**Objective:** To evaluate shear bond strengths of resin cements bonded to a specially modified zirconia surface versus a smoother machined zirconia surface, both with and without airborne-particle abrasion.

**Methods:** A new method for modifying the surface of zirconia ceramics has been developed. It involves application of a slurry of zirconia powder and a pore former, and results in formation of a porous surface. Two hundred specimens of a densely sintered zirconium oxide ceramic (Procera Zirconia) were fabricated. Sixty of these had a machined surface, and 140 were treated with the modification process. Machined specimens were assigned to 1 of 3 groups and modified specimens to 1 of 7 groups. After bonding, each group was further divided, with half the specimens tested before and half tested after artificial aging. Composite resin was bonded to machined specimens using Panavia F2.0 after air abrasion using either 50 or 110 μm alumina particles (or as a control, no air abrasion). Composite was bonded to modified specimens using various combinations of air abrasion and the resin cements RelyX ARC and RelyX Unicem in addition to the Panavia. Aged specimens were stored in distilled water for 90 days and then thermocycled 20,000 times. A universal testing machine was used to determine shear bond strengths.

**Results:** For machined, non-aged specimens air-abraded with 50-μm particles, the mean shear bond strength was 18.5 MPa. This declined to 7.98 MPa after aging. Without air abrasion, the mean for aged specimens was nearly zero. Bond strengths of modified specimens were more stable with artificial aging, but air abrasion of these specimens actually reduced their bond strengths.

**Conclusions:** Long-term bond strengths of cements bonded to modified zirconia are significantly higher than those bonded to machined surfaces, even when machined surfaces have been air-abraded.

**Reviewer’s Comments:** Bonding of resin materials to zirconia ceramic is difficult because zirconia cannot be etched effectively. This paper describes a new modification technique that provides a stable long-term bond of resin cements to zirconia. Air abrasion of modified zirconia surfaces is not indicated. This would be an advantage of the new method, because air abrasion has the potential to damage zirconia. (Reviewer—Edward J. Swift, Jr, DMD, MS).

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Keywords: Zirconia

Print Tag: Refer to original journal article
Early chipping of 3 different units may be a sign that the all-ceramic rehabilitation will not be a long-term solution.

This is a case report of an all-ceramic full-mouth rehabilitation on a patient with dentinogenesis imperfecta. The patient was first seen at age 14 years, but treatment appears to have been done at or about age 20 years. The panoramic radiograph in the manuscript is done at age 14 years and not at the time of restorative dentistry. The maxilla has a full dentition, and the mandible is missing both first molars. Two cantilevered mandibular fixed partial dentures (FPDs) were fabricated with zirconia frameworks. There are photographs (figures 3a and 3b in the article) that suggest multiple millimeters of interocclusal distance at the selected vertical dimension of occlusion. The arches have very steep curves of Spee and a left-side crossbite. Anterior crowns were fabricated in blocks to prevent loss of retention. The total treatment involved 14 single-unit restorations, two 4-unit cantilevered FPDs, and two 4-unit crown blocks. At the 6-week follow-up visit, 3 chip fractures are noted (#9, #13, and #31). The author declares, "...the complete all-ceramic rehabilitation was assessed as a success."

**Reviewer's Comments:** Metal ceramic restorations and all-metal second molars would be the mainstream treatment for a case like this. Very short clinical crowns are a challenge with any dental material. However, the doctor could have gained 1 or 2 mm of vertical wall height on most of the crowns if the preparations reached into the sulcus. Conventionally cemented restorations can tolerate subgingival margins, while adhesive luting will not. Very short anterior crowns that were done in blocks are clearly going to be a challenge for the patient to clean. Figure 7c in the article shows some boggy gingiva (at 6 weeks) that in 1 year could be a significant problem. I worry if the patient really understood the informed consent document. I remind my doctor candidates that I can sell my patients any treatment. The doctor can offer all alternatives, but I stress the downside on the choice I do not prefer and stress the upside on the choice I do prefer that the patient take. The author offers a good discussion of his justifications for the all-ceramic solution. I fear that the minor chipping at 6 weeks will be an area of major flaws in the next 5 years. It is almost certain that periodontal irritations noted at the 6-week follow-up will be persistent or progressive over time. (Reviewer-J.D. Overton, DDS).

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Keywords: Dentinogenesis Imperfecta

Print Tag: Refer to original journal article
Fiber-Reinforced Composite Posts Demonstrate Superior Performance

Placement of Fiber Prefabricated or Custom Made Posts Affects the 3-Year Survival of Endodontically Treated Premolars.

Cagidiaco MC, García-Godoy F, et al:

Am J Dent 2008; 21 (June): 179-184

Success of fiber-reinforced composite posts depends on remaining tooth structure.

**Background:** Fiber-reinforced composite (FRC) posts in endodontically treated teeth exhibit elastic behavior resembling dentin. Root fracture is reduced compared to metal posts. Teeth with FRC posts show higher fracture resistance than teeth without posts.

**Objective:** To evaluate 3-year survival of endodontically treated crowned premolars with 2 post systems. Teeth had varying degrees of remaining coronal tissue.

**Methods:** Prior to abutment preparation, teeth were grouped (n=40) according to number of coronal walls present: (1) all walls, (2) 3 walls, (3) 2 walls, (4) 1 wall, (5) ferrule effect-no walls except 2-mm dentin collar, and (6) no ferrule effect-no wall and <2 mm of dentin. Teeth were next subgrouped according to post placement: (A) no post, (B) DT Light Post, and (C) customized FRC post using EverStick fibers adapted into post space. Post spaces were 7 to 8 mm in length. All teeth received metal/ceramic crowns. DT Light Posts were bonded using Prime&Bond NT Dual Cure adhesive and dual-cure Calibra resin cement. EverStick fiber bundles were adapted into canals, cured, and then removed. These custom-made posts were then bonded with All Bond 2 and Bis-Core. Patients were recalled after 1, 6, 12, 24, and 36 months for clinical and radiographic evaluation. Failures were determined as: post debonding, post fracture, vertical/horizontal root fracture, core portion failure, crown displacement, or need for endodontic retreatment.

**Results:** Overall, the 36-month survival rate was 76.7%. The lowest survival rate was for teeth restored without posts (62.5%). DT Light Post-treated teeth had a 90.9% 3-year survival rate compared to EverStick fiber-treated teeth (76.7%). Teeth with posts suffered no fractures or core failure but exhibited post-debonding in teeth with reduced residual dentin. Teeth without posts recorded 13 root fractures and 32 crown displacements. Failure for EverStick fiber specimens resulted from crown dislodgement and root fractures. Failure was directly related to number of walls remaining after endodontic treatment. All 4-walled teeth survived regardless of specific restorative procedure or whether a post was placed. DT Light Posts have better mechanical properties and fatigue resistance than EverStick posts. Teeth without ferrules had significantly higher failure risks than when 1 or more coronal walls remained.

**Conclusions:** Over 3 years, placement of prefabricated or customized posts significantly improved survival of restored premolars. DT Light Post was more effective than EverStick Post. Preservation of 1 or more coronal walls greatly reduces failure risk. Dentin ferrule provides important protection.

**Reviewer's Comments:** This is another study demonstrating advantages of adhesively bonded fiber posts. It does reveal that not all systems are equal, so more research is needed to determine the best. Because it is difficult to coat entire canal walls with adhesive/bonding resin, bonding is never 100%. (Reviewer-Thomas G. Berry, DDS, MA).

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**Keywords:** Fiber Posts

**Print Tag:** Refer to original journal article
Background: In addition to the obvious esthetic superiority of direct composite resins as compared to amalgam, they offer the possibility of repair and thus a less invasive option as compared to complete restoration replacement. These restorations undergo degradation in the oral environment, which in addition to reducing physical properties of the composite, may interfere with bonding of new composite to old. Several surface treatments of aged composite material have been suggested to remove the superficial layer affected by the oral environment to create a clean, higher-energy composite surface. Additionally, these treatments may increase surface irregularity and improve micromechanical retention.

Objective: To analyze different surface preparation protocols on microtensile bond strengths of new resin composite to aged composite.

Methods: 40 blocks each of a microhybrid (Filtek Z250™) and a nano-hybrid (Filtek Supreme™) composite resin were built in increments and photopolymerized. They were finished, polished, and cleaned in deionized water. Blocks were aged in deionized water for 9 days to simulate surface effects that occur in the oral environment. Each material was then randomized into groups subjected to the following surface treatments: hydrofluoric acid etching, abrasion with a coarse diamond bur, sandblasting with aluminum oxide, and silica coating with silica-modified alumina particles. Surface-altered specimens were then either treated with a silane coupling agent or an adhesive system (Adper Single Bond Plus™). New resin of the same type was applied to each specimen and light cured. Specimens were sectioned and subjected to microtensile bond strength testing in a universal testing machine. Fractured samples were microscopically evaluated for mode of failure.

Results: The lowest bond strengths were noted with hydrofluoric acid etching and silane with both composite materials. Air abrasion and silica coating demonstrated the highest bond strengths regardless of the bonding agent chosen and demonstrated failures outside of the adhesion zone. Diamond bur-treated surfaces yielded intermediate values. The microhybrid material demonstrated higher bond strengths than the nano-hybrid material.

Conclusions: The sandblasting pretreatment (both aluminum oxide and silica coating) demonstrated the highest bond strengths independent of the adhesive used. The bur-abraded treatment produced intermediate values, and hydrofluoric acid-etched samples demonstrated unacceptable values. The microstructure affects this process, with the microhybrid demonstrating higher bond strengths.

Reviewer’s Comments: This study provides good evidence to support air abrasion prior to repairing aged composites and demonstrates the ineffectiveness of hydrofluoric acid treatment. Although the study demonstrates that the microstructure of aged composite influences bond strengths, this is not clinically relevant as the clinician cannot change this as presented and often does not know the type of material placed initially. (Reviewer-Daniel E. Wilson, DDS).

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Keywords: Repaired Resin Composite Restorative Materials

Print Tag: Refer to original journal article
A variety of patient-related factors can influence the survival of porcelain veneers.

**Objective:** To examine recorded intervals between initial porcelain veneer placement and re-intervention on the same tooth from a large sample of patients, and to determine factors that might affect this.

**Methods:** The authors evaluated records of >80,000 adult patients who received treatment from General Dental Services providers in England and Wales.

**Results:** Over a 13-year period, 1177 different adult patients received a total of 2462 porcelain veneers. At 10 years after placement, 53% of veneers were present and without re-intervention. Neither tooth position nor quadrant had a significant effect on veneer survival. Similarly, no dentist factor (gender, age, years since graduation, or location of dental training) had a significant effect. Re-interventions, in order of decreasing frequency, involved replacement by another veneer, placement of a crown, placement of a direct restoration, and re-cementation of the veneer. Several factors were found to have an effect on survival, including patient gender, patient age, and geographical area. Veneers tended to have shorter survival times in male than in female patients and in older patients (aged >60 years).

**Conclusions:** A variety of patient-related factors can influence survival of porcelain veneers.

**Reviewer's Comments:** Relative to other studies that I have seen on the subject of porcelain veneer longevity, the success rate reported in this study seems rather low. Based on those previous studies, I would have expected a success rate of approximately 90% at 10 to 15 years. So how do you explain the difference? Most clinical studies of veneers have been fairly limited, and veneers have been prepared and placed by select operators or groups of operators. In the present study, a wide variety of dentists in the British National Health Service placed the veneers. Furthermore, it appears that the average patient in this study received only 2 veneers. This suggests that, in many cases, single veneers were placed as true "restorations" rather than as purely "esthetic" treatments, which normally would include (for example) 6 to 8 veneers. Certainly, there would be greater likelihood of failure with the former type of veneer than with the latter. (Reviewer-Ethward J. Swift, Jr, DMD, MS).

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Keywords: Porcelain Veneers

Print Tag: Refer to original journal article
A 5% sodium fluoride varnish for in-office use is probably superior to 1.23% acidulated phosphate fluoride gels or foams.

This manuscript is a very good short review of in-office fluoride. The long-term default office fluoride has been acidulated phosphate fluoride (APF; 1.23%) as a foam or gel. Clinical trials with APF used a 4-minute exposure, but by the power of advertising, 1 minute is probably more common in the office. We do not have research to support 1 minute of APF. This paper is in support of fluoride varnishes over gels or foams. Single-use fluoride varnishes should be stirred prior to application. Multi-use tubes of fluoride varnish do have a problem with separation of ingredients. The author suggests that if the varnish comes out clear, that layer should be discarded because the fluoride concentration will be low. My problem with her suggestion is that the subsequent application will now have a fluoride concentration that is high! In the section titled “Fluoride Selection for Management of Dental Hypersensitivity,” it is stated that fluoride varnish will be excellent for treating painful open dentinal tubules. There are no quoted literature references for this section. I suggest to you this is because we do not have good research evidence that fluoride varnish is highly effective for this condition. Varnish could well be a great choice, but it is not yet conclusive in the literature. The yellow color of the fluoride varnish has been overcome by OMNI brand 5% sodium fluoride varnish, which goes on clear. The conclusion was that the research is very good in support of fluoride varnish to reduce tooth decay in children.

**Reviewer's Comments:** In my practice, I use single-use fluoride varnish for my high-caries-risk patients. It is simple to apply. The amount of fluoride swallowed by the patient is less than with that with gels or foams, while the total fluoride applied to the teeth is significantly higher. Varnish appears to be a no brainer for me, but it has been slow to be accepted in our university. While not in this manuscript, 1.23% APF will etch the surface of porcelain restorations. A single application is probably of little consequence, but over the course of years, one could expect surface changes in the porcelain. I use 1.23% APF only when I am, by intent, etching porcelain that has chipped on a crown or fixed partial denture that needs a resin composite repair. Eight minutes of APF will offer a reasonable surface for bonding. My caution is to determine why the porcelain chipped. If it was trauma, we can probably expect a good result. If it was flex of the substructure metal, then the repair will be very short lived. (Reviewer-J.D. Overton, DDS).

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Keywords: Professional Fluoride Selection

Print Tag: Refer to original journal article
Agitating Adhesives Improves Bonding

Active Application Improves the Bonding Performance of Self-Etch Adhesives to Dentin.

do Amaral RC, Stanislawczuk R, et al:

J Dent 2009; 37 (January): 82-90

Active application improves the dentin bonding performance of all-in-1 adhesives.

Objective: To evaluate early and 6-month bond strengths and leakage of 1-step self-etch adhesives using active and passive application techniques.

Methods: The all-in-1 adhesives tested in this study were Adper Prompt L-Pop, Clearfil S3 Bond, and Xeno III. The pH of these materials is considered aggressive, mild, or moderate, respectively. A single operator applied the materials to human dentin that had been polished to 600-grit. For passive application, the adhesive was spread over the entire dentin surface and was left undisturbed for 15 to 20 seconds. For active application, adhesives were vigorously agitated for 15 to 20 seconds using a microbrush. Excess solvent was evaporated using compressed air, the adhesive was light cured, and composite was applied. Bonded specimens were sectioned into small beams for microtensile bond strength (MTBS) testing. Specimens were tested immediately (ie, 24 hours after bonding) or after storage in distilled water for 6 months. Some specimens were evaluated for nano-leakage using field emission scanning electron microscopy after immersion in silver nitrate solution.

Results: The immediate bond strength of each adhesive was higher when it was applied actively rather than passively. Bond strengths tended to be lower at 6 months. However, the MTBS associated with active application remained higher than that with passive application. Nano-leakage of all adhesives was greater with passive application. The most acidic adhesive, Adper Prompt L-Pop, behaved differently than the milder adhesives. Its bond strengths declined significantly over the 6-month storage period. This adhesive causes more profound demineralization of the dentin, and it might suffer from incomplete resin penetration into the demineralized dentin.

Conclusions: Active application improves the dentin bonding performance of all-in-1 adhesives, and this effect persists over time.

Reviewer's Comments: This is not the first study to report that agitation of all-in-1 adhesives is generally a better technique than passive application. Agitation probably speeds up solvent evaporation and increases penetration of resin monomers into the dentin. Therefore, unless a manufacturer's directions specifically call for no agitation, agitation of all-in-1 adhesives should be the preferred technique and represents a very simple way of improving performance. (Reviewer-Eduard J. Swift, Jr, DMD, MS).

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Keywords: Dentin Bonding

Print Tag: Refer to original journal article
When compared to intact teeth, amalgam-restored teeth seem to be more prone to suffer from cracked tooth syndrome.

**Objective:** To investigate characteristics, distribution, and factors associated with cracked tooth syndrome (CTS).

**Participants/Methods:** 370 subjects aged 18 to 77 years with a suspected cracked tooth, eg, tooth with pain upon chewing or release as well as mild pain with cold stimulation, were examined and followed for 12 months. The inclusion criteria were non-restored and amalgam-restored teeth with or without an unidentifiable source and cases without percussive pain of periapical origin. Teeth with composite and glass ionomer restorations, those with spontaneous pain, endodontically treated teeth, and crazed teeth were not included in the study. The restorative, pulpal, and periapical statuses were radiographically assessed at baseline and at each recall (1, 3, 6, 9, and 12 months).

**Results:** 33 cases of CTS were diagnosed. Approximately 13% and 6% of the male and female population, respectively, was affected. Amalgam-restored teeth suffered from CTS in approximately 20% of cases and non-restored teeth in about 3% of cases. The frequency among teeth showed a higher incidence of CTS in first and second molars in the maxilla and mandible, respectively. No periapical or periodontal abnormality was noticed in baseline or recall evaluations. Of patients suffering from CTS, 23 had a history of masticatory accidents and 10 had a history of bruxism.

**Conclusions:** Amalgam-restored teeth with unidentifiable pain, with or without history of trauma, can possibly have CTS.

**Reviewer's Comments:** As the authors nicely discussed in the manuscript, (1) males are known to deliver a higher masticatory force, which may explain the higher incidence of CTS among males than females; (2) amalgam-restored teeth are many times heavily restored and consequently weakened teeth; and (3) the posterior position of molars, closer to the TMJ, put those teeth at a higher risk of suffering from CTS.

(Reviewer-Ricardo Walter, DDS)

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Keywords: Cracked Tooth Syndrome

Print Tag: Refer to original journal article
Etch, Wash of Enamel Improves Seal of Self-Etch Adhesives

In Vitro Enamel Sealing of Self-Etch Adhesives.
Perdigão J, Monteiro P, Gomes G:


Background: No-wash bonding systems have some problems etching enamel sufficiently to get a good seal. Objective: To determine if a separate etch wash of enamel improves the seal of Adper Prompt L-Pop, Clearfil SE Bond, or iBond.
Methods: Two 6.0 x 3.0 x 1.5-mm preparations were made in the buccal surface of 30 bovine incisors. One lesion was restored following instructions, while the other one was etched, washed, and then bonded following instructions. Researchers thermocycled half the specimens and did not thermocycle the other half.
Results: Thermocycling clearly was bad for the seal on 18 of 40 samples. Acid etching resulted in 8 of 10 with zero leakage using Clearfil SE Bond. Every sample of Adper Prompt L-Pop leaked. Only 1 of 10 samples of iBond did not leak.
Conclusions: Acid etching enamel prior to using a self-etching bonding agent improved the seal of no-wash bonding systems. The 2-step Clearfil SE Bond performed better than either iBond or Prompt L-Pop.
Reviewer's Comments: The best chance to make a mistake with a etch-wash-primer-adhesive bonding system (fourth generation) is to etch the dentin too long. If you or your assistant are not paying close attention, it is easy to imagine that the etchant will be on the dentin >15 seconds. A combination (in which the enamel is etched with phosphoric acid, the etch is washed away, and then a 2-step self-etch bonding system is used) could be excellent for the dentin. Systems like Clearfil SE Bond with etch-primer in 1 bottle and hydrophobic adhesive in the second bottle have given the most consistent lab results. If this is the wave of the future, it will save the dentist zero elements of time. It may, however, make the most successful combination. (Reviewer-J.D. Overton, DDS).

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Keywords: Self-Etch Adhesives

Print Tag: Refer to original journal article
Chlorhexidine Helps Preserve Dentin Bonds

*Chlorhexidine Diminishes the Loss of Bond Strength Over Time Under Simulated Pulpal Pressure and Thermo-Mechanical Stressing.*

Campos EA, Correr GM, et al:

J Dent 2009; 37 (February): 108-114

Chlorhexidine 2% is able to reduce the loss of bond strength over time for both an etch-and-rinse and a self-etch adhesive.

**Objective:** To evaluate the effect of different concentrations of chlorhexidine (CHX) on microtensile bond strength (MTBS) of 2 adhesives before and after long-term storage.

**Methods:** Adhesives evaluated in this study were Adper Single Bond (etch-and-rinse 1-bottle system) and Clearfil Tri S Bond (a self-etch all-in-1 material). Extracted human teeth were connected to an apparatus that maintained pulpal pressure of saline solution simulating the pressure that occurs in vivo. Occlusal surfaces were removed to expose dentin, which was polished to 600-grit. Composite was bonded to the dentin and peripheral enamel using the 2 adhesives in combination with either 0.2% or 2.0% CHX or no CHX (serving as the control). The CHX was applied after etching for the Single Bond system. Half the specimens were sectioned and tested immediately for MTBS. The other half were subjected to mechanical load and thermocycling 3 times per day for 180 days before they were sectioned for MTBS testing. Fractured specimens were examined using scanning electron microscopy (SEM).

**Results:** For the control group of Clearfil Tri S Bond, mean MTBS declined from an immediate value of 21.6 MPa to a 6-month value of 12.8 MPa. For the 0.2% CHX group, the decline was similar, from 20.2 MPa to 12.7 MPa. In the 2.0% CHX group, the mean decreased from 20.5 MPa to 16.0 MPa. For the Single Bond control group, the immediate mean MTBS was 24.2 MPa and the 6-month mean was 13.7 MPa. For 0.2% CHX, means were 23.5 and 17.9 MPa; for 2.0% CHX, they were 23.7 and 17.4 MPa.

**Conclusions:** CHX 2% was able to reduce the loss of bond strength over time for both an etch-and-rinse and a self-etch adhesive.

**Reviewer's Comments:** Some clinicians routinely use CHX as a disinfectant when placing bonded restorations. However, the real value of CHX in a bonding procedure is related to its inhibition of matrix metalloproteinases, which are enzymes released during dentin conditioning that can degrade collagen in and beneath the hybrid layer. In this study, CHX did not completely prevent loss of adhesion, but it did diminish the degree of loss under rather severe conditions of mechanical and thermocycling. (Reviewer-Ea. Swift, Jr, DMD, MS).

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Keywords: Bond Strength

Print Tag: Refer to original journal article
Surgical Root Coverage Procedures Are Not as Effective in Smokers

The Influence of Tobacco Smoking on the Outcomes Achieved by Root-Coverage Procedures: A Systematic Review.

Chambrone L, Chambrone D, et al:

J Am Dent Assoc 2009; 140 (March): 294-306

Smokers should be informed that surgical results from root coverage procedures have diminished outcomes, as compared to non-smokers.

Background: A large component of an esthetic smile is the interplay between the teeth and gingiva. Gingival recession can create an esthetic compromise that is best remedied through gingival surgery to recover the exposed tooth structure and return gingival symmetry to the smile. Several surgical modalities have been used to correct these defects, collectively referred to as periodontal plastic surgery. As with other periodontal procedures, as well as periodontal disease itself, smoking may negatively affect the prognosis. It is well established that heavy smokers exhibit more gingival recession than do non-smokers.

Objective: To analyze the relevant literature to determine the influence of smoking on clinical outcomes of these surgical procedures used to correct gingival recession.

Methods: The dental literature was searched through June 2008 for articles related to the effectiveness of various root coverage procedures. Articles were included that used any periodontal surgical intervention to treat recession. Studies were considered if they recorded outcomes separately for smokers and non-smokers and considered smokers who smoked ≥10 cigarettes per day. Outcomes measured included change in gingival recession, change in clinical attachment level, change in keratinized tissue, percentage of sites showing complete root coverage, and mean root coverage. Articles were reviewed for quality and relevance.

Results: Of 632 articles screened, 7 were deemed of sufficient quality and relevance to be included in the analysis. The combined data demonstrated that tobacco usage negatively affects root coverage. The included studies demonstrated that both smokers and non-smokers demonstrated improvement in recession and attachment level with these procedures. These meta-analyses showed that subepithelial connective-tissue grafts were less effective at both the extent of root coverage and improvement in clinical attachment in smokers. There were no statistically significant differences between smokers and non-smokers when coronally advanced flap procedures were studied.

Conclusions: These results showed that correction of recession defects by surgical means yielded improvements in both smokers and non-smokers, with non-smokers demonstrating greater improvement. Subepithelial connective-tissue grafts provided significantly better root coverage and attachment gain in non-smokers as compared to smokers. Smokers exhibited fewer sites demonstrating complete root coverage than did non-smokers. Overall, non-smokers had the best surgical results.

Reviewer's Comments: Although the results of this study are not surprising, it does add to the body of evidence supporting diminished clinical outcomes of these elective surgical procedures in smokers. This should be part of the discussion when patients are considering these procedures, both in terms of the advisability to quit smoking prior to having periodontal plastic surgery procedures accomplished, and the informed consent relative to expected outcomes of the procedures. (Reviewer-Daniel E. Wilson, DDS).

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Keywords: Root Coverage Procedures

Print Tag: Refer to original journal article
Background: Can the lab data collected on extracted teeth be used to predict success of dentin bonding agents in the mouth?

Objective: To compare dentin bonding in the mouth to data in the laboratory with and without simulated intrapulpal pressure.

Participants/Methods: 60 patients with teeth scheduled for extraction had a preparation placed and restored prior to extraction. That same tooth had 2 more restorations placed—-one with the tooth dry and the other when hooked to a device that placed Ringer's solution under 30 cm of pressure into the pulp space. The average pulpal pressure is 14 cm of water, but 30 cm was used in this study to mimic an inflamed pulp. The 3 bonding systems used were PQ1 + Amelogen; SE Bond + Clearfil APX; Syntac Classic + Tetric Ceram. Twenty teeth were used with each brand. For any one tooth, all 3 restorations were done with the same brand.

Results: The dry extracted teeth had the best adaptation of the resin to the dentin. The restorations bonded in the mouth had better adaptation than the extracted teeth attached to the positive pressure fluid device. SE Bond performed best under all conditions. PQ1 did not do well on the dry extracted teeth, and Syntac Classic did not do well with the wet extracted teeth.

Conclusions: According to the article, "The different experimental conditions tested influenced adaptation of bonding systems to dentin, but did not generally deteriorate or ameliorate the results. The degree of interaction between the conditions and the bonding system was dependent on the composition of the materials."

Reviewer's Comments: To date, dental research has not been able to draw direct lines from the lab to the mouth. What is good in the lab may or may not be good in the mouth. The authors did a very nice job of confirming that dentin bonding in the mouth does not yet have a perfect laboratory simulation. I would have preferred that they use 14 cm of water rather than 30 cm of water pressure in the wet extracted teeth portion of the study, which would probably be a better match to the teeth that they were extracting. The protocol says that the roots did not have carious lesions and were being extracted due to hopeless periodontal conditions. Marginal gap formation is probably a good measure of dentin bonding success. It would have been interesting indeed if 14 cm of water had been a statistical equal to the restorations placed prior to extraction. (Reviewer-J.D. Overton, DDS).

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Keywords: Dentin Bonding In Vivo

Print Tag: Refer to original journal article
Exposure of root dentin to bleaching agents might result in greater roughness and reduced hardness, indicating loss of mineral.

**Objective:** To test the effects of varying peroxide concentrations on enamel and root dentin.  
**Methods:** Enamel and dentin slabs (4 x 4 x 2 mm) were sectioned from bovine teeth and were polished to 1200-grit. One hundred specimens were made for each substrate. Microhardness of each specimen was measured using a Knoop indenter at several locations and was expressed in Knoop hardness numbers. A profilometer was used to measure surface roughness. Five different bleaching regimens were used: (1) Colgate Platinum Overnight, 10.0% carbamide peroxide for 8 hours per day for 21 days; (2) Day White 2, 7.5% hydrogen peroxide for 1 hour per day for 21 days; (3) Opalescence Xtra Boost, 38.0% hydrogen peroxide for 15 minutes once a week for 3 weeks; (4) White Speed In-Office, a combination of 18.0% carbamide peroxide and 30.0% hydrogen peroxide 30 minutes per week for 3 weeks; and (5) an unbleached control group. The materials in the first 2 groups were applied using flexible custom trays. When not being bleached (and in the control group), specimens were stored in artificial saliva. Surface hardness and surface roughness measurements were repeated following these various regimens.  
**Results:** For enamel, post-treatment hardness was significantly greater than pre-treatment hardness, and surface roughness was significantly less. In contrast, for dentin, surface hardness decreased and surface roughness increased after bleaching. Conversely, it is worth noting that these changes were observed in the control group as well as the experimental groups.  
**Conclusions:** Exposure of root dentin to peroxide bleaching agents might result in loss of mineral from the surface.  
**Reviewer's Comments:** This study confirms what most others have shown about the effects of bleaching on enamel, ie, that little, if any, mineral is lost if the teeth are exposed to either natural or artificial saliva. Apparently, this was not the case with dentin, as its hardness decreased and its surface roughness increased—both findings that suggest loss of mineral. However, I am somewhat skeptical of these results because there was no difference between the untreated control group and the bleached experimental groups. (Reviewer—Edward J. Swift, Jr, DMD, MS).  

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**Keywords:** Bleaching Agents  
**Print Tag:** Refer to original journal article
Multiple layers of all-in-1 adhesives seem to improve the immediate bonding of those materials to dentin.

**Objective:** To evaluate the effects of multiple coats of an all-in-1 adhesive on its microtensile bond strength (MTBS) to dentin.

**Methods:** 9 intact human third molars were sectioned perpendicular to their long axis in order to expose coronal dentin. After creation of a smear layer with 600-grit silicon carbide paper, the teeth were divided into 3 groups according to the number of adhesive coats to be applied. Clearfil S3 Bond (Kuraray) was applied using a sponge for 20 seconds, air-thinned for 5 seconds, and light-cured for 10 seconds in group #1. Two and 3 coats of adhesive were applied to dentin in groups #2 and #3, and each coat was air-thinned for 5 seconds prior to light activation. Buildups of Clearfil AP-X (Kuraray) were placed and specimens stored at 37°C for 24 hours prior to MTBS testing.

**Results:** There was a significant and positive correlation between the number of coats and MTBS of Clearfil S3 Bond to dentin. The application of 3 coats of adhesive resulted in significantly higher mean MTBS to dentin than the application a single coat.

**Conclusions:** The use of multiple layers of Clearfil S3 Bond on dentin can improve the strength of the adhesion of that material to the tooth substrate.

**Reviewer's Comments:** The bonding quality of all-in-1 adhesives to dentin has been questioned, which has prompted extensive study of those materials. One of the approaches suggested to increase the initial adhesion of those materials to dentin is the use of multiple layers of the adhesive. However, more relevant than the initial adhesion is the long-term performance of those materials to dentin. That has yet to be determined, as no long-term or clinical study on this topic is currently available in the literature. (Reviewer-Ricardo Walter, DDS).

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Keywords: Multiple Coats of Adhesive

Print Tag: Refer to original journal article
Etch-Rinse Dual-Cure Adhesives Perform Better on Enamel

Dentin and Enamel Bond Strengths of Dual-Cure Composite Luting Agents Used With Dual-Cure Dental Adhesives.

Ritter AV, Ghaname E, Pimenta LA:

J Dent 2009; 37 (January): 58-64

This study found that etch-and-rinse dual-cure adhesives performed better on enamel than their self-etch counterparts, but the reverse was true on dentin.

Objective: To evaluate the dentin and enamel bond strengths of dual-cure resin luting agents used with dual-cure adhesives.

Methods: The adhesive systems and resin cements tested in the study were (1) Xeno IV/Calibra using the new acetone-based self-cure activator, (2) Prime & Bond NT/Calibra using the same new self-cure activator, (3) OptiBond All-in-One/Nexus 2 with OptiBond Solo Plus Activator, and (4) OptiBond Solo Plus/Nexus 2 also with the OptiBond Solo Plus Activator. Xeno IV and OptiBond All-in-One are self-etch materials and Prime & Bond NT and OptiBond Solo Plus are etch-and-rinse adhesives. Extracted human molars were embedded in acrylic and polished to 600-grit, exposing labial enamel or dentin. Twenty specimens of enamel and dentin were treated using the 4 different adhesive systems. Pre-polymerized composite cylinders were sandblasted and bonded to the teeth using the resin cements. Half of the specimens were tested after 24-hour water storage, and the others were tested following thermocycling. Shear bond strengths were determined using an Instron Universal Testing Machine. Fracture patterns were evaluated using an optical microscope at 25x magnification.

Results: On enamel, Xeno IV and Prime & Bond NT had mean bond strengths of 23.9 and 30.4 MPa, respectively. The bond strengths of each material increased by 5 to 6 MPa. The mean enamel bond strength of OptiBond All-in-One was 9.7 MPa, and the mean value for OptiBond Solo was 16.4 MPa. Thermocycling had very little effect on either of these materials. On dentin, the mean bond strengths were 30.9 MPa for Xeno IV, 15.9 MPa for Prime & Bond NT, 20.4 MPa for OptiBond All-in-One, and 15.0 MPa for OptiBond Solo. Thermocycling generally had little effect.

Conclusions: On enamel, the etch-and-rinse dual-cure adhesives performed better than their self-etch counterparts, but the reverse was true on dentin.

Reviewer’s Comments: All of the adhesives tested in this study are light-activated materials that can be mixed with special activator solutions to make them dual-cure. One specific purpose of the study was to evaluate the performance of a new acetone-based activator (the one that was used with Xeno IV and Prime & Bond NT). The results confirmed that the activator was effective. Another interesting finding was that the etch-and-rinse adhesives had higher enamel bond strengths than their self-etch counterparts and that the reverse was true on dentin. (Reviewer—Edward J. Swift, Jr, DMD, MS).

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Keywords: Dentin & Enamel Bond Strengths

Print Tag: Refer to original journal article
20 bladed finishing burs followed by a single-step silicon polisher results in an efficient polish.

Discussion: This is an opinion paper about being efficient when polishing resin composite restorations. Dr Glazer makes an excellent case for using 20 or 30 fluted finishing burs rather than finishing diamonds on resin composite. He suggests that most of these finishing burs should have "safe-ended" non-cutting tips to protect the gingiva and the tooth apical to the restoration. The finishing burs with rounded angles are less likely to chip enamel than are the non-rounded burs. The next efficiency move is to use a single-step polishing system. The key here is to use light pressure on the single-step silicone polisher so that a very fine slurry of the diamond grains can produce a high shine in a short time. He discusses a number of different company brands of polishing systems. Most of them are the traditional step-down system with 3 or 4 grits of abrasive. His final choice appears to be the SS White Safe End Finishing Bur Kit and SS White Jazz Supreme single-step silicone polishing system.

Reviewer’s Comments: I am an advocate for the multi-fluted finishing burs on resin composite. They cost about 4 times as much as regular carbide burs, but they can clearly be time savers. Our students have an assortment of finishing bur shapes. At the university, we have gone back and forth about the polishing systems we teach our students. Right now, we are teaching a multiple-step (course, medium, and fine) rubber polish system impregnated with aluminum oxide. Yesterday, Dr Summitt and I discussed if we should look at a system that required fewer steps. Dr Glazer certainly got a high shine on the photographic examples he offers with his paper. (Reviewer-J.D. Overton, DDS).

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Keywords: Finishing & Polishing Techniques

Print Tag: Refer to original journal article
This study found that the shade matching ability of the Vitapan 3D Master shade guide was more reliable than that of the Vitapan Classical shade guide.

**Objective:** To evaluate the ability of a ceramic system to correctly reproduce the selected shade relative to 2 shade guides using a clinical spectrophotometer.

**Methods:** The Vita Easyshade spectrophotometer was used to measure color differences using the Vita Omega 900 ceramic system. Three different layering patterns were used to fabricate porcelain fused to metal specimens that were 1.3 mm thick. The layering patterns involved different thicknesses of the various porcelain layers (opaque, opaque dentin, dentin, and enamel). The shades A3 (Vitapan Classical) and 2M3 (Vitapan 3D Master) were selected because the manufacturer stated that they were the most popular shades in each system. The "restoration" mode of the spectrophotometer was used to measure the color of each specimen.

**Results:** Color differences (deltaE values) were 3.04, 2.88, and 2.90, respectively, for the 3 layering patterns used for Vitapan A3. For the 2M3 Vitapan Master shade, the respective values were 2.30, 1.76, and 1.34. For each of the 3 layering patterns, the color difference for the Vitapan Master shade was significantly less than that of the Vitapan Classical Shade.

**Conclusions:** The shade matching ability of the Vitapan 3D Master shade guide was more reliable than that of the Vitapan Classical shade guide for the ceramic system evaluated.

**Reviewer's Comments:** This is a somewhat limited study that only evaluated 1 ceramic system and only 2 shades of that system. However, it should be noted that the Vita Omega 900 is one of very few porcelains available in both shade schemes. Also, the color differences were measured versus the spectrophotometer's standards for each shade, not to an actual control specimen of some sort. Regardless, I chose to abstract this study because it does provide some information about the 3D Master shade guide. Specifically, this study tends to support others that have supported the superiority of the 3D Master over the traditional Vita shade guide. The 3D Master shade guide was the first scientifically designed guide based on a sequential selection of value, chroma, and hue. It is a bit harder to use than the Vitapan Classical guide, but is more likely to provide a more accurate shade match. The shade tabs in the Master guide cover the range of true tooth shades far better than the Classical guide does. (Reviewer-Erward J. Swift, Jr, DMD, MS).

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Keywords: Shade Guides

Print Tag: Refer to original journal article
Does Pre-Heating Composite Resin Improve Material Properties?

The Effect of Resin Composite Pre-Heating on Monomer Conversion and Polymerization Shrinkage.

Lohbauer U, Zinelis S, et al:


These authors did not find a significant improvement in the degree of conversion relative to pre-heating after 24 hours, nor did they observe any temperature rise that would be considered damaging to pulpal tissue.

**Background:** Pre-heating resin composites prior to direct placement has been suggested by several investigators in an effort to reduce viscosity and therefore allow better adaptation to the cavity walls and better handling characteristics. Some studies have also demonstrated a higher degree of conversion and resultant improvement in physical properties. Concerns exist regarding the possibility of pulp damage due to temperature elevation.

**Objective:** To evaluate the degree of conversion, polymerization shrinkage, and pulpal temperature effects with different composite pre-heating protocols.

**Design:** In vitro study.

**Methods:** 2-mm dentin discs were prepared from freshly extracted human molars. A cavity was prepared into the top disc and a thermocouple embedded in the bottom disc. The discs were laminated and stored in 100% humidity in a body temperature oven. The resin composite (Tetric® EvoCeram - Ivoclar, Vivadent) was placed into the dentin cavity at 10°C, 23°C, 39°C, and 68°C. After a 60-second waiting time to simulate intraoral handling, the composite was light cured with a quartz tungsten halogen light for 20 seconds. The temperature at the bottom of the cavity and 2 mm below were monitored and recorded. Degree of conversion was measured at the same pre-heated temperatures as well as 54°C using an FTIR spectrometer. Polymerization shrinkage was measured at the respective pre-heating temperatures after 5 minutes and 24 hours of water storage using Archimedes principles of buoyancy.

**Results:** The temperature changes noted after application of pre-heated composite were slight and very quickly changed to physiologic levels upon application. Greater temperature effects were noted during light polymerization. The higher pre-heating protocols resulted in the highest initial conversion for both storage times, but were not statistically significant after 24-hour storage. The initial polymerization shrinkage increased linearly as the pre-heating temperature increased. After 24 hours, the polymerization shrinkage was not significantly influenced by the pre-heating protocol.

**Conclusions:** The authors suggest that resins should be used at room or physiological temperatures, but not at reduced temperatures. They did not find a significant improvement in the degree of conversion relative to pre-heating after 24 hours. They did not observe any temperature rise that would be considered damaging to pulpal tissue.

**Reviewer's Comments:** Pre-heating of composite resins prior to direct placement has been advocated for several reasons, including better handling characteristics, better cavity adaptation, and increased degree of conversion, which presumably leads to better physical properties. This study agrees with other studies regarding the pulpal safety of the increased temperature, but conflicts with studies reporting an increased degree of conversion, particularly after 24-hour storage. The current understanding is that there are no real contraindications to pre-heating techniques, but some question claims of improved material properties. As always, clinical studies are needed to answer the question definitively. (Reviewer-Daniel E. Wilson, DDS).

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Keywords: Monomer Conversion & Polymerization Shrinkage

Print Tag: Refer to original journal article
This study found that opaque composite resin thicknesses of 0.5 to 1.0 mm were sufficient to mask a C4 ceramic background.

**Objective:** To evaluate the thickness of opaque-shade composite resins required to block out situations such as discolored tooth structure, and to assess the translucency of each opaque material at different thicknesses.

**Methods:** The composites and shades used in this study were Z-350 (OA3), Amelogen Universal (A2O), Esthet-X (A2O and A4O), Charmfil (CF), and Aelite Universal (OA3). Standardized thicknesses of each material were made by condensing and curing them in metal molds. Specimen thicknesses were 0.5, 1.0, 2.0, 2.5, 3.0, and 4.0 mm. White and black tiles were used as backgrounds to determine the translucency parameter, which is the color difference ($\Delta E$) of a specimen measured against the 2 backgrounds. In addition, color measurements were made of specimens against a C4 porcelain and the opaque resin itself. The thickness sufficient to mask discolored tooth structure (as represented by the C4 porcelain) was determined by calculating the color difference of specimens between the C4 and resin backgrounds. Color measurements were done using a Minolta Chroma Meter CR-321. $\Delta E$ values lower than 3.3 were considered to be the threshold for blocking the porcelain or black tile background.

**Results:** The masking ability of the composites was variable, with specimen thicknesses of 0.5 to 2.0 mm required, depending on the type of composite and the background. Translucency parameters decreased with increasing thickness for all composites.

**Conclusions:** Opaque composite resin thicknesses of 0.5 to 1.0 mm were sufficient to mask a C4 ceramic background, while a black background required thicknesses of 1.0 to 2.0 mm.

**Reviewer’s Comments:** Today many composites are available in varying degrees of translucency and opacity, designed for use in layering techniques to mimic natural tooth structure. The present study evaluated several opaque-shade composites to determine their translucency at various thicknesses and their ability to mask discoloration. Not surprisingly, the various composites differed from each other in both respects. However, and again not surprisingly, the translucency of all composites decreased with thickness and their masking ability increased with thickness. A good masking ability is essential when covering discolored tooth structure or placing through and through Class IV or large Class III restorations. (Reviewer-Erward J. Swift, Jr, DMD, MS).

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Keywords: Translucency & Masking Ability

Print Tag: Refer to original journal article
In-Office Bleaching Regimens Not as Effective as Extended Tray Bleaching

A Randomized CIE L*a*b* Evaluation of External Bleaching Therapy Effects on Fluorotic Enamel Stains.
Knösel M, Attin R, et al:
Quintessence Int 2008; 39 (May): 391-399

A colorimeter shows that a 14-day tray bleaching regimen is more effective than a single 1-hour session of in-office bleaching.

**Background:** Mild-to-moderate fluorotic mottling is primarily an esthetic problem. Veneering and crowning are used to cover more severe stains. Microabrasion and bleaching are more conservative approaches to successfully improve the esthetic situation.

**Objective:** To evaluate change in fluorotic stains and adjacent non-fluorotic enamel areas treated with external bleaching. CIE L*a*b* colorimetry was used to determine any changes. The study also appraised patient perception of the esthetic results on stains after bleaching therapy.

**Methods:** 18 adolescent patients with mild-to-moderate fluorotic stained maxillary incisors and/or canines were divided into 2 groups: Group A was the bleaching group and Group B served as controls. Baseline determination of each tooth was made using a colorimeter (ShadeEye, Shofu) recording CIE L*a*b* values. Parameter L* describes the luminance; a* describes the green to red value; and b* describes the blue to yellow value. Before bleaching was initiated, color measurements were made of affected and adjacent unaffected areas. Illuminé bleaching gel (30% hydrogen peroxide) was applied for 60 minutes using a tray. After bleaching application, color determination was done and repeated at 2 weeks. Then a continuation on Group A using a 14-day home bleaching regimen with Illuminé home bleaching agent (15% carbamide peroxide) applied for 1 hour/day was initiated. After the 14 days, color determinations were repeated. Color for Group B was assessed at baseline and repeated after a 4-week interval. Patient satisfaction was evaluated using a questionnaire.

**Results:** The bleaching group showed that the discolored areas evaluated demonstrated 96% of the fluorotic areas, and 100% of adjacent normally colored enamel showed significant change after the total bleaching regimen. However, no significant change was noted after in-office bleaching, but there was a noticeable improvement after the 2-week home bleaching period. The patients in the bleaching group indicated they were pleased with the results.

**Conclusions:** A single 1-hour session of in-office bleaching with 30% hydrogen peroxide does not have a significant effect on color and luminosity of fluorotic teeth. Fourteen days of home bleaching with 15% carbamide peroxide makes moderate fluorotic stains assimilate with surrounding normal dentin due to different responses of sound and fluorotic dentin. The study showed patients were satisfied with the bleaching therapy's results. Further use of CIE L*a*b* evaluation would be useful.

**Reviewer's Comments:** This study adds weight to the contention that in-office bleaching regimens are not as effective as extended tray bleaching. The study demonstrated that fluorotic stains can be lightened enough to blend with adjacent, unstained tooth structure. The stained areas are more susceptible to bleaching action than unstained areas so they lighten significantly more. Using the colorimeter to measure change is interesting. If used in future studies, it could standardize the degree of change brought about by bleaching. (Reviewer-Thomas G. Berry, DDS, MA).

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Keywords: CIE L*a*b* Colorimetry

Print Tag: Refer to original journal article
Reservoirs in home bleaching trays increase gingival inflammation.

**Background:** Does a reservoir for a home bleaching tray help or hurt the gingival response?

**Objective:** To evaluate the influence of reservoirs on gingival inflammation after home dental bleaching with 16% carbamide peroxide.

**Methods:** 19 male dental students had custom home bleaching trays fabricated with reservoirs on the left side and none on the right side of the tray. A 16% carbamide peroxide gel was to be used 2 hours per day for 21 days. A cytobrush was used to collect squamous epithelial cells from the gingiva between the canine and premolar at baseline, immediately after, and then 30 and 45 days. By this reviewer's reading, "immediately after" was day 21 of treatment.

**Results:** At 3 time intervals (days 21, 30, and 45), the reservoir side had more inflammatory cells in the cytologic wash collected from the gingiva than did the non-reservoir side.

**Conclusions:** The authors conclude that dentists need to closely monitor home bleaching effects on gingiva. They found the reservoirs to be a source of greater inflammation. They recommend extended rest periods before allowing the patient to bleach again.

**Reviewer's Comments:** This study used a cytology evaluation rather than visual or patient assessment of gingival inflammation. I suspect it is an acceptably accurate representation of what is really happening in the mouth. I would not have expected the negative bleach effect on the gingiva to persist 2 weeks after completion of home bleaching, but that was true for 60% of the non-reservoir and 82% of the reservoir sides. At the highest level of inflammation, this only occurred in 2 patients. It was on the reservoir side in 1 patient and the no reservoir side in a different patient. On the last day of bleaching (day 21) the reservoir side gingiva was significantly more inflamed. Matis in *Operative Dentistry* in 2002 and Javaheri in *Operative Dentistry* in 2000 both concluded that no clinical difference in bleach effect was found with or without reservoirs. Since reservoirs add to the effort in tray fabrication, I am inclined to suggest that you not place reservoirs in your bleaching trays. (Reviewer J.D. Overton, DDS).

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Keywords: Reservoirs

Print Tag: Refer to original journal article
Is 20-Second Polymerization Still Needed for Composites?

Influence of Different Exposure Times Required to Stabilize Hardness Values of Composite Resin Restorations.
Cavalcante LM, Valentino TA, et al:
J Contemp Dent Pract 2009; 10 (March 1): 42-50

Shorter polymerization times should be carefully used for isolated situations only.

Objective: To determine if polymerization time of different light curing units (LCUs) for top and bottom surfaces of different composites is clinically acceptable.

Methods: 2 composites (Heliomolar and Herculite XRV) and 4 LCUs (Optilux 501, Radii, Elipar Freelight 2, and Ultra Lume 5) were used. Cylindrical specimens of composites (4 mm x 2 mm) were made with polymerization times of 20, 40, 60, 80, and 100 seconds. Specimens were stored in water at 37°C for 24 h prior to testing. Knoop hardness testing was performed on top and bottom sides of the discs, and the results were statistically analyzed.

Results: Overall, Herculite XRV presented higher hardness values than Heliomolar. Use of Ultra Lume 5 resulted in the highest hardness values for the top surface of Heliomolar. Optilux 501 produced the lowest hardness values for the bottom surface. No difference between top and bottom surfaces was noticed when Herculite XRV was light activated for 20 seconds and 40 seconds, regardless of the LCU used. With extended polymerization times, use of LED lights resulted in top and bottom surfaces with higher hardness values than Optilux 501. Except for Heliomolar/Optilux 501 (top and bottom surfaces) and Heliomolar/Radii (top surface), all other combinations of LCUs/composites reached a plateau at 80 seconds of light activation.

Conclusions: Different LCUs and composites affect the exposure time required to stabilize hardness. Overall, LED lights resulted in a higher mean hardness than did the Optilux 501. Reviewers Comments: Besides the general conclusion that different LCUs require different polymerization times, not much more can be taken from this study. Any further clinical application of the results is impracticable because the shade of the composites used was not disclosed. Statistical differences are also not clear in the text. Nevertheless, it is better to use an extended polymerization time rather than a shorter one. Composites cannot be over-polymerized, as not more than about 65% of the conversion can be reached. Besides, as a general rule, increments should not exceed 2 mm in thickness. (Reviewer-Ricardo Walter, DDS).

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Keywords: Exposure Times

Print Tag: Refer to original journal article