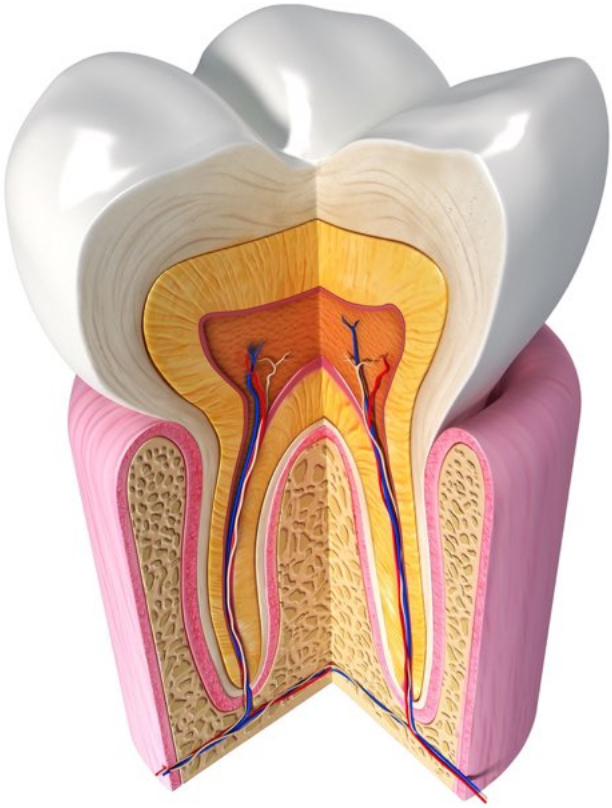
Tooth Structure



Nature's Best Restorative Material

A 30 Year Perspective

Richard A. Young, D.D.S.

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Richard A. Young, D.D.S
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Esthetic Dentistry for Adults & Children
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www.dentalphotographyseminars.com

work	909.888.4482
cell	951.315.8306
my fax	866.587.1502
office fax	909.888.4156

"That which is worth doing is worth doing well"

Contacts

- Kuraray: http://kuraraydental.com
- Danville: http://danvillematerials.com
- BioClear: http://www.bioclearmatrix.com
- Photomed: http://www.photomed.net
- Ultradent: https://www.ultradent.com
- Ribbond: http://ribbond.com
- Dentapreg: http://www.dentapreg.com/Dentists/Home
- Brasseler USA: http://brasselerusa.com
- Garrison Dental: https://garrisondental.com
- Addent: http://www.addent.com

Education

- David Clark, DDS: http://www.bioclearmatrix.com/events/
- Matthew Nejad, DDS: http://www.biomimeticdentistryce.com
- David Alleman, DDS: http://www.biomimeticdentistryce.com
- John Kois, DDS: http://koiscenter.com
- Bioemulation USA: https://www.bioemulationusa.org
- The Academy of Biomimetic Dentistry: http://www.academyofbiomimeticdent.org

More contacts listed on my website: http://ryoungdds.com/links.html

The graphics in the following slides were created by

Graeme Milicich, BDS
New Zealand
www.advancedental-ltd.com

modified for this lecture by r.young

Effects of cavity designs on tooth flexure

courtesy g. milicich

Cuspal Widening

(micro meter)

Amalgam	Composite
5µm	3.5µm
5.4µm	3.8µm
179.4µm	6.9µm

CT Scan-Based Finite Element Analysis of Premolar Cuspal Deflection Following Operative Procedures. Magne P, Oganesyan MS
Inter Journ of Periodontic and Restorative Dent:, 2009:29 (4).: 361-369.

RR: Rainey Ridges

PRF:Peripheral Rim Fractures

OEC:Occlusal Effect Caries

courtesy d. alleman

courtesy d. alleman

CLINICAL PRESENTATIONS OF STRESS DISTRIBUTION IN TEETH AND THE SIGNIFICANCE IN OPERATIVE DENTISTRY

2000

Figure 14. A tension facet and peripheral rim fracture are evident at the distal contact point.

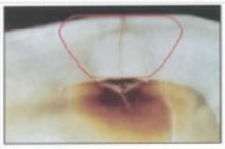
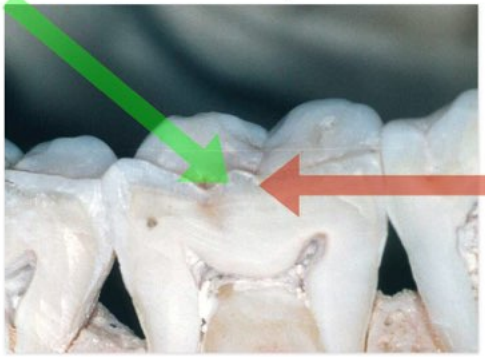


Figure 6. Caries is established through an enamel fracture. Minimal decalcification is evident and inverted. Red line indicates areas of normal inter-proximal contact point varies decalcification.

Structural Integrity

The Sub Occlusal Oblique Transverse Ridge of the Mandibular First Molar

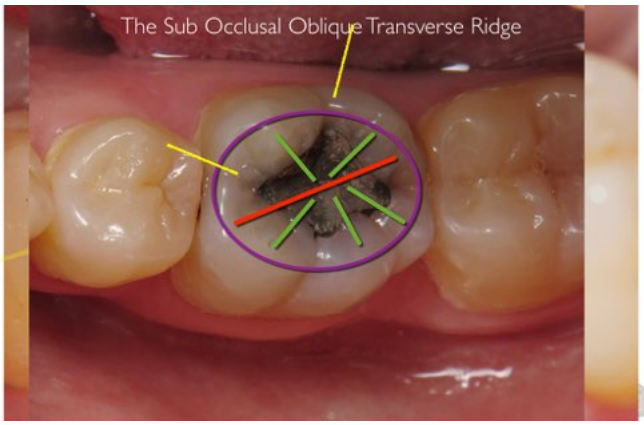


This is not a PIT

- Peripheral Rim Fractures

From Sharp line angles of amalgam prep you will see

- Dentin "Tension" Fractures



The Sub Occlusal Oblique Transverse Ridge

Marginal ridge fractures with class I amalgams

University of Zagreb, Croatia

No Restoration	4%
Composite	8%
Composite after previous Amalgam	28%
Existing Amalgam	42%

University of Ljubljana, Slovenia

49% (69/139) of molars with Cl. I amalgam had marginal ridge fracture. Correlation with age of amalgam.

Dentin "Tension" Fractures

Occlusal effect of caries milicich & rainey

- NOT all caries are caused from lack of flossing
- a peripheral rim fracture creates the 50-100 micron opening for bacteria to enter and replicate

And

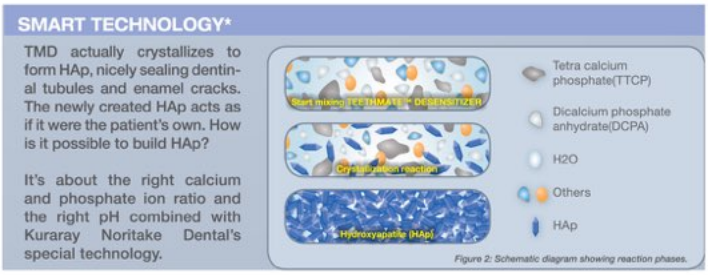
- Occlusal affects caries often start under occlusal cracks in adults. Not seen on x-ray until it's more than 1/3 the width of the tooth

so what do you do?

Start ultra conservative

Grab

DIAGOdent



If we have to go larger we need to understand

the "biobase"

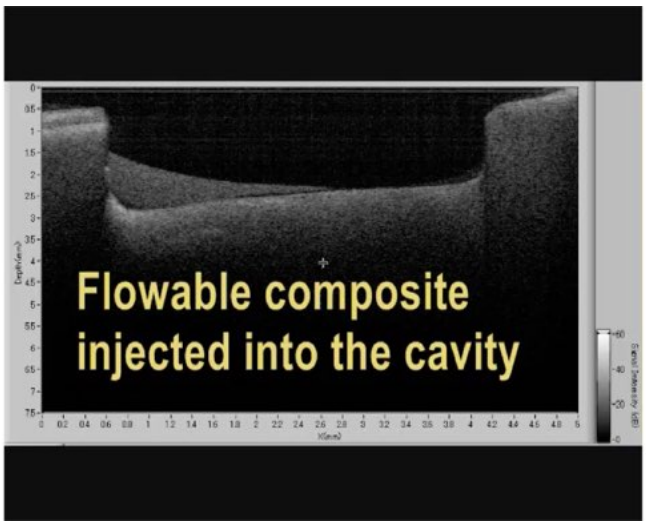
Why is it so important

How do you do it

Polymerization shrinkage:
it kills us in private practice

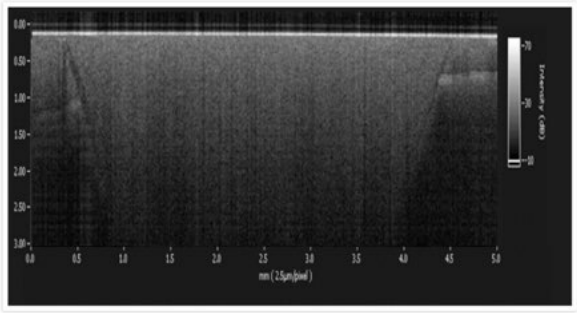
Methods:
- 2mm Deep Cavity
- Flowable Composite
- 7th Generation, Single-Bottle Adhesive

Laser Based, Optical Coherence Tomography System



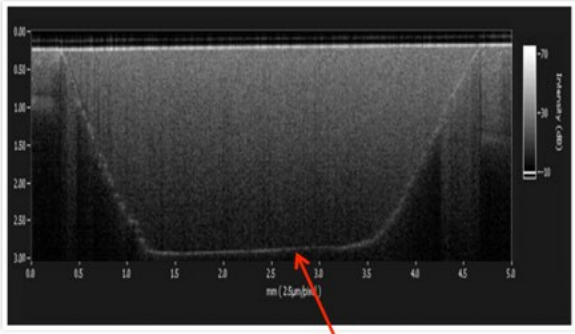
Source; Tokyo Medical & Dental University

CLEARFIL SE BOND 2



Estelite Flow Quick

Scotchbond Universal



Nearly 100% Delamination of Composite to Bonding Agent or Bonding Agent from Dentin.

Source; Tokyo Medical & Dental University

New SE Bond 2 With Improved Catalysts :
(20% Increase In Dentin Bond Strength
Stronger More Durable Resin Layer

6th-Generation, 2-Step,
Antibacterial & Fluoride
Releasing.
Most Durable Dentin Bond

LEARFIL MAJESTY FLOW
81% /wt Filler
10.5 GPa Modulus of Elasticity
Very High Radiopacity (290% of Aluminum)
Properties of Universal Restorative Composites

<u>Biobase Procedure</u>: This would be the same for any restoration involving composite, i.e., direct composite fillings, deep margin elevations, or indirect restorations.

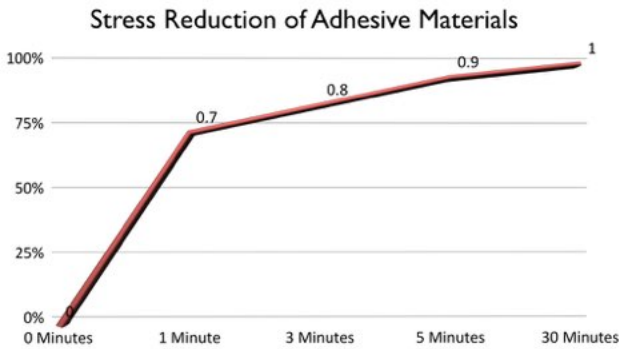
Using Clearfil SE Bond 2 or Clearfil SE Protect

1. "Selective etch" all enamel, extending well past your finish line for "direct composite" restorations.
2. Rinse away your etch and dry.
3. Place the primer with a micro brush on all enamel, and dentin surfaces of the tooth. Throughly scrub the primer for 20-30 seconds.
4. Air dry the primer throughly. It is key to air the primer to dissolve off the water.
5. Place the Bond with a micro brush throughly coating all prepped enamel and dentin surfaces and scrubbing it in. Use a micro brush to soak up excess bond. You do not want "pooling" of the bond in the corners of your prep or box. You can also gently air the bond. However, you do not want to use forceful air which can thin the bond too much.
6. Light cure the bond for 20-30 seconds.
7. Place a very thin layer of "Majesty Flow A1 or A2" at the margin of the tooth-matrix interface. Move it as needed with the tip of an explorer or perio prob. This is a critical area and should be done first. Cure for 20-30 seconds.
8. Now place a very thin layer (no more than 1 mm) of "Majesty Flow" by Kuraray on the rest of the dentin. Distribute this evenly to all the dentin with an explorer, perio probe, or the ball burnisher end of the "Brucia" composite instrument by Brasseler. (TINBRU26 Composite Instrument, #: 5024754U0).
9. Light cure for 20-30 seconds
10. Place a second layer of flowable if desired, again no more than 1mm thick and light cure.
11. Place AP-X (heated if desired) in no more than 2mm increments until you reach your desired height. You can fill the whole restoration with AP-X or place and enamel layer with the posterior composite of your such, such as Heliomolar, Herculite, etc.

<u>Bulk fill option</u>:

Steps 1-10 are critical in doing a bulk fill restorations. You do not want to stress this part of the bonding process. Once these steps are complete you can use the bulk fill of your choice, such as Danville's "Bulk EZ" composite.

slide courtesy of d.alleman d.d.s.

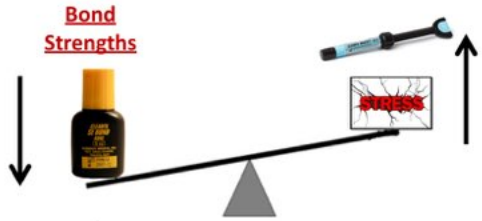


Layering Concepts

Influence of C-Factor & Layering Technique on Microtensile Bond-Strengths to Dentin, S. Nikolaenko, R. Frankenberger et al. *Dental Materials* 2004 Vol. 20: 579-585

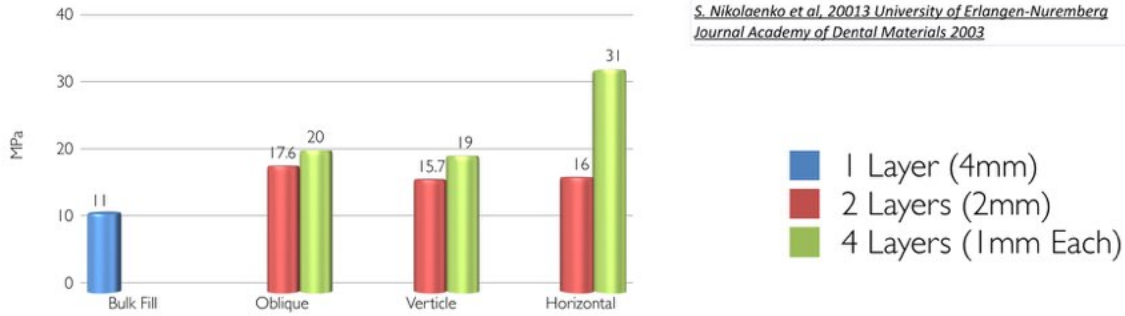
"Adhesive dentistry could be expressed as a simple relationship between bonds and stress. If the bonds can withstand the stress, the restorative technique will be successful."

Unterbrink and Liebenberg (1999)



#4: 2003

Influence of C-Factor and Layering Technique on Micro-Tensile Bond Strengths To Dentin
S. Nikolaenko et al. 20013 University of Erlangen-Nuremberg Journal Academy of Dental Materials 2003

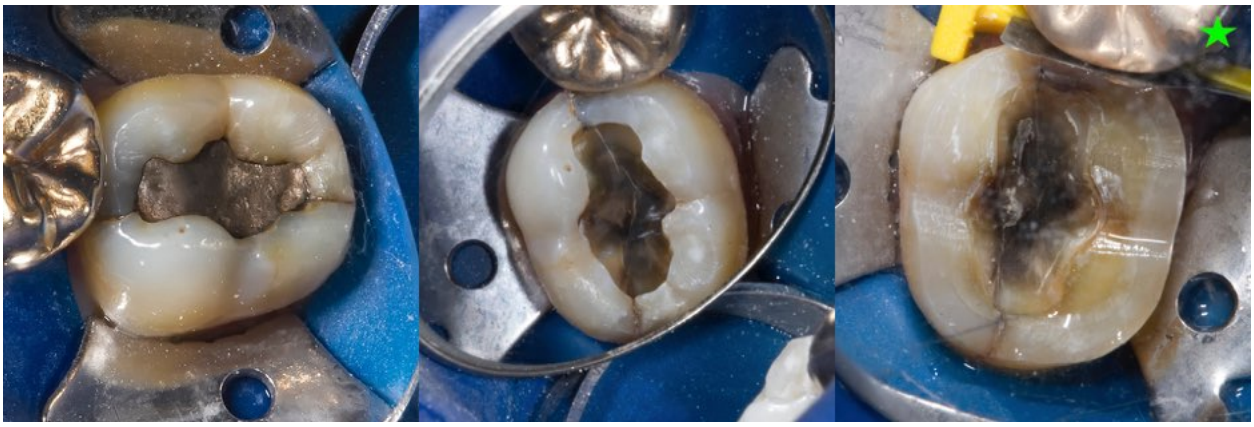


GC Fuji IX GP Fast
Greatercurve Matrix

Bioclear Maytrix System
David Clark, DDS

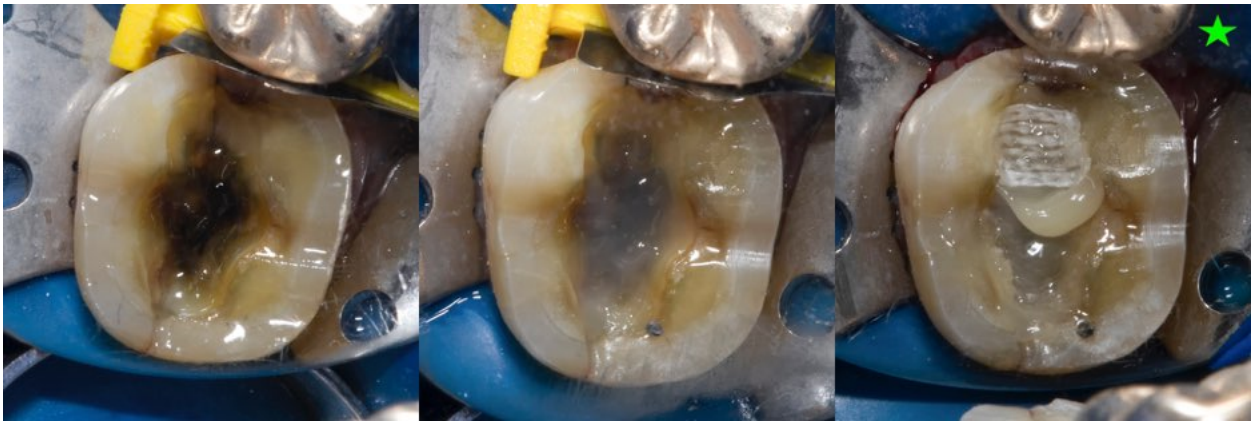
"the dumming down of the diastema closure"

Richard Young, DDS



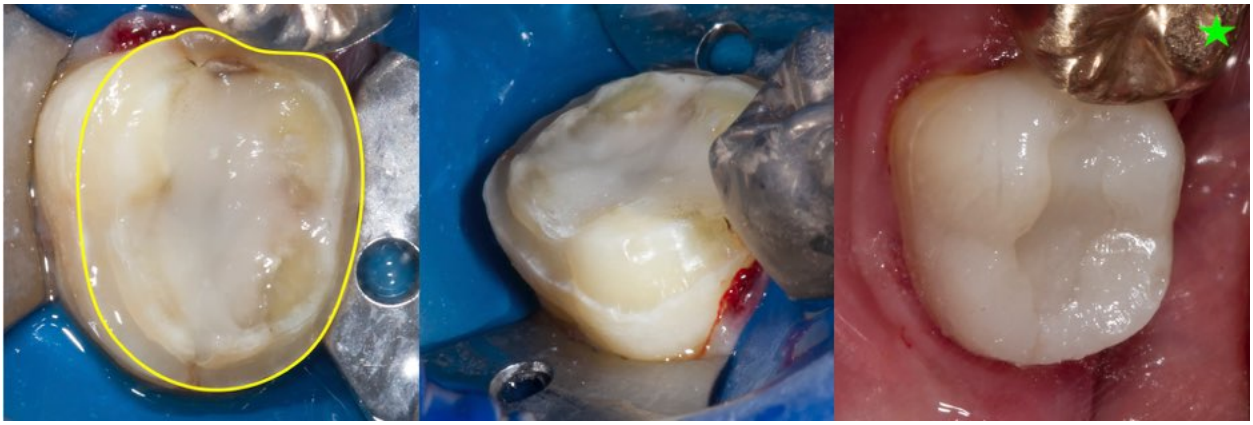
Biobase/Onlay Procedure: (the Biobase procedure would be the same for any restoration)

1. Take a quadrant impression of the tooth before preparation using a co-bite impression of your choice and a monophase VPS like Danville's "First Quarter-Monophase" #89386.
2. Remove the old amalgam using a new bur imparting as little stress on the tooth as possible.
3. Evaluate the tooth, use "decay indicator" by Kuraray to check for decay areas. Remove with a round bur.
4. Round out the cracks with SS White Fissurotomy® bur #18910 or 18013. In larger areas you can use a round ended diamond like the KS 2 by Brasseler, to round out the crack.
5. Use a depth cutting bur by Brasseler to get accurate reduction for your onlay.



Place the "Biobase"

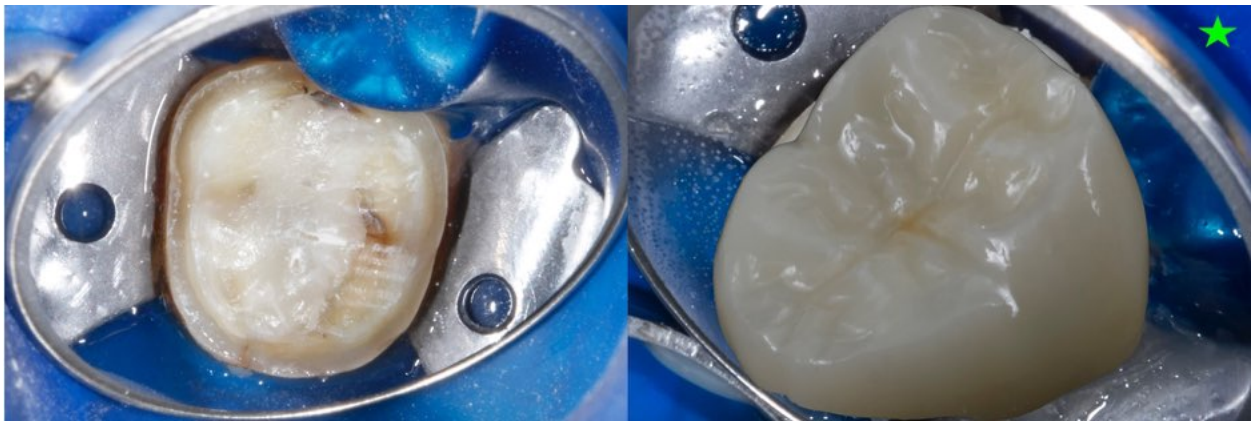
1. Use SE Bond or SE Protect bond. Rub in the "Primer" with a Micro brush for 30 seconds on all dentin and air dry throughly.
2. Place the "Bond" on the dentin with a Micro brush rubbing around throughly for 20-30 seconds. Damp up any excess with the micro brush. You do not want pooling of the bond.
3. Light cure the bond for 20-30 seconds.
4. Place a very thin layer (no more than 1 mm) of "Majesty Flow" by Kuraray. Distribute this evenly to all the dentin with an explorer, perio probe, or the ball burnisher end of the "Brucia" composite instrument by Brasseler. (TINBRU26 Composite Instrument, #: 5024754U0)
5. If you wish to place Ribbond or Dentapreg, place a very small amount of CLEARFIL AP-X (Kuraray) composite where you wish to place the fiber. Imbed the fiber into the AP-X and push into place the "Brucia" composite instrument #: 5024754U0. Once you have it placed where you want it soak it with bond carried over with the micro brush. Then light cure for 20-30 seconds.
6. Place additional "Majesty Flow" over the fiber and anywhere else you wish to have it to smooth out the prep or remove small undercuts. You should have coated all of the dentin when done.
7. Place "Liquid Lens" oxygen barrier over the restoration and light cure to eliminate the oxygen inhibited layer.



Prepare a chamfer margin in enamel creating a “compression dome” type restoration. This will also remove any bond that may have gotten on the enamel area during the biobase. Your prep is now finished and ready to scan or make an impression using your VPS of choice. I use Danville’s First Half “Black” #90467 in a “Mojo Syringe” #93735, and First Half “Green” Heavy Flex #93133 in the tray.

Fabricate a temporary using a lock on technique.

1. Vaseline the prep so the temp will release later.
2. Take your “quadrant impression” of the tooth before preparation and fill the prepped tooth area with “TurboTemp” by Danville, A2 #90344. Let this go to complete set, usually about 4 min.

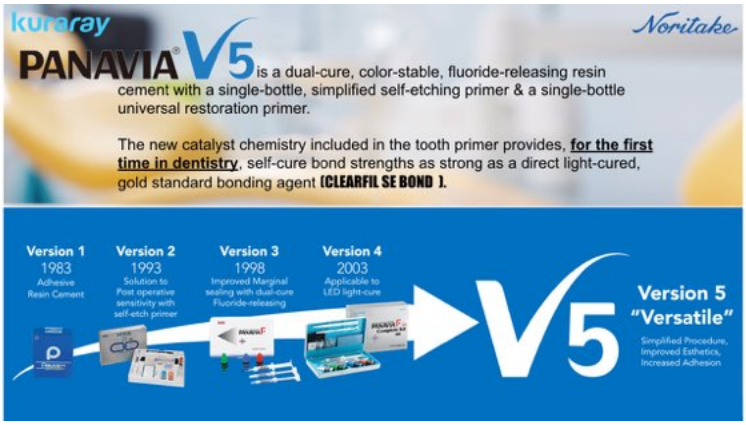


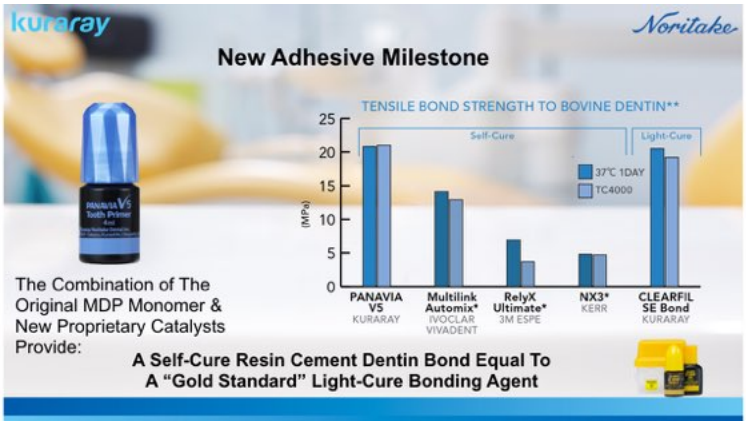
<u>Seating the Onlay:</u>

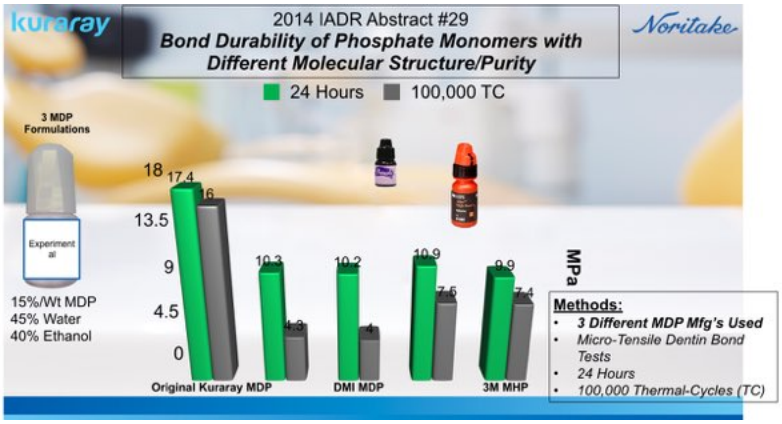
1. Pop off the temporary. You may have to make a couple of cuts in the temporary and break it away. Be cautious to not cut the tooth itself, look at your die to see where to cut.
2. Try-in your restoration and adjust occlusion and contacts as necessary. With a correctly placed temp and a lab that fits the restoration on a “solid” model you should have very little to no contact adjustment.
3. Place a rubber dam including the prepped tooth and one tooth on either side. If you created you “deep margin elevation “ correctly and prepped supra gingival the placement should be very quick and easy with out a requirement for anesthesia. I use a 12A or 13A clamp for molars, and a bicuspid or anterior clamp as needed further forward.
4. Use a “MicroEtcher IIA” #22005-01, “MicroEtcher CD”, “MicroProphy II” #201684-00, or PrepStart H2O #91747, all by Danville Materials to clean and surface the preparation getting it ready for cementation. I prefer the “.032 Nozzle #186113 on the MicroEtcher IIA for this using “Aluminum Oxide” 27 micron #80042A, I have a unit hooked up to each chair via a quick connect. If you do not have any of these available or a similar type of device you can just total etch the tooth and proceed with your bonding of the restoration.
5. Cement the restoration with Panavia V5.


kuraray
Noritake
KATANA Zirconia
KATANA Zirconia

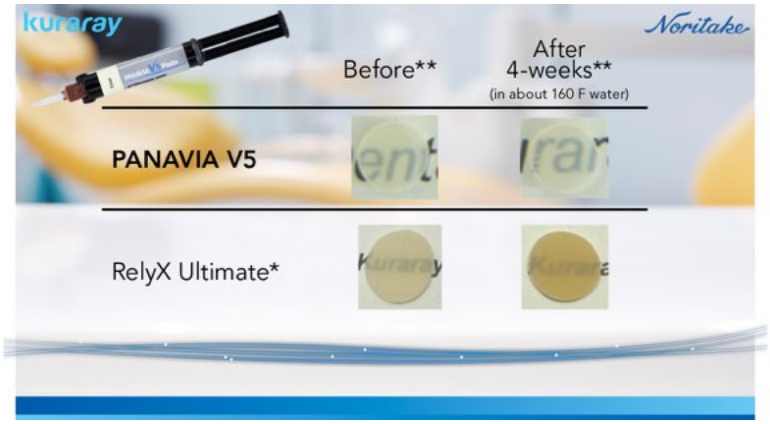

kuraray
Noritake
PANAVIA V5
One
SIMPLE & ESTHETIC
Cement For All Your Needs
Clear
PANAVIA V5 Paste

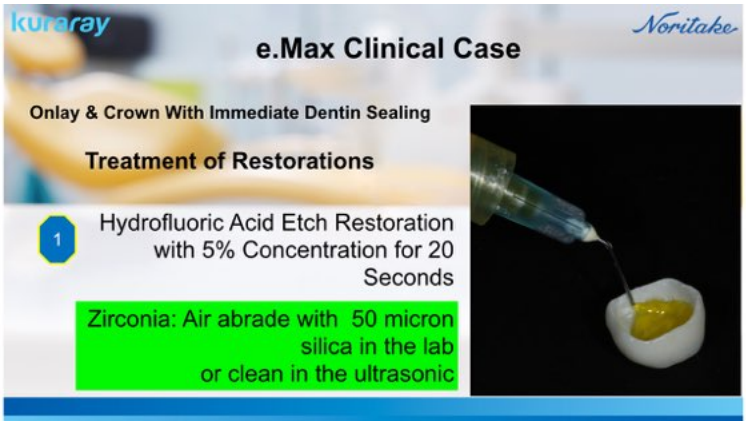

kuraray
Noritake
PANAVIA V5 is a dual-cure, color-stable, fluoride-releasing resin cement with a single-bottle, simplified self-etching primer & a single-bottle universal restoration primer.
The new catalyst chemistry included in the tooth primer provides, for the first time in dentistry, self-cure bond strengths as strong as a direct light-cured, gold standard bonding agent (CLEARFIL SE BOND).
Version 1
1983
Adhesive Resin Cement
Version 2
1993
Solution to Post operative sensitivity with self-etch primer
Version 3
1998
Improved Marginal sealing with dual-cure Fluoride-releasing
Version 4
2003
Applicable to LED light-cure
V5
Version 5
"Versatile"
Simplified Procedure, Improved Esthetics, Increased Adhesion


kuraray
Noritake
New Adhesive Milestone
TENSILE BOND STRENGTH TO BOVINE DENTIN**
Self-Cure
Light-Cure
37°C 1DAY
TC4000
(MPa)
25
20
15
10
5
0
PANAVIA V5
KURARAY
Multilink Automix*
IVOCLAR VIVADENT
RelyX Ultimate*
3M ESPE
NX3*
KERR
CLEARFIL SE Bond
KURARAY
The Combination of The Original MDP Monomer & New Proprietary Catalysts Provide:
A Self-Cure Resin Cement Dentin Bond Equal To A "Gold Standard" Light-Cure Bonding Agent



This research study by Bart Van Meerbeek and his staff a Catholic University Leuven Belgium was with 3 self-etching primers made by Kuraray. Each primer was exactly the same content except for the MDP. One solution has the Original MDP by Kuraray then the other two are from PCM and DMI (USA and German mfgs. of MDP).
This study also compared 4-Meta monomer from Sun Medical Inc. (makes Parkell products for USA) and also MHP





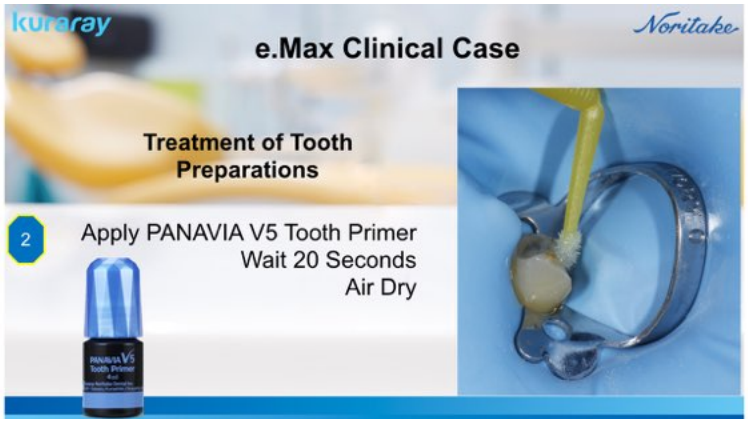
With the new Panavia V5 unique catalyst chemistry, we are able to eliminate HF etching and just use K-Etchant syringe (35% phosphoric acid) to clean and activate e.Max restorations.

Clearfil Ceramic Primer Plus has the same chemistry as the original Clearfil Ceramic Primer, however, Kuraray has expanded it clinical applications to include metals so it is now a universal restorative primer.
We still mfg. Alloy Primer for precious metals and we recommend it when doing repairs or when very high bonds are needed to precious metals.

In this clinical case immediate dentin sealing was done on the prep appointment, thus this image shows the K-Etchant syringe on the resin coated dentin and enamel not on dentin.
With immediate dentin sealing, DDS should do one of the 2 following treatments to enamel and resin coated dentin:

1. Pumice enamel and the resin coated dentin then use phosphoric acid to clean the surfaces for 5 seconds rinse and dry.
2. Use air abrasion (Micro-Etcher) to roughen the resin coated dentin and enamel then use phosphoric acid for 5 seconds.
3.

If a bonding agent only was used for Immediate Dentin Sealing, then pumice should be used and not air abrasion. Air abrasion can sandblast through a thin coat of bonding agent. Air abrasion can be used if a composite (flow or restorative) is being sandblasted.



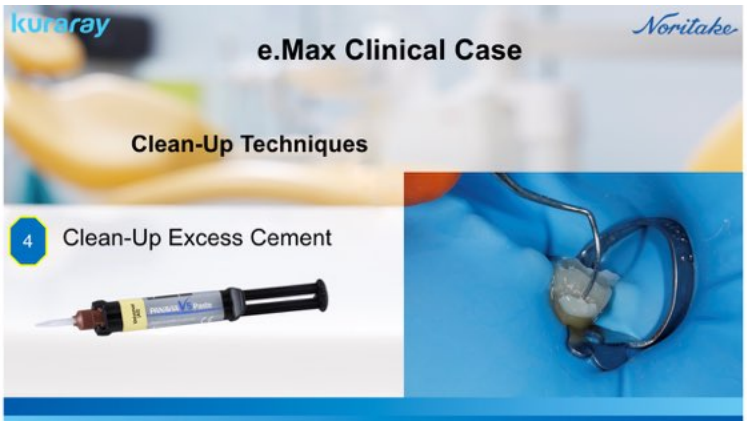
Clinicians can have biting pain issues if the bonding procedure is not done properly.

1. The primer has to be applied and left for 20 seconds or rubbed in for 20 seconds
2. The primer must be air dried well to evaporate the water and get the water out of the bonding layer/hybrid layer.
3. If air drying is not done properly the material does not cure fully and can be weak.

Panavia V5 paste is approximately 12 microns in film-thickness, the previous Panavia resin cements are 19 microns thick.

We have compared Panavia V5 paste versus the main full strength resin cements on the market in regards to clean-up:

1. Panavia V5 is less sensitive to light,
2. RelyX Ultimate is very sensitive to light and can be very hard to clean-up
3. NX3 and Variolink DC have nice clean-up, however, they are more light sensitive than Panavia V5


kuraray
Noritake
e.Max Clinical Case
Clean-Up Techniques
4
Clean-Up Excess Cement


kuraray
Noritake
e.Max Clinical Case
Seating Restorations
5
Finish Margins With Disc
Etc…..

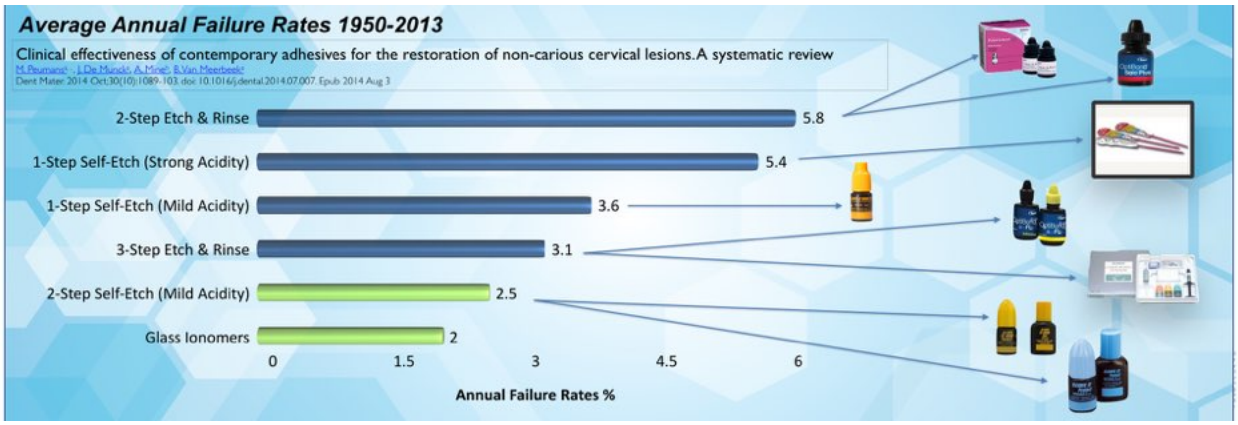

kuraray
Noritake
e.Max Clinical Case
Final Restoration
Final Polished e.Max Onlay

the products that made so much of what follows possible

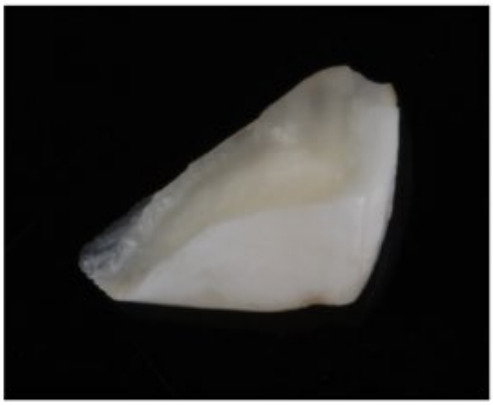
As well as the other "Gold Standard" Bonds

Kerr Optibond FL

Ultradent Peak



Enamel Fractures



For this type of tooth fracture do the following:

- Clean the fragment and the tooth off with water spray, saline, or chlorhexidine then etch both with 35% phosphoric acid solution.
- Apply SE Primer to both surfaces for 30 seconds and throughly air off the primer
- Apply SE Bond to both surfaces and put together. Light cure throughly from both the lingual and facial.
- DO NOT PUT A FILLED COMPOSITE between the two pieces. Your pieces will NOT go back together like glass.
- If you have a small chip in the enamel you can put a very small amount of flowable only where the void from the chip is. Do not put it where the two pieces fit perfectly.
- You are bonding to mostly enamel, a very strong bond.

If there is a small pulp exposure the procedure would be the same accept to rinse gently with sterile saline solution, or chlorhexidine then dry gently. If there is bleeding you can stop the bleeding with a small amount of hemostatic solution from Ultradent on a cotton pellet.

For more information on handling of the pulp refer to IADT Website:

http://www.dentaltraumaguide.org/Permanent_enamel-dentin-pulp_fracture_Treatment.aspx

The Five Most Important Research Papers For Adhesion Dentistry

1. Takao Fusayama 1978-1980
   Oper. Dent. 1979 Spring;4(2):63-70.
   Two layers of carious dentin; diagnosis and treatment
   New Concepts In Operative Dentistry
   Etching Dentin Article and 1st dentin adhesive (phosphate Monomer Phenyl-p)

2. Setting Stress in Composite Resin in Relation to Configuration of the Restoration
   (C-Factor), A.J. Feizler, A.J. De Gee & C.L. Davidson 1987, Journal of Dental Research

The Five Most Important Research Papers For Adhesion Dentistry

3. Immediate Dentin Sealing,
   1992 David Pashley et al, Medical College of Georgia
   3b. Efficacy of Resin Coating on Bond Strengths of Resin Cement to Dentin,
   Junji Tagami DDS et al, Journal of Esthetic Dentistry 2003
   3c. Immediate Dentin Sealing Improves Bond Strengths of Indirect Restorations,
   Pascal Magne et al, Journal of Prosthetic Dentistry 2005 Dec;94(6):511-9.

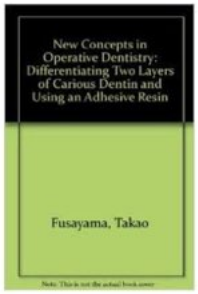
4. Influence of C-Factor and Layering Technique on Micro-Tensile Bond Strength to Dentin,
   Journal Dental Research, IADR 2003-
   S. Nikolaenko et al, University of Erlangen-Nuremberg

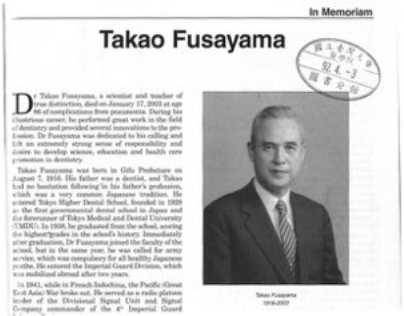
The Five Most Important Research Papers For Adhesion Dentistry

5. Relationship Between Bond-Strength Tests and Clinical Outcomes,
   Bart Van Meerbeek et al, 2010,
   Dental Materials 26 (2010) e101-121

"The Most Comprehensive Summary & Analysis of Long-Term Clinical & Laboratory Adhesive Research Results in the History of Adhesion Dentistry"

#1: New Concepts in Operative Dentistry 1980





In Memoriam

Takao Fusayama

Dr. Takao Fusayama, a scientist and teacher of true distinction, died on January 17, 2003 at age 86 of complications from pneumonia. During his illustrious career, he performed great work in the field of dentistry and provided several innovations to the profession. Dr Fusayama was dedicated to his calling and felt an extremely strong sense of responsibility and desire to develop science, education and health care promotion in dentistry.

Takao Fusayama was born in Gifu Prefecture on August 7, 1916. His father was a dentist, and Takao had no hesitation following in his father's profession, which was a very common Japanese tradition. He entered Tokyo Higher Dental School, founded in 1928 as the first governmental dental school in Japan and the forerunner of Tokyo Medical and Dental University (TMDU). In 1938, he graduated from the school, scoring the highest grades in the school's history. Immediately after graduation, Dr Fusayama joined the faculty of the school, but in the same year, he was called for army service, which was compulsory for all healthy Japanese youths. He entered the Imperial Guard Division, which was mobilized abroad after two years.

In 1941, while in French Indochina, the Pacific (Great East Asia) War broke out. He served as a radio platoon leader of the Divisional Signal Unit and Signal Company commander of the 4th Imperial Guard

Takao Fusayama 1916-2003

- *Introduced 2 Layers of Carious Dentin*
- *New Phosphate Monomer Phenyl-p*
- *1st Successful Dentin Bond*

#2: C-Factor (Stress) 1987

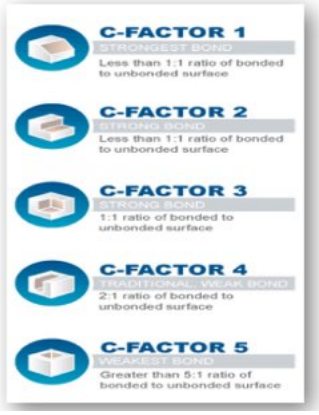
What is "C-Factor"

C-Factor means **Configuration Factor**

How is it Calculated:

C-Factor = "The ratio of bonded to un-bonded (free) surfaces"

Feilzer, DeGee, Davidson (1987),
Universtiy of Amsterdam, ACTA



Lowest Stress-Veneers

Low Stress

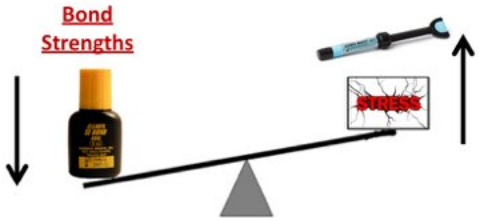
Medium Stress

High Stress-Class II

Highest Stress-Class I

"Adhesive dentistry could be expressed as a simple relationship between bonds and stress. If the bonds can withstand the stress, the restorative technique will be successful."

Unterbrink and Liebenberg (1999)



#3: Immediate Dentin Sealing

- Operative Dentistry **1992 Jan-Feb;17(1):13-20.**
- **Dentin Permeability: Sealing the Dentin in Crown Preparations**
  Pashley EL, Corner RW, Simpson MD, Horner JA, Pashley DH, Caughman WF.
- Medical College of Georgia, School of Dentistry.

One approach to the problem is to seal the dentin with dentin bonding agents at the completion of the crown preparation.

Abstract

Provisional restorations of full crown preparations may permit more micro-leakage of bacteria and their products than the final castings do. However, most investigations of the sealing qualities of cemented castings have reported that they too permit dye leakage. **One approach to the problem is to seal the dentin with dentin bonding agents at the completion of the crown preparation.** This study evaluated the ability of six different dentin bonding agents to seal the dentin of crown preparations of human teeth in vitro using two independent techniques. The first technique quantitated fluid filtration across dentin before and after treatment with dentin bonding agents at one hour, one day, one week, and one month and after thermo-cycling. The second method measured silver nitrate penetration of the thin veneers of dentin bonding agents into the dentin. Both methods correlated well with each other. The best seals were obtained with Prisma Universal Bond 2 or Super bond powder plus liquid. **The worst seals were found using Gluma and Super bond liquid only.** Clearfil Photo Bond, Amalgam bond, and Scotchbond 2 gave intermediate results. **Although the dentin bonding agents tend to accumulate on chamfers, thereby increasing their thickness to 200-300 microns, the method looks promising as a simple way to protect the pulp from the consequences of micro-leakage.**

#3b: Immediate Dentin Sealing 2003

Efficacy of a Resin Coating on Bond Strengths of Resin Cement to Dentin

- Primali R. Jayasooriya, BDS
- Patricia N.R. Pereira, DDS, PhD
- Toru Nikaido, DDS, PhD
- Junji Tagami, DDS, PhD

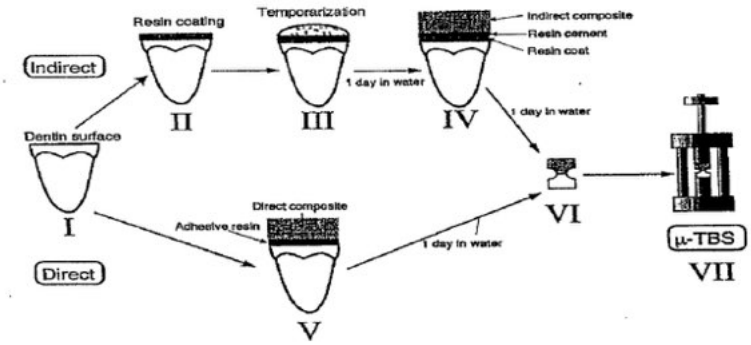
Journal of Esthetic and Restorative Dentistry, Volume 15, Number 2, **2003**

Purpose:

- *The aims of this study were to:*
- *(1) evaluate the effect of a resin coating consisting of a dentin bonding system and a flowable resin composite on the microtensile bond strength (μ-TBS) of a resin cement to dentin with indirect composite restorations and*
- *(2) compare the bond strengths of direct and indirect composite restorations.*

Materials & Methods:

- Occlusal surfaces of human premolars were ground to obtain flat dentin surfaces and were divided into seven groups. For indirect restorations, the dentin surfaces of the experimental groups were bonded with a dentin bonding system (**DBS**), **CLEARFIL SE BOND** (**SE**) or **Single Bond (SB)** with and without a flowable resin composite, **PROTECT LINER F,** temporized for one day and cemented with a resin cement (**PANAVIA F**) according to the manufacturer's instructions. The dentin surfaces of the control group were temporized without prior treatment and indirect composite (**ESTENIA**) was bonded with **PANAVIA F.** For the direct restorations, either **CLEARFIL SE BOND** or Single Bond was applied to the dentin surface and the entire surface was built-up with a direct composite (**CLEARFIL AP-X**). After 24 hours in water storage, μ -TBS was measured at a crosshead speed of 1 mm/min.

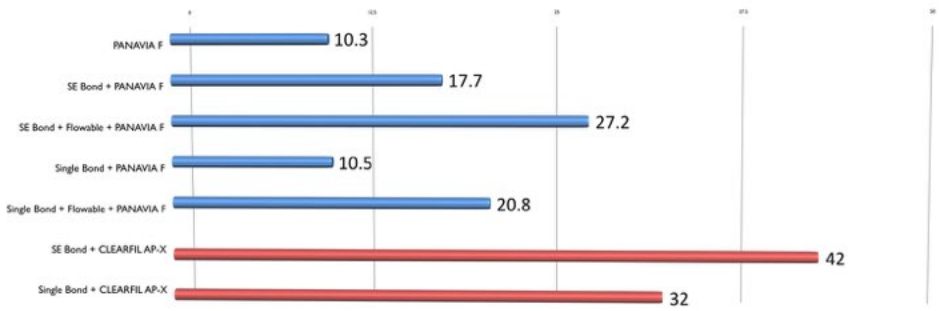


Results:

- The original bond strength of the resin cement (PANAVIA F) to dentin significantly improved with the use of a resin coating technique with indirect restorations. The combination of dentin bonding systems plus PROTECT LINER F showed significantly higher bond strengths compared with the single use of dentin bonding systems. The combination of CLEARFIL SE BOND & PROTECT LINER F as a resin coating provided the highest bond strengths with indirect restorations.

- However, the best bond strengths were observed when CLEARFIL SE BOND & Single Bond were used for direct composite restorations.

Immediate Dentin Sealing Bond Strengths (MPa)



Conclusions:

- The application of a resin coating consisting of a dentin bonding system and a flowable resin composite on the dentin following cavity preparation significantly improved the μ-TBS of the resin cement **PANAVIA F** to dentin with indirect restorations. However, the bond strengths of indirect composite restorations were significantly lower than those of direct composite restorations even with the resin coating technique.

"If indirect restorations are selected, a resin coating consisting of a dentin bonding system and flowable resin composite should be applied to the dentin surface to improve the bond strengths of resin cements to dentin".

Failure / Fracture Modes:

Where Do The Bonds Fail?

Bond between the resin coating and cement

		Failure Modes		
	Bond Strength (MPa)	@ Cement / Dentin Interface	Between Resin Coating & Cement	Failure In The Resin Cement
PANAVIA F	10.3	100%		
SE Bond + PANAVIA F	17.7	0%	80%	20%
SE Bond + Flowable + PANAVIA F	27.7	0%	75%	25%
Single Bond + PANAVIA F	10.5	40%	60%	0
Single Bond + Flowable + PANAVIA F	20.8	0%	80%	20%
SE Bond + AP-X	42.5	100%	0	0
Single Bond + AP-X	32.5	100%	0	0

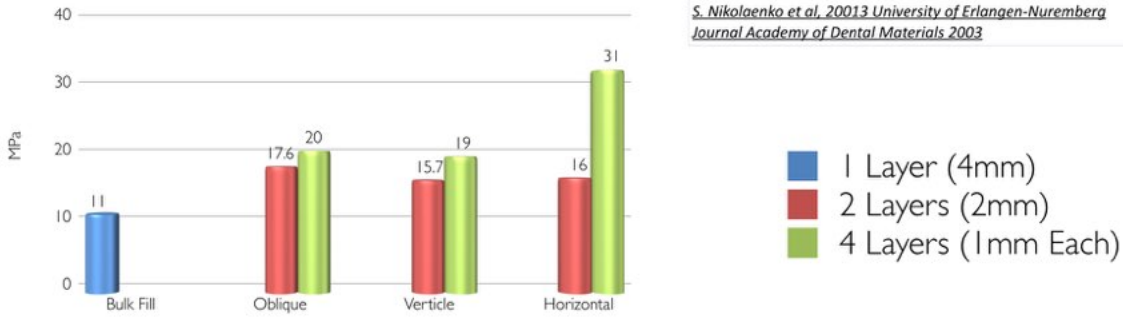
Layering Concepts

Influence of C-Factor & Layering Technique on Microtensile Bond-Strengths to Dentin, S. Nikolaenko, R. Frankenberger et al. *Dental Materials* 2004 Vol. 20: 579-585

#4: 2003

Influence of C-Factor and Layering Technique on Micro-Tensile Bond Strengths To Dentin

S. Nikolaenko et al, 20013 University of Erlangen-Nuremberg
Journal Academy of Dental Materials 2003



#5: **"The Relationship Between Bond Strength Tests and Clinical Outcomes"**
Dental Materials Journal 2010
B. Van Meerbeek, M. Peumans, A. Poitevin, A. Mine, A. Van Ende, A. Neves, J. DeMunck

The Most Comprehensive Clinical & Laboratory Data on Adhesive Dental Materials

Methods:

- ***Reviewed over 1,700 Laboratory Adhesive Bond Tests***
- *Reviewed 15-Years of Clinical Class-V (NCCL) Research Studies*
- ***Updated Clinical Review Analyzed 63 Years of Clinical Studies***

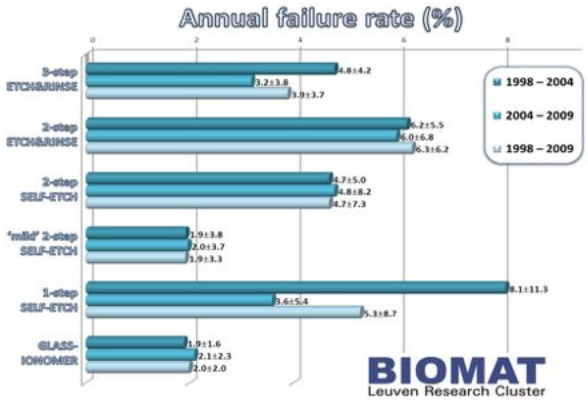
Conclusions:

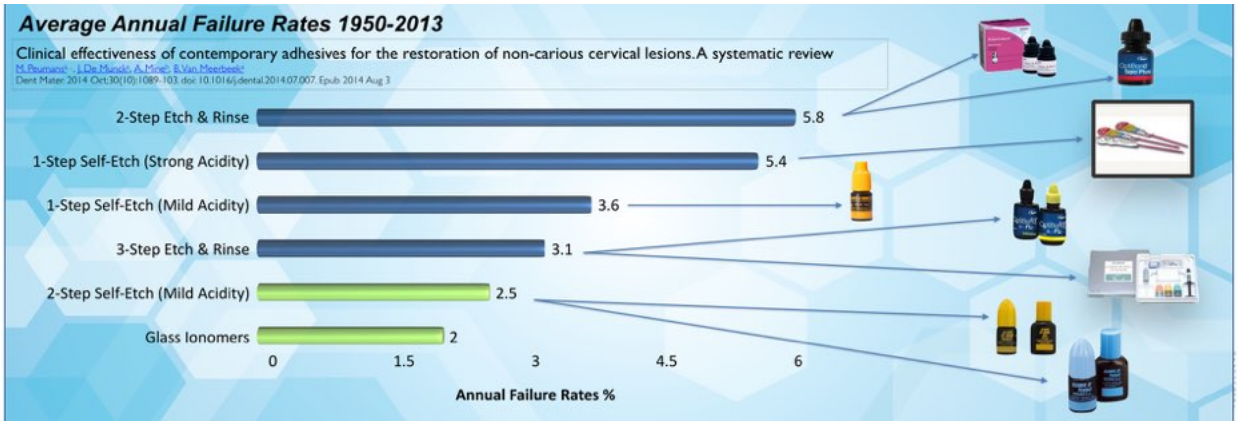
Relationship Between Bond-Strength Tests & Clinical Outcomes,

B.Van Meerbeek et al, Leuven Biomat Research Center, Dept of Conservative Dentistry, School of Dentistry, Catholic University of Leuven, Belgium

- **"Altogether, when bonding to both enamel and dentin, selective etching of enamel followed by the application of the 2-step self-etch adhesive to both enamel and dentin currently appears the best choice to effectively and durably bond to tooth tissue".**

2009 Data





kuraray

Noritake

- ***Excellent Desensitizer***
- ***Antibacterial (Cavity Cleansing)***
- ***Deactivates MMP Enzyme***
  (One of the causes of dentin bond degradation)
- ***Unique "Encpsulated Fluoride Release"*** *(Creates "Super Dentin Layer")*

Universal Bond

S3 Bond

Product Source: Your Dental Supplier

kuraray

Noritake

CLEARFIL MAJESTY ES Flow

CLEARFIL AP-X

CLEARFIL MAJESTY ES-2 Single Shade

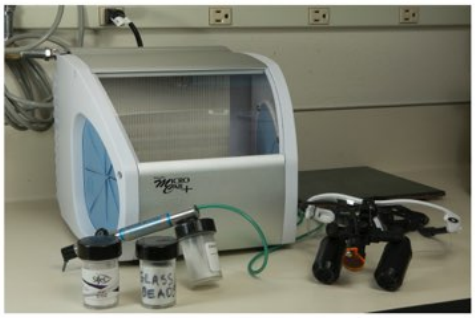
CLEARFIL MAJESTY ES-2 Premium (D&E)

kuraray

Noritake

Danville

The 3 Must Haves



Product Source: Your Dental Supplier

Danville

Mojo

VPS Impression Material

TurboTemp2

Liquid Lens

Retraction Instrument

Product Source: Your Dental Supplier

BIOCLEAR

HEAT SYNC by BIOCLEAR

BIOCLEAR ANTERIOR MATRIX

TWINRING

DIAMOND WEDGE

THE BLASTER by BIOCLEAR

BIOCLEAR POSTERIOR MATRIX

Other Materials

AdDent.com

DIAGOdent

Brucia Restoration Warmer

Ribbond
Dentapreg

Ultradent Wetting Resin

Greatercurve.com.

Brucia Composite Inst.

AutoMatrix-Dentsply

GC

Komet

Product Source: Your Dental Supplier