



Direct anterior composite veneers in vital and non-vital teeth: A retrospective clinical evaluation



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ABSTRACT

Objectives: This retrospective, longitudinal clinical study investigated the performance of direct veneers using different composites (microfilled × universal) in vital or non-vital anterior teeth.

Methods: Records from 86 patients were retrieved from a Dental School clinic, comprising 196 direct veneers to be evaluated. The FDI criteria were used to assess the clinical evaluation. The survival analysis was done using Kaplan–Meier method and Log–Rank test. The multivariate Cox regression with shared frailty was used to investigate the factors associated with failure.

Results: A total of 196 veneers were evaluated, with 39 failures. The mean time of service for the veneers was 3.5 years, with a general survival rate of 80.1%. In the qualitative evaluation of the restorations, microfilled composite showed slightly better esthetics. The annual failure rates (AFR) were 4.9% for veneers in vital teeth and 9.8% for non-vital teeth with statistical significance ($p = 0.009$). For microfilled and universal veneers the respective AFRs were 6.0% and 6.2% ($p > 0.05$). Veneers made in non-vital teeth had a higher risk of failure over time compared to those made in vital teeth (HR 2.78; 95% CI 1.02–7.56), but the type of material was not a significant factor ($p = 0.991$). The main reason for failure was fracture of the veneer.

Conclusion: Direct composite veneers showed a satisfactory clinical performance. Veneers performed in vital teeth showed a better performance than those placed in non-vital teeth. No difference in the survival rate for different composites was found, although microfilled composites showed a slightly better esthetic appearance.

Clinical significance: Direct composite veneers show good results in esthetic dentistry nowadays. Composite veneers in vital teeth have a lower risk of failure than those in non-vital teeth.

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1. Introduction

In the last decades there was a continuous evolution of composite resins, adhesive systems and restorative techniques that contributed to a significant improvement of esthetic dentistry [1,2]. The main advantages of composite restorations are related to their adhesive properties, the minimal preparation size, the reinforcement of remaining teeth and the esthetic appearance [3,4].

Many clinical situations such as tooth discoloration, extensive fractures, misaligned teeth or dental caries lesions may cause an important impairment in esthetic appearance and smile harmony, causing impact in the quality of life [1,4]. The use of direct composite veneers may be an interesting option to recover the esthetic appearance of damaged teeth [4,5], especially because indirect techniques require more removal of sound tooth structure and have a higher cost, due to the laboratory procedures involved [6,7]. In fact, in a minimal invasive approach direct composite veneers seem to be the first choice [4]. The esthetic appearance of endodontically treated anterior teeth is often compromised by staining. Discolored teeth can be treated with different restorative approaches, including tooth bleaching, ceramic crowns, ceramic veneers and direct composite veneers [2,8]. However, for

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endodontically treated teeth there is some controversy in relation to the results obtained, especially when considering direct composite veneers [2,9,10].

A large number of studies have demonstrated long lasting good results for composite restorations in posterior teeth [11–13]. A recent meta-analysis of prospective studies on anterior composite restorations showed a median overall estimated survival of 95% for class III and 90% for class IV, after 10 years [14]. Although the widespread clinical use of composite resins for anterior teeth restorations, there is a lack of scientific evidence regarding the longevity of direct composite veneers, especially when placed in non-vital teeth [3,6,10,15]. So far, few studies have evaluated the performance of direct composite veneers over a longer period of time [3,5,15]. Since esthetical appearance is the main concern for veneers in anterior teeth, some professionals have recommended the use of a composite resin with smaller filler size (microfilled or nanofilled composites), in order to produce a smoother surface, resulting in a better esthetic appearance [16]. However, there is a lack of clinical data supporting this assumption, and a systematic review of in vitro studies was not able to show better surface smoothness when comparing nanofill or submicron composites to microhybrid ones [17].

Therefore, the aim of this retrospective longitudinal study was to investigate the clinical behavior of direct veneers performed with different types of composite (microfilled and universal) in vital and non-vital anterior teeth.

2. Methods

2.1. Study characteristics, participants and design

The database with clinical records from the Operative Dentistry Clinic at the Federal University of Rio Grande do Sul, School of Dentistry, Porto Alegre was used in the present evaluation. From this database, all placed direct composite veneer restorations were selected for this retrospective analysis. The study had the approval of the local Ethics Committee (N. 21736) and the patients signed a written consent to participate in the study.

2.2. Inclusion and exclusion criteria

All restorations that were placed either by final year undergraduate dental students or by postgraduate students during Operative Dentistry courses (certificate program) between January 1999 and January 2012 with minimum observation time of 6 months were selected from the files. Veneers were placed in vital or non-vital teeth, using microfilled or universal hybrid composite resins, which are described in Table 1. Patients were excluded when heavy smokers, when they had also received indirect ceramic or composite veneers, had severe parafunctional habits or poor oral hygiene. In total, 118 patients fulfilled the inclusion criteria and were invited by phone calls to come to the Dental clinic for examination, of which 86 patients agreed to participate. From the files, the type of the composite, the tooth

vitality (vital or non-vital) date of placement, date of failure and reason for failure were collected.

2.2.1. Restorative procedures

The dentin-bonding agent used in all composite veneers was an etch-and-rinse 3-step adhesive system (Scotchbond Multipurpose, 3M ESPE, St Paul, MN, USA). The veneer restorations were placed using either a microfilled [Durafile VS (Heraeus Kulzer, Hanau, Germany)] or a universal composite [Charisma (Heraeus Kulzer, Hanau, Germany); 4Seasons (Ivoclar-Vivadent, Elwangen, Germany); Filtek Z350XT (3M ESPE, St. Paul, MN, USA); Opallis (FGM, Joinville, SC, Brazil)]. The applied materials are shown in Table 1. Composite veneers were placed under rubber dam or retraction cord with a multi-layer technique using different shades for dentin and enamel reproduction and were light-cured using an LED polymerization unit. The restorations were finished and polished in the same session using fine diamond burs and abrasive discs (Sof-lex, 3M ESPE, St. Paul, MN, USA).

2.2.2. Evaluation procedures

The restorations were clinically evaluated between August and November 2013 by one trained and calibrated examiner using dental explorer and mirror, in accordance with FDI criteria [18], including several items on aesthetic, functional and biological properties. The calibration procedures considered the analysis of some veneers twice, randomly distributed, for Cohen's Kappa calculation.

All scores 4 and 5 by FDI were considered as failure (restorations requiring repair – code 4– or replacement – code 5 being considered clinically unacceptable, Tables 3 and 4), with both codes being considered as failure for analysis. Whenever necessary, a radiographic examination was done to evaluate the endodontic treatment by another member of the clinical staff. Those patients who presented a treatment need during clinical evaluation were referred for treatment. When restorations had failed before the examination, date and reason for failure was recorded from the patient file.

2.2.3. Statistical analysis

The main outcome of this study was the survival of direct veneers. Additionally, the associated factors with failures were investigated and the qualitative evaluation of the restoration was also observed. Data were tabulated twice and statistical analysis was carried out using the Stata 11.0 software package (StataCorp LP; College Station, TX, USA). To report the frequency distribution for the evaluated criteria descriptive statistics was used. Data were subjected to non-parametric statistical analysis by the Mann-Whitney test (for qualitative analysis using FDI criteria). Survival curves were obtained using the Kaplan-Meier method and Log-Rank test for comparison between groups. There were multiple observations per patients in some cases (multiple restorations). To account for that, multivariate Cox regression analysis with shared frailty was used to verify the factors associated with failure. For survival analysis, data was censored after 8 years of follow-up.

Table 1
Characteristics of the composites evaluated

Composite	Manufacturer	Inorganic filler classification	E-modulus (GPa)	Inorganic filler percentage	Mean particle size	Clinical indication	N veneers
Durafile VS	Heraeus Kulzer	Microfill	6.15	37.5 vl	0.04 µm	Anterior teeth	41
Charisma	Heraeus Kulzer	Microhybrid	14.06	59.4 vl	0.7 µm	Universal	55
4Seasons	Ivoclar	Nanohybrid	9.05	76 wt	0.6 µm	Universal	37
Z350 XT	3M/ESPE	Nanofill	13.3	63.3 vl	20–75 nm	Universal	24
Opallis	FGM	Nanohybrid	9.1	58 vl	0.5 µm	Universal	39

* Information in relation to the materials provided by the manufacturers.

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