Three-step etch & rinse adhesives remain the gold standard for dentin bonding, but mildly acidic 2-step self-etch systems offer a nice compromise when ease of use is considered.

**Objective:** To evaluate bonding of various resin adhesives to dentin using bond strength testing and transmission electron microscopy (TEM).

**Methods:** As controls, 2 adhesives (OptiBond FL, a 3-step etch & rinse system and Clearfil SE Bond, a 2-step self-etching primer system) that have performed consistently well in clinical trials were included in the study. The other adhesives were: Scotchbond MP (3-step etch & rinse); Clearfil Protect Bond (self-etch primer); and Prime & Bond NT, Single Bond, and XP Bond (2-step etch & rinse systems); and Adper Prompt L-Pop, G-Bond, Clearfil S3 Bond, and Xeno III (all-in-one self-etch adhesives). The adhesives were used to bond to flattened dentin on extracted human molars. Composite was applied, and the bonded specimens were sectioned for microtensile bond strength (μTBS) testing, which was accomplished using a universal testing machine. Additional specimens were prepared for examination of the resin-dentin interface using TEM.

**Results:** OptiBond had the highest mean μTBS at 63.6 MPa. For the self-etch primer materials, the mean μTBS values of SE Bond and Protect Bond were 44.3 MPa and 31.0 MPa, respectively. The mean bond strengths of the 2-step etch & rinse systems ranged from 31.1 MPa for Prime & Bond NT to 52.2 MPa for XP Bond. Of the all-in-one systems, Clearfil S3 Bond and Xeno III had the highest means, right around 30 MPa, and Prompt L-Pop had the lowest at 11.1 MPa. The ultrastructure of the hybrid layer tended to vary with acidity of the self-etch adhesives but was very similar for all of the etch & rinse systems.

**Conclusions:** 3-step etch & rinse adhesives remain the gold standard for dentin bonding, but mildly acidic 2-step self-etch systems offer a nice compromise when ease of use is considered.

**Reviewer's Comments:** This study was done by the research group that probably does the most and best research in the world on dentin bonding. They tested a wide variety of materials representing the various categories of adhesives that are available. The results are clear; the most simplified systems tended to underperform the more complex systems. As has been reported by this group and others already, the 3-step OptiBond FL system remains the gold standard in dentin bonding. Clearfil SE Bond, a mildly acidic 2-step self-etch system is also very effective and provides the benefit of a chemical bond to dentin. (Reviewer—Edward J. Swift, Jr, DMD, MS).

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Keywords: Dentin Bonding, Microtensile Bond Strength, Resin Adhesives

Print Tag: Refer to original journal article
Patients should be advised to avoid toothpastes with high abrasive content, particularly in the presence of erosive challenges.

**Background:** Although generally considered safe and effective, at-home bleaching with carbamide peroxide has been shown to reduce microhardness of enamel and dentin surface in some studies. This causes some concern that this could lead to increased susceptibility to toothbrush abrasion and erosive challenges. In addition, this could potentially be related to the abrasive nature of some toothpastes. **Design/Objective:** This in-vitro study aimed to investigate the effect of at-home bleaching on erosive wear and toothbrush/toothpaste-mediated abrasive wear on tooth enamel and dentin.

**Materials/Methods:** 64 (4 x 4 x 2 mm) slabs of enamel and root dentin were obtained from extracted human molars. These specimens were flattened and embedded in acrylic resin with the external surfaces exposed. Each acrylic block had an enamel and dentin fragment. These 64 specimens were randomly assigned to 8 experimental groups. Three variables (bleach application, citric acid application, and high or low abrasiveness dentifrice toothbrushing) were arranged in each possible combination. Erosion and abrasion challenge was accomplished by immersion in 1% citric acid or deionized water followed by toothbrushing in a brushing machine with either high abrasive toothpaste (Aquafresh Advanced with Whitening) or low abrasive toothpaste (Aquafresh Advanced), which are both from GlaxoSmithKline. Bleaching groups received treatment with 10% carbamide peroxide (Opalescence-Ultradent) for 10 hours. This was accomplished prior to the erosive-abrasive cycling. An optical profilometer was used to measure any effects realized on the tooth surfaces.

**Results:** Bleach application had no significant effect on enamel, while erosion and abrasive toothpaste did significantly increase enamel loss. None of the interactions between the 3 factors were significant. The dentin samples did show significant interaction between the 3 factors. Specimens without erosion showed more surface loss when bleach was applied, and those with erosion demonstrated a decreased loss with bleach application unless the more abrasive dentifrice was used.

**Conclusions:** Overnight bleaching with 10% carbamide peroxide did not increase the enamel surface’s susceptibility to erosive and abrasive challenges. Dentin demonstrated an interaction between the bleaching, erosion, and abrasive dentifrice. Bleaching increased the surface loss of noneroded dentin and offered some protection to eroded surfaces brushed with the less abrasive toothpaste.

**Reviewer’s Comments:** This study offers yet another bit of confidence that home bleaching procedures are not deleterious to enamel. The more vexing question comes with those patients with root surface exposed relative to its effects on dentin. The surprising result was the seemingly protective effective of bleaching on dentin subjected to erosive challenge. The authors postulate that some bleaching gel remained entrapped in the dentinal tubules, acting as a mechanical barrier to subsequent erosion. What does remain clear is that higher abrasive toothpastes increase the dentinal loss, and patients should be made aware of this. (Reviewer-Daniel E. Wilson, DDS).

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**Keywords:** Erosion, Abrasion, Enamel, Dentin, At-Home Bleaching

**Print Tag:** Refer to original journal article
A newer all-in-one adhesive has acceptable clinical performance at 3 years with 2 types of composite.

**Objective:** To evaluate the 3-year clinical performance of 2 types of composite resin in noncarious cervical lesions (NCCLs) restored using a newer all-in-one adhesive.

**Participants/Methods:** 22 patients were enrolled in the study; a total of 98 NCCLs were restored, including replacement of 5 defective restorations. The materials used in the study were Clearfil S3 Bond, an all-in-one self-etch adhesive, the flowable composite Clearfil Flow FX, and the hybrid composite Clearfil AP-X. A short (1 mm) bevel was placed at enamel margins, and the dentin was roughened with a bur. No retention grooves were prepared. The hybrid composite was placed in a single increment, but the flowable was usually placed in 2 or 3 increments. Blind evaluations of the restorations were performed at baseline and at 6 months, 1 year, 2 years, and 3 years. Restorations were rated according to modified United States Public Health Service criteria, such as retention, marginal staining, marginal adaptation, and recurrent caries.

**Results:** All patients were available for the 3-year recall. Two teeth had been extracted and 3 of the remaining 95 restorations had been lost, all within the first 6 months after placement. All of the retention failures occurred in the flowable composite group, so the retention rates were 100% for the hybrid and 94% for the flowable. Marginal staining was present in approximately 25% of restorations, regardless of composite type and was generally slight. Marginal adaptation was excellent in both groups, and no recurrent caries were observed.

**Conclusions:** The all-in-one adhesive tested in this study had acceptable clinical performance at 3 years with both types of composite.

**Reviewer's Comments:** This clinical study has 2 interesting results. First, the all-in-one adhesive Clearfil S3 Bond performed extremely well. The retention rates were excellent, and even though marginal staining was fairly common, it was not severe. The staining at enamel margins probably occurred as the result of the mild acidity of this adhesive. Second, there was no difference in clinical performance based on the type of composite used. Theoretically, a low modulus composite (such as a flowable) can absorb functional stresses in the cervical areas of teeth and thus could improve the longevity of Class V restorations. However, this study suggests that the composite has little, if any, such effect. (Reviewer: Edward J. Swift, Jr, DMD, MS).

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Keywords: Non-Carious Cervical Lesions, Composite Resin, Dentin Bonding, Clinical Trial

Print Tag: Refer to original journal article
Crown lengthening is best done approximately 6 months before orthodontic bands are removed.

**Background:** Coordination between general dentists and specialists is critical for optimal patient treatment, especially between restorative dentists and the periodontist and orthodontist.

**Objective:** To discuss treatment coordination of patients with altered passive eruption.

**Results:** Altered passive eruption describes categories of excess gingival coverage of the anatomical crown. Two criteria characterize this condition. First, the tooth is short, and second, the CEJ cannot be detected in the sulcus because the attachment apparatus covers it. The "gummy smile" has >2 mm of gingival display in full smile. It can result from a short/hyperactive upper lip, dentoalveolar extrusion, and vertical maxillary excess. Many postorthodontic patients have maxillary central incisors with clinical crowns appearing too short and wide. Normal eruption has 2 stages. Active eruption begins as the tooth grows through bone and soft tissue into the mouth, stopping only when it occludes with its antagonist. Passive eruption is apical migration of gingival tissue that continues until it is within approximately 1 mm of the CEJ. Once stabilized, the clinical crown averages 10 mm to 11 mm in length. In altered passive eruption, tissue does not migrate apically to a sufficient level. Normal eruption is basically finished by 15 to 16 years of age. If the patient suffers from active passive eruption but there is no need for restorative treatment, the orthodontic treatment is related to incisal edge position. Orthodontic patients may need surgery after their orthodontic treatment. Surgery is accomplished after orthodontics bands are removed. Orthodontic treatment intends to level the CEJs of the teeth. Passive altered eruption makes that difficult because the CEJs are not visible clinically. Additionally, tooth positioning is determined by width-to-height ratios of the teeth. This cannot occur until excess gingival tissue is removed. Once tissue is removed, it is possible to position teeth with level gingival tissues and optimal positioning mesio-distally for placement of restorations. If the surgery is performed prior to orthodontic treatment, second-stage touch-up surgery is needed after debanding. It is also difficult to do crown lengthening for crowned/rotated teeth. It is advisable to perform surgery approximately 6 months prior to debanding to allow the orthodontist sufficient time to correctly position teeth. A case presentation illustrates treatment sequencing of initial orthodontics, surgery to remove redundant tissue, final orthodontic positioning, and porcelain veneer restoration placement.

**Conclusions:** This article discussed the prevalence of altered passive eruption in adolescent orthodontic population. It presented a rational for timing of esthetic crown lengthening surgery for orthodontic patients.

**Reviewer's Comments:** The important first step in dealing with teeth that appear too short and wide is to determine whether altered passive eruption is the problem. If so, crown lengthening is indicated. Dr. Robbins gives good rationale for the timing of this procedure in coordination with orthodontic treatment. (Reviewer-Thomas G. Berry, DDS).

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**Keywords:** Orthodontic Treatment, Soft Tissue Recontouring, Sequencing, Timing

**Print Tag:** Refer to original journal article
A resin-modified glass ionomer liner provides an excellent seal of dentin and thus should minimize postoperative sensitivity associated with restorations.

Objective: To measure the ability of a new paste/liquid resin-modified glass ionomer (RMGI) liner/base material to reduce fluid flow through human dentin.

Materials/Methods: The material tested in this study was Vitrebond™ Plus (VBP), a liner/base material that is based on methacrylate-modified polyalkenoic acid copolymer technology and is delivered as paste and liquid components that are mixed together and light-activated. Extracted human third molars that had been unerupted were sectioned to remove the roots and occlusal enamel, forming crown segments with exposed dentin surfaces that were 0.6- to 1.2-mm thick above the highest pulp horn. These were attached to the permeability apparatus that applied water into the pulp chamber and measured its flow through the dentin. This apparatus has been used in numerous studies over the years and has proven to be an effective method for determining dentin permeability. Permeability was measured under 4 conditions: with the smear layer having been removed by acid-etching; following creation of standardized smear layers by polishing with abrasive paper; and with VBP applied to both types of surfaces.

Results: The highest permeability occurred with the control (ie, acid-etched dentin). Creation of a smear layer decreased permeability substantially because the smear layer partially seals the dentinal tubules. On etched dentin without a smear layer, VBP reduced permeability by 87.7%. When a smear layer was created after etching, the liner material reduced permeability by 98.9% from its original value and by 95.0% from the smear layer value.

Conclusions: The RMGI liner, VBP, provided an excellent seal of dentin and thus should minimize postoperative sensitivity associated with restorations.

Reviewer's Comments: Dentinal hypersensitivity, whether associated with exposed cervical dentin or a new restoration, is related to movement of fluid in the tubules, which requires that the tubule orifices are open. The present study shows that an RMGI liner can effectively seal the dentinal tubules, which theoretically should help to prevent postoperative sensitivity. I am aware of 1 or 2 clinical studies that support this finding. For those not familiar with the product, VBP is a modification of the earlier powder/liquid material and provides a more consistent viscosity. (Reviewer—Edward J. Swift, Jr, DMD, MS).

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Keywords: Glass Ionomer Liner, Dentin Permeability, Sensitivity

Print Tag: Refer to original journal article
Objective: To evaluate the evidence behind claimed advantages of intraoral digital receptors.

Methods: PubMed and hand searches.

Results: Working Time. Time is saved when working with digital receptors compared to films. There are no studies where additional postprocessing time has been evaluated. Dose to the Patient. Dose used with most digital receptors is lower than with films; however, the increased sensitivity of current films has diminished this gap between digital and film radiography. Retake and Errors. The presumption of fewer retakes with sensors (charge-coupled device [CCD], complementary metal oxide semiconductor [CMOS]) and plates (photostimulable storage phosphor [PSP]) may be false. Positioning errors are greater when using digital radiography resulting in total increased dose to patients. Dynamic Range of the Receptor. This refers to the variation in radiation that the receptor allows while still producing an acceptable image. Plates have a wider dynamic range than sensors and films. That means fewer retakes with plates due to burn out. The down side of this is that unnoticed overexposure of plates is likely to happen more often resulting in higher radiation dose to patients. Information to the Patient. There is no evidence of any benefit from displaying the digital radiograph to the patient. Image Storage, Archiving, and Communication. Compression of the image files can save storage space, but it is not recommended when irreversible considering that hard disk space is inexpensive. Digital images can be sent via internet but should be encrypted when containing patient data. Patient Discomfort. Sensors seem to be more unpleasant to patients than plates and films. Damage to the Receptor and Degradation of the Image. Mechanical wear and trauma affects the cost-effectiveness of sensors and plates compared to films. Information is lost if the sensor or the plate is exposed to light before scanning. Cross-Contamination and Hygiene Precautions. Precautions with cross-contamination of digital receptors should be taken considering that these are used for examination of many patients. Viewing the Image. The difference in monitors seems not to affect the diagnostic outcome. Digital images should be viewed on a hooded monitor or in a dark room for better diagnosis.

Conclusions: Changing from analog to digital radiography is a revolution with potential benefits for patients. Proper training for that transition is needed.

Reviewer’s Comments: There are clear differences between CCDs, CMOS, and PSP plate used for digital radiography. Understanding the systems and pursuing proper training are key to success. (Reviewer-Ricardo Walter, DDS, MS).

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Keywords: Digital Radiography, Digital Receptor, Film

Print Tag: Refer to original journal article
Alcohol consumption speeds up discoloration of composite restorations when associated with smoking.

Background: Long-term color stability of resin composite remains one of the major reasons for replacement of these restorations. Discoloration of resin-based materials results from several intrinsic and extrinsic factors. Physico-chemical reaction can cause deterioration. External discoloration can be caused by plaque and colored pigment accumulation. Coffee, tea, red wine, orange juice, some soft drinks, and food colorants influence color stability of composite restorations. Cigarette smoking and alcoholic beverages may exacerbate this discoloration.

Design/Objective: This in vitro study investigated isolated and associated effects of cigarette smoke and whiskey on color stability of microhybrid, nanohybrid, and nanofilled dental composites.

Methods: Enamel and translucent shades of 5 different resin composites were used in the study. The composites chosen were Grandio, Charisma, Filtek Supreme XT, Opallis, and 4 Seasons. Ten standardized discs were made of both shades of each material, and initial color readings were made. Half of the specimens were subjected to discoloration in a cigarette-smoking machine for 4 cycles of 10 minutes per cycle. The other half of the specimens was immersed in whiskey for 24 hours at 37°C. The specimens were then switched so samples exposed to smoke were next exposed to whiskey and those immersed in whiskey were exposed to cigarette smoke following the original protocols. Color measurements assessed color changes after each treatment.

Results: Staining by the combination of whiskey and smoking significantly increased color changes for all composite samples. Immersion in whiskey resulted in less color change. There was a tendency to discolor to dark yellow for the materials used in this study. While whiskey immersion alone caused limited color change, significant discoloration was observed when whiskey immersion was followed by smoke exposure. Alcohol softens the composite surface plasticizing the resin. The result is a softer matrix that is more prone to degradation. Smoke exposure alone resulted in darkening the composite. Sugars and cocoa as well as tar found in smoke could explain the darkening of the composite.

Conclusions: Translucent shades demonstrated more darkening than enamel shades, possibly because translucent shades are less filled. The staining effect, ranked in order from greatest to least was as follows: whiskey/smoking, smoking, smoking/whiskey, and whiskey.

Reviewer's Comments: Certainly, it is well known that composite restorations do darken over time, and that certain dietary intake and other habits cause a rapid rate of discoloration. This study adds some more knowledge to what speeds up that discoloration. The dentist is not in a position to forbid patients from drinking and smoking. Nevertheless, the dentist can warn patients about the composite restorations darkening at a much faster pace when drinking alcohol and smoking are combined on a regular basis. (Reviewer-Thomas G. Berry, DDS).

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Keywords: Composites, Colors Stability, Smoking, Whiskey

Print Tag: Refer to original journal article
The results of this study suggest that IRM can be used as a base under composite.

**Objective:** To evaluate the mechanical properties and polymerization of light-cured composite resin placed over a zinc oxide eugenol (ZOE) base.

**Methods:** Class I preparations (5 mm deep) were made in plastic molar teeth. All were restored using Filtek Supreme composite, shade A4. Three experimental groups were included. In one group, the composite was bonded using the Scotchbond Multipurpose adhesive system. In the other 2 groups, a 2-mm thick eugenol-containing temporary restoration (IRM) base was placed first. In one of those groups, no adhesive was used. The bonded specimens were sectioned into halves. A nanoindentation device was used to measure the hardness and elastic modulus of the composite material at numerous locations. All specimens were examined using scanning electron microscopy (SEM) following the nanoindentation procedure.

**Results:** In the IRM adhesive composite group, a thin (approximately 20 µm) layer of less polymerized composite was observed with SEM near the IRM interface. At the measurement sites nearest the IRM, the composite mean hardness values and elastic moduli of the 3 groups were 0.51 GPa and 9.71 GPa, respectively, for the IRM/adhesive specimens, 0.96 GPa and 14.79 GPa, respectively, for the IRM/no adhesive specimens, and 1.03 GPa and 15.47 GPa, respectively, for the no-IRM group.

**Conclusions:** Zinc oxide eugenol (ZOE) base materials can be used under composite restorations without undue suppression of resin polymerization.

**Reviewer's Comments:** It is widely believed that eugenol-containing materials inhibit polymerization of methacrylate resins. However, based on the results of this study, the authors conclude that IRM can be used as a base under composite restorations. I must admit that I am skeptical about this. The data indicate that the hardness of composite was reduced by approximately one-third near the IRM/adhesive interface, which clearly shows that polymerization of the resin was inhibited in that area. Furthermore, I think there are very few clinical indications where a ZOE base would offer significant advantages over a resin-modified glass ionomer. That said, it is quite possible that you could place composite over an aged eugenol-containing material without any problem. For example, if an IRM sedative restoration had been placed for several weeks and was followed by a permanent composite restoration, it is likely that not all of the IRM would need to be removed. (Reviewer-Edward J. Swift, Jr, DMD, MS).

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Keywords: Composite Resin Restorations, Eugenol

Print Tag: Refer to original journal article
The control of gelatinolytic enzymes may provide improved bond longevity.

**Background:** Contemporary esthetic and restorative dentistry increasingly depends on reliable bonding to enamel and dentin. The bond to dentin is both less predictable initially and more questionable in regard to longevity. The integrity of the hybrid zone is threatened by a number of factors affecting the hydrophilic resin components as well as the dentin matrix. Recently, the role of host-derived proteases, known as matrix metalloproteinases (MMPs), has been questioned regarding the stability of the collagen matrix. Other studies have shown that a nonspecific protease inhibitor, chlorhexidine, when applied prior to bonding procedures, can suppress some of these MMPs. The use of more specific MMP inhibitors could potentially be used to help preserve the hybrid layer and thereby enhance bond longevity.

**Design/Objective:** This in vitro study examined the effect of a specific MMP inhibitor (galardin) on the morphological and mechanical preservation of the hybrid layer.

**Materials/Methods:** For the initial part of this study, 20 extracted, noncarious human molars were stripped of enamel and pulp and pulverized to create dentin powder. Five 1-g aliquots were assigned to experimental groups, which included: untreated dentin powder; partially demineralized dentin powder; partially demineralized dentin incubated with galardin; and partially demineralized dentin incubated with 2 different concentrations (0.2% and 2%) of chlorhexidine. All samples were then analyzed for MMP activity. Twenty-eight additional teeth were sectioned to expose flat dentin surfaces. They were then etched with 35% phosphoric acid and half treated with galardin prior to bonding with Adper Scotchbond 1XT (3M ESPE) and resin build-up with Filtek Z250 (3M ESPE). The specimens were then sectioned and subjected to microtensile bond strength testing either immediately or after 1 year of storage in artificial saliva. The remaining 12 molars were prepared identically to the bond strength samples and tested for nanoleakage.

**Results:** The mineralized dentin powder showed no MMP activity, while the demineralized dentin demonstrated activity with multiple forms of the gelatinolytic enzymes MMP 2 and 9. Complete inhibition of these enzymes was noted in the galardin and chlorhexidine groups. Bond strength testing demonstrated no differences between the control and galardin group relative to immediate testing. After 1 year of aging, both groups demonstrated lower bond strengths, with a 27% decrease in the galardin group and a 45% decrease in the control group. Nanoleakage was reduced in the galardin group as well.

**Conclusions:** Phosphoric acid etching encourages MMP activity. Galardin application eliminated MMP activity and resulted in better bond stability over time.

**Reviewer’s Comments:** This study as well as others demonstrating the effectiveness of chlorhexidine in MMP activity inhibition and improved bond stability when MMPs are inhibited provide promise that one piece of the bond longevity puzzle may be addressed. This study would have been stronger if chlorhexidine samples were included in the bond strength and nanoleakage arms. (Reviewer-Daniel E. Wilson, DDS).

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Keywords: Metalloproteinases, Dentin, Bond Longevity, Galardin

Print Tag: Refer to original journal article
In-office bleaching with 35% hydrogen peroxide had no effect on enamel hardness 14 days after treatment.

**Objective:** To evaluate the effects of different light sources and 35% hydrogen peroxide on the microhardness of human enamel subjected to in-office bleaching.

**Materials/Methods:** Small flat enamel slabs (2.5 x 2.5 x 1 mm) were obtained from extracted human third molars. A total of 160 slabs were taken from 32 teeth. Each slab was polished to 1200 grit and polished further with a graded series of alumina pastes. Intraoral appliances were fabricated on maxillary stone casts of study volunteers. The appliances contained 5 sections of 4 slots into which the enamel slabs were inserted. A 35% hydrogen peroxide gel was applied to the enamel. Except for 1 group that was not treated, all of the enamel specimens were bleached for 30 minutes. In one group, no bleaching light was used. In the others, an argon laser, halogen light-curing unit, or combined light-emitting diode-laser light was used. Following these bleaching treatments, the enamel slabs were inserted into the intraoral appliances. Subjects wore the appliances continuously (except while eating) for the next 2 weeks. Microhardness measurements of each enamel slab were made before treatment and at 1, 7, and 14 days after treatment.

**Results:** Microhardness tended to be less immediately after treatment (ie, 1 day) than before treatment. However, the greatest decrease in hardness for any group was only 5.8%. By 14 days after treatment, alterations in microhardness were minuscule (<1%) and not statistically significant.

**Conclusions:** Regardless of the light source used, in-office bleaching with 35% hydrogen peroxide had no effect on enamel hardness 14 days after treatment.

**Reviewer's Comments:** We occasionally see papers reporting that bleaching has adverse effects on hardness or some other property of enamel. However, most of the studies have been done in the laboratory and most have not accounted for the remineralization effects of saliva. The present study is a valuable one because it was done in situ and thus did account for the beneficial effects of saliva. Not unexpectedly, bleaching initially caused a slight decrease in enamel hardness. However, within a relatively short time, the effect was reversed by remineralization in the mouth. The study did use only 1 fairly short bleaching session, but that is a minor criticism. (Reviewer-Edward J. Swift, Jr, DMD, MS).

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**Keywords:** Bleaching, Peroxide, Enamel

**Print Tag:** Refer to original journal article
Be aware of evidence-based prognostic factors when planning apical surgery in your patients.

**Objective:** To assess potential prognostic factors for healing outcomes in apical surgery.

**Methods:** Studies on apical surgery with orthograde root canal filling and on apicoectomy alone were not included in this meta-analysis. Only studies that evaluated apical surgery with placement of root-end filling were selected. To be included, the outcome of the study had to be periapical healing based on radiographic and clinical evaluations. A minimum of 10 patients and 6 months of follow-up were also part of the inclusion criteria.

**Results:** 38 studies fulfilled the inclusion criteria. Patient-Related Factors. There was no difference in healing rates between younger and older patients and between males and females. Tooth-Related Factors. Both maxillary and mandibular anterior teeth showed higher healing rates than the other teeth. Mandibular molars showed the lowest estimated healing rate. Asymptomatic teeth, teeth without preoperative signs, and teeth with good radiographic density of the root canal filling had higher healing rates than their respective counterparts. The presence of a lesion and lesions >5 mm had lower healing rates than their counterparts. Root canal filling length, endodontic retreatment before apical surgery, and the presence of post were not significant. Treatment-Related Factors. First-time surgeries had a higher healing rate than reoperations. Cases where the root-end cavity preparation was done with a microtip had a higher healing rate than those done with a bur. Cases treated with an endoscope had a higher healing rate than those treated without it. The use of antibiotics was not significant. Mineral trioxide aggregate showed the highest healing rate and glass ionomer showed the lowest.

**Conclusions:** Patient-, tooth-, and treatment-related factors should be considered when planning apical surgery against treatment alternatives.

**Reviewer's Comments:** The current meta-analysis is useful as a guide in the decision process among root canal retreatment, apical surgery, and extraction with further prosthodontic restoration. However, be aware of the limited literature on the topic. Some of the data presented were based on nonhomogeneous material from the studies reviewed. (Reviewer-Ricardo Walter, DDS, MS).

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Keywords: Root Canal, Apical Surgery, Healing

Print Tag: Refer to original journal article
Initial low-intensity light exposure may reduce shrinkage during polymerization.

**Background:** Light-emitting diode (LED) curing units emit narrow band spectrum between 460 and 490 µm so they match the camphorquinone photoinitiator. Several approaches have been advocated to minimize shrinkage of composites during polymerization. These include incremental placement and reduced light intensity. This is accomplished by applying lower intensity for a longer time or by using variable intensities over specific times. They achieve equivalent degree of conversion. Initially, low-intensity curing is used briefly to allow surface network formation while delaying the gel point in inner layers until final high-intensity polymerization is initiated. High-intensity lights can cause rapid polymerization contraction forces.

**Objective:** To evaluate polymerization shrinkage of 2 fine-particle hybrid composites and a nanohybrid composite using LED curing units with different intensities.

**Methods:** Standardized samples of Tetric Ceram (hybrid), Tetric EvoCeram (nanohybrid), and Artemis Enamel (hybrid) were light cured 20 seconds. The LED units used included Bluephase C5 and Bluephase C8. One group was cured 20 seconds with C5 at 500 mW/cm². The second and third groups were cured 5 seconds at 650 mW/cm² (soft-start mode) and then 15 seconds at 800 mW/cm². Low-intensity mode was used to cure Tetric Ceram A3 (control group). Photopolymerization contraction was measured using digital laser interferometry.

**Results:** The highest shrinkage occurred with high-intensity polymerization using the Bluphase C8 unit, while lower values were obtained using the soft-start mode with Bluephase C8. Artemis A2 demonstrated the greatest overall dimension change regardless of curing light. Tetric EvoCeram A3 showed the lowest shrinkage with C8 in soft-start mode. Artemis A2 displayed significant differences among Bluephase C8 and Bluephase C5 high polymerization modes and Bluephase C8 soft-start mode. There was also significant difference between high polymerization mode of Bluephase C8 and the soft mode. No significant differences were noted in other cases. Materials polymerized using high-intensity mode had the greatest shrinkage. Shrinkage was higher with the C8 high-intensity mode for Tetric EvoCeram A1 and A3 as well as Artemis A2 composites. Shrinkage was higher for Tetric EvoCeram A2 and A3.5 with C5 and with C8 soft-start mode. This may possibly result from the materials’ composition.

**Conclusions:** Composite polymerization shrinkage is unavoidable. Choosing the optimal curing mode can minimize shrinkage. Curing units with different light intensities produce different shrinkage. Shrinkage occurs during the first 4 to 9 seconds regardless of curing program and composite. Soft-start with Bluephase C8 and C5 units gave the lowest shrinkage, while C8 high-intensity mode demonstrated greatest shrinkage. Low light intensity exposure should be the first choice for composite polymerization.

**Reviewer's Comments:** After many years and much research, we are still looking for the best way to minimize shrinkage in a clinically efficient way. It does appear that initial low-intensity light followed by high intensity offers the best approach. However, research has still not given us an absolute answer. (Reviewer-Thomas G. Berry, DDS).

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Keywords: Composite, Polymerization, Laser Interferometry, Shrinkage

Print Tag: Refer to original journal article
A bench study suggests that CCP-ACP might benefit the enamel surface after bleaching.

Objective: To determine if after each office bleach (38% hydrogen peroxide) session, whether enamel would benefit from application of either fluoride or casein phosphopeptide-amorphous calcium phosphate (CPP-ACP).

Materials/Methods: Enamel specimens were sectioned from bovine incisors. The specimens were bleached for 15 minutes with Opalescence Xtra Boost and then washed. The procedure was repeated for a total of 3 bleach sessions with 5 days between sessions. The treatment regimen among the groups was as follows:

- Group A (n=9), bleach only;
- Group B (n=9), 3 minutes with CCP-ACP paste (GC Tooth Mousse) and wash with water;
- Group C (n=8) 3 minutes with CCP-amorphous calcium phosphate fluoride (CPP-ACPF) (GC MI Paste Plus);
- Group D (n=8) 250 ppm sodium fluoride; and
- Group E (n=8) 1.23% acidulated phosphate fluoride (12,300 ppm).

Results: Enamel hardness went down in Group A with no after-bleach treatment. Hardness went up with both CCP-ACP and CCP-ACPF (Groups B and C), and it went up a little with Groups D and E.

Reviewer's Comments: This is where extracted tooth studies really fail to duplicate the mouth. That magic goo called saliva could change everything about this study. In general, we have not seen clinically significant changes in enamel when we follow standard bleaching protocols. Would CCP-ACP be a good way to follow in-office high-concentration bleaching? I do not know. Most of the independent research on bleaching reports the best result with nightguard bleaching, so I think that the number of dentists doing in-office bleaching is getting smaller with each passing day. I still see the POWER bleach advertisements in the journals but not as many as there once were. If given 2 guesses, I would have by luck gotten these 2 facts correct. The CPP-ACP with fluoride did not outperform the CCP-ACP without fluoride. The low concentration fluoride was not as good as the high concentration fluoride. My final recommendation is to use a 10% carbamide peroxide bleach in a custom tray. The urea breakdown will decrease acidogenic bacteria and inhibit acid dissolution of the enamel. Your patient can get a great result in a few weeks. (Reviewer-J.D. Overton, DDS).

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Keywords: Bleaching, Casein Phosphopeptide-Amorphous Calcium Phosphate, Fluoride

Print Tag: Refer to original journal article
The results of in-office bleaching are not enhanced by the use of a light.

Objective: To evaluate the effects of different light sources on in-office bleaching agents in regard to color change and enamel microhardness.

Materials/Methods: Segments were sectioned from bovine tooth crowns, and the buccal surfaces were polished to 4000 grit. Specimens were randomly assigned to 4 treatment groups: (1) bleaching with 15% hydrogen peroxide under a plasma arc light (Britesmile); (2) bleaching with the same agent but without the light; (3) bleaching with 35% hydrogen peroxide under a light-emitting diode (LED) light; and (4) bleaching with 35% hydrogen peroxide and no light. Multiple applications of the bleaching gels were made during 1 session. Microhardness (Knoop hardness) was measured before and after bleaching. Color changes were measured with a Vita EasyShade dental spectrophotometer before and immediately after bleaching and at 1 and 7 days later. The CIELAB parameters $L^*$ and $b^*$ were obtained as the outcome measures, and overall color change values (delta-E) were calculated.

Results: Microhardness was not affected by the 15% hydrogen peroxide gel. However, microhardness did decrease with the 35% hydrogen peroxide. None of the measured color changes was significantly better than the others, with 1 exception. The 35% system had a larger color change with the light immediately after bleaching, but there was no difference at 1 day after bleaching.

Conclusions: The results of in-office bleaching were not enhanced by the use of a light.

Reviewer's Comments: Several studies have reported that bleaching, whether in-office or at-home, can affect the hardness of enamel. However, this effect appears to be transient as it is reversed by salivary remineralization. The use of lights to enhance in-office bleaching remains a controversial and unproven concept. There is some evidence that light can alter the kinetics of peroxide decomposition if appropriate metallic ions are available in the bleaching gel. Theoretically, the heat associated with an intense light accelerates peroxide decomposition, but the amount of heat required for this is too high for clinical use. The bottom line with the bleaching lights available today is that they probably have little or no effect on the long-term efficacy of bleaching. (Reviewer: Edward J. Swift, Jr, DMD, MS).

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Keywords: In-Office Bleaching, Light Irradiation, Microhardness, Color

Print Tag: Refer to original journal article
Can Zirconia Core Materials Be Used in Feather-Edged Applications?

Restoring Severely Compromised Anterior Teeth With Zirconia Crowns and Feather-Edged Margin Preparations: A 3-Year Follow-Up of a Prospective Clinical Trial.

Schmitt J, Wichmann M, et al:

Int J Prosthodont 2010; 23 (March-April): 107-109

The strength of zirconium crown copings may someday allow unusual applications, such as feather-edged margins.

**Objective:** According to the authors, their study aimed, “…to assess the medium-term clinical efficacy of anterior all-ceramic crowns with reduced dimensional thickness in the marginal area associated with a feather-edged preparation design.”

**Design:** Pilot prospective clinical trials.

**Participants/Methods:** This is a case series report of 10 patients who received a total of 19 crowns on maxillary incisors. Eight of the teeth were vital, and 11 were nonvital and required zirconium dioxide posts and resin composite cores. All of the teeth were severely morphologically compromised to the point that a feathered-edge finish line was prepared due to the lack of natural tooth structure. From digital impressions, yttria-stabilized zirconium dioxide crown copings were made using the Lava system (3M ESPE). The crown copings were 0.3 mm in thickness at the feather-edged margins and increased to the recommended 0.5-mm thickness in the incisal areas. The copings were veneered with the Lava Ceram porcelain. The crowns were cemented with conventional glass ionomer cement and examined annually for 3 years. Two independent dentists evaluated the patients using the California Dental Association quality criteria. Nine of the 10 patients were available to attend the 3-year recall.

**Results:** There was 100% survival at the 3-year recall. Minor chipping had occurred on the incisal edge of 1 crown and slight surface roughness on 2 other crowns. Bleeding on probing was found significantly more often around the crowns than on surrounding nonrestored teeth. Plaque was significantly higher on the nonrestored teeth.

**Conclusions:** While definitive conclusions could not be drawn due to the small sample size and medium-term observation, “…it appears that zirconia copings with a marginal wall thickness of 0.3 mm and manufactured for a feather-edged preparation design provide sufficient mechanical stability in the maxillary anterior region.”

**Reviewer’s Comments:** Conventional wisdom says that using a feathered-edge margin for any ceramic restoration is contraindicated. So this small pilot study is notable in that its findings defy conventional wisdom. Feathered-edge crowns fared well over 3 years despite the reduced coping thickness of the Lava copings at the marginal area. Of course, it would be completely inappropriate to use this technique in private practice until larger and longer duration clinical studies are done to confirm these pilot study findings. This study was experimental and conducted with the approval of the institutional review board, which assured that the patients were informed and gave consent to the experimental nature of the study. This is the method by which new knowledge is gained. Case series reports are a lower level of evidence and should be interpreted cautiously. There were no control crowns included in the study, and it is impossible to put these findings into clinical perspective. Would well-made acrylic resin provisional have fared as well over the 3-year period? Future large randomized clinical trials will provide the answer to the question relative to whether zirconia core materials are sufficiently strong to be used in feather-edged applications. (Reviewer-Charles B. Hermesch, DMD).

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Keywords: Maxillary Incisors, Zirconia Crowns

Print Tag: Refer to original journal article
Information gathered from caries risk assessment tools should be used to educate patients regarding their oral health.

Objective: To evaluate the correlation between secondary caries and the estimated caries risk profile obtained from the Cariogram, to evaluate the quality of dental restorations placed in an adult Saudi population, and to determine the additional value of bite-wing radiographs in the evaluation of quality of restorations.

Participants/Methods: Adult subjects with at least 20 teeth and a minimum of 7 teeth with dental restorations were enrolled. Sixty-two females and 38 males with a mean age of 29 years fulfilled the inclusion criteria. Subjects’ caries risk was determined using the Cariogram. Factors relevant to this model are caries experience, related diseases, salivary flow rate, salivary buffer capacity, amount of plaque, diet frequency, diet content, mutans Streptococcus count, fluoride program, and clinical judgment. The worse status for caries experience was given to all subjects because all subjects had several restorations. After weighting all factors, the population was divided into 3 risk groups based on the percentage chance of avoiding caries. The number of subjects in each group was 38 (0% to 20% chance), 28 (21% to 40%), and 34 (41% to 100%). The clinical examination evaluated the presence of recurrent caries, marginal integrity, anatomic form, surface texture, and color match of the restorations. Bite-wings radiographs were taken to evaluate the gingival marginal integrity in which the presence or absence of radiolucency was recorded and anatomic form in which under- and overcontoured Class II restorations were identified.

Results: The lower the likelihood of new caries being avoided, the higher the percentage of secondary caries. Composite resin restorations performed better than amalgam and glass ionomer restorations in regard to anatomic form and surface texture. Clinical evaluation revealed secondary caries in 61%, 48%, and 76% of amalgam, composite, and glass ionomer restorations, respectively. Radiolucencies at the gingival margin of Class II composite restorations were noticed in 44% of the cases, while only 23% were deemed unacceptable under clinical evaluation. Those numbers for amalgam restorations were 39% (gingival radiolucency) and 42% (clinically unacceptable), and 56% and 51%, respectively, for glass ionomer restorations.

Conclusions: The Cariogram is a suitable model for caries risk assessment. Bite-wing radiographs were helpful when evaluating the marginal integrity and proximal anatomy.

Reviewer’s Comments: Secondary caries is the main reason for restoration replacement in dental practice. However, some literature questions that high incidence of secondary caries and suggests that overtreatment may sometimes be performed. In that regard, the current manuscript illustrates one of the most common problems in caries diagnosis, ie, misdiagnosed when using bite-wings radiographs. Composites with different radiolucencies, thick adhesive layers, and the angulation of the x-ray can sometimes lead the dentist to replace adequate restorations. (Reviewer-Ricardo Walter, DDS, MS).

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Keywords: Caries, Risk Assessment, Bite-Wing Radiograph, Class II

Print Tag: Refer to original journal article
Surface sealers might reduce leakage of composite restorations, but not all materials are equally effective.

**Objective:** To study the efficacy of surface sealing materials to minimize leakage in Class V composite restorations.

**Materials/Methods:** Standardized preparations were made in the labial surfaces of 50 bovine teeth. An etch & rinse adhesive and microhybrid composite were used to restore the preparations, with the composite being placed in 2 increments. The restorations were finished and polished using an abrasive disk series after 24 hours of water storage. The specimens were randomly assigned to 5 groups, with 1 of those receiving no further treatment to serve as the control. In the other groups, a 37% phosphoric acid gel was applied to the restorations and surrounding tooth structure. Fortify, OptiGuard, Seal & Protect, and Xeno III were applied as surface sealers. The first 2 materials are marketed as surface sealers; however, Seal & Protect is primarily used for desensitization and Xeno III is an all-in-one self-etch adhesive. All specimens were thermocycled and immersed in silver nitrate. They were sectioned and examined at 10x magnification. Digital images were captured and scored on a 0 to 3 leakage scale.

**Results:** Microleakage severity, from least to most, was Seal & Protect, OptiGuard, Xeno III, control, and Fortify. Compared with the control, only Seal & Protect significantly reduced leakage.

**Conclusions:** Resin-based surface sealers might reduce leakage of composite restorations, but not all materials are equally effective.

**Reviewer's Comments:** Because composites shrink as they polymerize, it is not unreasonable to assume that tiny marginal gaps might form. Further, it could be assumed that etching the margins and applying a fluid resin material could help to seal up those gaps. The present study does suggest that sealing indeed might fill gaps to reduce leakage. Surprisingly, the material that worked best was one designed not as a sealer for composite restorations, but for desensitizing exposed dentin surfaces. The use of an enamel/dentin adhesive such as the one tested in this study would not be advisable clinically because such adhesives contain hydrophilic monomers that could increase staining at margins. Materials marketed as surface sealers are more hydrophobic and would be less likely to stain. (Reviewer-Edward J. Swift, Jr, DMD, MS).

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Keywords: Composites, Leakage, Sealers

Print Tag: Refer to original journal article
The clinical fracture rate of IPS Empress crowns is higher in molars than in incisors.

**Objective:** To “…evaluate the clinical fracture rate of crowns fabricated with the pressable, leucite-reinforced ceramic IPS Empress and relate the results to the type of tooth restored.”

**Methods:** The study authors searched the scientific literature in March 2009 and found 10 reported clinical studies of IPS Empress crowns that had been adhesively cemented. The data from 7 of the studies were included in the review and 3 were excluded due to being inappropriate for various reasons. The main outcome variable was fracture of the IPS Empress crowns. IPS Empress crowns that failed for reasons other than fracture were excluded from the data analysis. The fracture results from the 7 studies were pooled resulting in 1487 crowns for analysis in the review (40% incisors, 8% canines, 28% premolars, and 24% molars). The mean observation period was 4.5 years (majority of crowns were 3 to 7 years old) at the recall examination.

**Results:** During the study period, 3.8% of the overall IPS Empress crowns fractured. The fracture rate of crowns by tooth type was: incisors, 2.3%; canines, 5.7%; premolars, 2.9%; and molars, 6.7%. The majority of the fractures (68%) occurred during the third to sixth year after placement. The study derived hazard rates such that the average number of crown fractures estimated per year out of 100 crowns would be 0.5 for incisors, 1.2 for canines, 0.7 premolars, and 1.6 for molars crowns.

**Conclusions:** It appears that adhesively luted IPS Empress crown have a low fracture rate for premolars and incisors but a somewhat higher rate for canines and molars.

**Reviewer’s Comments:** IPS Empress is a pressable, leucite-reinforced, all ceramic material that has been on the market over 15 years. Its name was changed to IPS Empress Esthetic in 2004. The dental profession is fortunate to have 10 clinical studies reported in the literature on the IPS Empress track record. To clarify potentially confusing product names, keep in mind that this study is about the original IPS Empress crowns, not the higher strength IPS Empress 2 introduced in 1998 that was made of lithium-disilicate ceramic. IPS Empress 2 was later replaced with IPS e.maxPress in 2006, which was made of a more translucent lithium-disilicate ceramic. This study had some limitations that could bias the results. The 7 studies were not randomized clinical trials, and most did not report the number of study dropouts. Since failures other than crown fractures were not recorded, the failure rate from all causes would obviously be higher. The hazard rate calculation assumes that the failure rate is constant over time, but this may or may not be the case. The lead author on the study is an employee of Vivadent, the manufacturer of IPS Empress. Nevertheless, the reported failure rates are important confirmations of clinical observations that adhesively cemented IPS Empress crowns have a higher fracture rate on posterior and canine teeth than on anterior and premolar teeth. Dentists should take that into consideration during treatment planning. (Reviewer-Charles B. Hermesch, DMD).

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**Keywords:** IPS Empress All-Ceramic Crowns, Fracture Rates

**Print Tag:** Refer to original journal article
All-in-One Adhesives Provide Strong Bond to Dentin

In Vitro Evaluation of Bonding Effectiveness to Dentin of All-in-One Adhesives.
Margvelashvili M, Goracci C, et al:
J Dent 2010; 38 (February): 106-112

Two all-in-one self-etch adhesives have dentin bond strengths similar to that of an etch & rinse control.

Objective: To evaluate the potential ability of all-in-one adhesives to bond to dentin.
Methods: 3 all-in-one self-etch adhesives were evaluated in this study: Bond Force, AdheSE One, and Xeno V (which, to my knowledge is not available in the US). The 2-step etch & rinse material XP Bond was used as the control. The pH values of the self-etch materials are 2.3, 1.5, and <2, respectively. Twenty extracted third molars were sectioned to expose a mid-coronal dentin substrate that was polished to 600 grit to produce standardized smear layers. Composite materials were bonded to the dentin after application of the various adhesive systems. The bonded specimens were stored in water for 24 hours and then sectioned for microtensile bond strength (µTBS) testing, which was done using a universal testing machine. Some of the specimens were reserved for inspection of the resin-dentin interface with scanning electron microscopy (SEM).
Results: The mean µTBS for XP Bond was 51.9 MPa. For the all-in-one adhesives, the means were 43.3 MPa (Bond Force), 42.8 MPa (Xeno V), and 31.7 MPa (AdheSE One). XP Bond had the highest proportion of mixed (adhesive/cohesive) failures in the bond strength test. Most failures in all groups were adhesive in nature. A well-defined hybrid layer with long resin tags was observed for the etch & rinse adhesive. In contrast, no distinct hybrid layer could be seen with the all-in-one adhesives.
Conclusions: The strongest bond to dentin was achieved by the etch & rinse control, but 2 of the all-in-one adhesives had mean bond strengths that were statistically similar to the control.
Reviewer's Comments: The all-in-one category of adhesives is the least well proven, both in laboratory testing and clinical trials. Despite that, they have become quite popular due to the perceived ease of use. Fortunately, these materials do seem to be evolving and improving. Case in point—in the present study, 2 of the 3 all-in-one adhesives tested achieved bond strengths similar to those of the etch & rinse control. Those 2 adhesives contain organic solvents in addition to water. The one adhesive that produced the lowest bond strengths uses only water as its solvent, which might account for its inferior performance. This study evaluated dentin bonding only, not enamel. (Reviewer-Edward J. Swift, Jr, DMD, MS).

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Keywords: Dentin Bonding, Self-Etch

Print Tag: Refer to original journal article
Minimally Invasive Veneer Preparations Benefit From Bonding to Enamel

Minimally Invasive Porcelain Veneers and an All-Ceramic Crown.

Strassler H, Kempler I:

Inside Dent 2010; 6 (February): 52-60

Adding some opacity to the veneer porcelain helps it blend with all-ceramic crowns.

**Background:** Minimally invasive treatment with veneers has demonstrated long-term success, which comes from maintaining enamel as the primary bonding substrate. Adhesive fractures of veneers bonded to dentin account for most failures. Dentin bonds, while initially strong, tend to deteriorate over time.

**Objective:** This article presents a case report illustrating the use of veneers bonded to minimally prepared teeth. **Case Report:** A 30-year-old man presented with the desire for a whiter smile. His teeth were discolored, and tooth #9 had a defective porcelain-metal crown. Teeth displayed relative proportional discrepancies and darkened gingival tissues around the porcelain-metal crown. Tray bleaching was performed until the desired tooth color was achieved. Diagnostic wax-up was used to preview the esthetic outcome. The treatment plan called for veneers on teeth numbers 7, 8, and 10, with an all-ceramic crown on #9. Veneer preps were minimal with no invasion of the dentin layer, even at the cervical margins. The laboratory prescription described desired veneer alignments, width and lengths, shade, and surface texture. The wax-up and digital photographs accompanied the prescription. A 50% opaque pressed porcelain was requested for the veneers to help match optical properties of very thin veneers and the thicker ceramic crown. After fabrication, the veneers and crown were seated on the teeth to verify fit, shape, and esthetic effects. Try-in paste helped determine the final shade of the bonding resin. Intaglio ceramic surfaces were conditioned with hydrofluoric acid and then conditioned with an organo-silane coupling agent. Resin adhesive was then applied to the intaglio surfaces. Tooth surfaces were etched 15 seconds with phosphoric acid, and adhesive was placed over prepared surfaces. The crown preparation's dentin surfaces were kept slightly moist while dentin adhesive was applied. Resin cement was used to bond all the restorations. Veneers were placed at the same time, using the back of the Benda Brush to fully seat them. The crown was seated next. Complete seating was verified, with excess cement brushed away with a brush wetted with adhesive. Veneers were tack-cured and excess cement removed before final photopolymerization. Final finishing was accomplished using hand instruments, a flame-shaped finishing diamond and burs. Polishing was done with porcelain polishing rubber abrasives. Proximal contacts were opened with a nonabrasive intraoral dental saw (CeriSaw) followed by interproximal finishing strips.

**Conclusions:** Placing all-ceramic crowns together with veneers on adjacent anterior teeth is challenging due to the thickness and optical properties of the porcelain used. This article discusses techniques and materials that can provide success.

**Reviewer's Comments:** Minimal preparation design has been used over 3 decades. The enamel bond is more durable than a bond to dentin. The decision of how much enamel to remove requires assessment of whether the restored tooth will be so bulky it decreases the esthetic effect or jeopardizes hygiene around the teeth. (Reviewer-Thomas G. Berry, DDS).

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Keywords: Porcelain Veneers, All-Ceramic Crowns

Print Tag: Refer to original journal article
Pressed Ceramics Over Nonretentive Preparations Can Withstand Occlusal Load


Clausen J-O, Tara MA, Kern M:

Dent Mater 2010; 26 (June): 533-538

Lithium disilicate ceramic has a higher fracture resistance than leucite-reinforced ceramic.

**Background:** All-ceramic indirect restorations have become a significant part of esthetic dentistry. There still exists a trade-off regarding strength and fracture resistance when compared to other restorations. In clinical circumstances in which traditional indirect restorations require significant tooth reduction in order to provide appropriate retention and resistance form, adhesively retained ceramic restorations could be more conservative.

**Objective:** To evaluate the influence of 2 different all-ceramic materials and different nonretentive preparation designs on the fatigue and fracture resistance of full occlusal coverage indirect restorations.

**Materials/Methods:** 64 extracted mandibular human molars that were free of caries and cracks were cleaned of calculus and soft tissues. Each tooth was mounted in a metal ring with acrylic to simulate alveolar bone after the application of an artificial periodontal membrane made of gum resin. The teeth were prepared with a nonretentive preparation either entirely in enamel (0.5 mm occlusal reduction) or within dentin with an enamel finish line. Two different finish line profiles were used, either a 0.8 mm chamfer preparation or a straight 170° bevel. This resulted in 4 preparation groups, which were subsequently restored with 2 different all-ceramic materials: IPS Empress Esthetic, a leucite reinforced ceramic or IPS e.max Press, a lithium disilicate ceramic, both from Ivoclar-Vivadent. The wax patterns were standardized to 1.5 mm thick at the fissure and 2 mm at the cusp tip. The restorations were pressed and finished according to manufacturer’s recommendations. The restorations were adhesively bonded to the teeth using Optibond FL (Kerr) and Variolink II (Ivoclar-Vivadent). After 1 week of water storage, the specimens were cyclically loaded 600,000 times and thermally cycled 3500 times in a computerized masticatory simulator. The loading was set to simulate high physiological chewing forces. Following the cyclic loading, each specimen was subjected to load with a 6-mm ball contacting both triangular ridges until fracture in a universal testing machine.

**Results:** All of the specimens survived the cyclic loading without chipping or fracture. The lithium disilicate had a higher fracture resistance than the leucite ceramic independent of the preparation design. The enamel preparations had a higher fracture resistance but not statistically significant. The finish line profile did not demonstrate an influence.

**Conclusions:** Both ceramic materials and both preparation designs resulted in restorations that resisted occlusal loading exceeding mean maximum masticatory forces. The use of these materials in nonretentive restorations for occlusal rehabilitation seems promising.

**Reviewer’s Comments:** This study demonstrates that both of these materials can withstand chewing forces similar to those tolerated by natural unrestored teeth. It is important to realize that although 1 of the preparation designs was in enamel and very shallow, the restoration tested was still 1.5 to 2 mm thick potentially increasing occlusal vertical dimension. (Reviewer-Daniel E. Wilson, DDS).

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Keywords: Leucite Lithium Disilicate Occlusal Reduction

Print Tag: Refer to original journal article
This editorial cites data from studies of health literacy and is relevant to the quality of communication between dentists and patients. Health literacy is defined as the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions. How literate are Americans overall? Survey data of English language literacy show that 43% of Americans have only a basic level of literacy and 14% have below a basic level of literacy. When it comes to health literacy, the Institute of Medicine reports that 90 million people in the U.S. (approximately 1 out of 3.4 people) have difficulty understanding and using health information, which results in misunderstood treatment plans, improper medication use, missed follow-up appointments, unintentional noncompliance, confusion over insurance rules, and poorer outcomes of care. The author is in private practice in South Dakota and discusses the communication gap between dentists and a considerable number of patients with various vulnerabilities. Vulnerable populations to low oral health literacy include the elderly due to cognitive decline (81% of adults >60 years cannot understand basic materials such as prescription labels), children, immigrants (50 million people in the U.S. do not use English in their homes), low income people (approximately 50% of Medicaid recipients read below a fifth grade level), people with chronic mental and/or physical health conditions, and education level (functional reading abilities are usually 3 to 5 grade levels below the last year of school completed due to the "use it or lose it" phenomenon). Changing demographics will probably increase the percentage of individuals with low oral health literacy due to increasing numbers of elderly and immigrants. The author believes that dental providers best serve their patients if they recognize their patients’ health literacy level and adapt their communication style appropriately. For example, using plain language rather than professional terms helps to better exchange of important health information.

**Reviewer's Comments:** Dentists can detect a patient's physical health problems easier than a patient's less visible low literacy problems. Patients may be reluctant to admit their lack of comprehension of health information. Occasionally, I have also seen low oral health literacy in well-educated people with good incomes. From an oral health literacy point of view, it is not surprising to me why patients do not always follow treatment recommendations or do not understand insurance rules and regulations. By assessing our patient's oral health literacy and responding appropriately, we increase the likelihood of optimal oral health outcomes. Two free, government sponsored, online training programs for health care professionals to enhance their ability to more effectively communicate with low health literacy patients are: www.cdc.gov/Features/OnlineTraining and www.ahrq.gov/qual/literacy. (Reviewer-Charles B. Hermesch, DMD).

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Keywords: Oral Health Literacy, Communication, Quality of Care

Print Tag: Refer to original journal article