

THE DENTAL ADVISOR™

Improving Patient Care Through Research & Education



Update on Adhesion – Universal Bonding Agents and Resin Cements

For more than 20 years, bonding agents were categorized as total-etch or self-etch systems with different methods of dispensing and application that characterized them as fourth- to seventh-generation adhesives. Now we have universal bonding agents that can be used with either total-etch or self-etch techniques in both direct and indirect applications. During this same period, resin cements have replaced traditional water-based luting cements for adhesive cementation of resin, metal and ceramic restorations.

This issue of THE DENTAL ADVISOR reviews the characteristics and properties of universal bonding agents and resin cements. Laboratory bond tests and long-term clinical results are reported.

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MAIN TOPIC

Update on Adhesion – Universal Bonding Agents and Resin Cements..... 2

CLINICAL EVALUATIONS

Riva Bond LC
(Light-cured Bonding Agent) 8

Virtual XD (VPS Impression Materials)..... 9

LONG-TERM EVALUATIONS

Tetric EvoCeram
Eight-year Clinical Performance
(Universal Hybrid Composite) 7

Venus Pearl with iBond Total Etch
and iBond Self Etch
One-year Clinical Performance
(Universal Nano-hybrid Composite) 10

Venus Diamond with iBond Total Etch
and iBond Self Etch
One-year Clinical Performance
(Radiopaque Nano-hybrid Composite)..... 11

EDITORS' CHOICE

FluoroDose
(Sodium Fluoride Varnish)..... 8



www.dentaladvisor.com

RATINGS:

Excellent + + + + +

Very Good + + + +

Good + + +

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From the Desk of Dr. Bunek, Editor-in-Chief



Universal has become a popular buzz-word in dentistry, categorizing cements, composites, and, as we will examine in this issue, bonding agents. With its all-encompassing definition, it is easy to see how this category of “universal” can become confusing. Universal has been used to describe a bonding agent that can be used with many different restorative materials, one that can be used with a total-etch, selective etch, and self-etch techniques, and agents that can be used in dual-cure and light-cure procedures. Because of the wide-spread use of this descriptor and the ambiguity of the resulting category, it is imperative that we do the necessary research on the products we are utilizing to ensure appropriate use. Some companies are moving towards systems of products in which an entire product line can be used synergistically. Utilizing these systems is a great way to avoid confusion. If we decide we want to choose our products a la carte, we must do our homework as additional activators may be necessary to achieve an adequate bond. Truly universal bonding agents, are for obvious reasons, desirable, and as our data show, are performing just as good or better than their predecessors. As always, I welcome your comments and suggestions; you can reach me at drbunek@dentaladvisor.com.

Universal Bonding Agents

For the past two decades, total-etch bonding agents were categorized as 4th- and 5th-generation products, and self-etch bonding agents were categorized as 6th- and 7th-generation products. The new universal bonding agents have essentially replaced these total-etch and self-etch generations of bonding agents.

There is no question universal bonding agents continue to gain popularity at a rapid pace. Last year, we reported on this category and introduced five products; this year we are reporting on 9 products. The idea that one adhesive system can be used with different etching techniques, can bond to the different substrates, and can be dual-cured, all without the use of separate activators or primers, is very appealing to clinicians.

While the term universal implies the product can be used in all situations, it is important to understand that manufacturers do not define “universal” the same way; it does, however, generally relate to two or more of the following:

1.

Compatible with different etching techniques: total-, self-, and selective-etch mode.

2.

Compatible with dual- and self-cured materials without the use of a separate activator.

3.

Can be used as a primer for silica-based, zirconia-based and metallic restorations.

Unique Indications for Universal Bonding Agents

As with any new dental material, be sure to thoroughly read the manufacturer instructions prior to use. Table 1 summarizes these materials and highlights their indications. Please note: TDA ratings are provided for products that have been clinically evaluated by THE DENTAL ADVISOR.

Product	Company	Compatible in TE, SE, mode	Compatible with dual-cure materials without use of a separate activator	Bonds to Lithium Disilicate w/o use of separate primer	Bonds to Zirconia and Metal w/o use of separate primer	1-Bottle System	TDA Rating
Adhese Universal	Ivoclar Vivadent, Inc.	✓	✓	✗	✗	✓	ce
ALL-BOND UNIVERSAL	Bisco Dental	✓	✓	✓ **	✓ **	✓	96%
CLEARFIL Universal Bond	Kuraray America, Inc.	✓	✓ *	✓	✓	✓	na
Futurabond U	VOCO America, Inc.	✓	✓	✓	✓	✓	na
Optibond XTR	Kerr Corporation	SE only	✓	✓	✓	✗	na
Peak Universal	Ultradent Products, Inc.	✓	LC only	✗	✗	✗	83%
Prelude One	Danville Materials	✓	✓	✓	✓	✓	96%
Prime & Bond Elect Universal Dental Adhesive	DENTSPLY Caulk	✓	✗	✗	✗	✓	na
Scotchbond Universal	3M ESPE	✓	✓ *	✓	✓	✓	98%

Table 1: Summary of indications for universal bonding agents on the market.

Legend: ce=Clinical Evaluation

*Does not require separate activator if used with the same manufacturers' cement system.

** **All-Bond Universal** does bond to lithium disilicate and zirconia but the manufacturer recommends using a silane primer with lithium disilicate and **Z-Prime Plus** with zirconia for optimum bond strengths.

In-vitro testing of universal bonding agents was performed by THE DENTAL ADVISOR Biomaterials Research Center (Table 2). The data demonstrate high bond strengths to enamel, dentin, zirconia and lithium disilicate. Also included are bond strength data for two self-adhesive resin cements.

Shear Bond Strength, MPa

Product	Total-etch Enamel	Self-etch		Zirconia	Lithium Disilicate
		Dentin	Enamel		
Universal Bonding Agent					
Adhese Universal	37	35	31	nt	nt
ALL-BOND Universal	32	37	20	31	nt
CLEARFIL Universal Bond	33	39	nt	47	47
Optibond XTR	36	44	31	31	nt
Peak Universal Bond		35		nt	nt
Prelude One		30		39	28
Prime & Bond Elect Universal Dental Adhesive	33	42	19	nt	nt
Scotchbond Universal	33	41	30	31	39

Table 2: Shear bond strengths of bonding agents on enamel and dentin using total- and self-etch techniques and on zirconia and lithium disilicate ceramics.

Legend: nt = Not Tested

ALL-BOND UNIVERSAL

+++++

Bisco Dental Products
(800) 247-3368
(847) 534-6000
www.bisco.com



Product Description: **ALL-BOND UNIVERSAL** is a single-component, light-cured bonding agent containing MDP that combines etching, priming and bonding in one bottle. It may be used in self-etch, total-etch or selective-etch bonding techniques. **ALL-BOND UNIVERSAL** is also indicated for desensitization

Shear Bond Strength, MPa

	Dentin	Enamel	Zirconia
	37 self-etch, 39 total-etch	20 self-etch, 32 total-etch	31

of preparations prior to provisionalization/immediate dentin sealing and for the desensitization of exposed root surfaces. **ALL-BOND UNIVERSAL** was evaluated by 19 consultants in over 900 uses. It received a 96% clinical rating.

Adhese® Universal

Ivoclar Vivadent, Inc.
(800) 533-6825
www.ivoclarvivadent.us



Product Description: **Adhese® Universal** is a light cured adhesive for direct and indirect procedures. It has consistently high bond strength and virtually no post-operative sensitivity with any etching technique: self-etch, selective etch or total-etch. The revolutionary **VivaPen®** delivery form delivers up to 190 single-tooth applications, three times more than a traditional adhesive bottle. This drastically decreases cost per application and contributes to more cost-effective treatments.

What does the Lab data show?

To give perspective on these numbers, we have included data from a few 5th, 6th and 7th-generation bonding agents.

Shear Bond Strength, MPa

Product	Enamel	Dentin
5th-generation (Total-etch)		
i-Bond Total Etch	39	23
MPa Max Maximum Performance Adhesive	48	51
6th-generation (Self-etch)		
Adper Scotchbond SE	34	33
7th-generation (Self-etch)		
Beautibond	25	41
BOND FORCE	24	35
i-Bond Self Etch	16	34

MPa Max Maximum Performance Adhesive

Clinicians Choice
(800) 265-3444
www.clinicianschoice.com



Product Description: Based on research to maximize your clinical results, **MPa Max** combines simplicity with reliable, maximum bond strength to all substrates. To ensure adhesive longevity, **MPa Max** contains .2% chlorhexidine, which is clinically proven to inhibit the breakdown of collagen by MMP's (matrix metalloproteinases). To prevent sensitivity, the **MPa Max** kit contains G5™, a clinically proven desensitizer.

BOND FORCE

+++++

Tokuyama Dental
America Inc.
(877) 378-3548
www.tokuyama-us.com



Product Description: **BOND FORCE** is a single-component self-etching, fluoride-releasing bonding agent. It requires one application and a light curing time of 10 seconds. It is supplied in a 5-ml bottle and 20 or 50, 0.1-ml unit-dose capsules. The adhesive needs to be stored at a temperature of 32° to 55° F and should not be used with self-cured composites. It is indicated for bonding of light- or dual-cured materials to cut/uncut enamel and dentin and for composite repair of fractured ceramic. Twelve editors evaluated **BOND FORCE** in 186 clinical applications. **BOND FORCE** received a 96% clinical rating.

Bond Strength, MPa

Dentin	Enamel
35	24

Beautibond

+++++

SHOFU Dental Corporation
(800) 827-4638
(760) 736-3277
www.shofu.com



Product Description: **BeautiBond** is a light-cured, self-etching, one component (7th-generation) bonding agent. Special features include dual adhesive monomers for bonding to enamel and dentin, single coat for shorter working time, and 5 um film thickness. Clinical use consists of: apply and leave for 10 seconds, air dry gently for 3 seconds and then strongly, and then 10-second light cure. **BeautiBond** is packaged in 0.1 ml unit doses. **BeautiBond** was evaluated in 952 uses by 27 consultants. It received a 96% clinical rating.

iBond TE

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Heraeus
(800) 431-1785
www.heraeusdentalusa.com



Product Description: **iBOND Total Etch** is a light-cured, 5th-generation etch-and-rinse bonding agent indicated for bonding of direct composite restorations, bonding of indirect restorations in combination with light-cured luting cements, and for sealing of hypersensitive areas of teeth. It contains nanofillers in an ethanol solvent and can be applied in one coat. Light curing time is 20 seconds. **iBOND Total Etch** is available in both 4 mL bottles and single-dose delivery. **iBOND Total Etch** was evaluated by 27 consultants in 647 uses. It received a 94% clinical rating.

Resin Cements

With the advent of all-ceramic restorations, resin cements have grown in popularity mainly because they address the shortcomings of luting cements. Resin cements exhibit high bond strength to tooth structure, excellent esthetics, and the lowest solubility of the available cements. Currently, resin cements can be classified into three categories:

1. *Self-adhesive Resins: No separate etching or primer of teeth or restorations*
2. *Adhesive Resins: Bonding to teeth based on self-etching primers*
3. *Esthetic Resins: Bonding based on total-etching adhesives*

Self-adhesive Resin Cements

Self-adhesive resin cements are composed of diacrylate resins with acidic and adhesive groups and glass filler. They are usually dual-cured resins that can be light-activated or self-cured. Self-adhesive resin cements bond to tooth structure with low to medium bond strengths (4-16 MPa). The separate use of a bonding agent is not recommended; however, some bonding agents recommended by manufacturers can be compatible with self-adhesive resin cements. Use of an bonding agent makes manipulation more complicated and does not dramatically improve bond strength to tooth structure. Therefore, when higher bond strengths are needed, they can be obtained with adhesive resin or esthetic resin cement systems. Self-adhesive cements have a tendency to darken over time and marginal discoloration tends to be higher than other cements. Self-adhesive resin cements have a lower incidence of sensitivity than adhesive or traditional crown and bridge cements. Some examples are: *G-CEM Automix* (GC America), *Panavia SA CEMENT Plus* (Kuraray America, Inc.), and *RelyX Unicem 2 Automix Self-Adhesive Resin Cement* (3M ESPE).

Shear Bond Strength, MPa

Product	Total-etch Enamel	Self-etch Dentin	Zirconia	Lithium Disilicate
Panavia SA CEMENT Plus	35	26	52	57

Adhesive Resin Cements

Adhesive resin cements require separate priming of the tooth and may require separate priming of the restorative material. Typically, adhesive resin cements utilize self-etching primers or universal bonding agents for bonding to enamel and dentin. For higher bond strengths to zirconia-based ceramics and metals, some companies recommend use of separate zirconia or metal primers. Some examples are: *Multilink Automix* (Ivoclar Vivadent, Inc.), *Panavia F 2.0* (Kuraray America, Inc.), and *RelyX Ultimate Adhesive Resin Cement* (3M ESPE).

Esthetic Resin Cements

Esthetic resin cements are tooth-colored or translucent cements based on diacrylate resin. They are often provided with water-soluble try-in pastes. They have high flexural strength and high bond strengths to enamel and dentin. These cements typically require etching the tooth with phosphoric acid, followed by priming of the restoration and application of resin cement. Recent esthetic resin cements utilize self-etching bonding agents. Esthetic resin cements require a separate primer for bonding to ceramic, metal, and tooth substrates. Some examples are: *RelyX Veneer* (3M ESPE), *Lute-It! Esthetic Luting System* (Pentron Clinical), *NX3 Nexus Third Generation* (Kerr Corporation), and *Variolink Veneer* (Ivoclar Vivadent, Inc.).

Which Resin Cement Should I Use?

Numerous factors influence the dentist's decision regarding cement selection (Tables 3 and 4). Ease of use, cost, strength, and postoperative sensitivity are just a few. To add to the confusion, there are a large variety of cements to choose from. One type of category of cement is not ideal for every situation; therefore, it is imperative to understand the difference in the physical and mechanical properties, as well as handling characteristics.

Product	Self-adhesive	Adhesive Resin	Esthetic Resin
Etch and/or Bonding Agent Required on Tooth	No etch No Bonding agent	Yes - Self-etching bonding agent	Yes - requires both etch and bonding agent
Bond Strength	Low-med (4-16 MPA)	Med-high	High
Curing Mode	Dual-cured	Dual-cured	Light-cured
Technique Sensitivity	Low	Med	High
FL Release	Yes	No	No
Shades	Usually available in universal, translucent and opaque shades	Usually available in universal, translucent and opaque shades	Usually available in VITA and translucent shades Try in pastes are also available
Indications	<ul style="list-style-type: none"> All-metal or ceramic-metal crowns/ bridges with good retentive preparations High-strength ceramic (zirconia) crowns and bridges Posts (metal and fiber) 	<ul style="list-style-type: none"> All-ceramic crowns/ bridges, and inlays/onlays High-strength ceramic (zirconia) crowns and bridges Maryland bridges Posts (metal and fiber) 	<ul style="list-style-type: none"> All-ceramic crowns and veneers in esthetic zone All-ceramic inlays/onlays

Table 3: Features and indications of self-adhesive, adhesive resin, and esthetic resin cements.

Resin Cements (cont.)

Long-term Clinical Data of Self-adhesive and Adhesive Resin Cements

Long-term performance studies conducted by THE DENTAL ADVISOR for self-adhesive and adhesive resin cements have shown excellent results. Four clinical studies are highlighted in the table below.

Product	Number of Years	Number of Restorations Observed at Recall	Lack of Post-operative Sensitivity	Resistance to Marginal Staining	Retention
G-CEM Automix (GC America)	2	52	90%	100%	100%
Multilink Automix (Ivoclar Vivadent, Inc.)	4	407	100%	99%	97%
PANAVIA SA CEMENT (Kuraray Noritake Dental)	2	257	97%	100%	100%
RelyX Unicem Self-Adhesive Resin Cement (3M ESPE)	10	1311	99%	92%	96%

Table 4: Long-term clinical data of self-adhesive and adhesive resin cements.

Clinical Tips - Resin Cements

- May require refrigeration – bring to room temperature before using.
- Clean the intaglio surface of zirconia-based ceramic restorations after try-in.
- Use *Ivoclean* (Ivoclar Vivadent, Inc.) and then apply zirconia primer for better retention.
- Use light activation whenever possible - dual-cured cements typically have increased flexural strength and bond strength when activated with a light vs. self-curing.
- Translucent shades are more sensitive to ambient light.
- Excess cement is easy to remove after 3-5 seconds of tack curing with an LED Curing Light.
- Do not apply resin cements directly on exposed pulp or dentin that is close to the pulp. Use *TheraCal LC* (Bisco Dental Products).

TheraCal LC

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Bisco Dental Products
(800) 247-3368
(847) 534-6000
www.bisco.com



Product Description: *TheraCal LC* is a light-cured, resin-modified calcium silicate material. It is indicated for direct and indirect pulp capping and as a protective base/liner under restorative materials including composite, amalgam and cements. *TheraCal LC* is white in color and is radiopaque. It is supplied in a 1 g syringes. The kit contains 4 syringes of *TheraCal LC* with disposable application tips. *TheraCal LC* was evaluated by 20 consultants in 438 uses. It received a 96% clinical rating.

Ask Our Editors

Q: Dr. Bunek, I want to cement a full-contour zirconia crown that has poor retention. What type of resin cement do you recommend?

A: The use of adhesive resin cement (*3M ESPE RelyX Ultimate Adhesive Resin Cement* with *Scotchbond Universal*, *3M ESPE*; *Multilink Automix*, *Ivoclar Vivadent*; *DUO-LINK UNIVERSAL RESIN LUTING CEMENT* with *ALL-BOND Universal*, *Bisco Dental Products*) is recommended with non-retentive preparations.

Q: Dr. Farah, would you use self-adhesive or adhesive resin cements for bonding of ceramic veneers?

A: No, I prefer esthetic resin cements. Light-cured resin cements do not contain an amine catalyst (found in many dual-cure resin cements), so working time is good and there is less chance of shade change over time that can result from oxidation of the amine catalyst. These veneer kits (*3M ESPE Rely X Veneer Cement*, *3M ESPE*; *Mojo Veneer Cement*, *Pentron Clinical*; *Variolink Veneer*, *Ivoclar Vivadent, Inc.*) also provide try-in pastes and a variety of shades.

Q: Dr. Powers, can I assume that resin cements labeled as dual-cured will self-cure?

A: Some dual-cured resin cements will self-cure without light activation, whereas others require light activation to initiate the self-curing reaction. Laboratory testing shows that most dual-cured resin cements have higher strength when light activated.

Tetric EvoCeram

Ivoclar Vivadent, Inc.

(800) 533-6825 | www.ivoclarvivadent.us

Description

Tetric EvoCeram is a universal, hybrid composite indicated for anterior and posterior esthetic restorations. The composite is radiopaque and available in both Enamel and Dentin formulations with a variety of shades able to meet any rigorous esthetic challenge. This composite consists of particles ranging in size from 40 to 3000 nm with an average particle size of about 550 nm. It is packaged in 0.2 g, color-coded, unit-dose capsules and 3 g color-coded syringes.

Clinical Evaluation Protocol

- 873 restorations were placed and monitored over an eight-year period.
- 637 (73%) of these restorations were recalled over six months. The restorations included both anterior and posterior teeth (Figure 1).
- The recalled restorations were Class I, Class II, MOD and Class IV composites (Figure 2).
- Timeline of restorations in clinical service is shown in Figure 3.
- At recall the following categories, esthetics, resistance to fracture/chipping, resistance to marginal discoloration, and wear resistance were rated on a scale of 1 to 5 with 1=poor, 2=fair, 3=good, 4=very good, 5=excellent. Any restoration receiving a rating of 1 or a 2 in a category is automatically replaced. Restorations receiving a rating of 3 or 4 in a category are still clinically acceptable and are not replaced.

Clinical Observations

Esthetics

The esthetics of **Tetric EvoCeram** was excellent at recall (Figure 4). Out of 637 recalled restorations, 93% received an excellent rating and 7% received good to very good rating and did not require replacement. Only three restorations (0.5%) required replacement because of poor esthetics. **Tetric EvoCeram** layered with a translucent shade often resulted in improved esthetics, opalescence and translucency. Layering is especially important in teeth that are discolored.

Resistance to Fracture and Chipping

Over 95% of the 637 recalled **Tetric EvoCeram** restorations received an excellent rating (Figure 4). 2% of the restorations had chipped but did not require replacement, while 3% or 19 restorations did need to be replaced. **Tetric EvoCeram** proved to be very resistant to fracture and chipping at 8 years, especially given that 96% of the restorations were posterior restorations and were subjected to high occlusal forces.

Resistance to Marginal Discoloration

Microleakage is affected by both the composite and the bonding agent. Excessive microleakage can lead to decay or poor marginal esthetics. 86% of the recalled restorations had no visible microleakage and were rated excellent (Figure 4). 13% had slight to medium microleakage, while 1% had excessive microleakage which necessitated the replacement of the restoration. A variety of self-etch (88%) and total-etch (12%) bonding agents were used.

Wear Resistance

98% of the restorations showed no evidence of wear and received an excellent rating, whereas 1.5% of the restorations received a good or very good rating (Figure 4). Only 0.5% of the restorations required replacement because of excessive wear.

Conclusions

Tetric EvoCeram has excellent handling characteristics. It is non-slumping, not sticky, contours well, and is easy to finish and polish. This eight-year evaluation of 637 restorations demonstrated that **Tetric EvoCeram** had superior performance in esthetics, resistance to fracture/chipping, resistance to marginal discoloration, and wear resistance. **Tetric EvoCeram** received a 97% clinical performance rating. ■

8-year Clinical Performance



No. 31, **Tetric EvoCeram** at 8 years.

Consultants' Comments

"Definitely my favorite material when it comes to handling and shaping posterior composites."

"Retains esthetics and polish over time."

"Amazing resistance to wear even after eight years."

"Best handling posterior composite."

FIGURE 1

Distribution of **Tetric EvoCeram** Restorations.

Anterior
Posterior

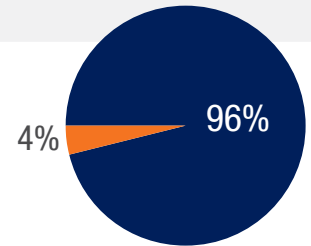


FIGURE 2

Distribution of **Tetric EvoCeram** Restorations.

Class I MOD
Class II Class IV

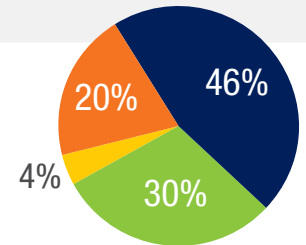


FIGURE 3

Timeline of **Tetric EvoCeram** Restorations in Service.

5 yrs or less 7 or more
6 yrs

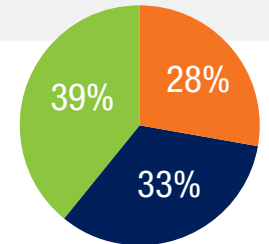
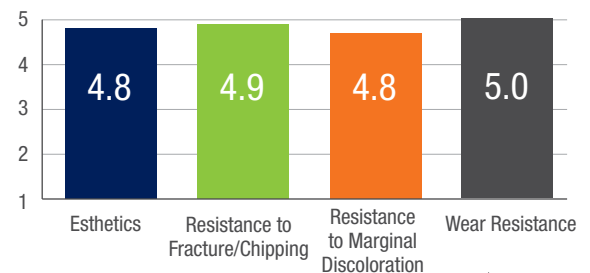


FIGURE 4 Results of **Tetric EvoCeram** Restorations at 8 Years.



FluoroDose

Centrix, Inc

(800) 235-5862 | www.centrixdental.com

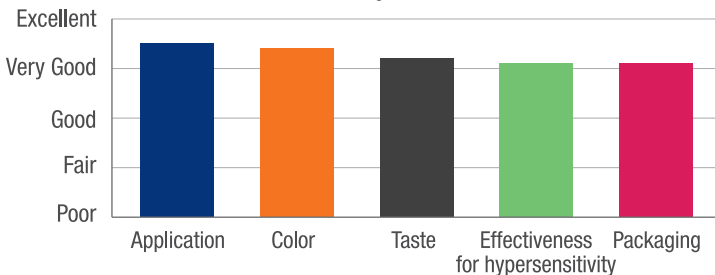
Description

FluoroDose is a clear 5% sodium fluoride varnish. **FluoroDose** is indicated for the treatment of hypersensitive root surfaces and prevention of root decay in older patients, and for caries prevention in children who do not receive fluoride from their water source or from another dental treatment. **FluoroDose** comes in a unit-dose *LolliPack* that includes 0.3 ml of varnish packaged with a *BendaBrush* for application. It is available in four flavors: bubblegum, mint, cherry, and melon. Excess moisture should be removed from the area to be treated. **FluoroDose** varnish is then applied in a thin layer and allowed to dry for 10 seconds before the patient is instructed to close their mouth. Patients should be instructed to eat soft foods and only cold liquids, excluding alcohol, for two hours after application and not to brush their teeth for a minimum of 4-6 hours. Individual flavors are available in boxes of 120, 600 or 1200 units. **FluoroDose** was evaluated by 26 consultants in 584 uses. This fluoride varnish received a 93% clinical rating.

Suggested Retail Cost

120-count pack	\$129.95
600-count pack	\$532.95
1200-count pack	\$998.95

Key Features:



++++ 1/2



Consultants' Comments

- "Seemed to be less sticky than other brands I have used."
- "Patients like the variety in flavors."
- "Every child liked it!"
- "Application is smoother than most varnishes."
- "Brushes sometimes slip out of the packages before opening."
- "Offer a variety pack of flavors."

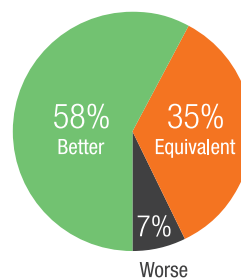
Product Features

FluoroDose has less volume than many other fluoride varnishes, and consultants thought it was just the right amount for a single patient treatment without waste. The varnish applies smoothly without clumping and dries clear. The colorful *LolliPack* packaging was visually appealing to children. Adults and children found the four flavors to be pleasant.

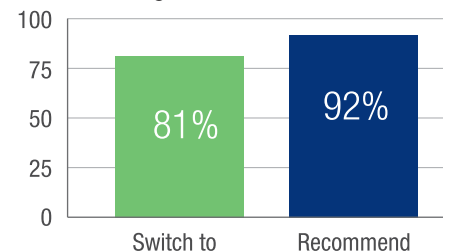
Clinical Tips

- FluoroDose** is a good product to add to dry mouth therapy protocol.
- Dry the teeth before application. ■

Compared to current product:



Percentage of consultants who would:



Riva Bond LC

SDI (North America), Inc.

www.sdi.com.au

Description

Riva Bond LC is a light-cured bonding agent based on resin-modified glass ionomer chemistry. It is designed to expand enough to compensate for polymerization shrinkage, while maintaining adequate bond strength. It is indicated for use as an adhesive for direct restorations, for bonding composite resin to self-cured/light-cured glass ionomer cement in the sandwich technique, bonding between layers of composite resin in larger restorations to reduce polymerization shrinkage stress, sealing hypersensitive cervical areas, and as a liner under amalgam fillings. Preparations should be etched with 37% phosphoric acid for 5 seconds, rinsed thoroughly and dried but not desiccated. **Riva Bond LC** comes in capsules that must be activated by depressing the plunger and triturated for 10 seconds in an amalgamator prior to adhesive placement. Use the provided brush applicator to pierce the foil end of the capsule and apply a thin layer of **Riva Bond LC** to all surfaces (air thin if necessary), and light cure for 10 seconds. **Riva Bond LC** was evaluated by 29 consultants in 590 uses. This bonding agent received an 86% clinical rating.

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Consultants' Comments

- "Easy to use, multipurpose product."
- "Coats tooth surface well."
- "I'm interested to see if the 'compensation' aspect of the polymerization results in less evidence of marginal leakage over time."
- "Good radiopacity."

Suggested Retail Cost

\$157.45/50 unit dose capsules

Product Features

The unique delivery system of **Riva Bond LC** provides fresh adhesive for each use. Capsules are easy to activate and mix, although consultants noted that having to use an amalgamator was

Virtual XD

Ivoclar Vivadent, Inc
www.ivoclarvivadent.com

Description

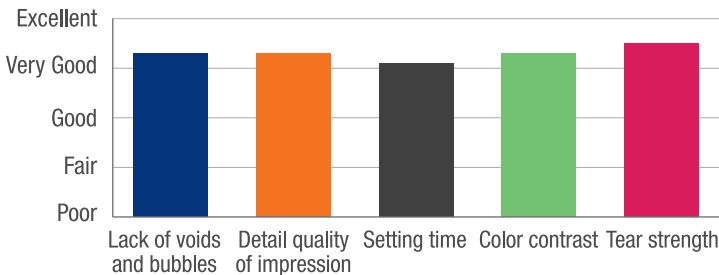
Virtual XD (*Extra Definition*) is a line of VPS impression materials featuring wash materials intended to increase accuracy and improve fit of final restorations. The wash materials have very low contact angles, allowing for the capture of fine details. **Virtual XD** is available in four viscosities and two setting times:

Product	Fast set	Regular set
Extra Light Body (yellow)	2:30	3:30
Light Body (orange)	2:30	3:30
Heavy Body (blue)	2:30	4:30
Putty (blue)	2:30	4:30

Virtual XD comes in standard 50 mL cartridges. Heavy body is also available in 380 mL cartridges compatible with dynamic mixing machines such as *Virtual Mixer* (Ivoclar Vivadent), *Pentamix 3* (3M ESPE) and *Dynamix speed* (Heraeus Kulzer). The putty is available in 300 mL tubs. Fifteen consultants evaluated **Virtual XD** Heavy Body/Light Body Fast Set material, taking 200 impressions. This VPS impression material received an 89% clinical rating.

Suggested Retail Cost	
50 mL cartridge	\$56.00
380 mL cartridge	\$410.00
300 mL Tub	\$140.00

Key Features:



Consultants' Comments

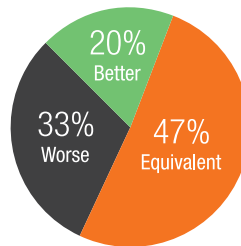
- "Very good impression detail."
- "Blue/orange color contrast is easy to read."
- "The setting time printed on the label is a good reference."
- "Fast set is ideal for 1-2 units."
- "Heavy body is difficult to extrude."

Product Features

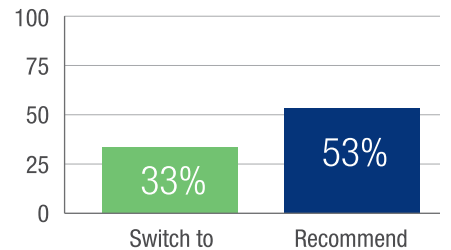
- Optimized flow characteristics for deeper penetration into the sulcus and improved coverage of the preparation.
- Advanced wetting ability for precise detail reproduction of both soft and hard tissue.
- High tear strength to maintain the integrity of preparation margins and fine detail upon removal of the impression.

Virtual XD light body has very good flow into the sulcus and captures accurate detail for crown and bridge impressions. It stacks well and blends completely with the heavy body tray material. After setting, **Virtual XD** has good stiffness without being difficult to remove from the mouth. ■

Compared to competitive products:



Percentage of consultants who would:



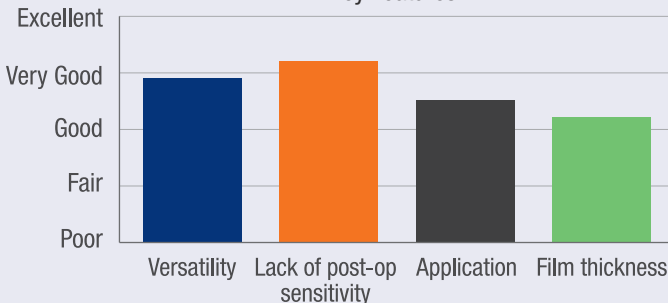
Riva Bond LC (cont.)

inconvenient. The four-minute working time and the volume of liquid in each capsule are ideal for use on multiple teeth. Seventy-nine percent of consultants were using a self-etch adhesive; 80% of those would be willing to switch for increased durability of the bond. **Riva Bond LC** coats the tooth well and can be thinned with air before light curing. Bond strength to dentin is 14MPa. ■

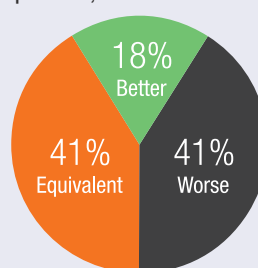
Editors' Note

Riva Bond LC also comes in hand-mixed, powder/liquid presentation that is indicated for use as both a bonding agent as well as a RMGI lining material. When using as a RMGI lining material, make sure the correct prescribed powder/liquid ratio is used. SDI offers a 100% satisfaction guarantee on their products. You can purchase **Riva Bond LC** and return it for a full refund if you are not 100% satisfied.

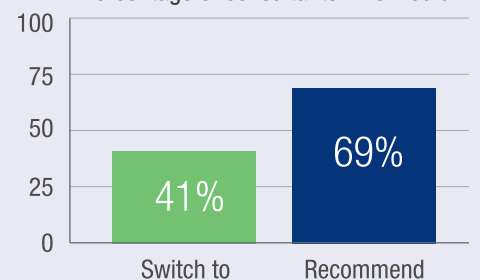
Key Features:



Compared to current product, **Riva Bond LC** is:



Percentage of consultants who would:



Venus Pearl with iBOND Total Etch and iBOND Self Etch

Heraeus Kulzer

(800) 431-1785 | www.heraeusdentalusa.com

Description

Venus Pearl is a universal, nano-hybrid composite based on the chemistry of **Venus Diamond** but with a creamier consistency. **Venus Pearl** is suitable for all classes of anterior and posterior restorations and is designed to produce a durable, highly esthetic result with a long-lasting, high luster polish. **Venus Pearl** is available in both syringe and unit dose (PLT) delivery in 27 shades. **iBOND Total Etch** is a light-cured adhesive used in conjunction with phosphoric acid etchant. It contains nanofillers in an ethanol solvent and can be applied as one coat. **iBOND Self Etch** is a light-cured, self-etching, one-component bonding agent. Light curing time for both adhesives is 20 seconds. **iBOND** is available in both 4 mL bottles and single-dose delivery.

Purpose

The purpose of this evaluation was to monitor the one-year clinical performance of **Venus Pearl** restorations bonded with **iBOND Total Etch** and **iBOND Self Etch**.

Clinical Evaluation Protocol

- 190 **Venus Pearl** restorations were placed; 169 restorations were recalled during the first year after placement.
- Anterior and posterior restorations were placed (Figure 1).
- Restorations were bonded with **iBOND Total Etch** and **iBOND Self Etch** (Figure 2).
- At recall, restorations were evaluated for resistance to fracture/chipping, esthetics, resistance to marginal discoloration, wear resistance, lack of sensitivity, and retention.
- Restorations were evaluated on a 1-5 rating scale: 1 = poor, 2 = fair, 3 = good, 4 = very good, 5 = excellent.

Clinical Observations

Resistance to Fracture/Chipping

Resistance to fracture and chipping was excellent with this restorative material (Figure 3). Of the 169 restorations recalled, only one, a Class II filling on a second molar, fractured and required replacement. No chipping was observed.

Esthetics

Esthetics of **Venus Pearl** was rated excellent in both anterior and posterior applications (Figure 3).

Resistance to Marginal Discoloration

Venus Pearl exhibited excellent resistance to staining at the margins of the restorations (Figure 3). Five of the recalled restorations (3%) showed marginal staining. Four of these were minor, requiring no treatment; one involved recurrent caries at the margin.

Wear Resistance

No visible signs of wear were noted on the **Venus Pearl** restorations recalled (Figure 3).

Lack of Sensitivity

When patients were questioned about sensitivity at their recall appointments, excellent results were reported (Figure 3). There was only one instance of sensitivity - a Class II **Venus Pearl/iBOND TE** restoration was replaced and an area of incomplete bonding was discovered at that time.

Retention

The overall retention rate of the **Venus Pearl** restorations in this evaluation was 99% (Figure 3). Two Class V restorations on second molars (on the same patient) debonded. These restorations were bonded with **iBOND TE** and were found to be missing nine months after placement. The other restorations were intact.

Conclusions

Venus Pearl used with **iBOND Total Etch** and **iBOND Self Etch** received excellent ratings for resistance to fracture/chipping, esthetics, resistance to marginal discoloration, wear resistance, lack of sensitivity, and retention at one year. **Venus Pearl/iBond** received a 99% clinical performance rating. ■

1-year Clinical Performance



Consultants' Comments

"Fillings blend perfectly."

"Versatile composite - works everywhere in the mouth."

"Reliable restorative material."

"Holds its polish."

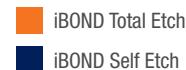
FIGURE 1

Distribution of **Venus Pearl** Restorations Recalled.



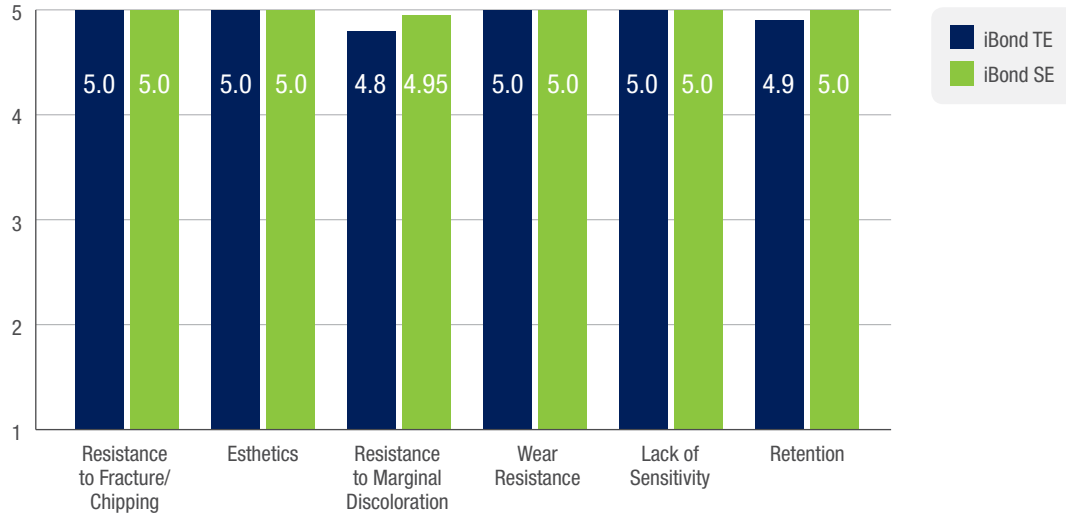
FIGURE 2

Distribution of Bonding Agents Used with **Venus Pearl**.



Venus Pearl with iBond Total Etch and iBond Self Etch One-year Clinical Performance

FIGURE 3

Results of Recalled *Venus Pearl* Restorations at One Year

Venus Diamond with iBond Total Etch and iBond Self Etch

Heraeus Kulzer

(800) 431-1785 | www.heraeusdentalusa.com

Description

Venus Diamond is a radiopaque, nano-hybrid composite with a packable consistency. *Venus Diamond* is indicated for all classes of anterior and posterior restorations and may be used with any suitable bonding agent. *Venus Diamond* is available in both syringe and unit dose (PLT) delivery in 23 shades. *iBOND Total Etch* is a light-cured adhesive used in conjunction with phosphoric acid etchant. It contains nanofillers in an ethanol solvent and can be applied in one coat. *iBOND Self Etch* is a light-cured, self-etching, one-component bonding agent. Light curing time for both adhesives is 20 seconds. *iBOND* is available in both 4 mL bottles and single-dose delivery.

Purpose

The purpose of this evaluation was to monitor the clinical performance of *Venus Diamond* restorations bonded with *iBOND Total Etch* and *iBOND Self Etch* at one year.

Clinical Evaluation Protocol

- 120 *Venus Diamond* restorations were placed.
- 108 restorations were recalled during the first year after placement.
- Anterior and posterior restorations were included (Figures 1 and 2).
- Restorations were bonded with *iBOND Total Etch* and *iBOND Self Etch* (Table 1).
- At recall, restorations were evaluated for resistance to fracture/chipping, esthetics, resistance to marginal discoloration, wear resistance, lack of sensitivity and retention.
- Restorations were evaluated on a 1-5 rating scale: 1 = poor, 2 = fair, 3 = good, 4 = very good, 5 = excellent.

Venus Diamond	# Placed	# Recalled
with <i>iBOND Self-Etch</i>	84	76
with <i>iBOND Total-Etch</i>	36	32

1-year Clinical Performance



Consultants' Comments

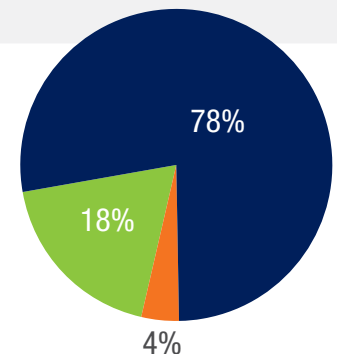
"Excellent esthetics."

"Good radiopacity."

"Strong composite for posterior restorations."

FIGURE 1

Venus Diamond/iBOND Self-Etch Restorations Recalled



Venus Diamond with iBOND Total Etch and iBOND Self Etch (cont.)

Clinical Observations

Resistance to Fracture/Chipping

Venus Diamond proved to be a durable restorative material during this first year after placement. No instances of fracture or chipping were observed in any of the restorations recalled (Figure 3).

Esthetics

Venus Diamond was used mainly in posterior applications, and 96% of the recalled restorations received ratings of “excellent” for esthetics. Five restorations (4%) had a slight fault in color match to the tooth (Figure 3).

Resistance to Marginal Discoloration

Venus Diamond exhibited excellent resistance to staining at the margins of the restorations (Figure 3). No staining was seen in any of the restorations bonded with *iBOND Total-Etch*. Three (4%) of the restorations bonded with *iBOND Self-Etch* showed minor marginal staining.

Wear Resistance

No visible signs of wear were noted on the *Venus Diamond* restorations recalled (Figure 3).

Lack of Sensitivity

Patients were questioned about sensitivity at their recall appointments; no sensitivity was reported (Figure 3).

Retention

All patients recalled had intact restorations during the first year after placement (Figure 3). No de-bonds occurred.

Summary

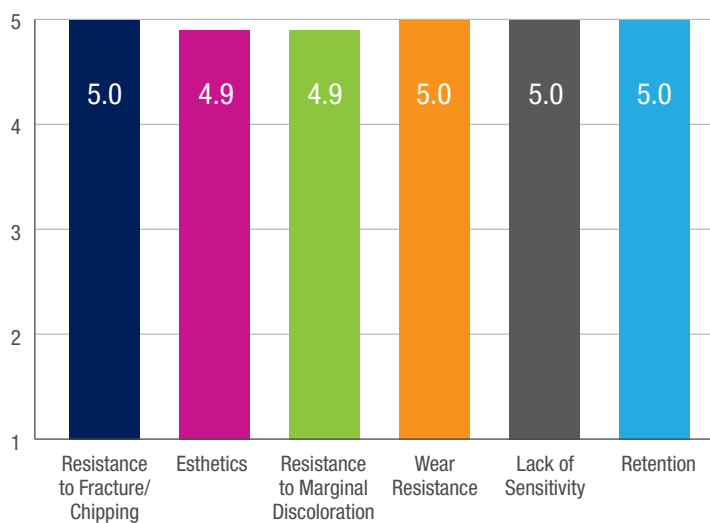
Venus Diamond restorations bonded with *iBOND Total Etch* and *iBOND Self Etch* were evaluated at one year. Excellent ratings were observed for resistance to fracture/chipping, esthetics, resistance to marginal discoloration, wear resistance, lack of sensitivity and retention. *Venus Diamond/iBOND* received a 99% clinical performance rating. ■

FIGURE 2

Venus Diamond/iBOND
Total-Etch Restorations
Recalled



FIGURE 3 Results of *Venus Diamond / iBOND* at One-year Recall



SPECIAL THANKS TO:

Select Senior Clinical Consultants (Over 20 years):

J. Amara, CT · R. Fisher, OH · W. Gregory, MI · E. Katkow, MD · J. Lockwood, MI · J. Mayer, OH · W. Nagy, TX · G. Poy, MI · J. Shamraj, MI · R. Trushkowsky, NY · P. Yaman, MI

Senior Clinical Consultants (15-19 years):

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Laboratory Consultants:

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