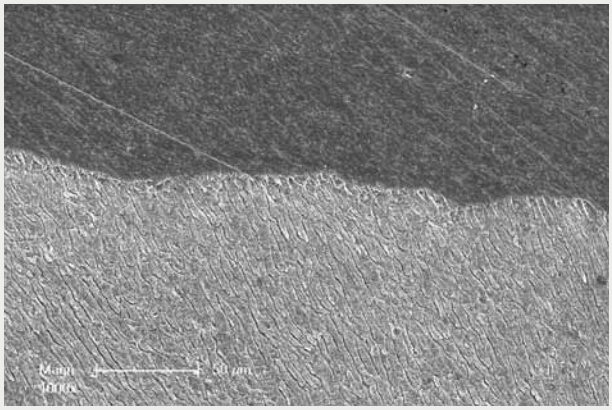
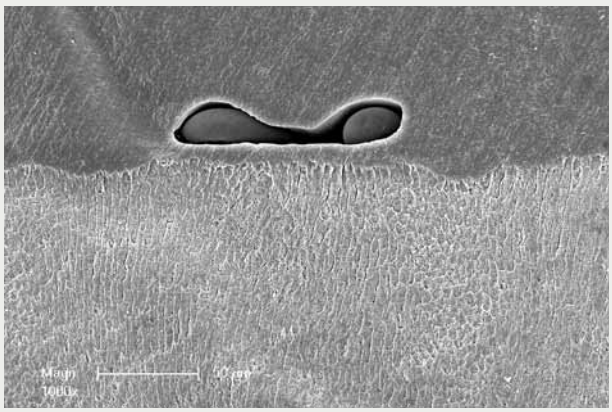


Fig 6 View of the transition area, from enamel to dentin. The composite-composite interface is also visible and shows that this interface is stable and resisted perfectly to occlusal loading.



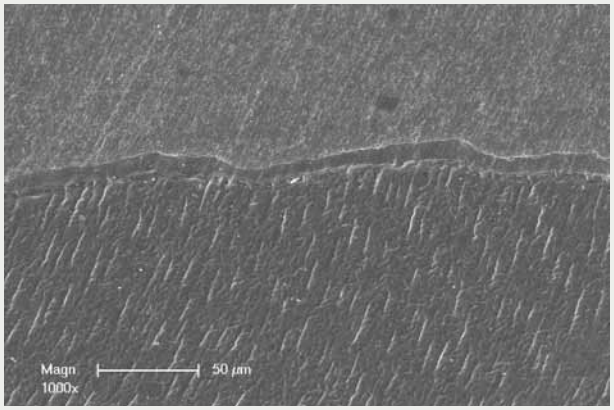


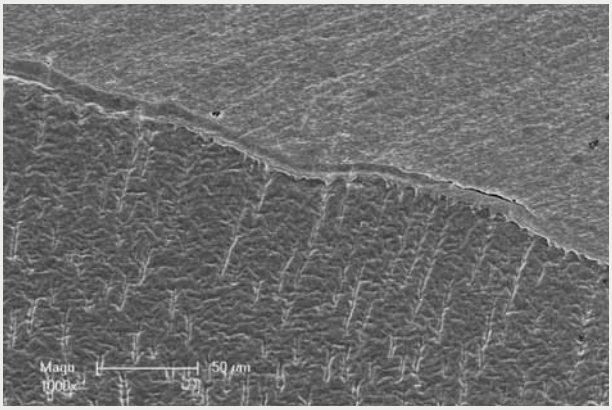
Figs 7 and 8 The interface with enamel proved to be free of any defect after the loading test, as shown on the image below (7). Only a few bubbles were observed but which did not affect the adaptation (8).

or composite-composite interfaces. At the dentin level, minor defects were observed but which all together account for an insignificant proportion of the overall dentin-luting composite interface.

Case report

A young female patient born in 1976 consulted with a complaint about two dark front teeth. The discoloration of teeth 11 and 21 was the result of an endodontic treatment she received after an accident that happened several years ago. Different treatment options were discussed with the patient but an internal bleaching of the discolored teeth followed by ceramic laminate veneers was considered a "state of the art treatment" for such a case. On the one hand, the patient could not consider this option because of economic limitations but on the other hand wished to change the color and form of her incisors as quickly as possible for an already planned video recording. Then, it was decided to go for an immediate long term temporary solution using prefabricated composite veneers to cover the dark tooth structure and to enhance the anatomy of the existing teeth. The aforementioned clinical protocol was followed to restore these two incisors.





Figs 9 and 10 The adaptation to dentin was also highly satisfactory after loading test (9). Only negligible proportions of interfacial defect (gaps) was observed (10).

Conclusions

The concept for prefabricated composites veneers was introduced in dentistry about 35 years ago with rather limited success due to former technological limitations. As a result, this interesting treatment option was replaced by an increase in the porcelain veneering technique. This "old" idea has been recently revisited by taking advantage of modern technology via the introduction of a surface laser vitrification for the first time; enabling the production of a resistant, inorganic glossy surface. However, this rejuvenated technique shall not replace conventional "custom-made" ceramic veneers, but rather offers the clinician a one-visit, cost-effective alternative to directly (or free hand) built-up composite veneers. This system may also allow us to fill in gaps within our treatment armamentarium with obvious and interesting application potential, such as the treatment of young patients with localized or generalized hypoplasia/dysplasia, discoloration and in general, when a long-term temporary and highly-esthetic solution is needed.

With the exception for the need to individualize the cervical profile and possibly the proximal and incisal edges, the overall preparation and cementation procedures are for the most part very similar to those applied for indirect porcelain veneers, which keeps the learning curve for this technique to a minimum. Another advantage for both the patient and the dental team is of course the fact that no temporaries are needed. With regards to the internal surface treatment, these restorations are handled identically to composite inlays and onlays, which eliminate the need to acquire additional material or products, which is also of practical interest.

In conclusion, the prefabricated composite veneer is likely to establish itself as the modern and improved version for direct composite veneers.

Figs 11 and 12 Initial situation showing discolored incisors due to endodontic treatment and old composite build up performed after an accident happening several years before.

Fig 13 Bonded composite veneers. The discoloration is almost invisible and the integration in the surrounding tissue is clinically acceptable.

Acknowledgments

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Figs 14 and 15 Post-operative smile views with enhanced esthetics using simple, one-session prefabricated veneers to restore the two non-vital discolored central maxillary incisors.

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