Prosthodontics NEWSLETTER

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A Courtesy of:

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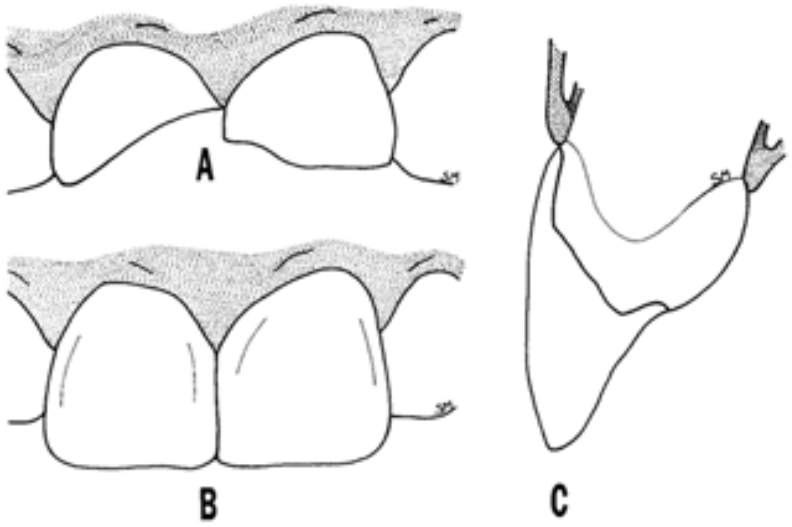

A recent case series evaluated the clinical performance of porcelain laminate veneers. Teeth that would commonly receive complete artificial crowns (A) were treated instead with bonded porcelain laminate veneers (B). These laminates represented an experimental conservative approach to restoring the esthetics and functional anterior guidance of teeth that had substantial loss of coronal tooth structure (C).

Esthetic Applications in Prosthodontics

Patients' concerns with the esthetic qualities of dental restorations have resulted in more widespread use of materials and methods designed to mimic the appearance of natural tooth structure. This paradigm shift in our treatment approach has improved the short-term satisfaction of our patients, but knowledge of the clinical outcomes of these esthetically oriented procedures is elusive. This issue of *Prosthodontics Newsletter* is devoted to studies involving esthetic applications in prosthodontics with special emphasis on expected clinical outcomes.

Performance of Porcelain Laminate Veneers

Porcelain laminate veneers represent a conservative restorative method that has been used to improve the appearance of esthetically compromised teeth or to restore minor structural coronal defects. Results have been favorable, especially when used on anterior teeth, but most dentists have avoided the use of a laminate when more than 2 mm of the incisal edge of a tooth must be replaced.

Magne et al from the University of Geneva reported on the outcome of 48 veneers that incorporated substantial incisal porcelain extensions. The veneers were made of conventional feldspathic porcelain (Creation, Klema) and were placed in the mouths of 16 patients. With the exception of 1 patient, all veneers restored functional anterior guidance. In some patients, these veneers were used to restore traumatized teeth that had extensive loss of tooth structure (see cover illustration).

At recall, the follow-up time for the restorations ranged from 3 to 7 years with a mean clinical service of 4.5 years. Thirteen clinical parameters were recorded and evaluated, as well as another 4 that applied to the patient's occlusal comfort, social impact, personal impact and satisfaction.

All veneers were rated satisfactory at recall. One veneer experienced chipping at the incisal edge, which was corrected with polishing only. With the exception of 1 patient, no plaque accumulation was detected on the porcelain.

Evidence of cracking was observed in 6 of the 48 veneers, but none of the cracks compromised the esthetics or structural integrity of the restorations. One restoration cracked on its lingual aspect after only 2 weeks of service. The authors attributed this cracking to an error in tooth preparation design (Figure 1).

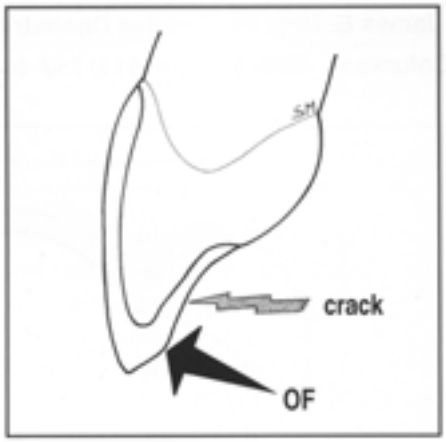

Figure 1. *One incisor was prepared with a long palatal chamfer. Occlusal forces (OF) caused tensile stresses in the thin palatal extension of porcelain and cracking occurred.*

Comment

Although the mean follow-up time was relatively short, a 100% survival rate without major complications is encouraging. For many of the structurally compromised teeth in the study, conventional treatment would most likely have included surgical crown lengthening, endodontic therapy, a post-and-core restoration and a complete crown, as well as a high financial burden. All of these procedures can be avoided with the use of a veneer.

Even though the veneer restoration involves a less invasive procedure, its long-term prognosis is not known. New cracks may develop in the porcelain over time and the cracks that were previously noted may eventually propagate to cause overt fracture. However, in most situations it would still be possible to retreat any tooth with a failed veneer by using a traditional complete crown.

Magne P, Perroud R, Hodges JS, Belser UC. Clinical performance of novel-design porcelain veneers for the recovery of coronal volume and length. Int J Periodontics Restorative Dent *2000;20:441-457.*

Six-Year Study of Glass Ceramic Inlays and Onlays

A prospective, clinical trial of leucite-reinforced glass ceramic inlays and onlays was conducted by Frankenberger et al from the University of Erlangen-Nuremberg, Germany. Ninety-six restorations were made from IPS-Empress (Ivoclar) and luted with 4 different composite luting agents (Dual Cement, Variolink Low, Variolink Ultra and Tetric). At 6 years, 67 restorations were available for evaluation. Seven of the restorations had failed previously, and 22 were not observed because the patients had dropped out of the study.

Marginal deficiencies were apparent in 94% of the restorations. Although many gingivo-proximal margins were located on dentin, there were no differences in marginal quality when dentin margins were compared with enamel margins. Cracking of the ceramics was noted for 40% of the restorations, and these cracks were associated primarily with marginal ridges. However, there were no differences in crack formation between inlays and onlays.

Despite the obvious marginal deterioration, there were few patient complaints, and secondary caries did not occur. Thickness of the ceramic material at standardized points on the restorations was measured prior to their cementation, but these values did not influence any of the outcomes studied.

Comment

The authors concluded that the high rate of marginal deterioration did not jeopardize the serviceability of the restorations because of the absence of secondary caries. Cracking was more of a concern because it was noted on 40% of the restorations. The authors suggested that these cracks were located primarily in areas involved in occlusal adjustment after luting.

The authors hypothesized that more thorough polishing of the ground ceramic surfaces after occlusal correction might have improved the performance of the restorations. Cracking in the region of marginal ridges was observed on some of the restorations after only 2 years of service, and 5 restorations failed during the 6-year period as a result of bulk fracture. With time, many of these cracks in stress-bearing areas could increase to further produce catastrophic failures.

Frankenberger R, Petschelt A, Krämer N. Leucite-reinforced glass ceramic inlays and onlays after six years: clinical behavior. Operative Dent *2000;25:459-465.*

Survival of Different Post-and-Core Systems

An in vitro study of 64 teeth by Butz et al from Albert Ludwigs University, Germany, evaluated the survival rate and fracture strengths of 4 post-and-core systems: (1) titanium post with composite core; (2) zirconia ceramic post with composite core; (3) zirconia post with pressed-ceramic core; and (4) cast gold post and core.

Teeth were restored with a 2-mm ferrule, a core reconstruction 2 mm in height and a complete crown (Figure 2). Samples were loaded dynamically with 30 N to simulate 5 years of clinical service, combined with thermocycling. In addition, samples were statically loaded until failure.

Only 63% of the samples with zirconia posts and composite cores survived the dynamic loading test. By contrast, 94% of the titanium/composite samples and cast gold core samples survived, and 100% of the zirconia posts with ceramic cores survived. In addition, the fracture strength of the zirconia post with composite core was significantly lower than the strengths of the other 3 groups.

Comment

The zirconia post was originally developed for use with a composite core to provide an esthetic foundation for an all-ceramic crown. Results of this study suggest significantly lower strength values, which could lead to poorer clinical performance, for the zirconia post and composite core system.

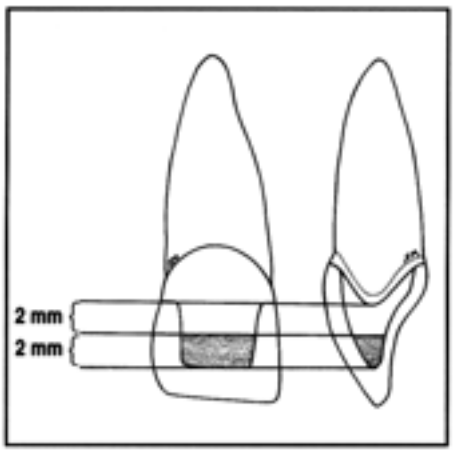

Figure 2. *Teeth were restored with 2-mm ferrule, 2-mm core and complete crown.*

All other systems performed better, and the researchers recommended avoiding the combination of zirconia post and composite core. The use of a pressed glass core with the zirconia post increased the strength of the restoration to that of more traditional systems of coronoradicular stabilization.

Butz F, Lennon ÁM, Heydecke G, Strub JR. Survival rate and fracture strength of endodontically treated maxillary incisors with moderate defects restored with different post and-core systems: an in vitro study. Int J Prosthodont *2001;14:58-64.*

Color Stability of Compomers

Compomers, a group of relatively new restorative materials, combine the chemistry of composite resin with that of glass ionomer. The physical properties of compomers are superior to those of the glass ionomers; another major advantage is their ease of handling.

Compomers can produce very good esthetic matches to natural tooth structure initially, but these materials have been shown to possess a high potential for water imbibition. Absorption of oral fluids could produce intrinsic staining, which could defeat the esthetic advantage of this material.

Abu-Bakr et al from Niigata University, Japan, evaluated the effects of various liquid media on the color stability of tooth-colored materials. Four compomers (Dyract, Compoglass F, Xeno, F2000) were included in the study, as well as 2 controls—a conventional composite resin (Clearfil AP-X) and a resin-modified glass ionomer cement (Fuji II LC). Test solutions were whiskey, cola, orange juice and deionized water.

Minimal color changes were noted for the composite resin, but the compomers and the resin-modified glass ionomer cement were significantly more susceptible to staining.

Next:

- Microleakage of cements and foundation materials
- Tooth preparations for fixed prosthodontics
- Microleakage of restored endodontically-treated teeth

Our next report features a discussion of these issues and the studies that analyze them, as well as other articles exploring topics of vital interest to you as a practitioner.

Whiskey produced the most pronounced color changes for all materials and water the least.

Comment

In this study, color changes were measured after 1 day, 1 week, 30 days and 60 days. Staining increased significantly with time, but the color changes for the composite resin were minimal by comparison and increased only slightly over time.

This study only measured staining after 2 months of immersion. It is likely that the color changes would continue for all materials with further exposure to the test liquids, and this factor should be considered when selecting a restorative material in esthetically critical areas of the mouth. Composite resin appeared to possess the best color stability.

Abu-Bakr N, Han L, Okamoto A, Iwaku M. Color stability of compomer after immersion in various media. J Esthetic Dent *2000;12: 258-263.*

Light Transmission Through All-Ceramic Crowns

Metal posts and cores do not transmit light and may alter the optical effects of all-ceramic crowns. A recent study by Carossa et al from the University of Turin, Italy, used 3 natural teeth (maxillary right central incisor, lateral incisor and canine) as models to evaluate light transmission through 3 different all-ceramic crowns supported by 4 types of posts and cores: (1) matte-finished, cast gold post and core; (2) cast gold post and core with polished core; (3) all-ceramic post and core; and (4) metal post and core with opaque porcelain masking the core.

The 3 ceramic systems for the crowns were: (1) surface-colored IPS-Empress 2 (Ivoclar); (2) IPS-Empress 2 veneered with feldspathic porcelain (Noritake); and (3) In-Ceram (Vita) veneered with feldspathic porcelain (Vitadur N, Vita). The crowns were backlit, and translucency was measured with a spectrophotometer.

The surface-colored IPS-Empress 2 crown provided the best translucency, and the all-ceramic post and core was more translucent than the other post systems. The polished gold core produced luminance similar to the opaqued core.

Clinical appearance of the various post/crown combinations was evaluated subjectively by 15 dentists. Subjective observations could not detect any visual differences with any of the combinations.

Comment

The results suggest that any of the post/crown combinations can produce an esthetically acceptable resul and that metal posts will have litt impact on the optical effects of porc lain crowns. Elaborate techniques t opaque a cast metal core or fabricat an all-ceramic post and core may nc be necessary.

Carossa S, Lombardo S, Pera P, et al. Influen of posts and cores on light transmissio through different all-ceramic crowns: spectr photometric and clinical evaluation. Int Prosthodont *2001;14:9-14.*

Do you or your staff have any questions or comments about **Prosthodontics Newsletter***? Please write or call our office. We would be happy to hear from you.*