

Tenure® A&B and Tenure® Quik® With Fluoride Multipurpose Bonding Systems Research Reference Guide

Tenure A&B

Long-Term Clinical Studies

Strassler, H.E. and Weiner, S., “Long Term Clinical Evaluation of Etched Porcelain Veneers Using Ultra-Bond® and Tenure®,” University of Maryland Dental School, presented at the International Association for Dental Research (IADR), March 2005.

The purpose of this study was to evaluate the clinical performance and durability of anterior etched porcelain Lumineers™ by Cerinate®*. The study population consisted of 30 patients with discolored or malpositioned teeth. A total of 167 Cerinate Lumineers (Den-Mat® Corp.) were placed with Ultra-Bond and Tenure. The patients were recalled for collection of long-term data at periods of 140 months up to 232 months (19.3 years) with a mean of 174.8 months (14.6 years). Modified U.S.P.H.S. criteria were used to evaluate color, cavosurface marginal adaptation, and marginal discoloration. The data at the last recall are as follows:

	Alpha	Bravo	Charlie	Delta
Color	143	14	—	—
Marginal Adaptation	128	12	3	14
Marginal Discoloration	133	22	2	—

There was 100% retention of the Lumineers over the period of the study. Over the duration of the study, of the patients that were able to be recalled, 94% of the restorations were clinically successful (157 of 167) with only 10 Lumineers needing replacement. Replacement was usually due to chipping or cracking on stress bearing surfaces. In some cases, the Lumineers were replaced not due to the severity of the fracture, but because the protocol called for the Lumineers to be replaced if any fracture occurred.

Results indicate that the Cerinate Lumineers cemented with Ultra-Bond and Tenure were highly successful over the period of the study.

Taleghani, M., Leinfelder, K.F., "Two-Year Clinical Evaluation of Tenure Dentin Bonding Agent." International Association of Dental Research, Abs. 1530 1991.

Fifty abfraction lesions were restored using Tenure. No mechanical preparation was generated and no enamel was involved. The retention rate at the end of one year was 92%, and at the end of two years the retention rate was 88%.

Tyas, M.J., et al., "Comparison of Bond Strength in Cavities Restored Before and After Extraction (MPa)." Journal of Dental Research, 69 Abs. 99 1990: 945.

Tests were conducted in cavities before and after extraction with evaluations of 11 different bonding systems. In all cases, the Tenure/Perfection combination yielded the highest bond strengths.

Tyas, M.J., "Three-Year Clinical Evaluation of Tenure Dentin Bonding Agent." Australian Dental Journal, 39 1994: 188-189.

Twenty, non-undercut, cervical abrasion lesions were restored using Silux® composite resin in conjunction with Tenure. At the end of three years of clinical service, the retention rate was 89%.

Biocompatibility

Waknine, S., Gable, P., Schulman, A., "Physicomechanical Adhesion and Cytotoxicity Characterization of Eleven Commercial Dentin Adhesives." Journal of Dental Research, 69 1989: 375.

Tenure proves to be significantly more biocompatible when characterizing adhesion to dentin, hygrolytic and dimensional stability, strength, and cytotoxicity of eleven commercial dentin adhesives. This study indicates that Tenure has the least relative cytotoxicity.

Shelf Life and Stability

Davis, E.L., Joynt, R.B., Wieczkowski, Jr., G., Yu, X.Y., "Dentin Bonding System Shelf Life and Bond Strength." American Journal of Dentistry, 6 1993: 229-231.

The purpose of this study was to assess the shelf life of dentin bonding systems by means of bond-strength testing. The systems evaluated were Mirage-Bond, All-Bond and Tenure. Specimens were tested initially, and 1, 2, 3, 4, 5 and 12 months after opening the kits. Tenure resulted in a substantially longer shelf life.

Clinical Applications

Abel, Martin G., "Contemporary Restoration of Class II Caries, Direct Posterior Composites." DENTISTRY TODAY, November 2002.

This article reviews the author's method for successfully placing posterior composite restorations. Tenure was the bonding agent of choice for this restoration case study because of its hydrophilic properties. It percolates further into the dentin tubules and allows for a more complete obturation of the tubules and a stronger bond. The author preferred to use the "two-bottle" Tenure that has acetone as a solvent.

Strassler, Howard E., "A Durable Flowable Composite Resin for Preventive Resin Restorations." DENTISTRY TODAY, October 2002.

This study describes the treatment of carious lesions and the placement of successful restorations. Tenure® A +B was the primer of choice for one of the case studies. Virtuoso® Flowable was then applied to complete the restoration. Tenure was selected for its compatibility and durability.

Berlund, Lorin, "Accidents Happen." DENTISTRY TODAY, October 2002.

Tenure was used in the tooth preparation of a case study following the Bonded Core Post system (Westbrook and Associates). Tenure A and B was brushed into the canal in preparation prior to placing the post. Tenure Quik was the bonding agent of choice when the author created a restoration to close a diastema space. The author stated that choosing the correct products during restorative work is a critical component for durable, esthetic restorations.

Bond Strengths

Barkmeier, E., et al., "Bond Strength, Microleakage and Scanning Electron Microscopy: Examination of the Prisma Universal Bond 2 Adhesive System." Journal of Esthetic Dentistry 1990: 134-139.

The purpose of this study was to evaluate the shear bond strength and SEM evaluation of a series of different dentin bonding systems. While shear bond strengths ranged from 9 to 18 MPa, the shear bond values for Tenure were the highest.

Gwinnett, A.J., "Moist Versus Dry Dentin and its Effect on Shear Bond Strength." American Journal of Dentistry, 5 1992:127-129.

The findings of this study show that dentin can and should be moistened prior to the application of the primer. Under such conditions, the shear bond strengths were appreciably higher than when a dried dentinal surface was employed. Tenure achieved a mean of 28.5 MPa under the condition of the test.

Lacy, A.M., Fowell, I., Watanabe, L.G., "Resin-Dentin Bond Strength Following Pre-treatment with Temporary Cements." Journal of Dental Research, Abs. 1049 1991.

No significant differences in bond strengths were found between specimens pre-treated with either eugenol or non-eugenol cements. While not statistically significant, Tenure exhibited the highest bond strength values, regardless of the pretreatment conditions.

Pacropis, D.R., Ibsen, R.L., "Effect of a Hydrophilic Agent on Dentinal Bond Strengths." International Association of Dental Research, Abs. No. 0784 1993.

The results of a new, hydrophilic resin demonstrated an increase in bond strength when Tenure S was employed. The greatest increase however was realized with Tenure (43%).

Sorensen, J.A., "In Vitro Shear Bond Strength of Dentin Adhesives." International Journal of Prosthetics, 4 1991: 117-125.

Adhesive agents, in conjunction with composite resins and glass ionomers, were evaluated for their ability to bond to dentinal tooth structure. Strengths varied, but none of the specimens bonded to dentin as well as to the enamel controls. Tenure exhibited the highest adhesion values.

Staniec, M., Kawakami, M., "Shear Adhesion, Microleakage Test of a New Dentin Bonding System." American Association of Dental Education, Abs. 1047 1991.

This study compared the shear bond strengths of several different types of dentin bonding agents. Regardless of the time the tests were conducted, the Tenure-Marathon combination exhibited the highest, shear bond strength values.

Yu, X.Y., Davis, E.L., Joynt, R.B., Wiczowski, G., "Bond Strength Evaluation of a Class V Composite Resin Restoration." Quintessence International, 22, Abs. 3079 1991: 391-396.

A three-dimensional cavity design was developed for the purpose of testing the adhesion between restorative materials and tooth structure. Such a design provided a means for differentiating between mechanical retention and true adhesion. Tenure exhibited the highest bond strength of the six different bonding agents.

Microleakage

Godder, B., Settembrini, L., Zhukovskyj, L., "Direct-Shrinkage Composite Placement." General Dentistry, 1995.

The degree of dye penetration produced through incremental filling and other bulk filling indicated no difference in microleakage between the restorations with Tenure/Marathon combination.

Ibsen, R., Ouellet, D., Strassler, H. E., "Clinically Successful Dentin and Enamel Bonding." American Journal of Dentistry, 2 1989: 125-131.

The results of this study demonstrated that Tenure provides microleakage-resistant bonding to both dentin and enamel, and supported the use of Tenure for controlling hypersensitivity.

LoPresti, J., Scherer, W., Settembrini, L., et al., "Reducing Microleakage and Microgap Formation in Amalgam Using Adhesive Primers." Journal of Dental Research, 73 Abs. 693 1994.

A laboratory study was conducted to determine if adhesive primers were effective in reducing leakage in amalgam restorations. The study conclusively proved that Tenure A/B significantly reduced microleakage in these restorations.

Swift, E.J., LeValley, B.D., "Microleakage of Etched-Dentin Composite Resin Restorations." Quintessence International, 23 1992: 505-508.

Of all five materials tested in this bond-strength study, the use of the Kanca technique, in conjunction with Tenure, produced the most beneficial results.

Tjan, A.H.L., Grant, B.E., Dunn, J.R., "Microleakage of Composite Resin Cores Treated with Various Dentin Bonding Systems." Journal of Prosthetic Dentistry, 66 1991: 24-29.

All the dentin bonding systems included in this study significantly reduced microleakage. The Tenure and Scotchbond 2 bonding agents, however, were the most effective.

Teeth Strengthening

Kasloff, Z., Galan, D., Williams, P.T., "Cuspal Deflection Studies Using an Electronic Probe to Evaluate Restorative Materials and Bonding Agents." Esthetic Dentistry Update, 6, No. 1 February, 1995.

The purpose of this study was to measure the amount of deflection that would occur when a vertical load is applied to the cuspal incline of a tooth using Amalgam, Tenure+Core Paste, Tenure+Marathon, and Geristore+ Tenure+ Amalgam. Amalgam alone provided an insignificant amount of resistance to deflection. Tenure+Core Paste, Tenure+Marathon, and Tenure+Geristore demonstrated significantly increased resistance to deflection when compared to Amalgam. There was no significant difference in resistance to deflection between Tenure+Core Paste, Tenure+Marathon, and Tenure+Geristore.

Medige, J., Deng, Y., Yu , X.Y., Davis, E.L., Joynt, R.B., "Effect of Restorative Materials on Cuspal Flexure." Quintessence International, 26 1995: 571-576.

The purpose of this study was to compare the effects on stiffness of different restorative materials in a tooth subjected to cuspal loading. Two, linear strain gauges were mounted on each of the 30 extracted, maxillary, premolar teeth. The following restorative materials were used: Amalgam, Scotchbond 2 with P-50, and Tenure with Marathon V. These tests indicated statistically significant differences in slope between prepared and restored conditions for Tenure/Marathon V only, at both the proximal and buccal sites. The results demonstrated that Tenure/Marathon has a teeth-strengthening effect.

Other Applications

"Core Buildup and Adhesive Incompatibility." Clinical Research Associates Newsletter, Vol. 24, Issue 6, June 2000.

The purpose of this study was to exam retention in core-buildup resins. The study consisted of seven core buildup materials with 24 adhesives. Tenure Quik with fluoride was one of the 24 adhesives. The study demonstrated that Tenure Quik with fluoride outperformed other single-bottle bonding agents and it bonds to both light and self-cured composites.

Ambus, C., Munksgaard, E.C., “Dentin Bonding Agents and Composite Retrograde Root Filling.” American Journal of Dentistry, 6 1993: 35-38.

Of the five systems evaluated, Tenure and Gluma produced the most positive results of dentin bonding agents in conjunction with composite resins for retrograde, root-filling techniques.

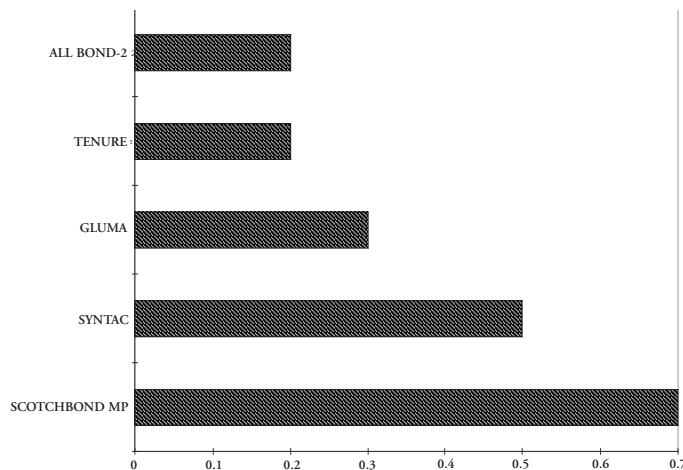
Sorenson, J.A., Munksgaard, E.C., “Relative Gap Formation Adjacent to Ceramic Inlays with Combinations of Resin Cements and Dentin Bonding Agents.” Journal of Prosthetic Dentistry, 76 1996: 472-476.

This study investigated the effect of combining dentin bonding agents (DBAs) with various resin cements on contraction gap formation at the cavity floor of resin-cemented ceramic inlays. Refer to the following table and chart for results.

<u>Dentin Adhesive Choice</u>	Cement			
	<u>Sono-Cem</u>	<u>Porcelite</u>	<u>Dual</u>	
All Bond 2+H3PO4	65	30	48	62
Tenure	68	32	50	23
Gluma	53	37	23	17
Syntac	25	8	10	17
Scotchbond MP	8	7	3	8
Bondlite	0	0	0	0

Note: These figures represent the percentage of bonds (out of 60 measurements) that didn't have a contraction gap.

Mean Gap Index (SD)



There is a difference in dentin bonding agents in conjunction with resin cement procedures. Tenure performed significantly better than Syntac and Scotchbond MP bonding system.

White, S.N., Yu, Z., Tom, J.F., Sangsurasak, J., "In-Vivo Microleakage of Luting Cements for Cast Crowns." Journal of Prosthetic Dentistry, 71 1994: 333-337.

After six months, restorations made with Infinity and Infinity combined with Tenure All-Surface Bonding System revealed significant differences when compared to zinc phosphate. Infinity and Tenure significantly reduced micro-leakage of cemented crowns clinically.

Tenure Quik with Fluoride

"Core Buildup and Adhesive Incompatibility." Clinical Research Associates Newsletter, Vol. 24, Issue 6, June 2000.

The purpose of this study was to exam retention in core-buildup resins. The study consisted of seven core buildup materials with 24 adhesives. Tenure Quik with fluoride was one of the 24 adhesives. The study demonstrated that Tenure Quik with fluoride outperformed other single-bottle bonding agents and it bonds to both light- and self-cured composites.

Bonella, E., et al., "Microleakage of a New 'Single' Component Dentin Bonding Agent," Journal of Dental Research. 76, Abs. No. 407 1997.

This study evaluated microleakage of Tenure Quik with Fluoride. The material performed "exceptionally well" and was not inferior to multicomponent systems.

El-Kalla, I., Garcia-Godoy, F., "Saliva Contamination and Bond Strength of Single-Bottle Adhesives to Enamel and Dentin." American Journal of Dentistry, 10, No. 2 April, 1997.

The bond strength (MPa) of Tenure Quik with Fluoride to enamel and dentin was determined to be 1) enamel-34.8, dentin-26.2, 2) enamel-32.6, dentin-22.4 (bonding surface was contaminated with saliva for 20 seconds; excess saliva was removed by cotton pellet), 3) enamel-34.4, dentin-25.8; similar to group 2 (saliva was rinsed out with water). This study showed saliva contamination did not affect the shear bond strength to enamel and dentin of Tenure Quik With Fluoride.

Ferrari, M., "Scanning Electron Microscope Observations of Hybrid Layer Formed by Tenure Quik with Fluoride Bonding System Tested in Clinical Conditions." University of Siena, Italy (1997). Unpublished data available on request.

This study tested the bonding mechanism of Tenure Quik with Fluoride on demineralized dentin under clinical conditions. It showed the formation of a hybrid layer-three (3) microns thick. In-vivo results showed excellent interlocking.

Powers, J.W., "Bond Strength of Tenure Quik with Fluoride." 1995 Unpublished data available on request.

Tensile bond strength to etched, moist, human dentin results as follows: 22.4 MPa (13.7 - 34.1).

Powers, J.W., "Tenure Quik with Fluoride on Dentin Permeability." 1995. Unpublished data available on request.

Tenure Quik with Fluoride is an effective dentin desensitizer. A laboratory study indicates Tenure Quik with Fluoride to be effective in reducing dentin permeability when tested in-vitro immediately after application. Reduction of dentin permeability is believed to be an effective clinical mechanism for resolving dentin hypersensitivity.

The Dental Advisor Plus, March-April 1997.

This report noted findings of evaluators' experiences with Tenure Quik with Fluoride. This material received a 4-STAR rating and was highly recommended as a single-bottle bonding agent for use with dentin, enamel, and root/dentin desensitization.

Yu, X., Matthews, A., "Bond Strength, Microleakage of One-Component Dentin Bonding Agent." Journal of Dental Research, Abs. 3079 March 1997.

This study compared a one-component bonding agent, Tenure Quik with Fluoride, to a two-component system, Perma Quik. Mean shear bond strength, MPa (SD), of Tenure Quik with Fluoride was 19.5 (8.2); Perma Quik showed a statistically significant difference at 14.6 (4.9). The microleakage testing showed significantly greater leakage at gingival margins with Perma Quik when compared to Tenure Quik with Fluoride. Results suggest it is possible for a one-component bonding agent to outperform a two-component dentin bonding agent.