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PROSTHODONTIC ASSOCIATES

Izchak Barzilay
D.D.S., Cert. Prostho., M.S., F.R.C.D.(C)
Effrat Habsha
B.Sc., D.D.S., Dip. Prostho., M.Sc., F.R.C.D.(C)
Howard Klaiman
D.D.S., F.R.C.D.(C)
Vinay Bhide
B.ArtsSc.(Hons), D.D.S., M.Sc. (Perio), F.R.C.D.(C)
David Chvartszaid
D.D.S., M.Sc. (Prostho), M.Sc. (Perio), F.R.C.D.(C)
M.K. (Bobby) Baig
B.D.S., Cert. Prostho.
Jonathan Rapp
D.D.S., F.R.C.D.(C)
Laura Brass
B.Sc., N.D.

2300 Yonge Street, Suite 905 • Box 2334 • Toronto, Ontario M4P 1E4
(416) 322-6862 • Fax: (416) 322-5282 • www.buildyoursmile.com

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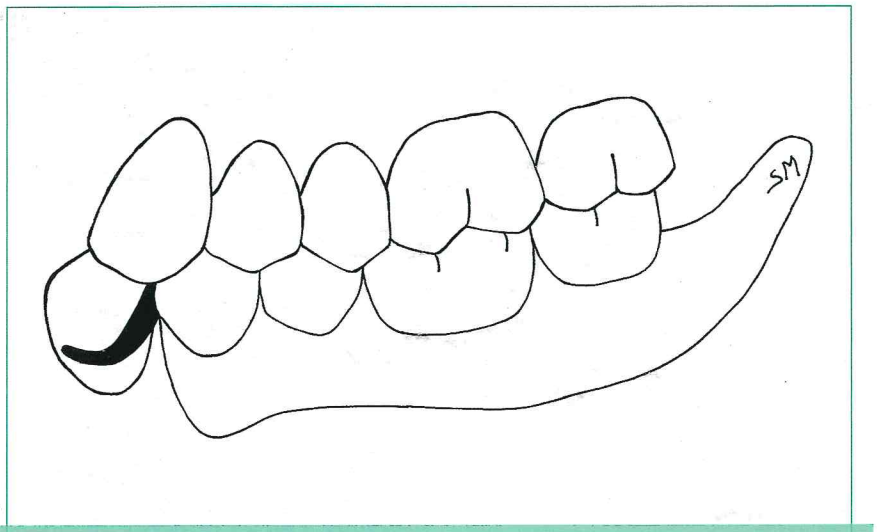
Prosthodontics Newsletter™



A recent clinical study evaluated the effect of reduced length of the occlusal table on the masticatory performance of a restored mandibular bilateral extension-base removable partial denture that occludes with a maxillary complete denture. See *MASTICATORY PERFORMANCE WITH EXTENSION-BASE REMOVABLE PARTIAL DENTURES* (inside).

Clinical Outcome of Prosthodontic Treatment

Many in vitro studies on the physical and mechanical properties of prosthodontic materials are published every month and are welcome additions to the body of knowledge in the specialty. Nevertheless, knowledge and understanding of the clinical outcome of prosthodontic care is of equal, if not greater, importance to the profession. This issue of *Prosthodontics Newsletter* is devoted to clinical studies that investigate the outcome of prosthodontic treatment.

Survival of Feldspathic Porcelain Laminate Veneers

Porcelain laminate veneers can improve the appearance of teeth. The introduction of contemporary etching and bonding procedures in the 1980s improved the predictability of bonding. Porcelain veneer restorations have become common, and their availability is often highlighted in popular magazines and on television programs.

Nevertheless, studies of porcelain laminate veneer treatment outcomes have been contradictory, with re-

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Inside this Issue

Survival of Feldspathic Porcelain Laminate Veneers

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ported failures ranging from 5% to 47% after 10 years and 2% to 42% after 5 years.

Layton, a private practitioner in Australia, et al systematically reviewed literature related to feldspathic porcelain laminate veneer survival. Included in the review were human cohort studies (prospective or retrospective) and controlled trials assessing the outcome of feldspathic porcelain laminate veneers for >15 patients, with at least some veneers in service for ≥5 years.

Of the 4294 articles identified, initial screening reduced the number to 116. When full-text screening of these articles was accomplished, 11 studies were selected for inclusion in the qualitative analysis. Of these, 6 studies of 5 different patient populations were subjected to meta-analysis:

- 2 were retrospective cohort studies
- 4 were prospective cohort studies

The estimated cumulative survival rate for the veneers at 5 years was 95.7% (range, 92%–98%). Removal of 1 outlier study increased the survival rate to 97.3% for 5 years. Ten-year survival rates ranged from 64% to 96%. Removal of the same study eliminated from the 5-year analysis resulted in a 10-year pooled estimated survival rate of 95.6%.

The study eliminated from the meta-analysis reported a 5-year survival of 92% that dropped to 64% after 10 years. In that study, some veneers were bonded to existing restorations or to dentin rather than to enamel, and some were not adhesively bonded at all. These shortcomings of the treatment provided could explain the dramatic drop in the success rate for the 10-year follow-up; therefore, elimination of that study from the meta-analysis appears appropriate.

Comment

Results of this review suggest that the placement of porcelain laminate veneers is technique sensitive. Lack of adequate enamel substrate or inadequate bonding procedures can jeopardize the longevity of these restorations. Also, the presence of parafunctional habits has been reported to play a role in the failure of porcelain veneers. However, it appears that when recommended protocols are followed and patients are carefully selected, very high 10-year success rates can be expected.

All the veneers in the 6 studies were fabricated from feldspathic porcelain, which is a predominately glassy ceramic that has a relatively low flexural strength. Newer ceramic materials, such as lithium disilicate–filled glass, are considerably stronger and could, potentially, offer an even better long-term prognosis. Future clinical studies will likely provide additional information on these stronger ceramic materials when used as veneers.

Layton DM, Clarke M, Walton TR. A systematic review and meta-analysis of the survival of feldspathic porcelain veneers over 5 and 10 years. Int J Prosthodont *2012;25:590-603.*

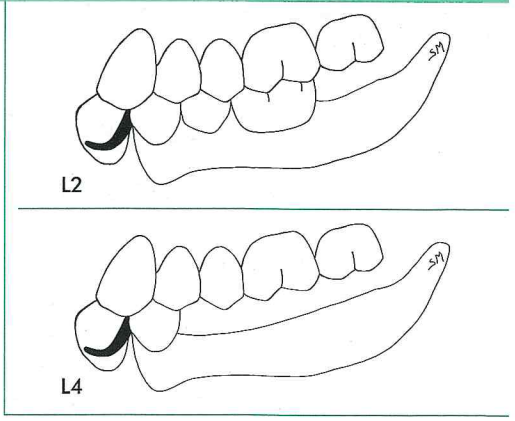
Masticatory Performance with Extension-base Removable Partial Dentures

Partially edentulous patients are commonly treated with removable partial dentures (RPDs). Although it can be assumed that these restorations will improve masticatory performance, data supporting this assumption are limited.

Some studies have suggested that reducing the length of the occlusal table with an extension-base removable partial denture can reduce the load on the abutment teeth and the residual ridges. Nevertheless, the effect of a reduced occlusal-table length on masticatory efficiency is unclear.

Sánchez-Ayala et al from the State University of Campinas, Brazil, evaluated the influence of the length of the occlusal table of extension-base RPDs on masticatory function. The 23 patients enrolled

Figure 1. The occlusal table was reduced t the first premolar (L4) and eliminated entirel



The mean total observation time was 50 ± 2.4 months. The clinical survival of the metal-ceramic FPDs was 100%. The survival for the zirconia restorations was 95%. No fractures of the zirconia or metal frameworks occurred. Chipping of the veneering ceramics was observed with 2 zirconia FPDs. With the exception of the 1 zirconia FPD that experienced a biologic failure (vertical fracture of an endodontically treated abutment), all FPDs were rated satisfactory.

Comment

Results of this study appear promising. In general, the gingival tissues showed an excellent response to the zirconia restorations, and the outcomes of both types of FPDs were comparable. Nevertheless, longer follow-up times with zirconia-based FPDs are necessary. Also, results of this study can be applied only to 3-unit posterior FPDs made with the Lava system. Longer-span FPDs or FPDs made from a different system could produce different results.

Pelaez J, Cogolludo PG, Serrano B, et al. A four-year prospective clinical evaluation of zirconia and metal-ceramic posterior fixed dental prostheses. Int J Prosthodont *2012;25:451-458.*

Fracture Rate of All-ceramic Crowns

All-ceramic single crowns provide excellent esthetics and biocompatibility. Nevertheless, ceramics are brittle materials and subject to fracture during clinical service. Wang et al from Sun Yat-sen University, China, conducted a systematic review focused on the fracture rates of all-ceramic crowns. A total of 5600 articles and abstracts were collected. After screening, 37 publications were selected for the systematic review. All crowns in the review were cemented onto natural teeth. Follow-up time for the 37 studies ranged from 36 to 97 months.

Results of the review demonstrated the following:

- All-ceramic crowns demonstrated an overall annual fracture rate of 1.6% (5-year fracture incidence, 7.7%).
- Posterior crowns experienced a higher annual fracture rate (2.1%) compared with anterior crowns (0.9%).
- The annual fracture rate for molars was 3.0%.
- The annual fracture rates were 1.1% for premolars, 1.2% for canines and 0.7% for incisors.

Fracture rates were then recalculated excluding the data obtained from studies of obsolete glass-ceramic crown systems (Dicor, Cerestore and Hi-Ceram), which have been shown to have inferior mechanical properties.

The overall 5-year fracture rate with the revised calculations was 4.4%. With these revised calculations, annual fracture rates, according to tooth type, were

- 1.1% for posterior teeth
- 0.6% for anterior teeth

The annual fracture rate for molar crowns was 1.7% compared with 0.6% for premolar crowns.

Comment

The data suggested that currently used ceramic materials demonstrated acceptable 5-year fracture incidences, although a higher incidence of fractures occurred with posterior teeth, especially with molar crowns. Zirconia-based crowns are relatively new, and the authors noted that there is limited information about their long-term success rate. The most frequent complication observed with zirconia crowns was fracture of the veneering ceramics, and more long-term clinical trials of zirconia-based crowns are needed.

Wang X, Fan D, Swain MV, Zhao K. A systematic review of all-ceramic crowns: clinical fracture rates in relation to restored tooth type. Int J Prosthodont *2012;25:441-450.*

In the Next Issue

- Complete denture occlusion
- Implant-bone load transfer with implant-supported fixed complete dentures
- Muscle activity with implant-supported fixed complete dentures

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.

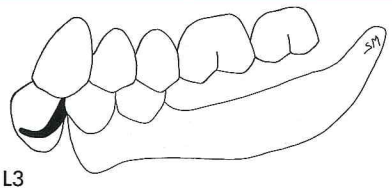
Do you or your staff have any questions or comments about **Prosthodontics Newsletter?** Please write or call our office. We would be happy to hear from you.

in the study were totally edentulous in the maxillae. In the mandible, only the 6 anterior teeth were present. Bone loss in the edentulous ridges was slight to moderate. None of the patients had neuromuscular diseases, temporomandibular disorders, parafunctional habits, xerostomia or advanced periodontal disease of the remaining dentition.

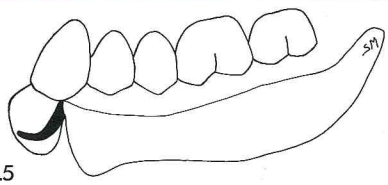
Patients were fitted with maxillary complete dentures and bilateral extension-base (Kennedy Class I) RPDs. The occlusal scheme was bilaterally balanced occlusion. Patients were allowed a 2-month adaptation period with the new prostheses before masticatory function was tested.

Masticatory performance and efficiency were measured with a sieve. Participants chewed test "food" made of polydimethylsiloxane (Optosil Comfort; Heraeus Kulzer, São Paulo, Brazil) for 20 strokes and then expectorated it. The particles were dried for 1 week and then placed in a sieving machine (Bertel Indústria Metalúrgica, Caieiras, Brazil) with a stack of 10 sieves. The particles retained in each sieve and the bottom pan were weighed. Median particle size was then calculated.

e first molar (L2), the second premolar (L3), 5).



L3



L5

Performance was evaluated for an occlusal table to the second molar (L1, full occlusal table, control; cover illustration) and then for abbreviated occlusal tables to the first molar (L2), to the second premolar (L3) and to the first premolar (L4). Absence of all posterior occlusal support (L5) was also evaluated (Figure 1).

Results indicated a progressive decrease in masticatory function and efficiency with a progressive reduction in the length of the occlusal table; the poorest performance was recorded for L5. As the length of the occlusal table was decreased, bolus breakage function was reduced.

Comment

The best masticatory performance was recorded for the full occlusal table. Reduction in the number of teeth resulted in progressively poorer performance. Whether or not patients can adapt to a reduced length of the occlusal table is unknown because the investigators evaluated occlusal function immediately after each successive change in the occlusal table. Possibly, an occlusal table that lacked the mandibular second molars could produce results comparable to a full occlusal table after an adaptation period.

Sánchez-Ayala A, Ambrosano GMB, Rodrigues Garcia RCM. Influence of length of occlusal support on masticatory function of free-end removable partial dentures. Int J Prosthodont *2012;25:472-479.*

All-ceramic vs Metal-ceramic Fixed Partial Dentures

All-ceramic fixed partial dentures (FPDs) have become popular; however, these restorations possess lower fracture resistance when compared with metal-ceramic FPDs. Zirconia, the strongest dental ceramic material currently available, has been recommended for use with posterior all-ceramic FPDs.

Pelaez et al from Complutense University of Madrid, Spain, conducted a prospective clinical trial that compared the outcome of zirconia-based FPDs and metal-ceramic FPDs. The study enrolled 37 patients requiring 40 posterior 3-unit FPDs. Randomly, 20 FPDs were metal-ceramic restorations and 20 were zirconia-based, all-ceramic restorations.

Tooth preparations were standardized for the FPDs. The all-ceramic FPDs were fabricated with the Lava CAD/CAM system (3M ESPE, St. Paul, MN). The milled zirconia frameworks were veneered with Lava Ceram (3M ESPE).

The metal-ceramic FPDs were cast from chromium-cobalt alloy (Heraenium Pw; Heraeus Kulzer, São Paulo, Brazil) and veneered with VITA VM 13 ceramics (VITA Zahnfabrik, Bad Säckingen, Germany). All restorations were prepared by the same technician. The FPDs were evaluated by using the California Dental Association assessment system at baseline (1 week after cementation) and 1, 2, 3 and 4 years after cementation.