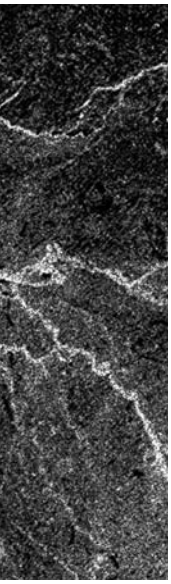

Critical Appraisal

PORCELAIN VENEER OUTCOMES, PART I

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Etched porcelain veneers have now been used clinically for about 20 years. The profession was originally very skeptical about bonding thin shells of a brittle ceramic material to teeth. However, ceramic veneers have proved to be not only very esthetic but also extremely durable restorations. This two-part Clinical Appraisal reviews several articles related to veneer longevity and clinical factors contributing to—or detracting from—longevity. Part II will appear in the next issue of JERD.

CLINICAL PERFORMANCE OF PORCELAIN LAMINATE VENEERS. A RETROSPECTIVE EVALUATION OVER A PERIOD OF 6.5 YEARS

F.J. Shaini, A.C.C. Shortall, P.M. Marquis
Journal of Oral Rehabilitation 1997 (24:553–9)

ABSTRACT

Objective: This study evaluated the clinical performance of porcelain veneers placed over a 78-month period at a single institution (Birmingham Dental Hospital, UK).

Materials and Methods: Veneers were placed between 1984 and 1992. They were not placed in patients with severe tooth discoloration, extensive loss of tooth structure, poor oral hygiene, or periodontal problems. Occlusal guards were provided to patients with parafunctional habits. Ninety percent of the veneered teeth were not prepared. In those that were prepared, the preparation typically involved only a minimal labial reduction. Margins were either at or coronal to the free gingival margin. All veneers were fabricated on platinum foil using a single porcelain material. The veneers were sandblasted and silanated and were cemented following a try-in using a light-cured microfill composite. The procedures were done by either staff or students. The veneers were evaluated at variable intervals and were classified as being clinically satisfactory, presenting with a repairable problem, or failed. Failures were further classified as fractures, debonding, or "other." Kaplan-Meier analysis was used to estimate survival time.

Results: During the insertion period of the study, 372 porcelain veneers were placed in 104 mostly young (age 14–24 yr) patients. Approximately 90% of the veneers were on maxillary anterior teeth.

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The failure rate for veneers placed by students was 39%, with an additional 11% of veneers having repairable problems. The corresponding rates for veneers placed by staff were 22% and 7%. The overall estimated probability of a veneer surviving with no problems at 78 months (6.5 yr) was only about 50%.

Conclusion: Higher failure rates occurred with veneers placed by inexperienced operators and those placed over existing restorations.

COMMENTARY

This study points out the importance of operator experience in the clinical success of porcelain veneers. It also underscores the importance of placing veneers on a substrate of sound tooth structure as opposed to existing restorations.

However, even ignoring these two factors, the failure rates reported in this study are high. Two technical reasons probably contributed to the failures. First, almost none of the teeth were prepared; rather, the veneers were bonded to unprepared enamel. Second, the veneers were not etched with hydrofluoric acid—they were sandblasted and silanated only.

Today, of course, nearly all veneer procedures involve tooth preparation and etching of the ceramic. Therefore, the high failure rates observed in this study are now unlikely. However, the two factors identified by the authors as contributing to failure—that is, lack of operator experience and presence of existing restorations—remain relevant today.

SUGGESTED READING

Castelnuovo J, Tjan AHL, Phillips K, et al. Fracture load and mode of failure of ceramic veneers with different preparations. J Prosthet Dent 2000;23:171–80.

Magne, Belser UC. Novel porcelain laminate preparation approach driven by a diagnostic mock-up. J Esthet Restor Dent 2004;16:7–16.

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A 15-YEAR REVIEW OF PORCELAIN VENEER FAILURE—A CLINICIAN'S OBSERVATIONS

M.J. Friedman

Compendium of Continuing Education in Dentistry 1998 (19:625–36)

ABSTRACT

Objective: This retrospective report described porcelain veneer failures seen in a single private practice. The clinician observed approximately 3,500 veneers placed over a 15-year period.

Materials and Methods: During a 15-year period, the clinician placed and observed over 3,500 porcelain veneers. This figure does not include veneers placed but not available for follow-up evaluation. The veneers were in place for varying lengths of time, and most were much less than 15 years old. The clinician defined failure as any porcelain veneer that required modification, repair, or replacement as a result of fracture, debonding, or leakage.

Results: Approximately 7% (245) of the 3,500 porcelain veneers were classified as failures. Two-thirds of those failures were related to fracture. Leakage caused 22% of failures, and debonding caused 11%.

The author described three types of fractures. One is the static fracture line, in which fractured segments remain intact on the tooth surface and are separated by a microscopic fracture line. This problem might be caused by fatigue related to occlusal loading or polymerization shrinkage stresses during the luting process. Another type is cohesive fracture, or a fracture within the ceramic material in areas subjected to repeated stress (eg, incisal edges). The third and least common type of fracture is adhesive fracture, in which the ceramic material separates from the underlying tooth.

Identifying the exact location of leakage is difficult, but the author states that when leakage occurred, it was almost always between the tooth and resin, not between the resin and ceramic. Leakage was virtually nonexistent at etched enamel margins.

Debonding, or a total interface failure without ceramic fracture, occurred only when large areas of the preparation involved dentin.

Conclusion: The failure rate of porcelain veneers, excluding those replaced strictly to improve the original esthetic result, was 7%. Failure involved three primary mechanisms, with ceramic fracture being the most common cause of failure.

COMMENTARY

This article does not describe a prospective controlled clinical trial but nevertheless is quite valuable. The author is recognized as a leading expert in the field, and his observations of a large number of carefully done veneers over a long period of time are worthy of note. The failure rate of 7% would suggest that these restorations are highly predictable. However, this author advocates an enamel substrate as a critical element to a successful outcome, creating what he refers to as an *enamel ceramic restoration*. Recent trends in tooth preparations for veneers are more aggressive than initially described 20 years ago. Enamel is often minimal or absent so the veneers are adhered to primarily a dentin substrate. This trend may negatively impact the high level of success originally reported for these restorations. It may be due in part to the popularity of pressed ceramic veneers and the greater thickness demands of the fabrication technique. Some cohesive failures are inevitable simply because feldspathic ceramics cannot withstand high tensile stress. The clinician must be aware that proper case selection, material selection and tooth preparation—including an intraenamel preparation as much as possible—are important requirements for predictable success even when the latest dentin bonding agents are used. Factors such as unfavorable occlusion and extensive dentin exposure during preparation increase the chances of veneer failure.

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Barghi N, Berry TG. Postbonding crack formation in porcelain veneers. J Esthet Dent 1997;9:51–4.

Belser UC, Magne P, Magne M. Ceramic laminate veneers: continuous evolution of indications. J Esthet Dent 1997;9;197–207.

Magne P, Kwon K-R, Belser UC, et al. Crack propensity of porcelain laminate veneers: a simulated operatory evaluation. J Prosthet Dent 1999;81:327–34.

PORCELAIN LAMINATE VENEERS. A RETROSPECTIVE EVALUATION AFTER 1 TO 10 YEARS OF SERVICE: PART II—CLINICAL RESULTS

H. Dumfahrt, H. Schäffer

International Journal of Prosthodontics 2000 (13:9–18)

ABSTRACT

Objective: This study evaluated the clinical quality of and gingival response to 191 porcelain veneers placed over a 10-year period.

Materials and Methods: The study initially involved 72 subjects. Sixty-five of those, with a total of 191 porcelain veneers, were available for the final evaluation. The clinical methods for preparation and bonding were described in Part I of this two-part article.

Two calibrated clinicians (the authors) evaluated each veneer following modified California Dental Association/Ryge criteria for color match, porcelain surface smoothness, marginal discoloration, and marginal integrity. The position of each veneer margin relative to the gingival margin (the Silness "margin index") was assessed. Measurements of the distance between incisal edge and gingival margin were made on epoxy replicas cast from addition silicone impressions. Patient satisfaction was determined by questioning.

The Kaplan-Meier survival estimation method was used to calculate the survival probability of the veneers. *Survival time* was defined as the time between cementation of the veneer until the time that it presented with an irreparable failure. The main failure criteria included porcelain fracture, debonding with exposure of tooth structure, and impaired function or esthetics. The veneers were considered in two groups—those that had been placed 14 to 60 months previously and those that had been placed 61 to 127 months previously.

Results: The Kaplan-Meier method estimated that the survival probability of the veneers was 97% at 5 years and 91% at 10.5 years. Over the entire observation period, only seven restorations (4%) actually failed. The failure rate increased significantly when the finish line crossed an existing restoration. Although not statistically significant, there was a strong trend toward an increased failure rate when the preparation involved dentin. Occlusion played a major role in most failures.

Ninety-nine percent of the veneers had satisfactory margins, although about one-third had a slightly detectable or visible marginal defect, usually at the facial gingival margin and more likely when the margin was in dentin. Marginal discoloration occurred in 17% of the veneers and most often with dentin margins. No secondary caries was detected.

Increased gingival recession occurred around 31% of the veneers, and ranged from 0.1 to 0.5 mm. Almost all of the recession occurred near veneer margins that were originally at or apical to the soft tissue margin. Ninety-nine percent of the patients rated the esthetics as excellent.

Conclusion: Porcelain veneers offer a predictable and successful treatment that preserves tooth structure while providing excellent esthetic results and patient acceptance.

COMMENTARY

This study provides additional evidence that porcelain veneers are clinically successful over a relatively long period of time, with an estimated survival rate of over 90% at 10 years. Veneer failures are more likely when the restorations are partially bonded to dentin or when the patient has a clenching or grinding habit.

SUGGESTED READING

Aristidis GA, Dimitra B. Five-year clinical performance laminate veneers. Quintessence Int 2002;33:185–9.

Dumfahrt H. Porcelain laminate veneers. A retrospective evaluation after 1 to 10 years of service: part I—clinical procedure. Int J Prosthodont 1999;12:505–13.

Friedman MJ. Porcelain veneer restorations: a clinician's opinion about a disturbing trend. J Esthet Restor Dent 2001;13:318–27.

The Bottom Line feature will follow in Part II of the series.

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