

Clinical Longevity of Ceramic Veneers Bonded to Teeth with Aged Composite Restorations (Literature Review)

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Received: 28 Aug 2023; **Accepted:** 03 Oct 2023; **Published:** 10 Oct 2023

Citation: Husein A Al omer, Abdullah A Alduhaymi, Hassan Ali Shutur, et al. Clinical Longevity of Ceramic Veneers Bonded to Teeth with Aged Composite Restorations (Literature Review). Oral Health Dental Sci. 2023; 7(4); 1-4.

ABSTRACT

In this study the literature was reviewed to investigate the clinical outcome and longevity of anterior ceramic laminate veneers bonded to prior existing composite restorations. Clinical studies had investigated the survival of anterior ceramic laminate veneers adhered to teeth structures for at least 5 years of follow-up. This review has traced the studies which recorded the clinical longevity of porcelain laminate veneers bonded over old composite restorations; also the main reasons associated with restorations failure were searched. Sources in PubMed, Scopus, and Cochrane databases were searched in English language and without restriction on date. three reviewers screened titles and/or abstracts of 195 studies, all screened articles did not met the inclusion criteria of this review; which to have five years and more follow up in clinical retrospective or prospective studies, for that reason we have selected the most In vivo could possibly more related and the related In vitro studies. Within the limitation of this review, the clinical evidence for the practice of ceramic laminate veneers bonded over prior aged composite restorations is not strong. There is information lack about the long duration follow up for such treatment modality. The approach of replacing the prior existing composite restoration with new ones could be a wise option but using extended veneer design might be a wiser alternative. We recommend more clinical trials for long enough duration to evaluate the long success of ceramic laminate veneers that will be adhered to prior existing composite restorations.

Keywords

Ceramic laminate veneers, Labial porcelain veneers.

Introduction

Labial porcelain veneers give reliable esthetic treatment modality to restore anterior unaesthetic conditions. At the beginning of 1980s Calamia, Simonsen and Horn have introduced the ceramic etching procedure which allowed ceramic laminate veneer restorations to be bounded to teeth enamel and partially dentine in some cases [1], as the porcelain and glass ceramic nature, material needs to be bonded to tooth structure for reinforcement, the best results are achieved by pretreating and etching the ceramic surface with hydrofluoric acid [1-3], then applying a silane coupling

agent or a ceramic primer, then luting with a light- or dual-cured adhesive cement [2]. The improvement in adhesive dentistry and porcelain veneers have changed the longevity of such treatment with low total failure in 10 years follow up, [4,5]. In order to achieve durable and optimal bonding, with the underlying tooth structures the ceramic veneers preparations have to be on enamel or at least the margins have to be on enamel . But it is not always possible to achieve this optimal condition. It is quite common to see porcelain laminate veneers margins prepared and bonded over existing composite restorations. Clinical trials on anterior composite restorations per say usually are limited to periods up to three years, with follow-up for periods over 10 years being seldom reported [6], Despite the long period that composite resins

are used in anterior teeth Very limited clinical trials have proven the Longevity of Anterior composite restorations, 10-year survival rates for Class III and Class IV restorations were reported to be 95% and 90%, correspondingly [7].

Even though the longevity of porcelain veneers bonded to teeth structures have been reported for long follow up duration, the interface between porcelain and tooth structure will exhibit clinical microleakage that increase after 5 years of functions regardless the bond strength [4].

When searching for clinical studies that were reporting veneers luted to old composite, the dental literatures have limited and unclear evidence about bonding the porcelain laminate veneers over prior existing composite restorations by means of longevity of such treatment modality and the mood of failures.

Aim

This study was implemented to review the literature about the long-term clinical outcome and survival of ceramic veneers bonded to existing composite resin restorations, as it is one of the common clinical complications. Also to trace the mood of failures in patient mouth as microgaps, recurrent caries, debonding or fractures.

Materials and Method

Study selection

This literature review conducted for evidence-based research articles using keywords such as “ceramic laminate veneers and composite resin”, “ceramic bonded with composites”, “Porcelains veneers and composite”.

Search strategy, Selection of studies was based on a search strategy for each international electronic database (National Library of Medicine – MEDLINE/PubMed, SciVerse Scopus, and Cochrane Central Register of Controlled Trials).

Study design

Clinical (in vivo), Search For clinical trials, clinical prospective and retrospective studies. Eligible studies were longitudinal prospective or retrospective clinical studies that evaluated the clinical survival of ceramic laminate veneers bonded to prior existing composite resin restorations (aged restorations).

Type of teeth: no restriction. Studies referring to human anterior permanent teeth were included.

Language: Peer reviewed papers written in English.

Titles and abstracts of all identified studies were screened independently by 3 reviewers for eligibility. All studies that met the eligibility criteria were selected for full-text reading. Full-text articles that fulfilled the eligibility being the last search carried out in March 2023, the search and selection of studies was performed without any restriction on date but in English language. The references of all eligible studies identified by the search were checked to find other relevant studies.

Results

Selected articles Characteristics

Among 195 articles which were initially selected and screened by 3 calibrated dentists, there were no clinical studies met the inclusion criteria (clinical studies for 5 years and more follow up), we have decided to review the most related reticles, even though the selected articles were not all clinical studies, but they were the most possibly related. Selected articles published between date 2011 and 2014, most of them were for the same authors.

Clinical Studies

Marco M.M et al. J Adhes Dent 2013; 15: 10 [8]

In this study, IPS EMPRESS laminate veneers placed over composite, as clinical longitudinal study up to 3 years and result has shown no clinical significance with survival rate of 93%, in compare to 96% for veneers on sound tooth.

Marco M. M et al. Clin Oral Invest (2013) 17:823–832 [9]

In this study, 66 teeth on with existing composite restorations have received feldspathic ceramic laminate Veneers, some of those composite restorations have been replaced with new ones. Good quality composite was not removed but conditioned using silica coating (CoJet) and silanization (ESPE-Sil). Enamel and dentin were etched with 38 % H3PO4 for 15–30 s and rinsed 30 s; adhesive resin (Excite) was applied, and laminate veneers were then cemented (Variolink Veneer). 66 veneers were cemented onto teeth with existing composite restorations of which 62 veneers had their margins in the composite. The distribution of their locations in the maxilla was as follows: 35 on central incisors, 36 on lateral incisors, and 21 on canines. Of the 66 laminate veneers bonded onto teeth with existing restorations, 7 were big, 17 medium, and 42 small restorations. Ten of the existing restorations were Class III, 52 of them were Class IV, and 4 of them were Class V restorations. Of all teeth, 27 had no visual dentin exposure, 13 teeth had more than 50 % dentin exposure, and 50 laminates were placed on teeth without margins in the dentin. Restorations were evaluated at baseline and thereafter every 6 months using modified United States Public Health Service criteria. Mean observation period was 21.6 months with (93.5 %) survival rate and no clinical differences with other ceramic laminate veneers bonded to sound teeth 94.6 %.

In Vitro Studies

Marco M.M et al., J Adhes Dent 2011; 13: 569–577 [10]

The study was to evaluate the effect of static and cyclic loading on ceramic laminate veneers adhered to aged resin composite restorations. 3 test groups of maxillary central incisors with 2 class III composite and with 2 class IV and complete composite substrate in addition to control unrestored teeth. Fracture strength values were higher in teeth restored with composite than control. In control sound teeth with laminate veneers predominantly total debonding and failures of the dentine /cement interface occurred.

Leyla Sadighpour et al., J Adv Prosthodont 2014; 6: 278-84 [11]

The aim of the study was to evaluate the fracture resistance and microleakage of Porcelain laminate veneers bonded to teeth with

existing composite restorations.

20 teeth received class III and IV composite fillings were stored in water at room temperature for 3 week then have had Porcelain laminate veneers of IPS-Empress ceramic. The microleakage of all of the specimens was tested before and after cyclic loading.

Data analysis

High heterogeneity was observed among the selected studies regarding study design, methods, and outcomes. Despite the numbers of the study included. Descriptive statistical analysis based on the survival rates. The Cochran Q test was performed ($P < 0.001$; 95% confidence interval [95% CI]) to evaluate the heterogeneity among studies. The presence of heterogeneity was analyzed using the inconsistency test ($I^2 \geq 50\%$) (Higgins and Thompson 2002). The inverse variance method was used with the DerSimonianLaird estimator for the I^2 value. Data were transformed and the individual confidence intervals of the studies were calculated by the Clopper-Pearson method (R software, version 3.1.0; R Core Team).

Discussion

No doubt that Randomized clinical trials are the best accredited design to provide scientific evidence for efficacy and safety of the clinical procedures. However, they may not be feasible for long-term follow-ups or when a large number of patients should be enrolled in the study [12].

In fact It is not uncommon clinical practice where the ceramic veneers margins could be end on old existing composite resin restorations, although Bonding of ceramic restorations to composite resin material has no proven chemical bound and very week mechanical retention, But the current application of adhesive dentistry for ceramic restorations over composite resin were commonly used as in deep marginal elevation or marginal relocation with cases of deep margins, as first have presented by Dietschi and Spreafico in 1998 [13].

The Marginal elevation technique and re-margination, which used to bond ceramic over resin margin with specific manipulation and conditioning has become common practice after pascal magne presentation for the technique [14]. But specific preparation has to be performed via silica coating combined with silane application. This technique was used as an alternative which might provide enhanced adhesion. Another important point that resin margin in marginal elevation was not for aged composite resin. Systematic reviews have not proven the success of such practice for long duration [15]. On the other hand some Laboratory trials findings exhibited gap formation at the veneer-composite interface. And that interfaces became substantial when dentine was exposed by the preparation. Since the available literature for marginal relocation is limited mainly to in vitro studies. Therefore, randomized clinical trials with extended follow-up periods are necessary to clarify all aspects of the technique and ascertain its validity in clinical practice [16].

In Marco M. M. et al. (2013): the mean time for the clinical

evaluation was 21.5 months; the ceramic laminate veneers with composite restorations which completed the final recall were 62 out of 66. The old composite which been replaced with new composite restorations were not specified in numbers or locations, and that might effects the concepts of prior existing composite restorations. As aged composite could not be compared to newly bonded ones. In the other clinical study of Marco M.M. et, al, J Adhes Dent 2013, the study did not specify the number of veneers bonded over composite out of the total 23 ceramic veneers.

Marco M. M. Gresnigt et al, J Adhes Dent 2011, the result was in favor of the ceramic laminate veneers adhered to surface conditioned aged composite. The fracture strength values were higher in teeth with prior existing composite restorations surprisingly more than ceramic laminate veneers bonded to sound teeth, but that laboratory cycling fatigue study did not take in account the biological factors of degrading enzymes in dentine as Matrix metalloproteinases (MMPs) and cysteine cathepsins which capable of degrading the adhesive hybrid layer under composite restorations [17]. Biological degradation of resin restorations is inevitable irrespective of the material and techniques used. Salivary esterases such as cholesterol esterase and pseudocholinesterase and cariogenic bacterial esterase can degrade dental resin, weakening the hybrid layer at the resin-tooth interface, affecting the bond strength, and causing failure [18].

In Leyla Sadighpour et al 2014, the results demonstrated that cyclic loading significantly increased the microleakage of teeth in the test groups, and microleakage after loading was significantly higher in the class IV group than in the intact teeth control group. The flexural difference between the tooth structure and ceramic materials could cause gap formation and increase microleakage. In addition, the increased surface of the tooth-resin-ceramic interface decreased the flexural strength in the class IV group teeth.

Conclusion

Within the limitation of this review, the clinical long duration evidence for the practice of ceramic laminate veneers bonded over old prior existing composite restorations is not strong; there is lack in knowledge about long duration follow up for such treatment modality. Replacing the prior existing composite restoration with new composite restoration could be a wise option, but using extended veneer design might be a wiser alternative.

Therefor we recommend more clinical trials for long enough duration to evaluate the long success of ceramic laminate veneers that will be adhered to prior existing aged composite restorations.

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