



Veneers: Clinical Survey for Evaluation of Failures and Patient Satisfaction

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Abstract

Introduction: Laminate veneers, valued for their aesthetic appeal, biocompatibility, and long-term reliability, are routinely used to treat teeth with shape and color alterations, slight malposition, or gaps. However, the procedure can be challenging for dentists lacking clinical skills and procedural knowledge, and insufficient patient education can also lead to failures.

Aim: No long-term clinical failure surveys have been conducted on veneer patients in the Indian population. Hence, this survey aims to include patient, operator, and material factors responsible for veneer failures.

Material and Methods: A survey was conducted among dentists across India, collecting data on 330 veneers in 49 patients. A pilot study was carried out to validate the questionnaire and determine the necessary sample size, which was established as 227. Factors evaluated included patient demographics and habits, operator skills and techniques, materials used, and biological, mechanical, functional, and esthetic parameters.

Results: Among the 49 patients, 12.2% were treated with composite veneers and 87.8% with lithium disilicate veneers. 80% displayed healthy gingival status. Common failures included debonding, chipping, and hypersensitivity with porcelain veneers, while composite veneers showed color changes and chipping. However, most veneers did not encounter major issues.

Conclusion: The study identified several factors associated with the failure of porcelain laminate veneers. Patient factors such as hygiene maintenance and habits, operator factors including the type of veneer preparation and cementation technique, and material factors like the type of restorative material used, were all linked to veneer outcomes. Despite some observed failures, most veneers remained problem-free.

Keywords: Composite Veneers, Debonding, E-max, Fluorosis, Laminates, Lithium Disilicate, Porcelain Veneers, Resin Cement

Introduction

The introduction of composite resins by Bowen in 1958 revolutionized restorative dentistry by allowing the use of acid and adhesives. Further advancements by Fusayama in 1978 and Nakabayashi in 1982 enhanced adhesiveness, leading to improved clinical outcomes. Rochette's technique in 1973, which involved conditioning ceramic laminates with acid, made adhesiveness practical [1]. Calamia in 1984 introduced the treatment of porcelain with hydrofluoric acid and silane, creating an adhesive

interface that significantly improved the aesthetic results of anterior restorations [2].

With the increasing demand for aesthetic restorative treatments for anterior teeth, it became crucial to use materials that met patients' aesthetic and functional needs. Full crown preparations result in significant destruction of tooth structure, leading to the development of more conservative aesthetic solutions

such as bleaching, direct composite veneers, and porcelain laminate veneers [3].

Traditional resin composites, although simple and cost-effective, offer less resistance and lower colour stability compared to porcelains which have high aesthetics, biocompatibility, and resistance to staining and wear [4, 5]. However, the application of porcelain veneers requires careful patient selection and precise technique. Factors such as parafunctional habits, unbalanced occlusion, and inadequate oral hygiene can impact the success of these restorations. Despite these challenges, porcelain veneers are an excellent option for addressing teeth that are stained, discoloured, broken, misaligned, or have diastemas.

Many longitudinal studies have predicted the success and patient satisfaction outcomes of veneers. However, there is no long-term clinical failure survey done on veneer patients in the Indian population. Hence this survey aims to investigate the association of the failure of porcelain laminate veneers with factors related to the patient, material, and operator in the Indian population.

Materials And Methods

Ethical Considerations

A cross-sectional survey was conducted by circulating Google Forms through social media to dentists and dental students across India. Ethical approval for this study (No: EC/NEW/INST/2021/573) was provided by the Ethical Committee of Government Dental College and Hospital, Ahmedabad, on 13th December 2023. Permissions were obtained from the patients before conducting the survey.

Study Population and Sample Size

A pilot study was carried out to validate the questionnaire and determine the required sample size. Initially, the questionnaire was sent to five dentists across India. They were briefed about the survey's aim and asked to complete it. Based on their feedback, any unclear questions were revised for the final questionnaire. The sample size was calculated for a 95% confidence level and an acceptable margin of error of 5%, resulting in a final sample size of 227.

Questionnaire

The survey consisted of 25 questions, including patient demographic data, patient habits, veneer preparation features, and materials used for

impression, cementation, and fabrication of veneers. It also inquired about the reasons that motivated patients to opt for veneer placement and the long-term effects such as debonding, sensitivity, chipping, caries, wearing off, stains, gingival and periodontal status, cleaning habits, functional efficiency, and aesthetic looks. The survey also collected follow-up clinical photographs of veneers.

Inclusion Criteria

1. Patients who have undergone veneer treatment and have been on follow-up at least one-year post-cementation.
2. Indian population only.
3. Patients to be evaluated clinically by a dentist on the day of follow-up.

Exclusion Criteria

1. Questions not answered in the survey form are to be excluded.
2. Foreigners having veneers are excluded.
3. Period of follow-up less than one year is to be excluded.
4. Patients evaluated by hygienists or assistants other than dentists.

Statistical Analysis

Descriptive statistics were obtained for data analysis. The chi-square test or proportional t-test was used for statistical analysis at a significance level of 5% ($P < 0.05$). Data were analyzed using IBM SPSS software (version 16; IBM, Armonk, NY, USA).

Results

A survey was conducted involving 50 patients who received a total of 328 veneers. The survey aimed to evaluate the distribution, preparation techniques, and issues encountered with composite and lithium silicate veneers.

Veneer Distribution and Demographics

Out of the 328 veneers placed, 64 (19.5%) were composite, while the remaining were lithium disilicate. The patient cohort consisted of 54% females and 46% males, indicating that both genders are equally concerned with aesthetic dental solutions. Age-wise, 74% of the patients were within the 20-30 age group, and 24% were between 30 and 60 years old. The majority of patients had some level of education, with graduates being more aware of veneers.

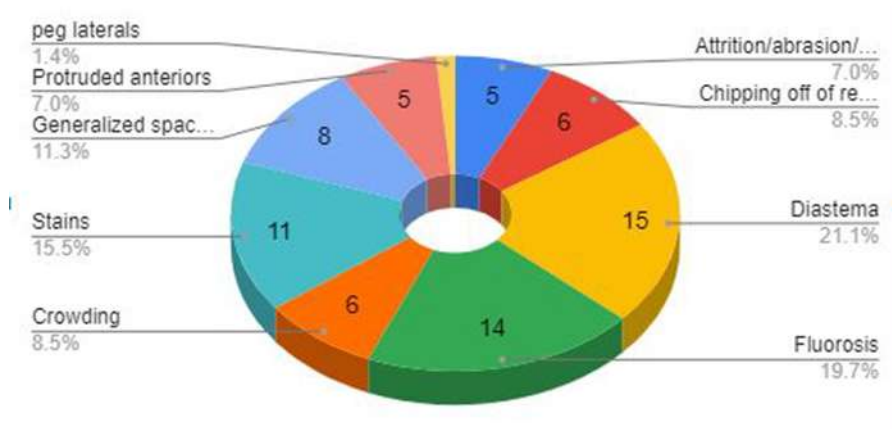
Nevertheless, 22% of the patients who received veneers were illiterate. The socioeconomic status of the patients varied, with 38% belonging to the middle class (annual income of 1 to 3 lakh), 8% earning below 1 lakh, 26% earning between 3 and 6 lakhs, 12% between 6 and 9 lakhs, and 8% earning above 10 lakhs annually. Most patients (82%) were employed. This data underscores the increasing awareness and value placed on aesthetic dental treatments among working

individuals across various income and educational backgrounds.

Motivations for Veneers

The survey revealed that the primary motivations for patients undergoing veneer treatment were diastema, stains, and fluorosis. Other reasons are illustrated in Figure 1.

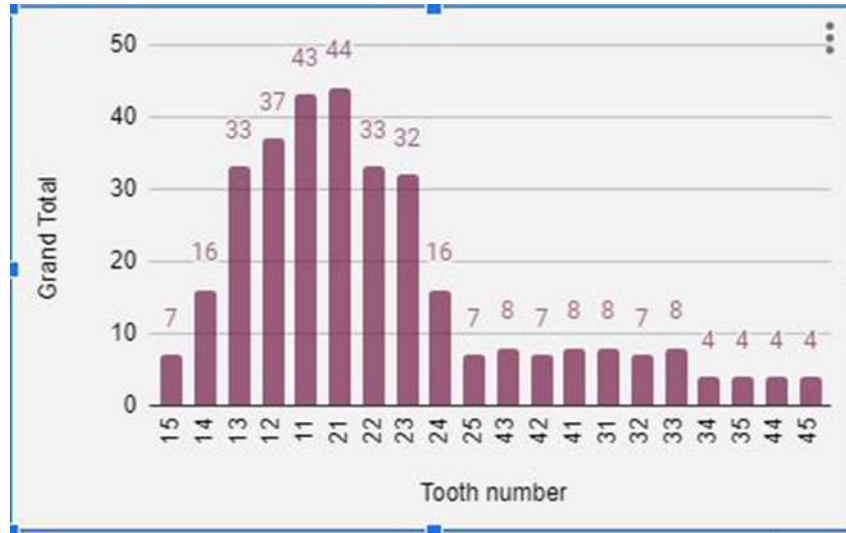
Figure 1: Reasons to consider veneers



Clinical Procedures and Material Usage

Regarding the clinical execution of veneer preparations, 68% were performed by prosthodontists, 24% by other MDS specialists, and the remaining 8% by general BDS graduates. Maxillary anterior teeth were the most common sites for veneer application compared to mandibular anterior teeth, with the percentage distribution detailed in Figure 2.

Figure 2: Percentage distribution of veneers placed on the teeth



Preparation Techniques: 50% of the veneers had incisal overlap preparations, 32% had bevel preparations, 12.8% had window preparations, and 2% had feather preparations. Composite veneers were mostly prepared with the window technique, while Emax veneers predominantly used incisal overlap and bevel preparations. The majority of the preparations (75.6%) were done on enamel, with the remaining on dentin.

Marginal Placement: 69% of the veneers had an equigingival finish line, 26% had a subgingival finish line, and 5% had a supragingival finish line.

Impression Techniques: Two-step putty light body addition silicone material (56%) and digital scanning

(24%) were the most used methods to record impressions.

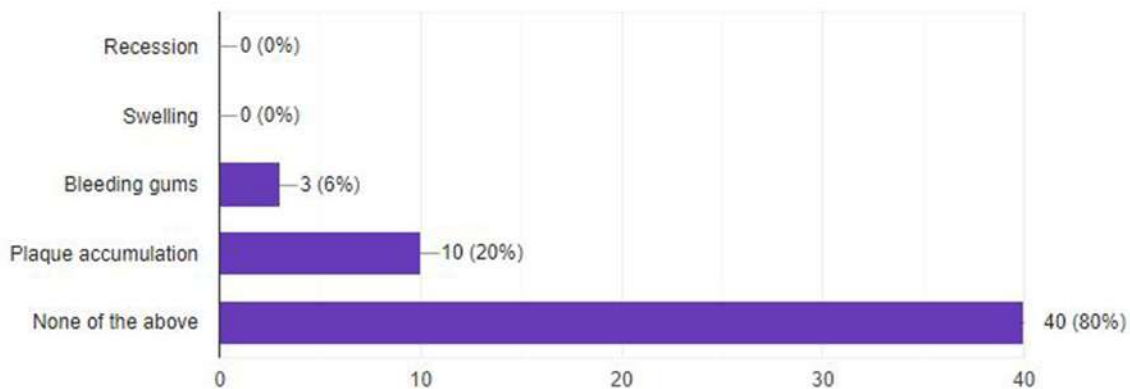
Cementation: For Emax veneers, 48% were cemented with RelyX cement, 36% with Multilink, 11% with Variolink, 3% with Panavia, and 2% with other cements.

Post-Operative Outcomes

Color Changes: 8% of the veneers showed color changes, with most of these cases involving composite veneers.

Gingival Health: 6% of the patients experienced gingival bleeding, 20% had plaque accumulation near the veneers and none had gingival recession.

Figure 3: Post-operative gingival problems faced by patients

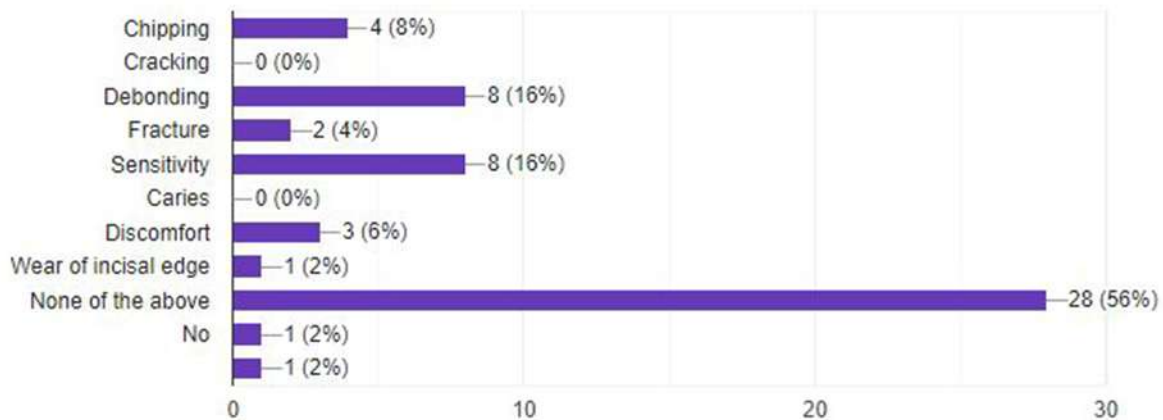


Oral Hygiene: 44% of the patients reported difficulty maintaining oral hygiene due to anxiety and fear of dislodging the veneers while brushing.

Functional Chewing: 32% of the patients had difficulty with functional chewing.

Other Problems: 16% of the veneers experienced debonding, and another 16% reported sensitivity. 8% of the veneers faced chipping, 6% had discomfort, and 4% experienced fractures; 0% had secondary caries. Composite veneers showed a higher failure rate in terms of chipping and debonding compared to lithium disilicate veneers that faced sensitivity.

Figure 4: Reason for failures of laminate veneers faced by patients



Follow-Up Visits: 36% of the patients visited the dentist once for follow-up, while 26% visited more than twice due to problems faced. Despite the failures faced by patients, they were still motivated and recommended the treatment of veneers to others.

Discussion

This study underscores the importance of meticulous clinical procedures, patient education, and follow-up care in achieving successful long-term outcomes with veneers.

The aesthetic success of porcelain laminate veneers (PLVs) is influenced by factors such as the thickness, shade, and translucency of the porcelain, the type of resin cement used, and the underlying substrate tissue. Long-term colour stability is crucial, and composite veneers have shown greater susceptibility to discoloration compared to lithium disilicate veneers. Light-cured resin cements demonstrate superior color stability over dual-cured cements due to the latter's amine coinitiator being prone to oxidation and degradation. The coinitiator in light-cured cements is typically aliphatic and more chemically stable, resulting in less color variation [6]. Historical data

supports these findings; for example, Fradeani reported in 1998 that the color match of most PLVs remained consistent after six years [7]. However, other studies have noted color change as a significant issue, with one retrospective study citing it as the most common PLV failure, occurring in 45% of cases [8].

Four critical aspects of design directly impact periodontal health: margin placement level, margin adaptation, restoration contour, and occlusal factors [9]. Gingival and plaque indices are commonly used to evaluate the gingival health of porcelain laminate veneer (PLV) restorations [10]. In this study, patients with subgingival margins showed bleeding on probing, while plaque accumulation was observed around all types of margins. This was also evident in the study conducted by Imad et al. [9], stating that over-contouring and poor oral hygiene was a significant factor causing gingival inflammation. Arif et al. reported on the periodontal health status of 108 PLVs over 198 months, finding that 46% experienced moderate inflammation and bleeding on probing (BOP) [12]. Gingival recession rates varied across

different studies, being reported at 0% [8], 7.70% [11], and 27% [12].

The survival rates of PLVs are influenced by the extent of enamel and dentine exposure. PLVs bonded to pure enamel and those bonded to enamel with minimal dentine exposure showed similar survival rates of 93.2% and 95.7%, respectively [13]. However, PLVs bonded to severely exposed dentine had significantly lower survival rates. The veneers that were debonded (16%) in this study were majorly prepared on dentin [14].

Historically, debonding was common with porcelain laminate veneers (PLVs). In 1993, Dunne and Millar reported an 11% debond rate. However, due to advances in the luting cements, studies have shown significantly lower debond rates. Some studies have even reported a 0% debond rate [15].

Porcelain fractures can range from minor edge cracks to gross fragmentations. The reviewed literature reports fracture rates between 0% and 13.05%, with a mean fracture rate of 3% as per the systemic review conducted by Cotert Irem and Cotert H. Serdar. Studies have shown a significant interaction between porcelain fractures and parafunctional habits [15].

Chipping was seen in 8% of veneers in the present study but typically does not end the service life of a PLV. A follow-up study in 1994 reported a 5.18% chipping rate at the incisal finishing line [16]. Newer studies have shown lower chipping rates of 1.08% and 1.57% [17, 18].

Hypersensitivity is generally minimized with minimal invasive preparation techniques, as evident in the follow-up reports of Cotert HS *et al.* [13] and Karagozoglu *et al.* [19] indicating a hypersensitivity rate of 0%. However, some studies have reported higher rates, ranging from 3.1% [11] to 21.73% [17]. Alhekeir *et al.* found an even higher rate of 83.30%, attributing this to the insufficient skills of operators [8]. In the present study, patients who experienced sensitivity (16%) had their veneer preparations mainly on dentin.

Historically reviewed literature and this study also conclude that incisal overlap and bevel preparation are most commonly adopted for veneers among four types of preparations [11]. The preparation techniques also affect survival rates. A study found significant differences in survival rates over 18 months, with

97.8% for overlapped PLVs and 84.7% for non-overlapped PLVs [13]. However, Guess *et al.* found no significant differences in overall survival between overlapped PLVs and full veneers [20].

Conclusion

Meticulous clinical procedures, patient education, and follow-up care are crucial for successful long-term outcomes with veneers.

1. Composite veneers were more susceptible to discoloration and chipping than lithium disilicate veneers.
2. Margin placement, adaptation, restoration contour, and occlusal factors critically impact periodontal health. Supragingival margins followed by equigingival margins are preferred over subgingival margins.
3. Advances in luting cements have significantly reduced debond rates, while porcelain fractures and hypersensitivity remain a primary concern.
4. Incisal overlap preparations and preparations limited to enamel tend to have higher survival rates, emphasizing the importance of proper preparation techniques.

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