DIRECT RESTORATIONS

CONTACTS, COMPLICATIONS AND OCCLUSION

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American Academy of Cosmetic Dentistry

The American Society For Dental Aesthetics

CATAPULT EDUCATION

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Former Faculty, UCLA Center For Esthetic Dentistry

Speaker, Catapult Education

LEGIONpride.com, Online Training Challenge for Dentists

LEGION

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PATHOLOGY ***DRIVEN*** DIAGNOSTICS

11

ll diagnosing with this??

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RADIOGRAPHIC ANALYSIS

In New Orleans, C. Edmond Kells was the first dentist to take dental X-Rays in 1896.

13

Existing Tooth Decay Diagnostics

Gold standard detection methods (visual & x-ray) fundamentally unchanged for decades.

<50%

Tooth Decay Detected

Since 1896

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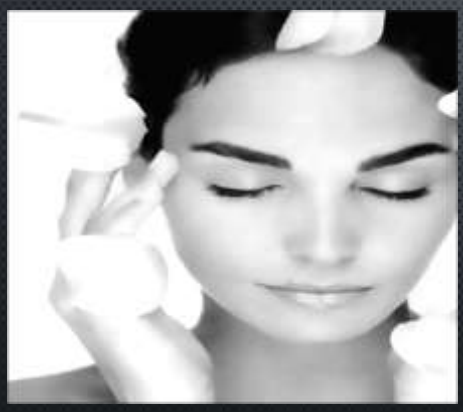
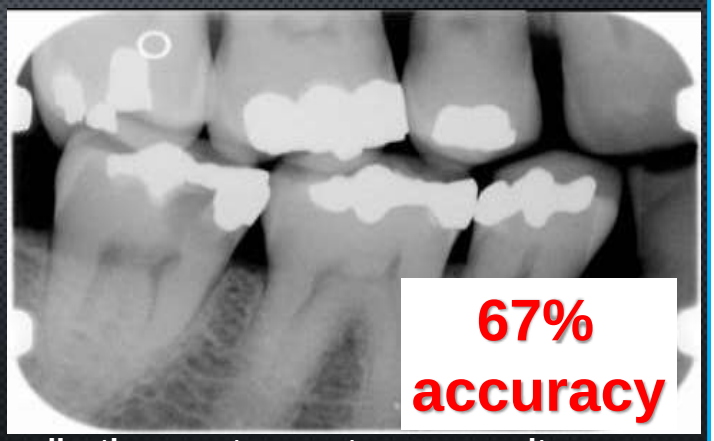
PORTABLE DIGITAL X-RAY SYSTEMS

15

HOW DO YOU DIAGNOSE DECAY??





67% accuracy

Is it thru conventional radiographic analysis?

Approximately 25% demineralization must occur to see a cavity on a conventional radiograph. Equates to 40-60% demineralization on the tooth surface. Radiographs miss 70-80% of occlusal cavities.

Digital radiographs provide the ability to manipulate image size and appearance.

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75% of *all* Learning is Visual

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FIBER OPTIC TRANSILLUMINATION

MICROLUX

KAVO DIALUX 2300L

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Fiber Optic Transillumination

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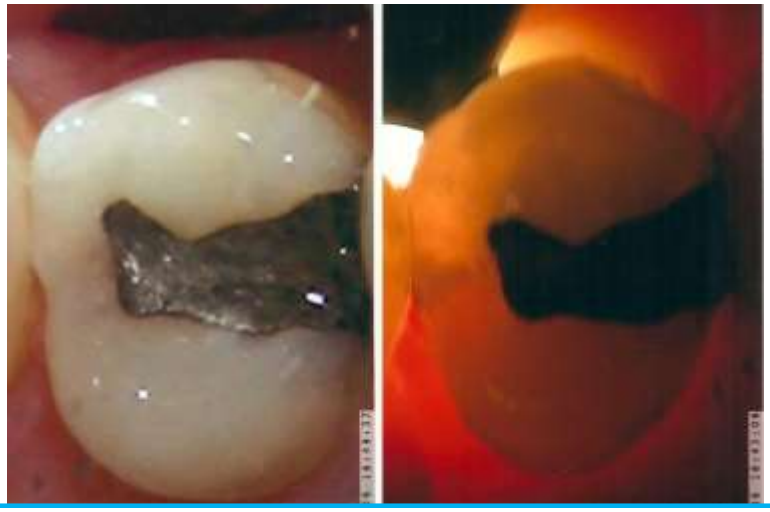
Fiber Optic Transillumination



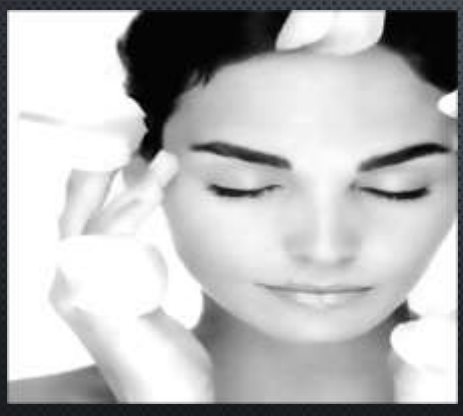
20

VISUALIZATION ***DRIVES*** DESIRE!

Knowledge solidifies needs

21

How do you diagnose decay??



Thru intraoral photographic interpretation?

22

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FLUORESCENT TECHNOLOGIES

What fluoresces in fluorescent-based technologies?

- Bacterial porphyrins (bacterial breakdown product),
- Stain,
- Tartar,
- Food debris

All fluoresce under the wavelengths used in most caries detection devices, whether or not caries is present.

- Lussi A , Imwinkelried S, Pitts N, Longbottom C, Reich E. Performance and reproducibility of a laser fluorescence system for detection of occlusal caries in vitro. Caries Res 1999;33(4):261–266.
- Lussi A, Hibst R, Paulus R . DIAGNOdent: an optical method for caries detection. J Dent Res 2004;83C, C80–83.
- Verdonschot E H, van der Veen M H. Lasers in dentistry 2. Diagnosis of dental caries with lasers. Ned Tijdschr Tandheelkd 2002;109(4), 122–126.
- Konig K, Flemming G, Hibst R. Laser-induced autofluorescence spectroscopy of dental caries. Cell Mol Biol (Noisy-le-grand) 1998;44(8), 1293–1300.
- Alwas-Danowska HM, Plasschaert AJ, Suliborski S, Verdonschot EH. Reliability and validity issues of laser fluorescence measurements in occlusal caries diagnosis. J Dent 2002;30(4):129-34.
- Rechmann P, Rechmann BM, Featherstone JD. Caries detection using light-based diagnostic tools. Compend Contin Educ Dent. 2012;33(8):582-4, 586, 588-93; quiz 594, 596.

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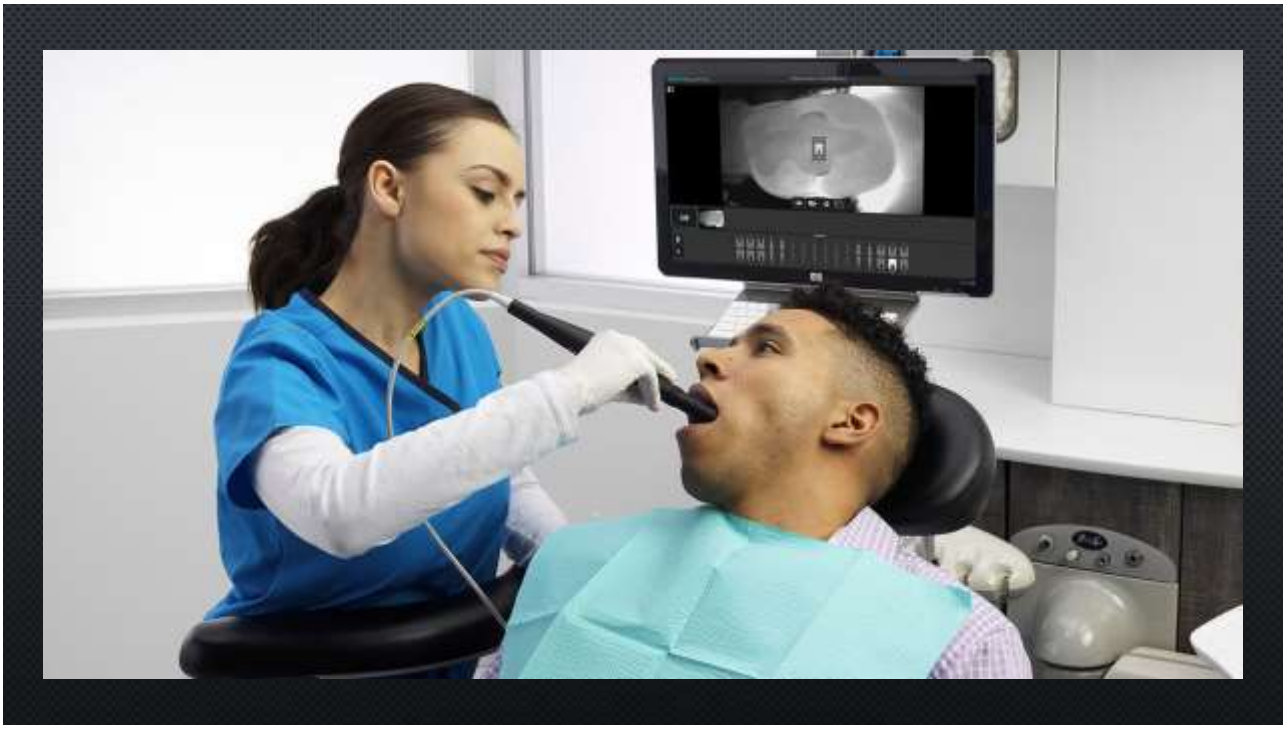
CariVu Fiber Optic Transillumination
DEXISCariVu
ZERO RADIATION
DEXISCariVu
CAVITY DETECTION

25



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CariVu: Transillumination

- Near Infrared light…no radiation
- Enamel appears transparent or light
- Porous lesions appear **darker** by trapping and absorbing the light: these include cracks and caries
- Video capture….live scans
- Stored in DEXIS, excellent for communication to patient and yes…to insurance companies

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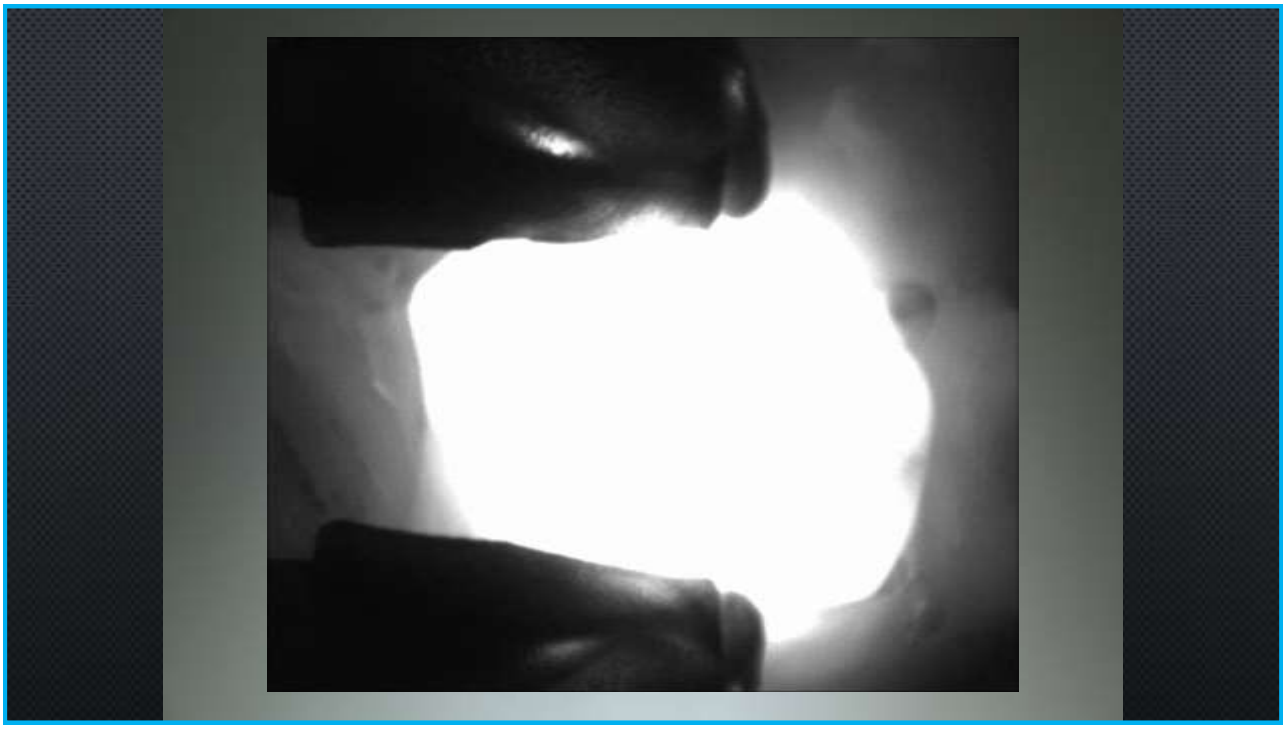

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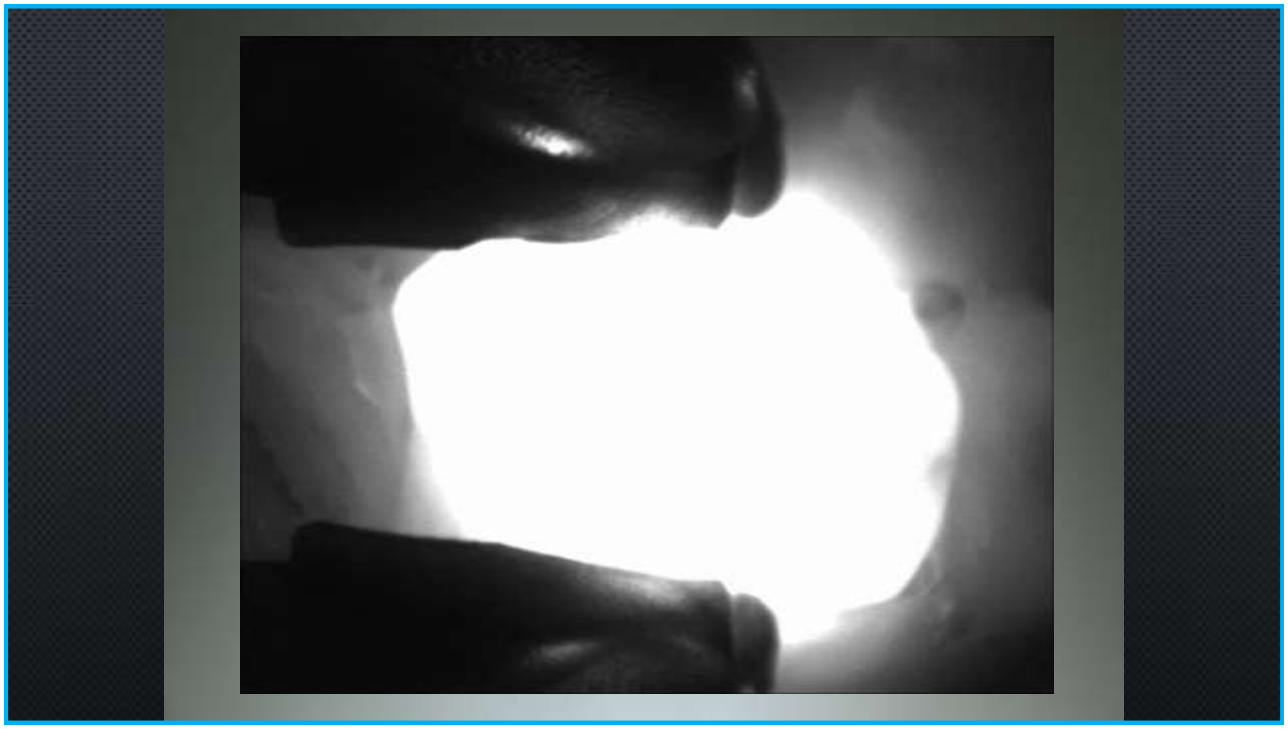

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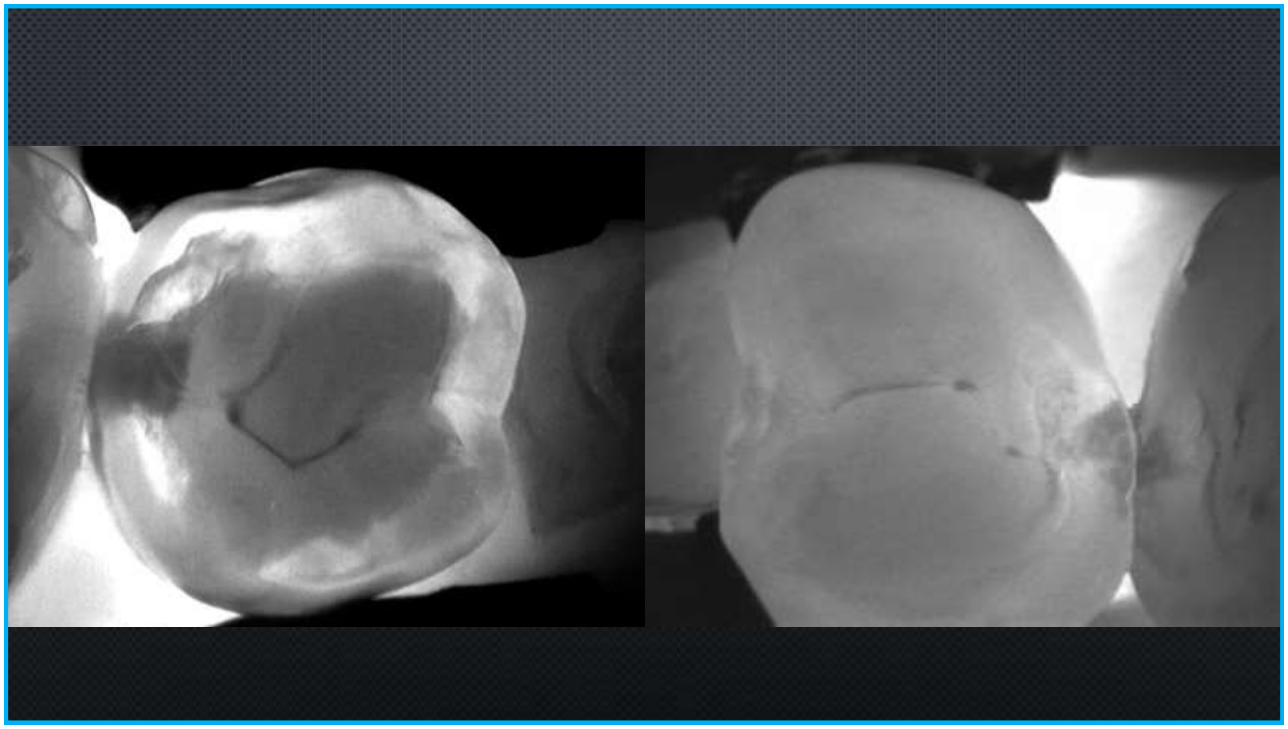

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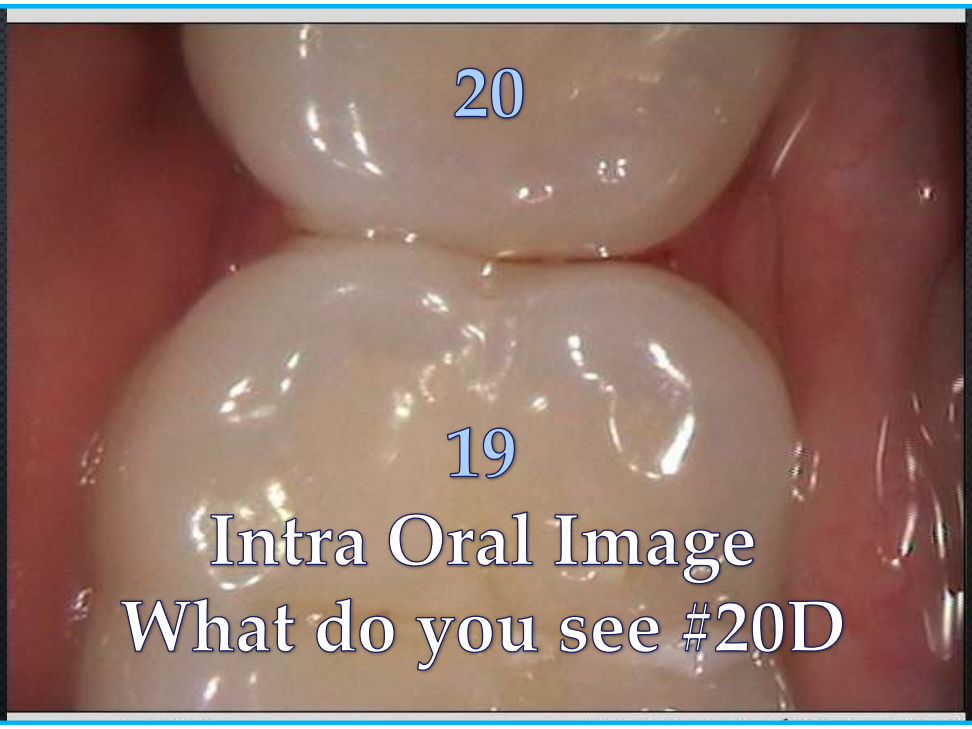

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BITEWINGS VERSUS CARIVU

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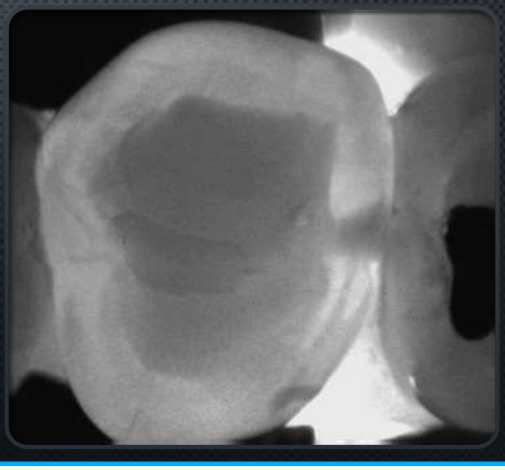
A NEW STANDARD OF CARE?



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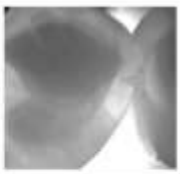
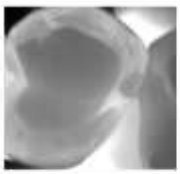
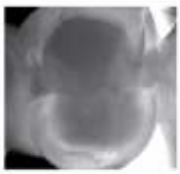
Short Learning Curve

What does a caries lesion really look like? The transillumination technology of DEXIS™ CariVu™ can reveal its shape and size!

Healthy ⟷ **Established**







Diagnosis					
Sound surface	First detectable signs of an enamel caries lesion	Established enamel caries lesion	Established enamel caries lesion which reached the DEJ at a single point	Dentin caries due to an established enamel caries lesion with extended involvement of the DEJ	Established dentin caries

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ANOTHER EXAMPLE

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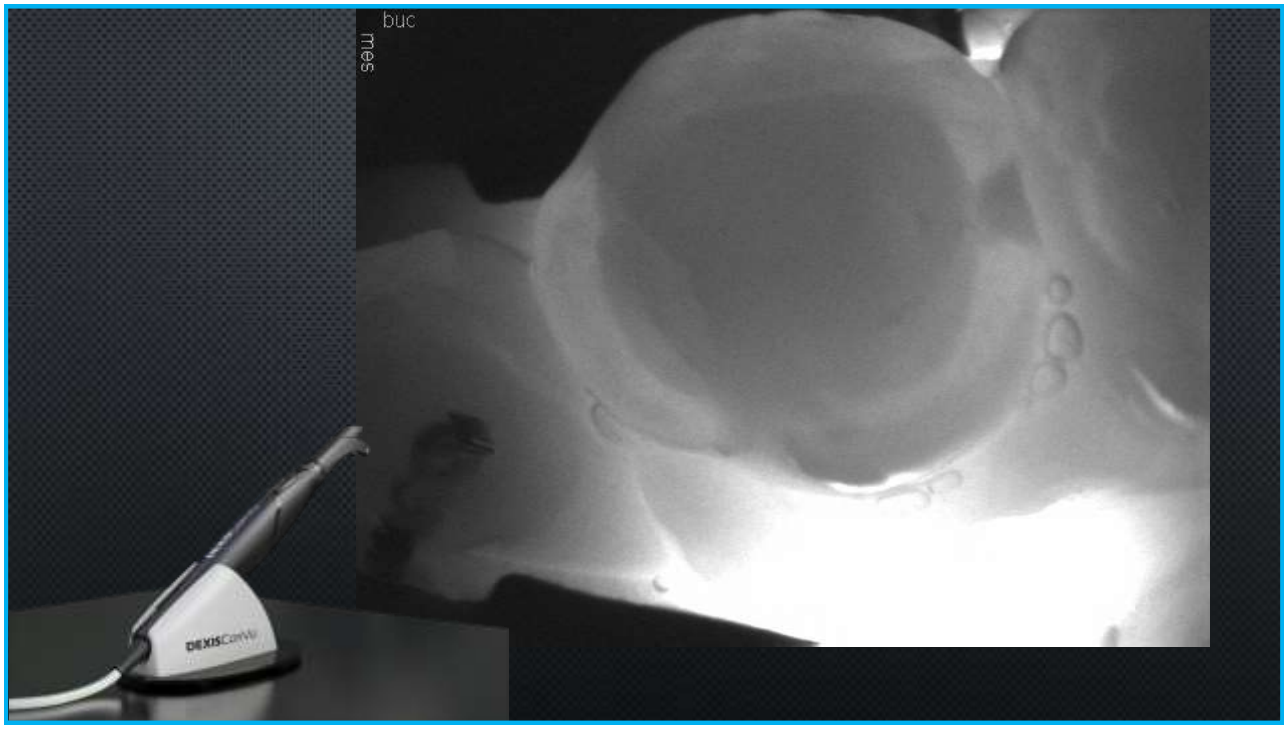

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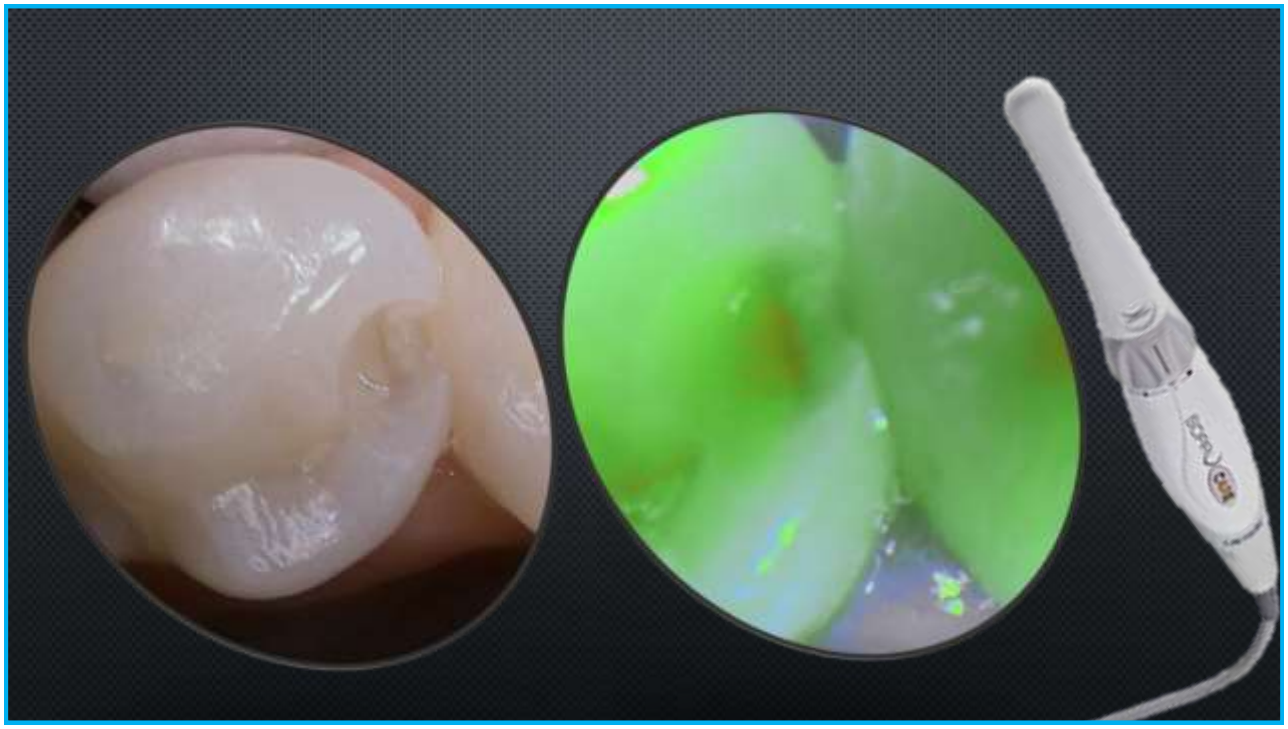

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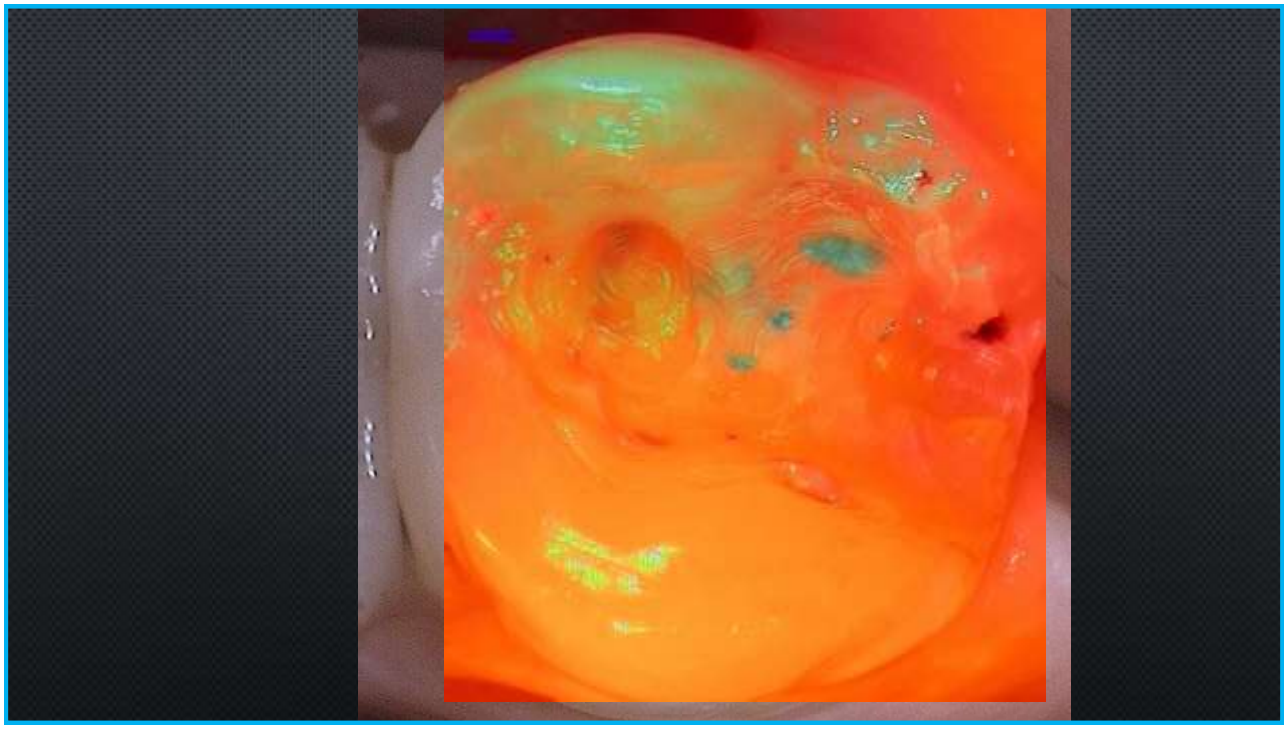
WHAT WOULD YOU DO?

42



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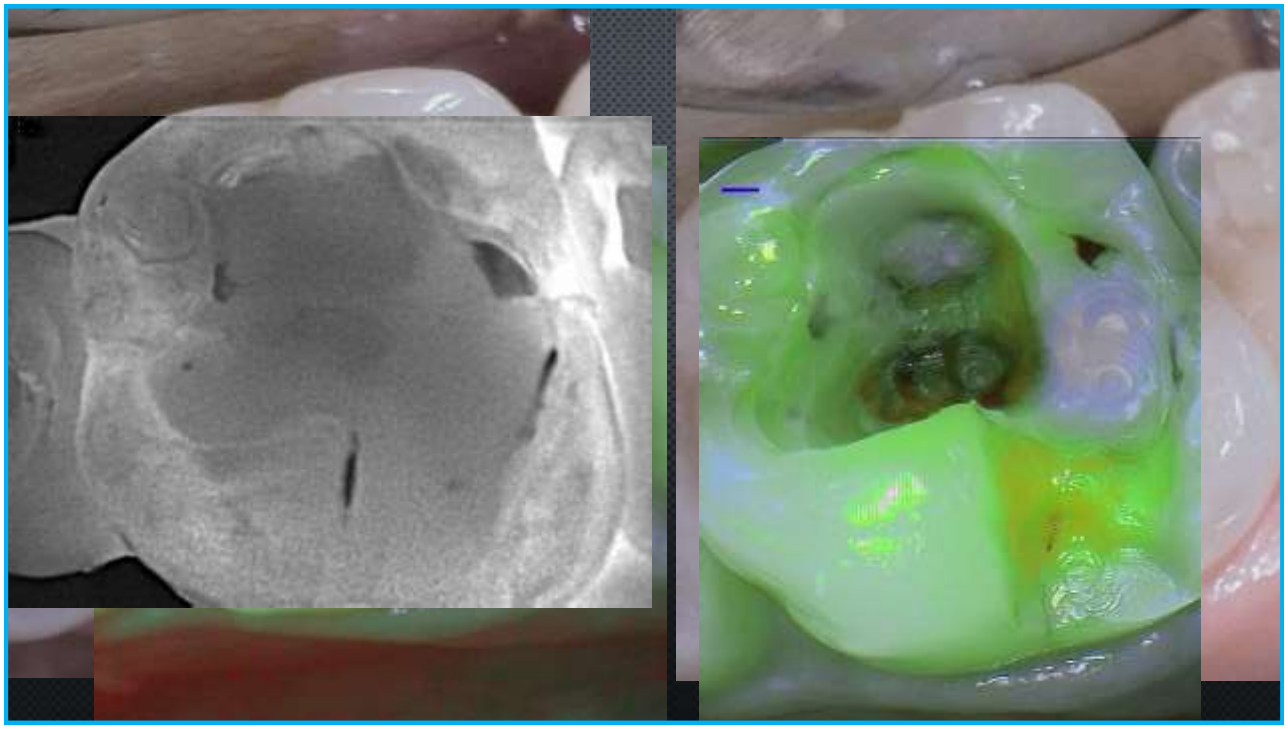
WHAT WOULD YOU DO?

44



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FIND THE LESION?

46

DO YOU SEE THE PROBLEM?

47

HOW MANY OF THESE DO WE MISS AS DENTISTS?

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MORE CONSERVATIVE RESTORATIONS

49

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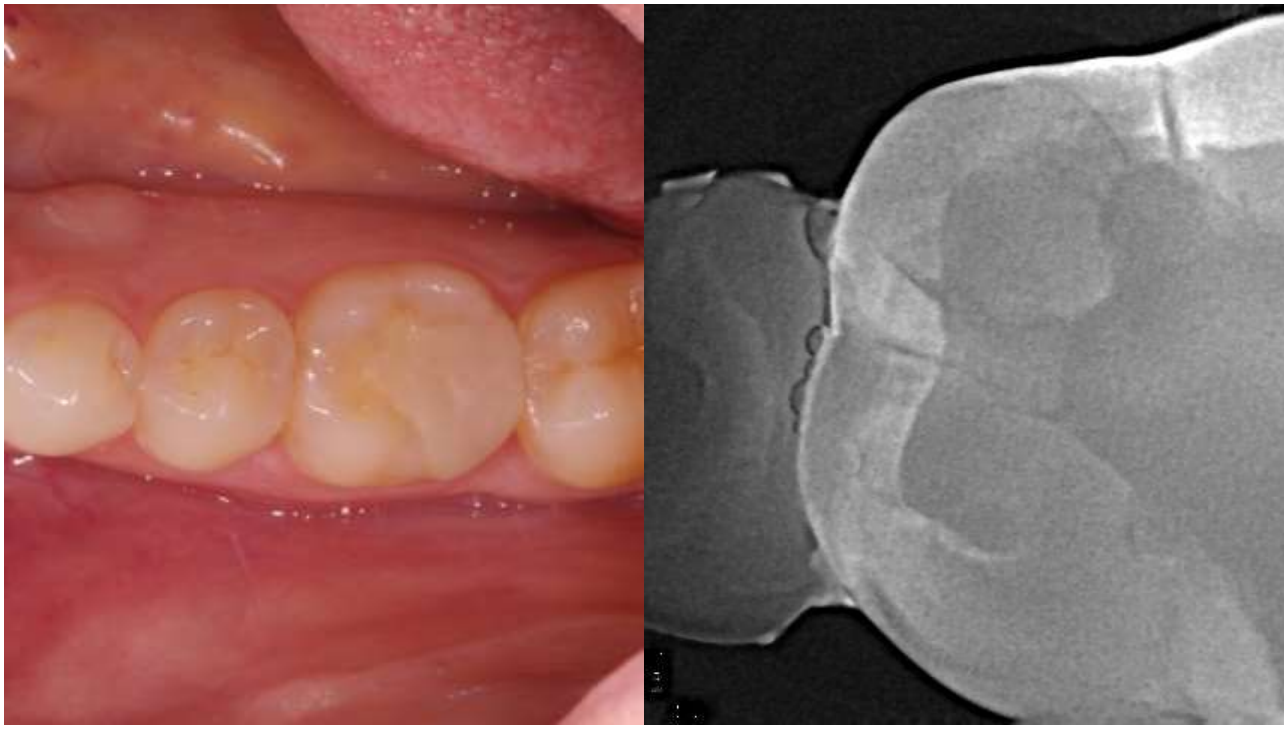

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GETTING TO THE FINISH LINE... ACCURACY, CONSISTENCY & SPEED

53

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Crystal Structure Diagnostics

The Canary System Detects Cracks & Cavities not Visible on X-rays

+ Around & beneath intact margins of fillings & crowns
+ Under sealants (including opaque sealants)
+ On proximal surfaces
+ On smooth surfaces, pits & grooves
+ Around orthodontic brackets

Measures tooth structure breakdown, allows for early treatment

+ Restore conservatively
+ Remineralize back to health
+ Seal with confidence

Research claims validated by 60+ papers

15+ case reports & 2 FDA CFR 21 clinical trials

55

The Science Behind The Canary System

- Pulses (2 Hz) of laser light hit the tooth surface.
- Tooth glows (Luminescence, LUM) and releases heat (Photo-Thermal Radiometry, PTR).
- Defective tooth crystal structure affects the retained heat and luminescence signatures.

➢**Energy Conversion Technology**

Temperature increase < 1°C ***not harmful***

- Detected signals reflect the tooth's condition.
- Detects 50 micron lesion up to 5 mm below the surface.

56

Delegated Scanning & Whitening Assistant

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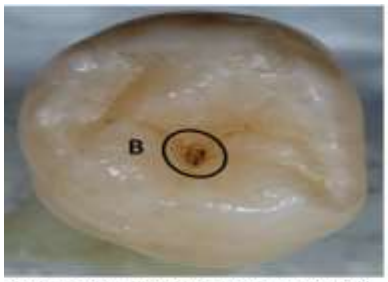
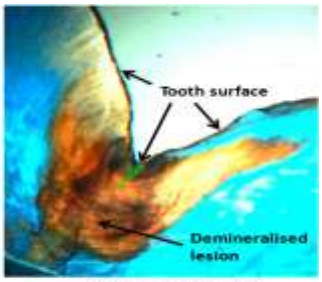
Sensitivity & Specificity Study: University of Texas October 2012

Study Design

- 20 tooth surfaces selected with range of clinical conditions from healthy to early caries
- Visual ranking by 2 dentists
- Canary Scan
- DIAGNODent
- Polarized Light Microscopy used as the gold standard to confirm presence of lesion & depth in that section



Photographic image of scanned area (Spot B)



PLM image of Spot B

Spot	Canary Number	DIAGNOdent Peak Value	PLM Lesion Depth (µm)
B	91 ± 14	2 ± 1	808.89

Caries Detection Method	Canary System	DIAGNODent
Sensitivity	100%	18%
Specificity	100%	100%
Spearman Correlation with Lesion Depth	.84	.21

58

Canary is Superior to X-Rays for Proximal Caries Detection

Jan J et al. Caries Res 2014;48:384–450 DOI: 10.1159/000360836

Objective:

To compare the accuracy of The Canary System, ICDAS-II and bitewing radiographs in detecting proximal caries *in vitro*.

Methods:

Conclusion:

- **BW radiographs could only identify 26.7% of the lesions which questions its ability to be the gold standard**
- **The Canary System is the only method examined with both high sensitivity and high specificity.**
- **The Canary System is more sensitive than bitewing radiographs in detecting interproximal caries**

Parameter	The Canary System	ICDAS-II	BW Radiograph
Sensitivity	0.93	0.73	0.27
Specificity	0.83	0.65	0.88

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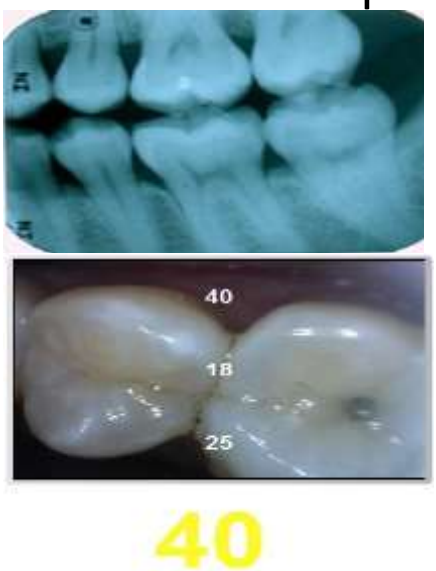
Interproximal Caries Detection

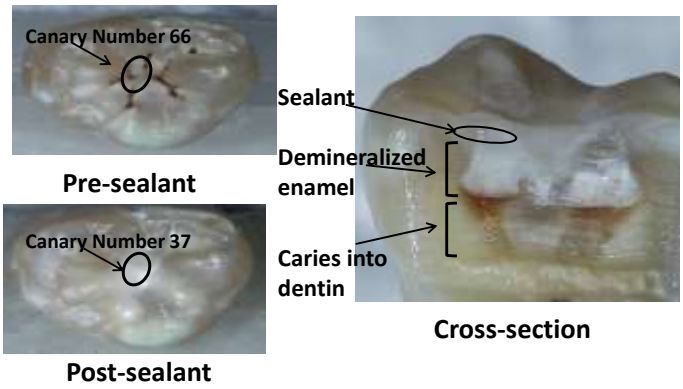


Bitewing radiograph did not detect caries.
Caries located on buccal aspect of the contact area

60

Detection of Caries Beneath Sealants

- Canary Numbers >20 when scanning sealants (3M™ ESPE™ Clinpro™ Sealant) placed over pit & fissure caries.
- The caries detection ability of the Canary System was not affected by sealant & was more accurate than DIAGNOdent.



Sensitivities and specificities for pit & fissure caries detection after sealant placement.

Caries Detection Method	The Canary System	DIAGNOdent
Sensitivity	83%	64%
Specificity	79%	46%

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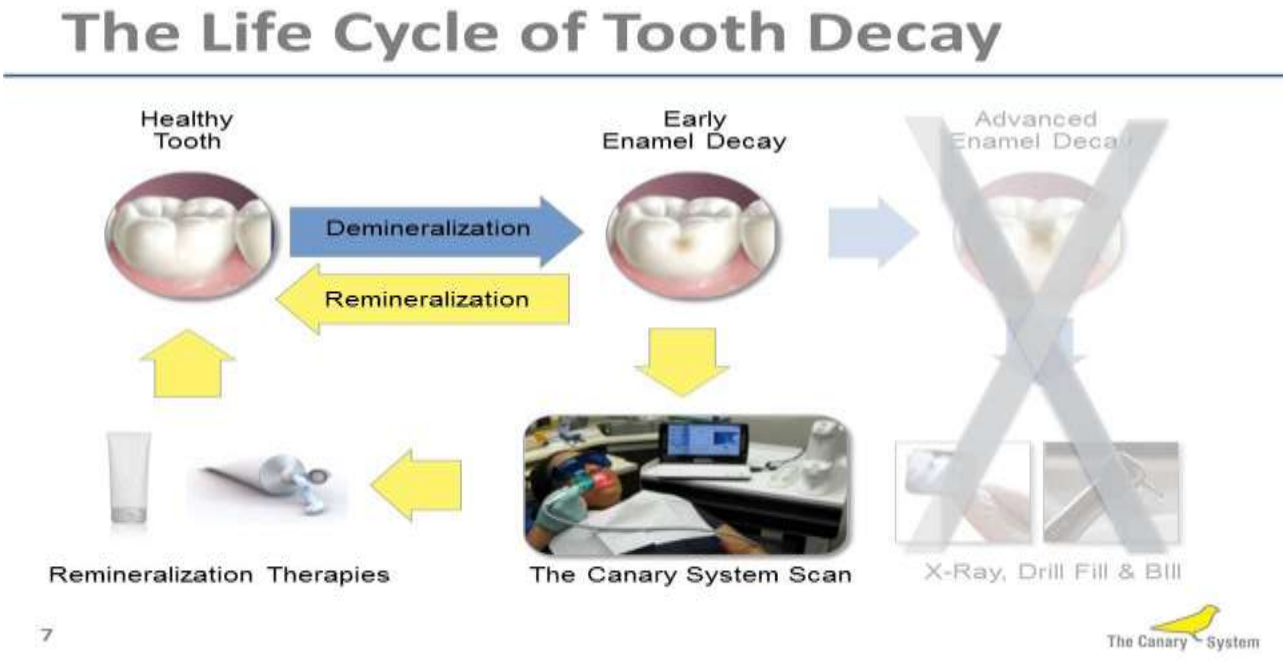

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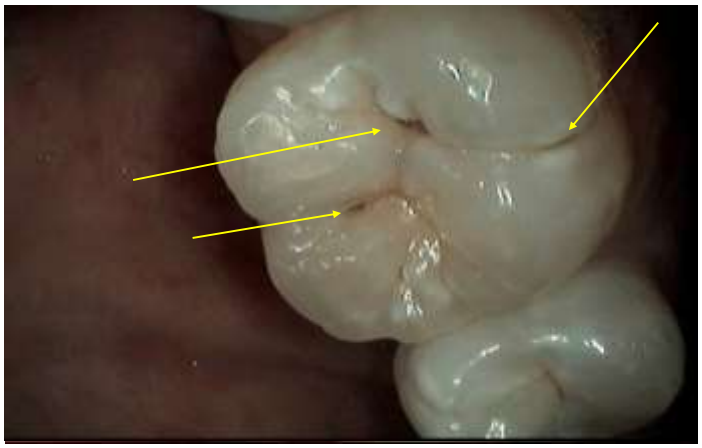
After all the cleaning and diagnostic technology being used, what if you find something?



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Topical Therapies

- More caries resistant
- Remineralization

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MINIMUM INTERVENTION

The first Professional product containing RECALDENT™ (CPP-ACP) Technology

- Prevent disease & maintain dental health
- Identify caries (cavities) risk
- Heal carious lesions (cavities) in their earliest stage
- Demineralized tooth structure can be **REMINERALIZED**

CPP-ACP

CPP-ACP
900 ppm
Sodium Fluoride

65

Minimally Invasive Treatment

- Apply MIPaste Plus for 3 minutes
- Patient applies at home 2x/day

66

MI VARNISH™ WITH RECALDENT™ (CPP-ACP)

*Bioavailable **calcium, phosphate & fluoride** for an **enhanced** varnish treatment*

67

Other Materials

- Xylitol toothpaste, rinses and gums
- Clinpro 5000 with TCP (3M)
- Enamelon with fluoride and ACP (Premier)
- Remin Pro (Voco)
- Sensodyne ProNamel
- Arm & Hammer's Enamel Care
- Arm & Hammer Complete Care w/ Enamel Strengthening
- Colgate Sensitive pro relief
- Fluoride Varnishes
- Glass Ionomers

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Huge Marketing Opportunity

- Remineralizing teeth
- Non Ionizing Diagnostic Tools
- Minimally Invasive Dentistry
- Health Product Sales
- Community Educational Programs
- Internet and Local Media Advertising

69

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Paradigm Shift

- One can place a number of restorations or fillings and yet not treat the underlying disease
- The bacteria remain in the plaque on the teeth, capable of creating new areas of tooth decay
- Patients value a shift from a surgical approach to disease management and prevention

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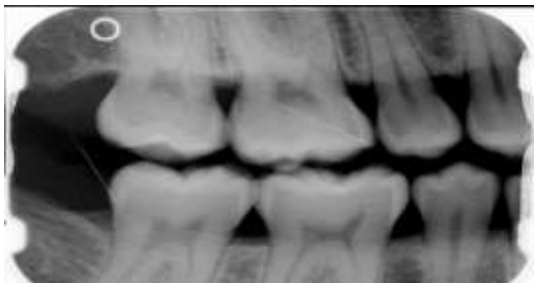
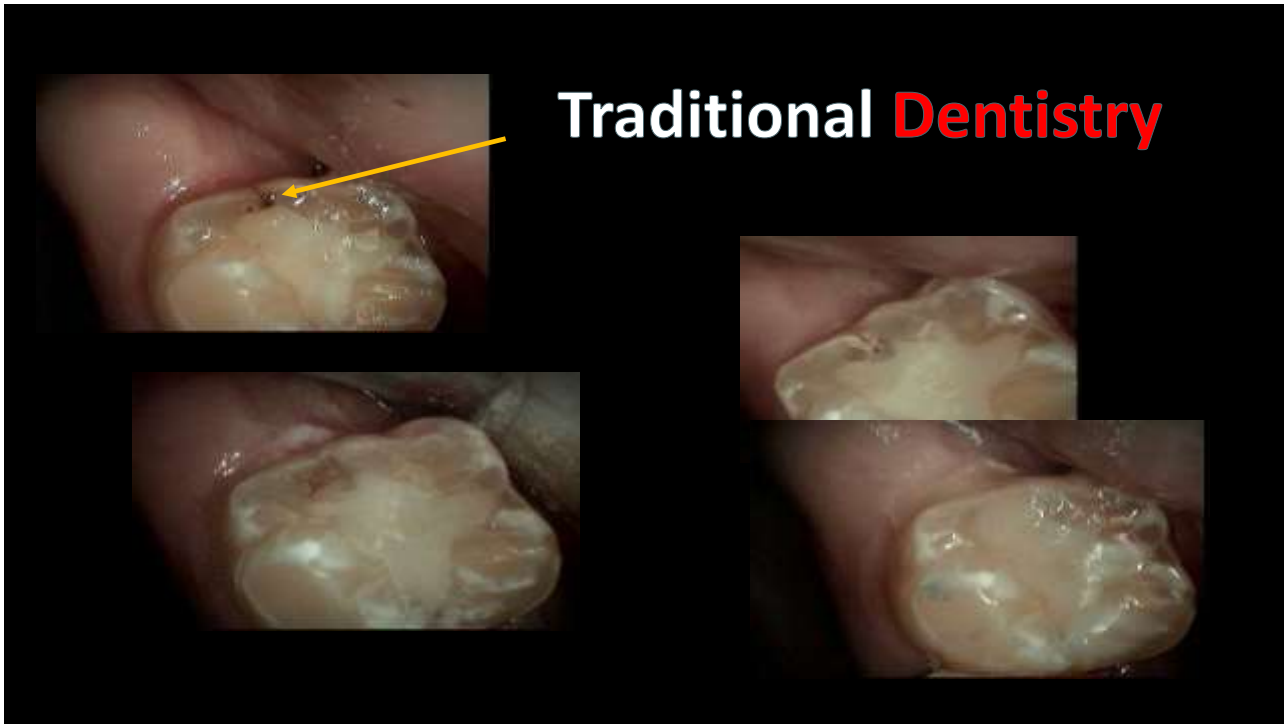
How will you diagnose?



How will you treat?

72



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MICROCOPY

Everyday Go To Minimally Invasive Burs

74

Flowables

- *Access, viscosity, small areas*
- *Deep, narrow, preparations*
- *Lots of enamel*

75

Small to Medium sized Lesions (<2MM)

- Mostly superficial
- Good restoration longevity
- ½ enamel with ½ extending into dentin
- Dentin is fairly dense
- Open &/or Closed defect
- Risks are low
- Minimal occlusal loading

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Large Defects
(<2MM)*(occlusal)*

Recurrent decay

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Think about material choices & their long term durability & susceptibility for failure in adhering to deep dentin.

pulpal proximity

78

Large sized Lesions (>2MM)

- Mostly dentin
- Dentin has more moisture and less substance
- Open and Closed defects
- Complications & Risks are higher
- Porous, Wet, Dentin Available
- Interproximal concerns
- Increased Occlusal Loading
- Remaining Tooth Structure

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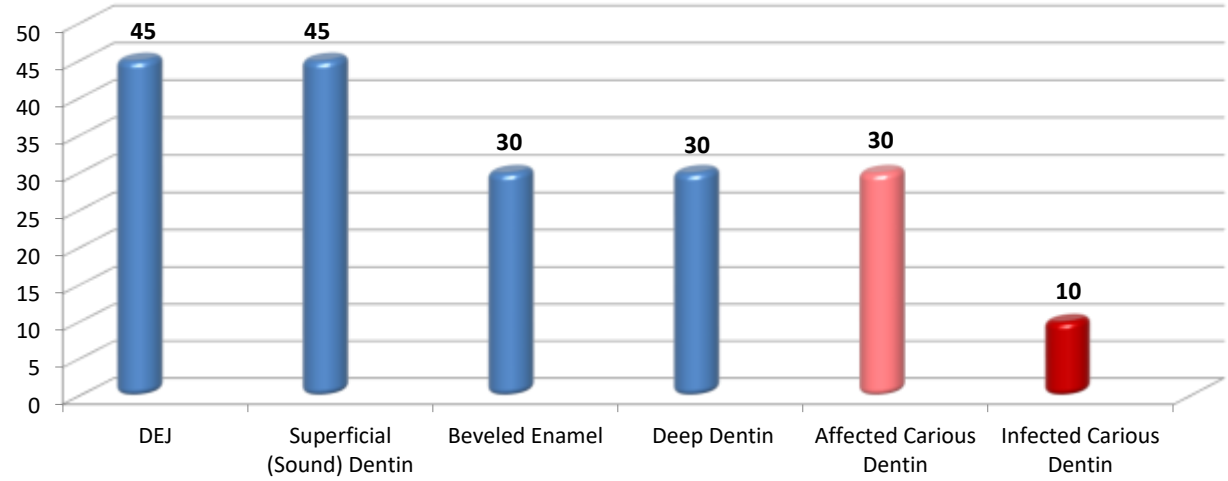
Bond Strengths Related To Type of Dentition



Irie m, suzuki k, watts dc, 2004, marginal gap formation of light activated restorative materials, affects of immediate setting shrinkage and bond strength. Dent Mat 18, 2002; 203-210

80

Caries Indicator Dyes

- Ultradent-Seek*/Sable Seek*
- Roydent-To Dye For
- Kuraray-Caries Detector*
- ProOptions-Caries Indicator
- Danville-Caries Finder
- Pulpdent-Snoop
- Vista-Caries Indicator
- Ronvig-See It
- Patterson-
- Henry Schein-
- Pearson-

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Note Caries on Floor of 2nd Molar

82

Further Inspection Reveals More Caries

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Caries Removal Burs

- SS White
  - Single use
  - Polymer
  - Hardness
  - 5000-10,000 rpms
- Komet
  - Multi use
  - Ceramic
  - Hardness
  - 1000-1500 rpms

Article on the Comparison of Caries Removal Burs

84

Round Burs (#6)

Carbide (SS White)

CeraBur (Komet) 1,000-1,500rpm

SmartBurs II (SS White) 5-10,000rpm

J Adhes Dent 2011 Feb;13(1):7-22. doi: 10.3290/j.jad.a18443.
Current concepts & techniques for caries excavation & adhesion to residual dentin.
de Almeida Neves A, Coutinho E, Cardoso MV, Lambrechts P, Van Meerbeek B.

85

Handpiece Lubricants

87

Yiu CK, Hiraishi N, King NM, Tay FR. Effect of dentinal surface preparation on bond strength of self-etching adhesives. J Adhes Dent. 2008 Jun;10(3):173-82.

Higher bond strengths when using tungsten carbide burs with SE adhesives

Long term failure occurs at gingival margins and adhesive interfaces.

88

Preparation

- Limited to removal of pathology with the exception of access and bevels.
- Maintaining enamel and superficial dentin
- Preserving occlusal stops
  - Marginal ridges
  - Transverse ridges
  - Oblique ridges
- Rounded line angles
- Purge hand piece oils
- Bur Choice

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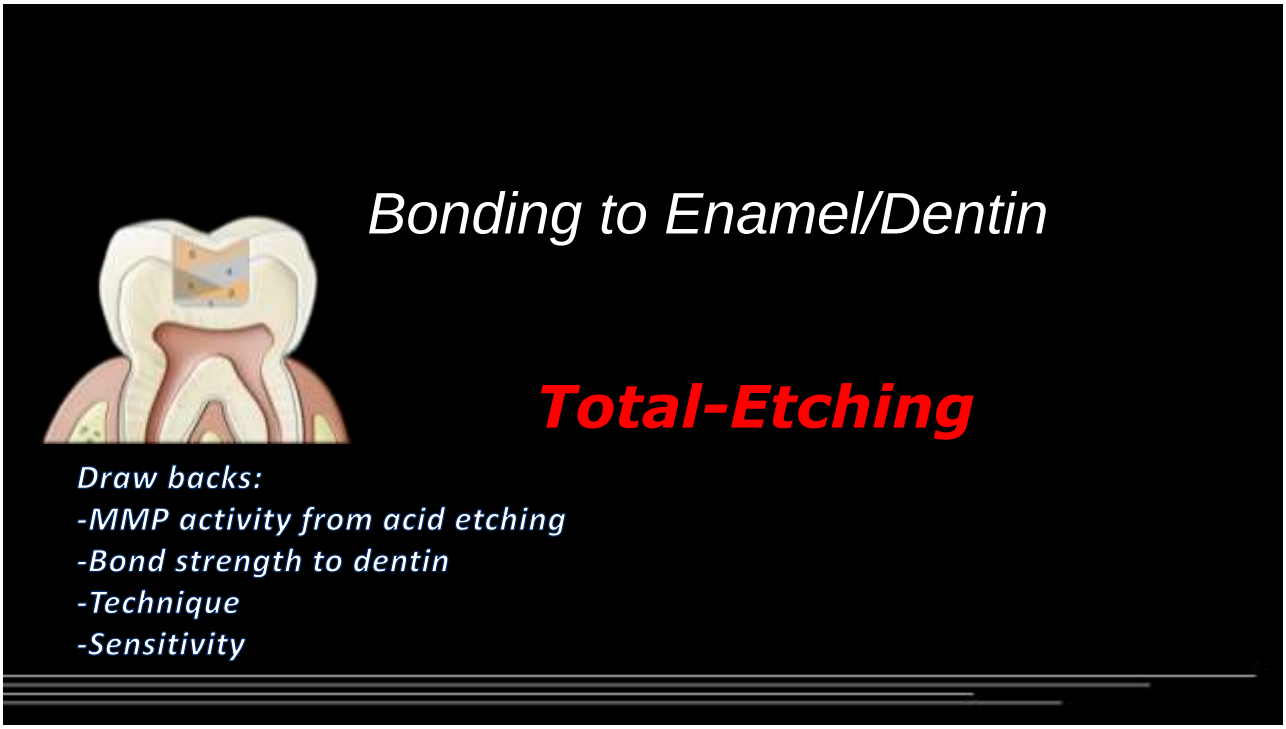
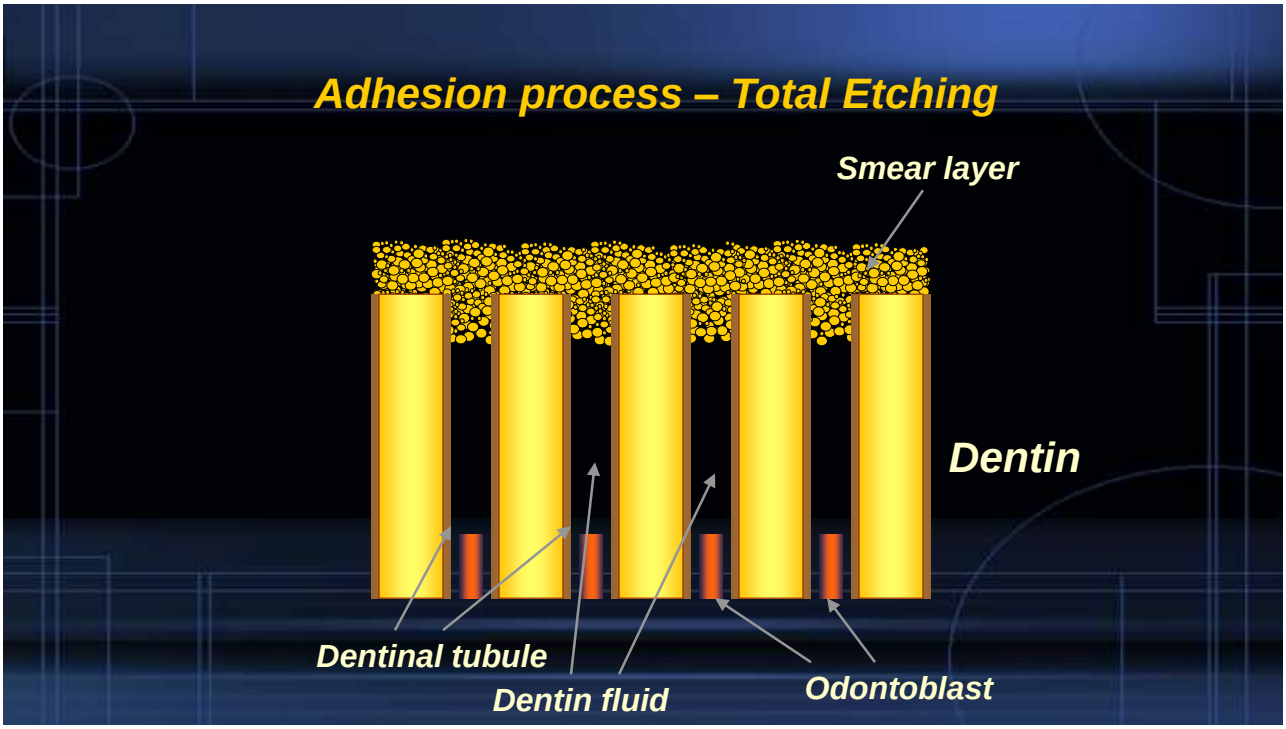
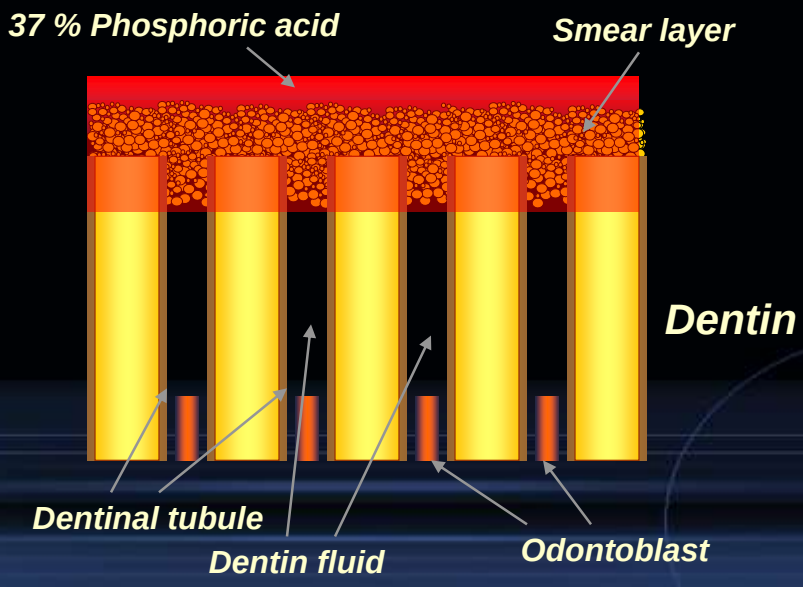

Bonding to Enamel/Dentin
Total-Etching
Draw backs:
-MMP activity from acid etching
-Bond strength to dentin
-Technique
-Sensitivity

90


Adhesion process – Total Etching
Smear layer
Dentin
Dentinal tubule
Dentin fluid
Odontoblast

91

Adhesion process – Total Etching



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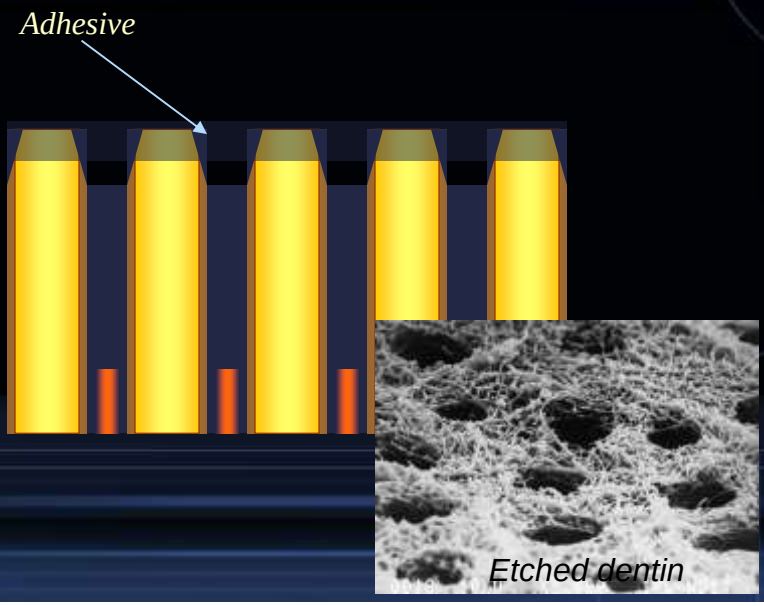
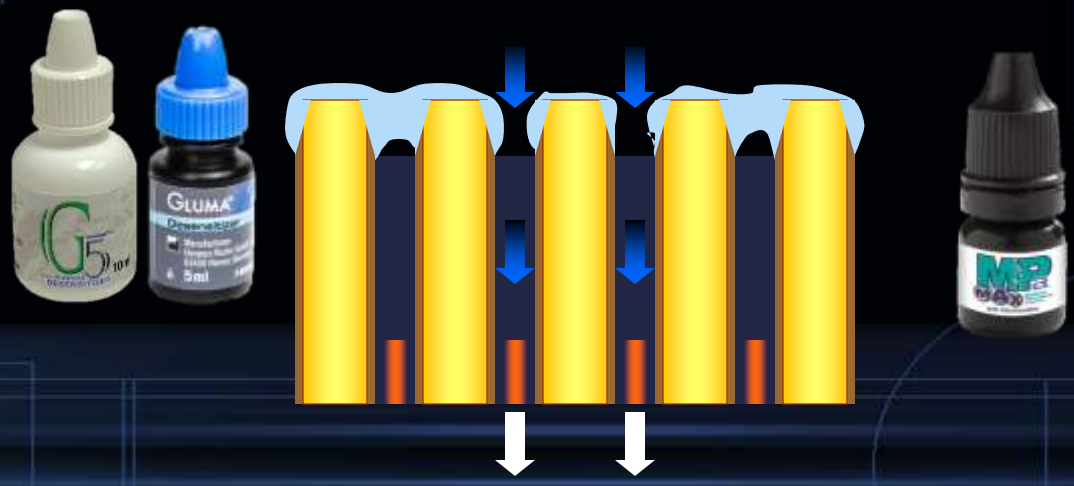
Adhesion process – Total-Etching



93

Adhesion process – Total-Etching



Post- Operative Sensitivity

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Mpa MAX (Clinician's Choice)

- MPa MAX 5th Generation Total-Etch Adhesive produced the highest bond strength to dentin, enamel, zirconia and lithium disilicate.
- MPa MAX is one of the few adhesives that contains 0.2% CHX to help prevent adhesive bond degradation caused by MMPs

95

Mpa MAX (Clinician's Choice)

- G5, a gluteraldehyde-based desensitizer that prevents post-operative sensitivity.
- G5 is placed after etching and before MPa MAX adhesive placement.
- G5 works by coagulating the intratubular fluid, helping to seal the dentin and prevent stimulation of the odontoblast processes.

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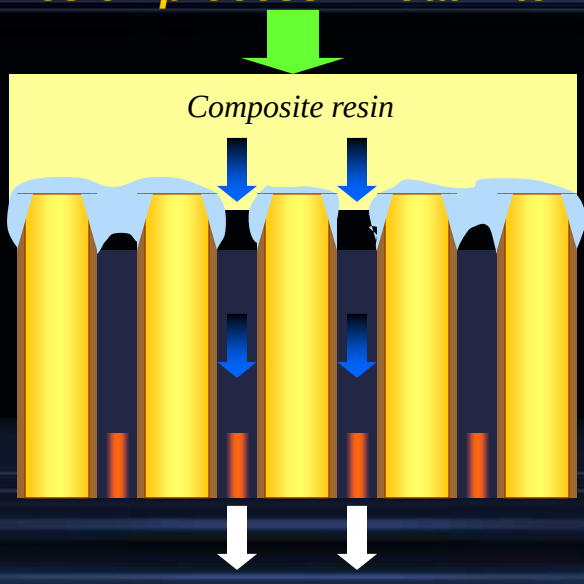
Adhesion process – Total-Etching



Post- Operative Sensitivity

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Bonding to Enamel/Dentin

Self-Etching

Draw backs:
-Need to selective etch enamel
-MMP activity from acidic monomers pH x<2
-Bond strength
-Technique
-Sensitivity

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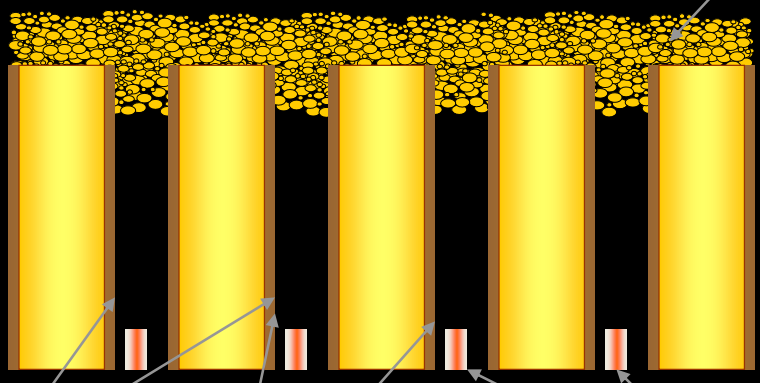
Adhesion process - Self-Etching

Use Carbide Burs

Large layers inhibit acidic monomers

Smear layer

Duration of exposure & acidity



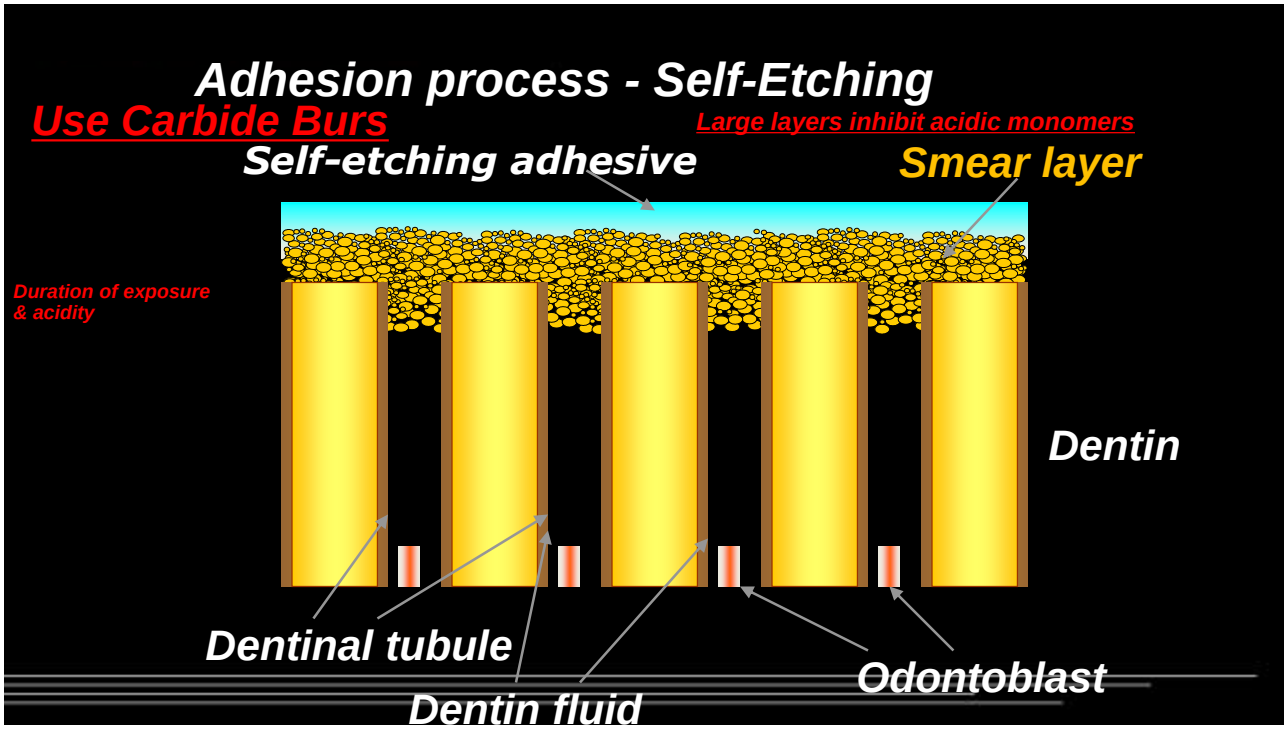
Dentin

Dentinal tubule

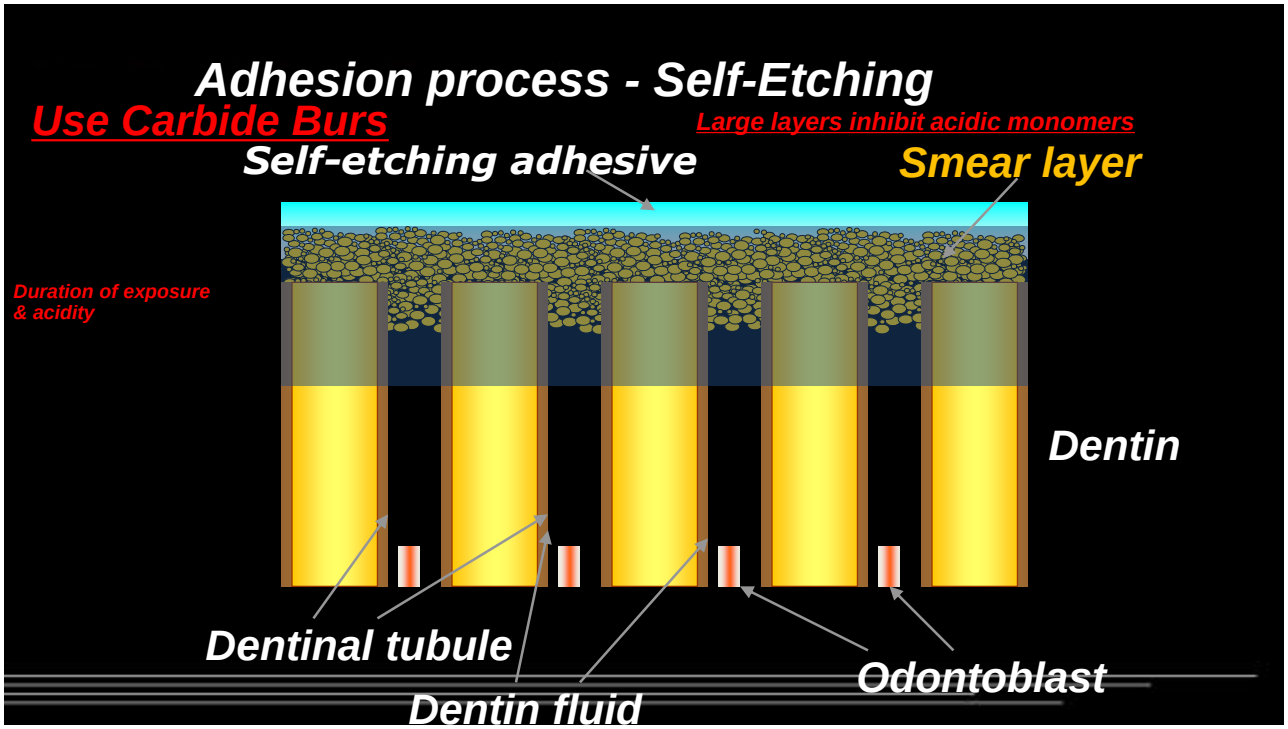
Odontoblast

Dentin fluid

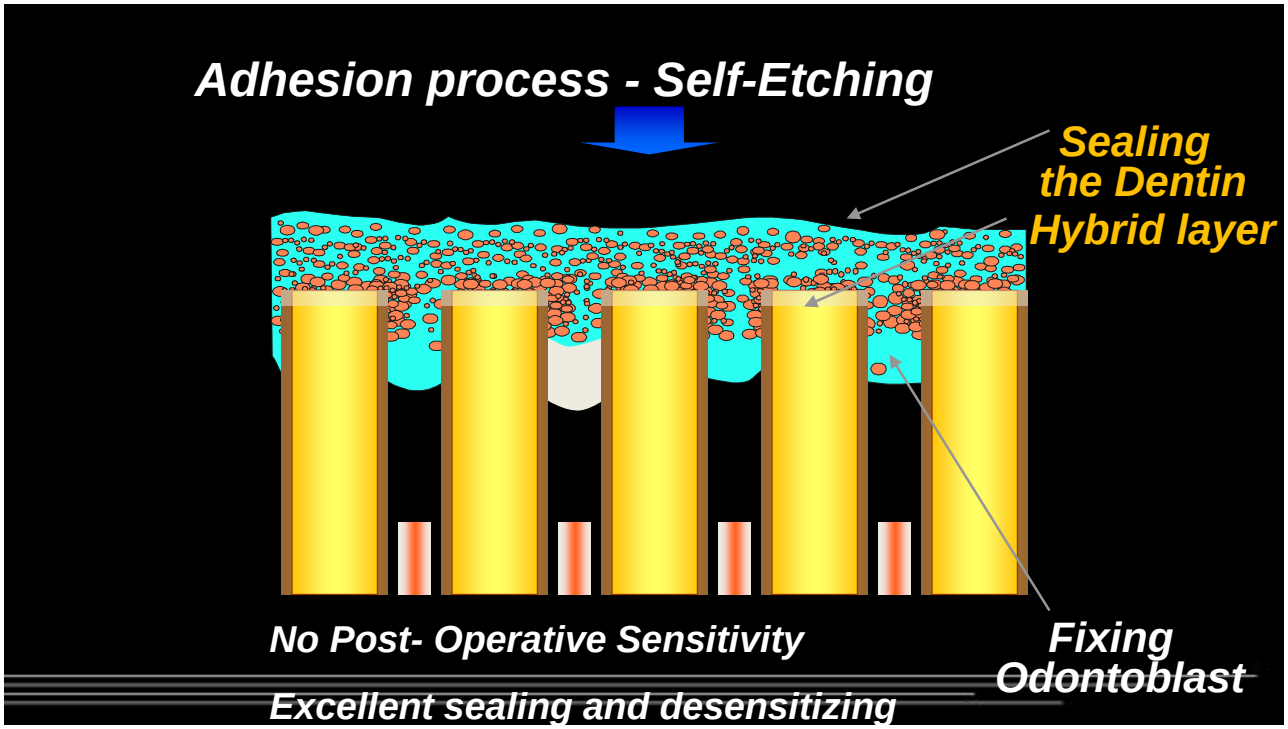
99


Adhesion process - Self-Etching
Use Carbide Burs
Large layers inhibit acidic monomers
Self-etching adhesive
Smear layer
Duration of exposure & acidity
Dentin
Dentinal tubule
Odontoblast
Dentin fluid

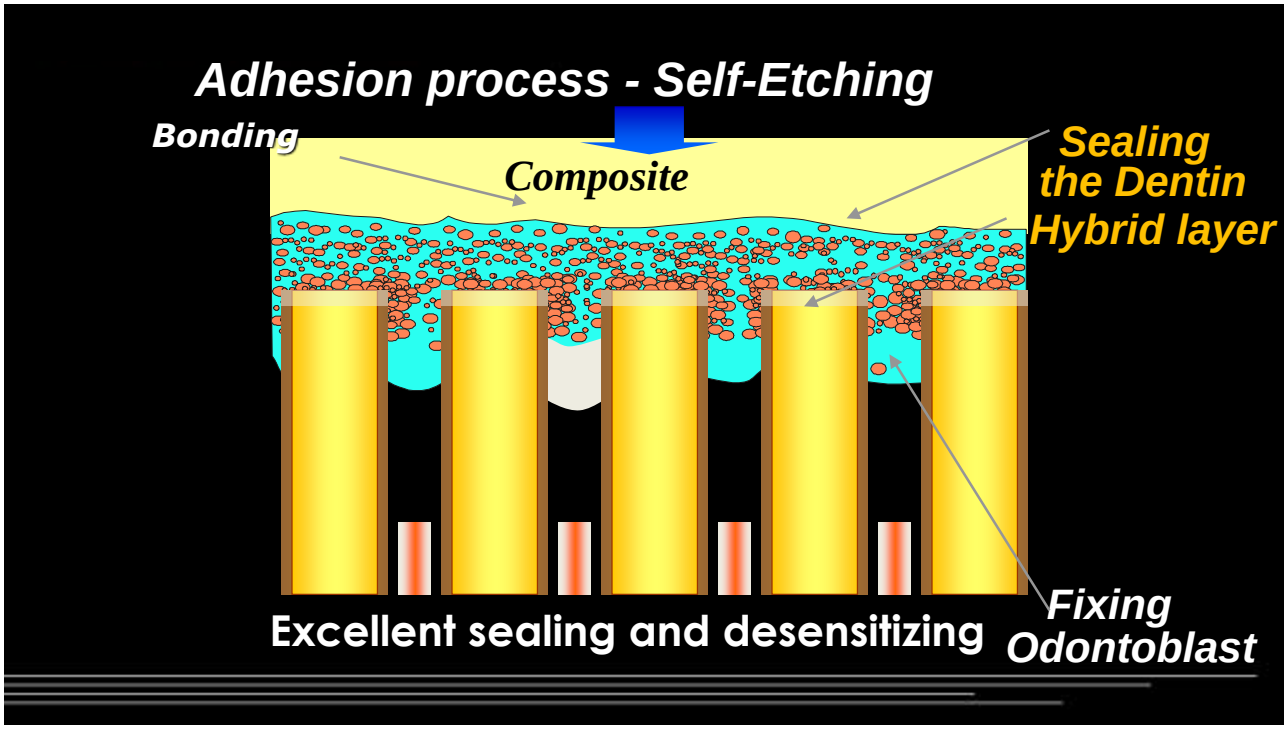
100


Adhesion process - Self-Etching
Use Carbide Burs
Large layers inhibit acidic monomers
Self-etching adhesive
Smear layer
Duration of exposure & acidity
Dentin
Dentinal tubule
Odontoblast
Dentin fluid

101


Adhesion process - Self-Etching
Sealing
the Dentin
Hybrid layer
No Post- Operative Sensitivity
Excellent sealing and desensitizing
Fixing
Odontoblast

102


Adhesion process - Self-Etching
Bonding
Composite
Sealing
the Dentin
Hybrid layer
Excellent sealing and desensitizing
Fixing
Odontoblast

103

Factors that compromise bond durability in restorative dentistry

Hydrophilic dentin bonding (1956 -)

alarming words …

but the reality we face should trigger alarm

CRITICAL REVIEWS IN ORAL BIOLOGY & MEDICINE

A Critical Review of the Durability of Adhesion to Tooth Tissue: Methods and Results

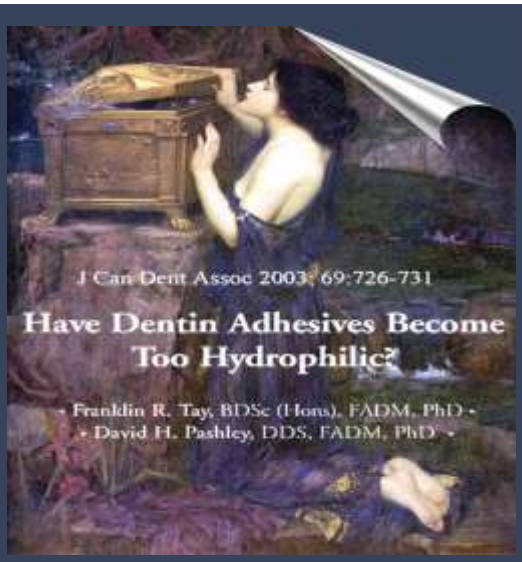
J. De Munck[1], K. Van Landuyt[1], M. Peumans[1], A. Poitevin[1], P. Lambrechts[1], M. Braem[2], and B. Van Meerbeek[1]*

"The major shortcoming of contemporary adhesive restoratives is their limited durability in vivo."

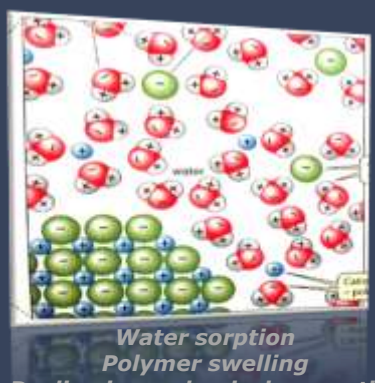
104

Factors that compromise bond durability in restorative dentistry

Hydrophilic dentin bonding (1956 -)



We challenged that current dentin adhesive designs that incorporate increasing concentrations of hydrophilic monomers are going in the wrong direction

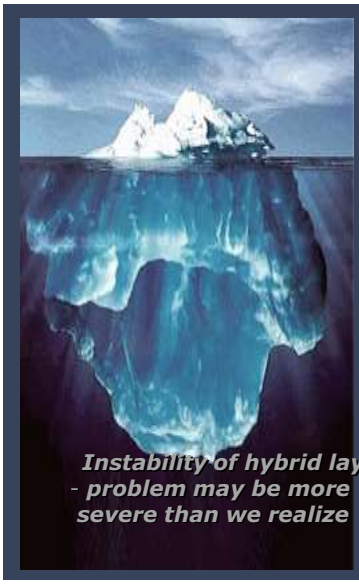


Water sorption
Polymer swelling
Decline in mechanical properties
Leaching of hydrolyzed resin components

105

ⓘ *Factors that compromise bond durability in restorative dentistry*

Hydrophilic dentin bonding (1956 -)

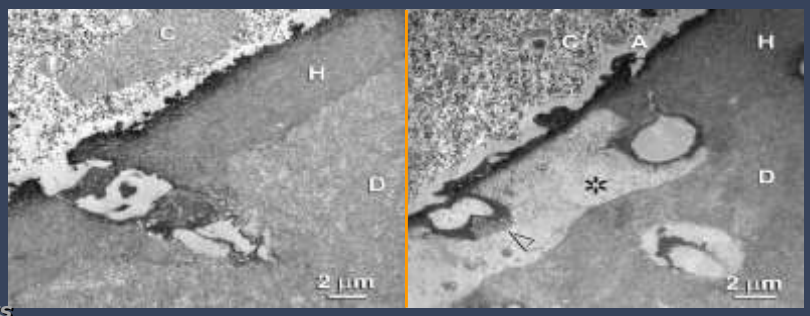


Instability of hybrid layers - problem may be more severe than we realize

RESEARCH REPORTS
J Dent Res 2005; 84:741-746

J. Hebling[1], D.H. Pashley[2], I. Tjäderhane[3], and F.R. Tay[2,4]*

Chlorhexidine Arrests Subclinical Degradation of Dentin Hybrid Layers *in vivo*



Intact hybrid layers created by a simplified etch-and-rinse adhesive in caries-affected primary dentin partially disappeared after 6 months of

106

ⓘ *Factors that compromise bond durability*

Hydrophilic dentin bonding (1956 -)

RESEARCH REPORTS
J Dent Res 2004; 83:216-221

D.H. Pashley[1]*, F.R. Tay[2], C. Yiu[3], M. Hashimoto[1], L. Breschi[4], R.M. Carvalho[5], and S. Ito[2]

Collagen Degradation by Host-derived Enzymes during Aging

Demineralizing dentin is like opening the Pandora's box, releasing endogenous enzymes (Matrix Metalloproteinases - MMPs) that were trapped within the mineralized dentin matrix.

In the presence of water (such as that derived from water sorption or from adhesives, MMPs (2,8 & 9) can breakdown collagen fibrils that are not protected by intrafibrillar minerals

Sukala et al. (2007)
Mazzoni et al. (2007)

107

Bond Degredation

- Pashley DH, Tay FR, Imazato S. How to increase the durability of resin-dentin bonds. Compend Contin Educ Dent. 2011 Sep;32(7):60-4, 66.

Resin-dentin bonds are not as durable as was previously thought. Microtensile bond strengths often fall 30% to 40% in 6 to 12 months.

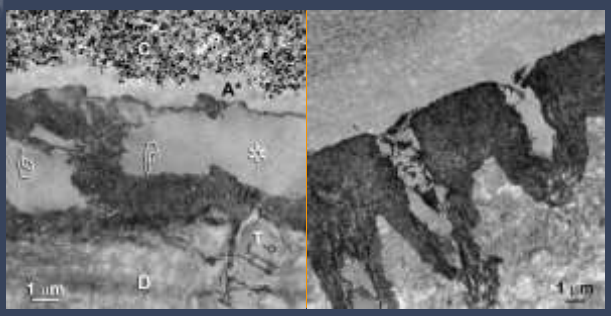
108

Potential ways to extend bond longevity

MMP inhibition with chlorhexidine

Brackett et al. Chlorhexidine preserves hybrid layers but not nanofillers in vivo. Oper Dent (2009)

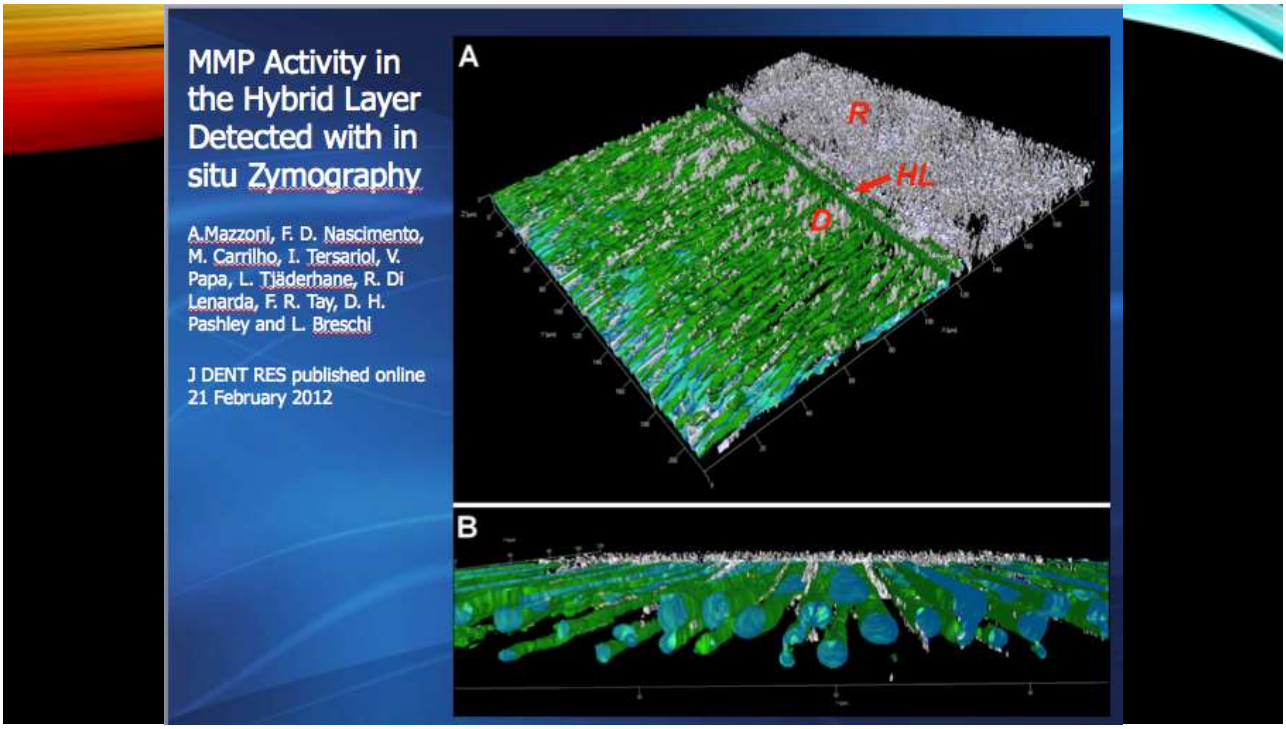
Without chlorhexidine



With chlorhexidine as a MMP inhibitor

Chlorhexidine prevented degradation of hybrid layers created by Prime&Bond NT after 12 months of intraoral function

109


MMP Activity in the Hybrid Layer Detected with in situ Zymography
A.Mazzoni, F. D. Nascimento, M. Carrilho, I. Tersariol, V. Papa, L. Tjäderhane, R. Di Lenarda, F. R. Tay, D. H. Pashley and L. Breschi
J DENT RES published online 21 February 2012
A
R
HL
D
B

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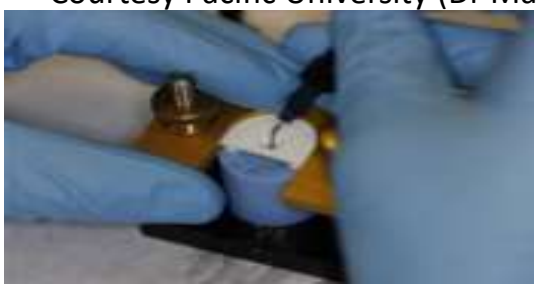
What is the best adhesive?
Can you get good results?

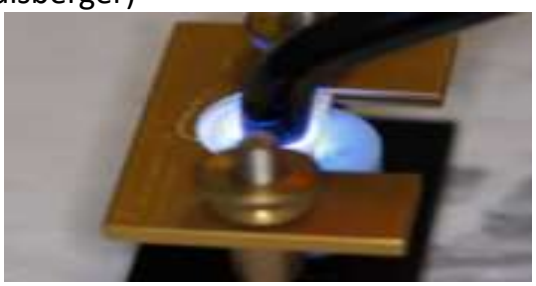
111

•Courtesy Pacific University (Dr Marc Guisberger)

112

•Courtesy Pacific University (Dr Marc Guisberger)





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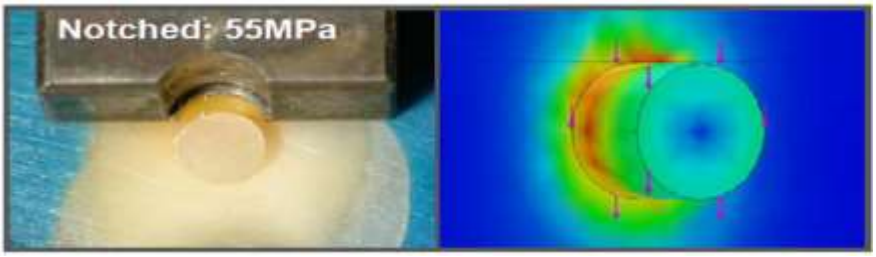
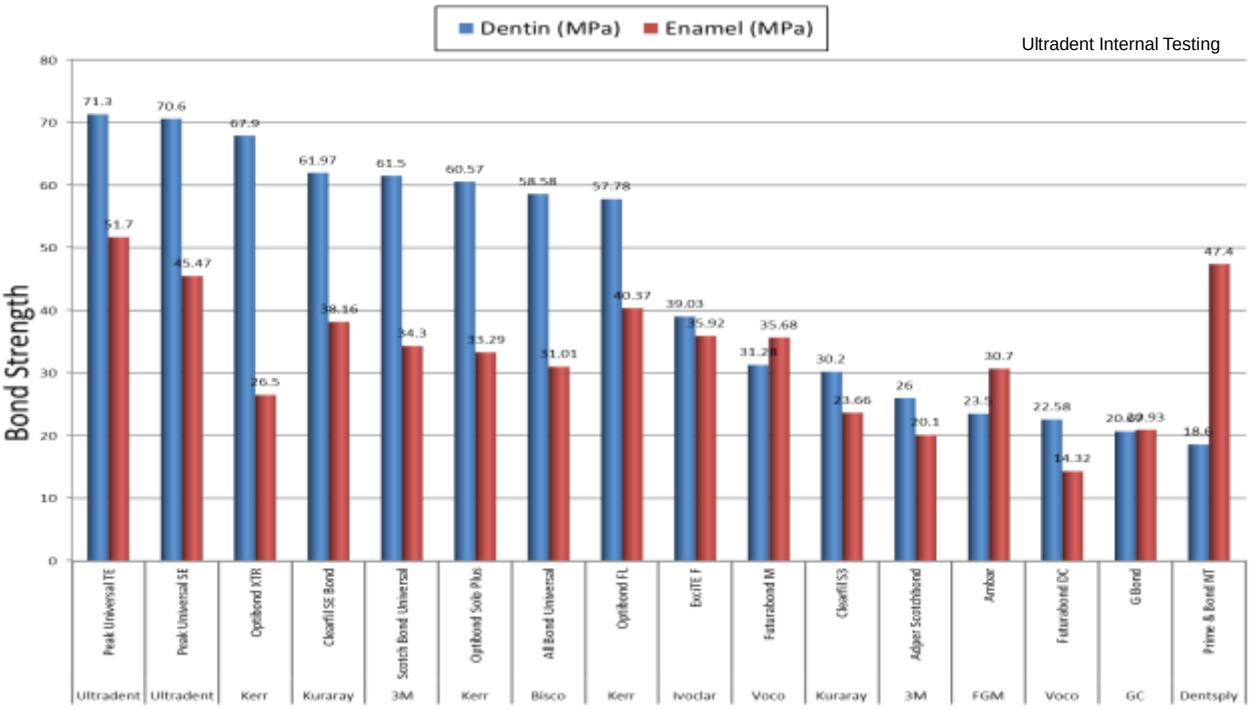
InstroN

- Ultra Tester (Ultradent)
- Ultra Jig (Ultadent)



Ultradent's shear bond strength testing method has been adopted as an ISO Standard. The UltraTester machine uses this highly accurate method to determine bond strengths.

114



115

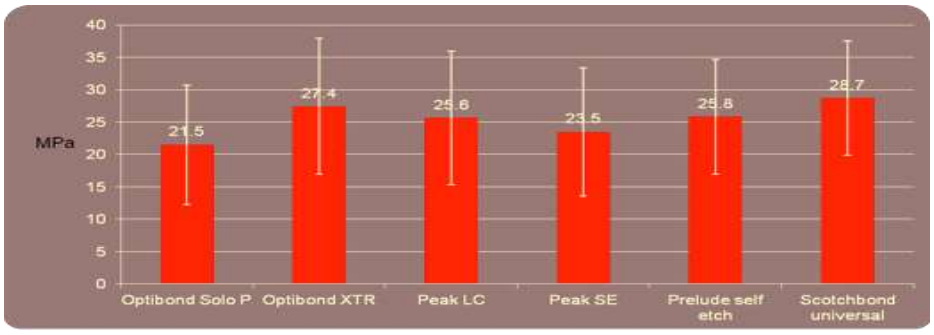
Technique & Errors

116

- Courtesy Pacific University (Dr Marc Guisberger)

Shear Bond Test Results - 2012

Average Shear Bond Strength to Dentin: 24.2 MPa



117

- Courtesy Pacific University (Dr Marc Guisberger)

Shear Bond Test Results - 2012

Maximum/Minimum Shear Bond Strength per Bonding Material

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Why different pH?

Adhesive Functional Monomers

MDP | BPDM | MDP | MDP | Penta-P | GPDM

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When bonding to enamel, an etch & rinse approach is definitely preferred, indicating that simple micro-mechanical interaction appears sufficient to achieve a durable bond to enamel. *When bonding to dentin, a mild self-etch approach is superior, as it {MDP} involves (like with glass-ionomers) additional ionic bonding with residual HAp. This additional primary chemical bonding definitely contributes to bond durability*. 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*

Van Meerbeek B, et al. Relationship between bond-strength tests and clinical outcomes. Dent Mater (2009), doi:10.1016/j.dental.2009.11.148

120

MDP ADHESION MONOMER:

- **Developed by Kuraray 1983**
- **Acidic Monomer Activates Silanes & Chemically Bonds to Metal Oxide Ceramics (Zirconia & Alumina).**
- **(Key Ingredient to make a Silane Universal)**
- Hydrophilic & Hydrophobic
- **Very Durable Dentin Bond**
  (Creates An Insoluble, calcium Salt with Dentin)
- Is The Most Copied Monomer In Dentistry
- **The Most Researched Monomer In Dentistry**
- 20 + Years Of Research On Metal Oxide Ceramics (Zirconia & Alumina)
- **Strongest & Most Durable Bond to Metal Oxide (Zirconia & Alumina) Ceramics**

121

NEW "UNIVERSAL" SYSTEMS

- Simple & easy to use
- Direct & indirect techniques
- Use as Total, Selective or Self Etch
- Low sensitivity
- Lots of MDP Based Products

122

DRAWBACKS OF ANY COMPOSITE RESIN

- Material placement techniques
- Variable substrate
- Polymerization stress & shrinkage
- Water absorption
- Hydrophobic bonding agents
- Decreased adhesive bond strength over time
- MMPs and Cathepsins
- Microleakage

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DECREASED BOND STRENGTHS DUE TO:

- Substrate
- Preparation technique
- Bur selection
- Hand piece oils
- Bonding agent
- Curing device and position
- Material selection
- Layering technique

124

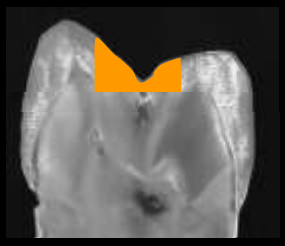
Direct Composite Restorations

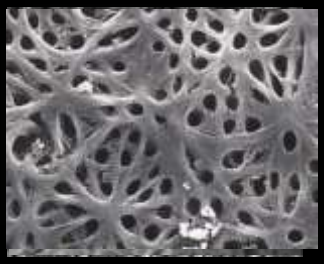
PLACEMENT TECHNIQUES

125

What substrate are we treating?

:Composite Preparation





Class I or II

3x Tubule Density Equals Higher Fluid & Increased Difficulty for Bonding
%30 Degrease in Bond Strengths with most bonding systems.

126

"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)

127

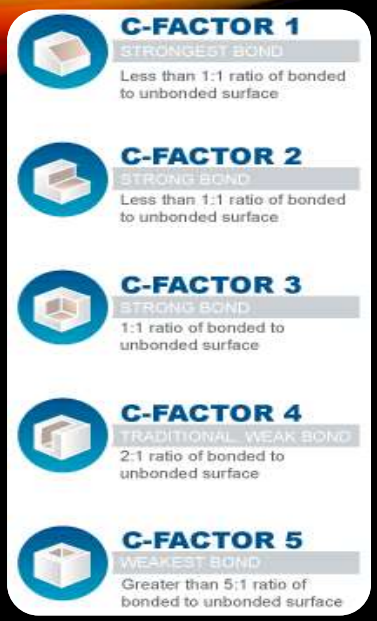
"C-FACTOR" DEFINITION

Configuration Factor:

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

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

128



Lowest Stress

Low Stress

Medium Stress

High Stress

Highest Stress

129

"C-FACTOR" DEFINITION

What are you placing
Where in the tooth
How are you utilizing it?

Enamel
Superficial Dentin
Middle Dentin
Deep Dentin
Sclerotic Dentin
Infected Dentin
Affected Dentin

MDP BASED BONDING AGENT AND…..X?

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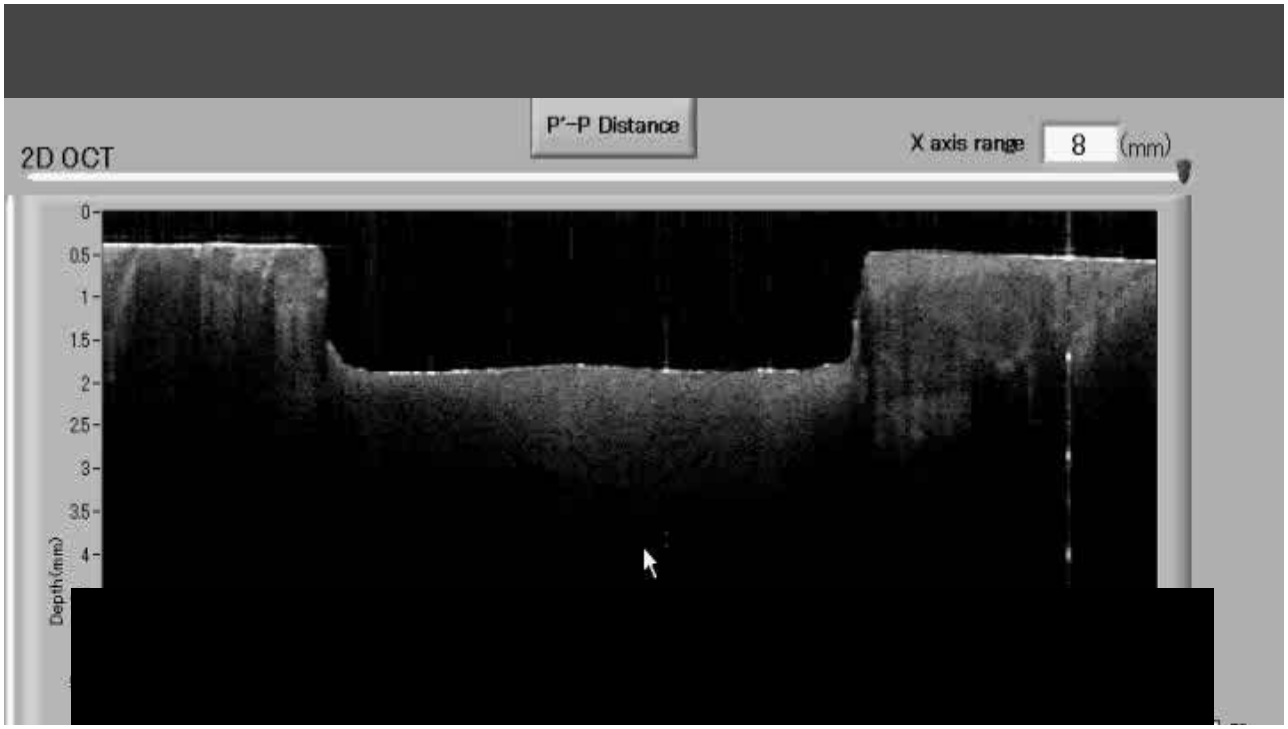
"C-FACTOR"

Base/ Lining

Excellent Flow & Handling

131



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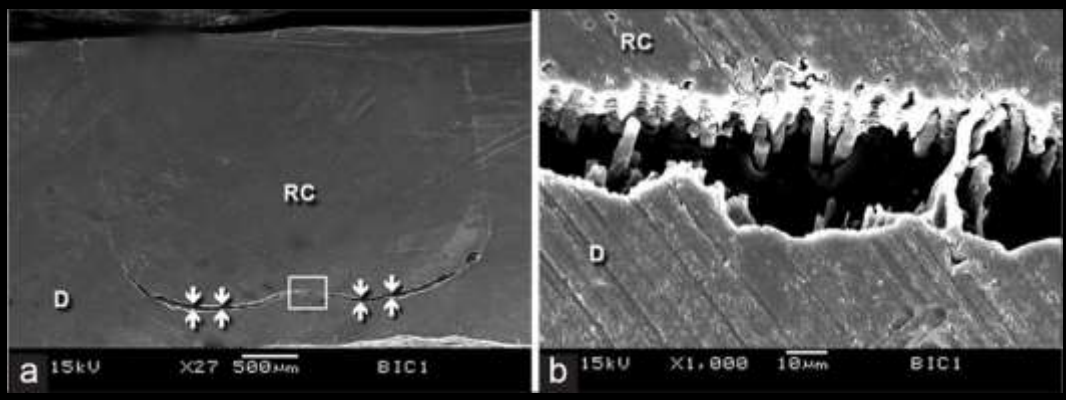
HYBRID ZONE



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Dentin Replacement with Composite Cap?

- Dentin substitute
  - Flowable Resins
    - -3%-6% vol. shrinkage
    - -1.6-3mpa shrinkage stress
    - -thin on pulpal floor only
    - -or SureFil SDR +
    - -What bonding agent?
  - Glass Ionomers
- Enamel Replacement
  - Modern Composite

ADA reports flowable resins are used by 82% of dentists as bases or liners.

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V3RING®

NiTi only spring

Anatomically shaped tines

Built in lip for increased stability in forceps

V-Shaped glass reinforced autoclavable plastic tines (leaves room for the wedge)

140

V3RING®

Universal V3 Ring *Narrow V3 Ring*

TrioDent has developed *Narrow V3 Ring* in addition to the *Universal V3 Ring* to ensure ideal separation on smaller teeth.

141

Selective Etch Enamel Only

142

143

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G-aenial Universal Flo

"operates like a flowable but performs like a restorative"

- Bis-GMA free / Radiopaque
- High Strength & Wear Resistance
- High density uniform dispersion nanofiller technology
- Self shining effect allows the material to increase polish over time

145

146

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POLYMERIZATION

Cure with VALO for 10 seconds or 20 seconds for lights with output <600mw/cm2

148

GETTING TO THE FINISH LINE... ACCURACY, CONSISTENCY & SPEED

Radiometers

How good is your light?

Radiometer
Check daily in am
300mW/cm2 (600mW /cm2)

Initial study by Dr.Nassar Barghi found

- 30% of units tested had output less than 200mW/cm^2
- Second study <20%
- Intensity of light inversely proportional to age of unit
- 10% had cracked filters
- Most doctors never replaced the bulb

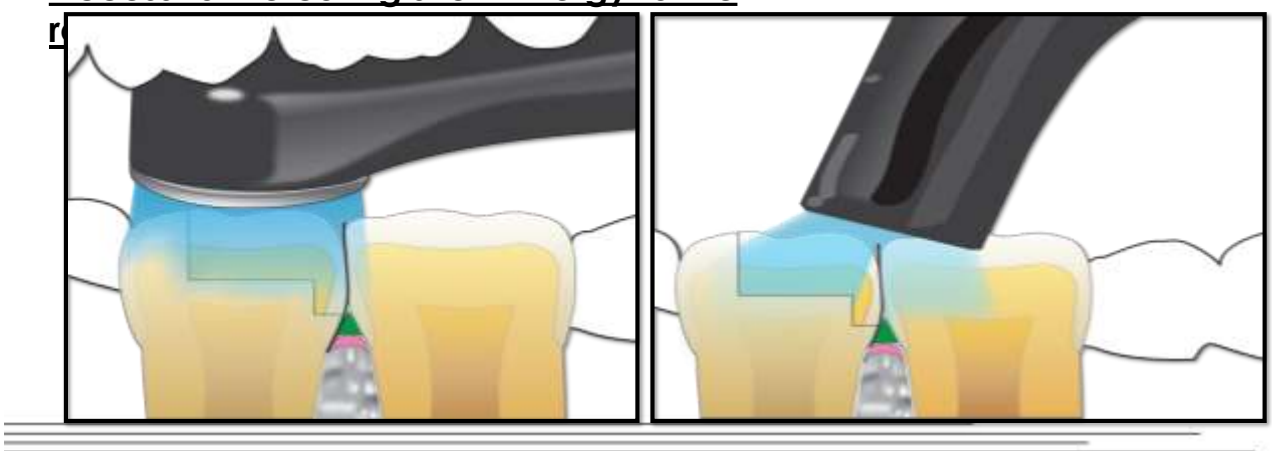
**Proper care of curing light will ensure that your restorations are thoroughly cured. **

149

150

GETTING TO THE FINISH LINE... ACCURACY, CONSISTENCY & SPEED

Access to the curing site = Energy to the r



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GETTING TO THE FINISH LINE... ACCURACY, CONSISTENCY & SPEED

152

GETTING TO THE FINISH LINE... ACCURACY, CONSISTENCY & SPEED

153

GETTING TO THE FINISH LINE... ACCURACY, CONSISTENCY & SPEED

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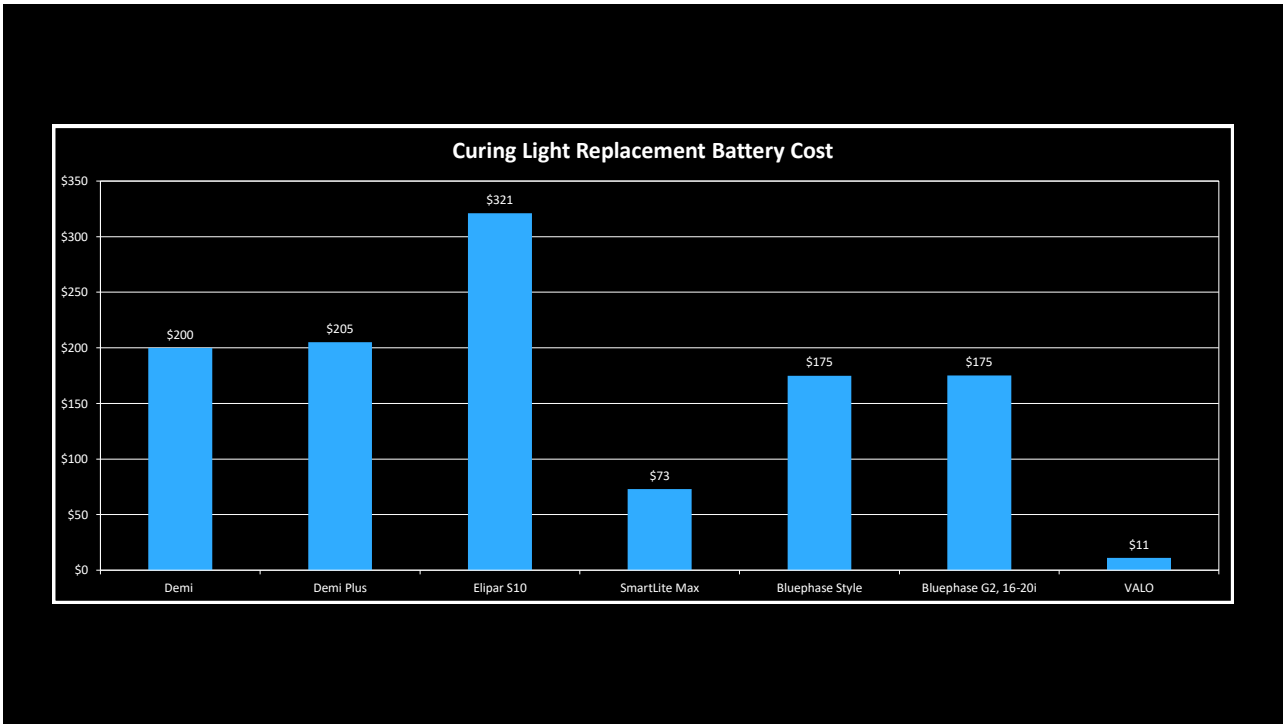

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WHAT ARE YOU MISSING?
When it comes to curing, the circumstances aren't always ideal. Squirming patients, sectional bands blocking the light from getting to the entire restoration, even a simple hand movement can prevent a complete cure. That's where the VALO Grand curing light comes in. The VALO Grand light has a large 12 mm lens that allows you to cover more area in a single cure. With the VALO Grand light, you won't miss a thing.
AVERAGE COMPETITOR
VALO
VALO GRAND
SURFACE AREA
48
78
107
ACTUAL SIZE
10 MM MOLAR COVERAGE

156


VALO GRAND
ECLIPSING THE COMPETITION.
VALO® GRAND
XTRA (2384mW)
HIGH (1781mW)
STANDARD (889mW)
ELIPAR DEEP CURE (785mW)
BLUEPHASE STYLE (651mW)
DEMI ULTRA (700mW)
SMART LIGHT FOCUS (486mW)
10mm
20mm
30mm
40mm
50mm
60mm
70mm

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COMPOSITE PLACEMENT REVIEW

- Etch enamel
- Self etch dentin
- Flowable on just the pulpal floor
- Horizontal layering (2mm Increments) {Stay within similar dentin bond strengths}
- Complete curing (use LED curing lights)

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nano-enhanced Evanesce™ universal restorative

166

EVANESCE means to disappear gradually; vanish; fade away

- Indications
  - Anterior & Posterior Simple or Complex Bonding
  - Excellent Handling
  - Easy to Polish
  - Refractive Color Index Similar to Tooth

UNIVERSAL SHADES (85% Opacity)											
A1	A2	A3	A3.5	A4*	B1	B2	C1*	C2	C3*	BL1*	BL3*

DENTIN SHADES (90% Opacity)							
A1	A2	A3	A3.5	B1	C2	C4*	

ENAMEL SHADES (80% Opacity)							
A1	A2	A3	A3.5	B1	B2*	C2	

ENAMEL /X SHADES		
ENAMEL Incisal	ENAMEL White	ENAMEL Clear

nano-enhanced Evanesce™ universal restorative

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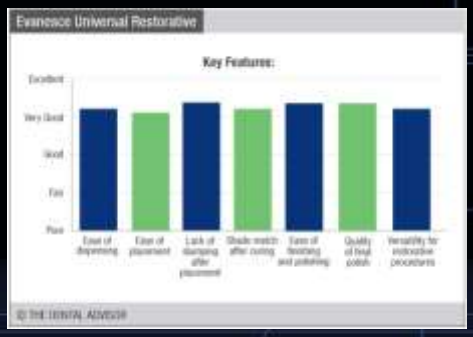
Excellent Handling / Incredible Colors



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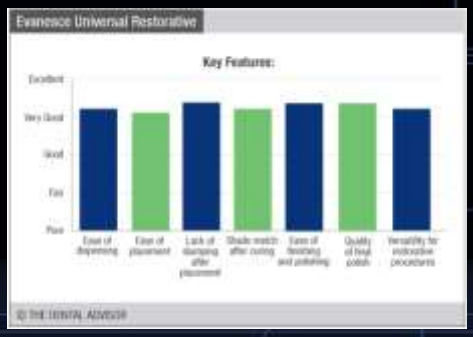
The Dental Advisor



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Dentsply Palodent Plus System

-Nickel Titanium sectional rings
-Wedge Guards
-EZ Coat matrices

175

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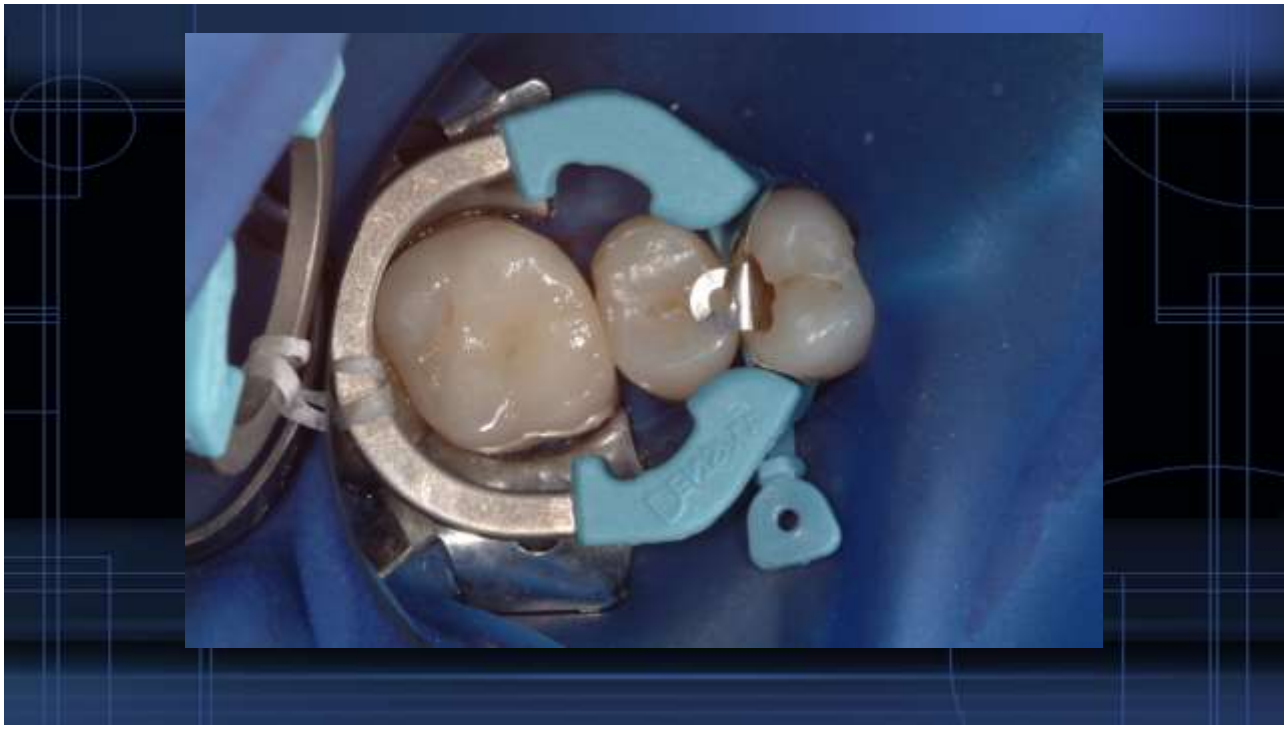

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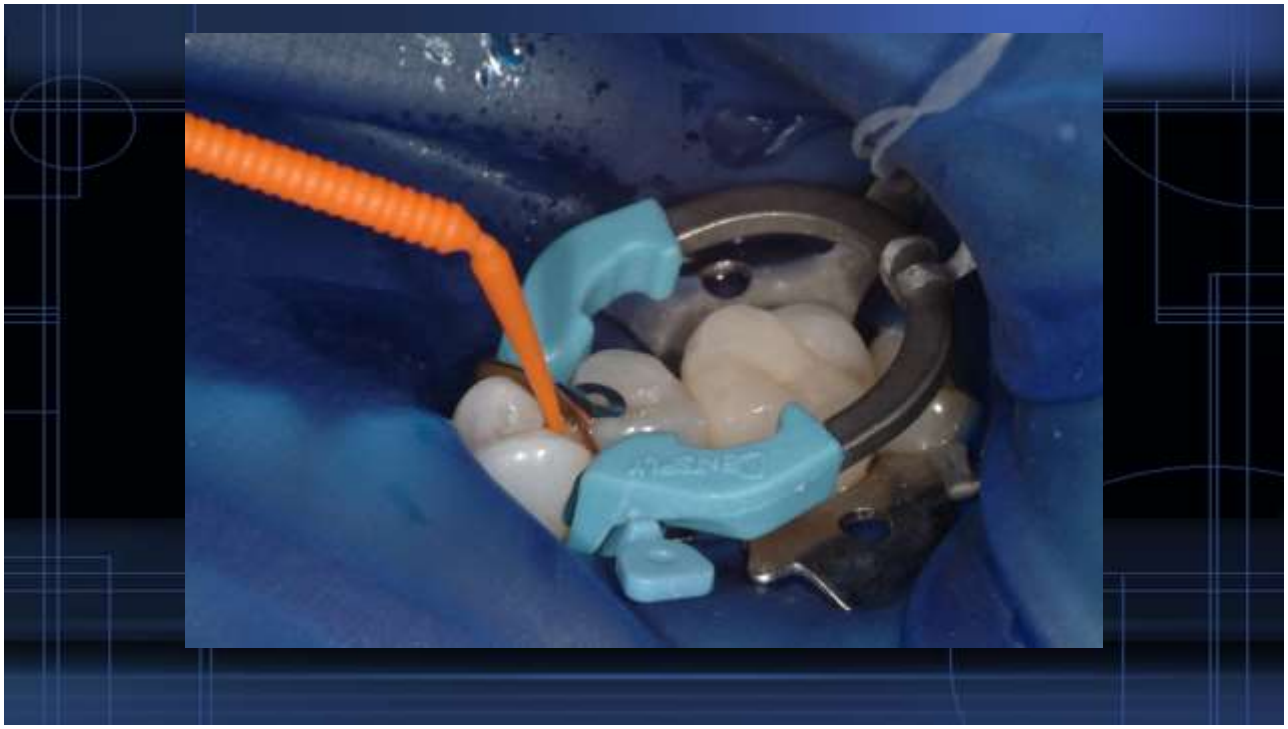
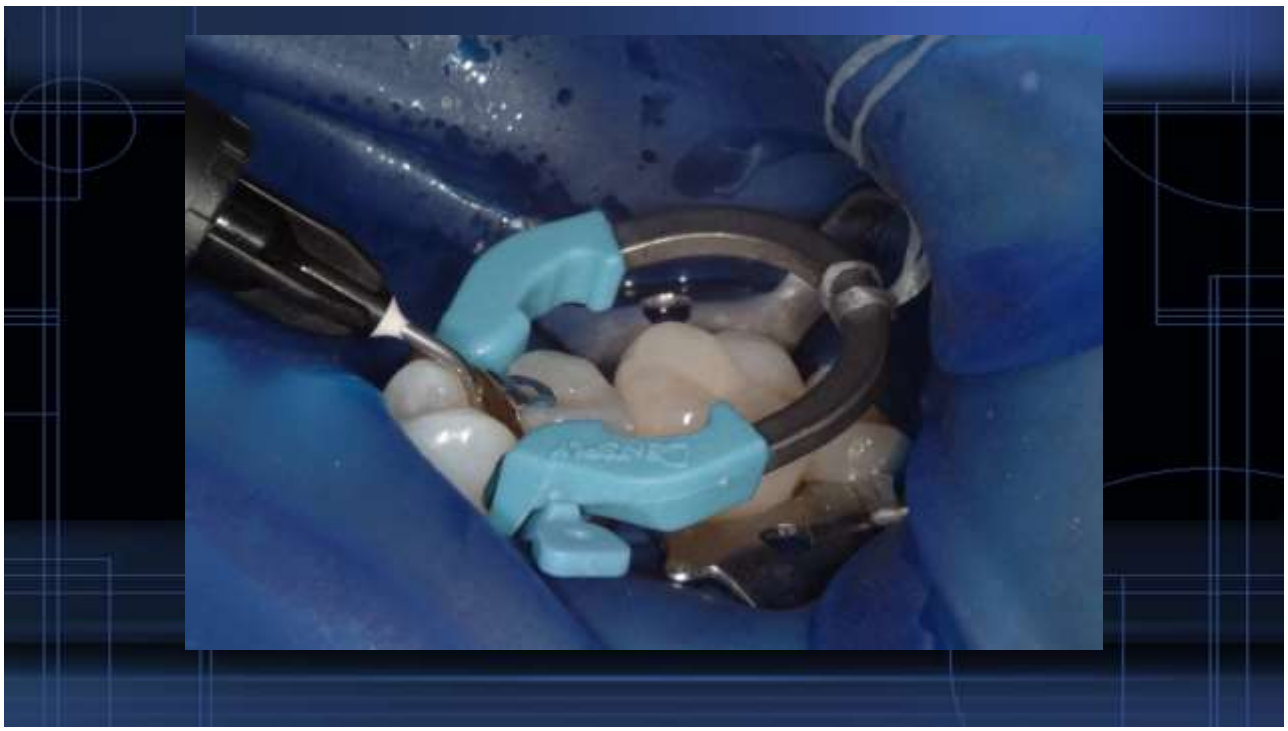


180



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ASAP Polishers (Clinician's Choice)

- A.S.A.P. Pre-Polisher (purple) (44 micron diamond particles) reduces small surface defects, without affecting anatomy, and prepares the surface for a final high gloss polish
- A.S.A.P. Final High Shine Polisher (orange) (3-6 micron diamond particles) to provide a life-like polish in as little as 20 seconds
- Both are autoclavable

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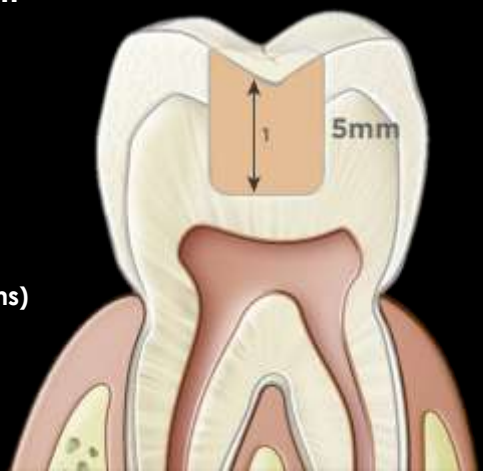
LIGHT CURED BULK FILL COMPOSITES

- Long term research?
  - **Dentin & Enamel Replacement**
    - **Requires one layer**
    - **1.6%-2.4% vol. shrinkage**
    - **2.3-2.8mpa shrinkage stress**
  - **Bonding agent**
    - **(2 bottle highly filled system)**
  - **Self Cured BulkFill**
    - **Danville Materials (Zest Dental Solutions)**
    - **Coltene**
    - **Pulpdent**
    - **Parkell**



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BULK FILL COMPOSITES

- Fastest growing dental material category in North America.
- Convenient, Time Savings
- Reduced polymerization shrinkage
- Depth of cure
- Flow or adaptability
- Physical properties
- Wear
- Esthetics

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BULK-FILL RESEARCH

- August 2017 American Journal of Dentistry
- https://www.researchgate.net/publication/320065147_Stress_distribution_of_bulk-fill_resin_composite_in_class_II_restorations
- December 2016 American Journal of Dentistry
- https://www.researchgate.net/publication/316645293_The_new_generation_of_conventional_and_bulk-fill_composites_do_not_reduce_the_shrinkage_stress_in_endodontically-treated_molars

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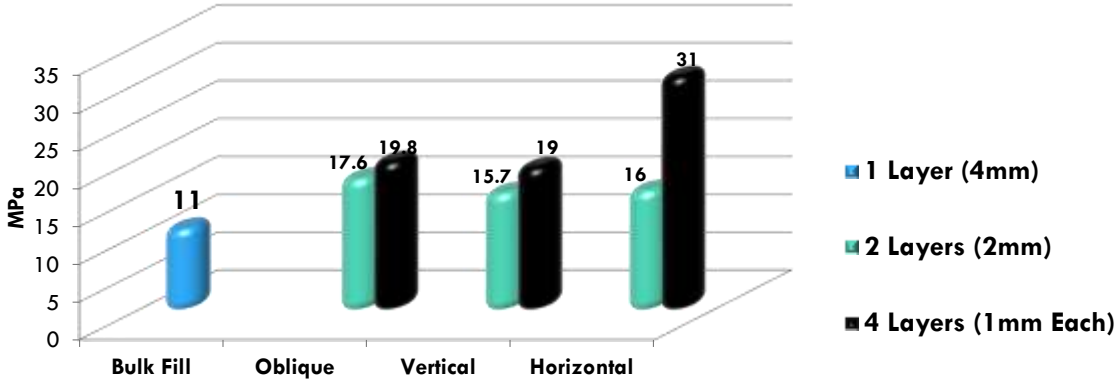
EFFECTS OF COMPOSITE LAYERING ON BOND STRENGTHS



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

190

Operative Dentistry

Today's resin-based composite materials are excellent. The bulk-fill concept is desired by many dentists; however, *CR research shows adequate depth of cure deeper than 3 mm remains questionable for most brands of resin composites and most resin curing lights.* Concepts for making Class II resin-based composites predictable and profitable were published in *Clinicians Report* February 2014.

These CRA research results agree with Dr. Tagami's results on SonicFill. Tagami stated SonicFill cures to only 70% on bottom at 4 or 5mm depth of cure.

191

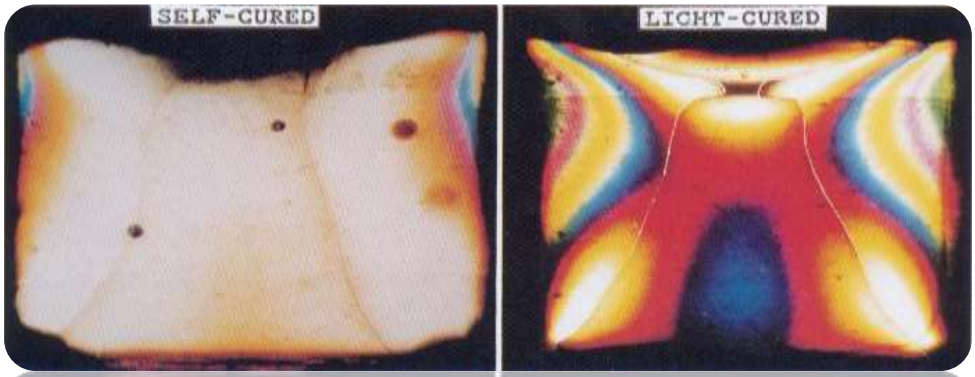
CRA questions the ability for most practitioners to place bulkfill materials properly in addition to getting adequate curing.

Curing bulk fills remains a question

Test your light output and practice with your materials

192

Internal (Polymerization) Stresses of Composites



"A Simple Pain-Free Adhesive Restorative System by Minimal Reduction & Total-Etching (1993)
Takao Fusayma DDS,
Tokyo Medical & Dental University

193

SELF CURE BULKFILL….

- Danville-BulkEZ
- Coltene-Fill-Up!
- Parkelll-HyperFil

Competitive Bulk Fill Composites	Microleakage scores
Bulk fill -- M	2.8 ± 1.3
Bulk fill -- K	2.8 ± 1.1
Bulk fill -- D	2.8 ± 1.6
Bulk EZ™	0.2 ± 0.4

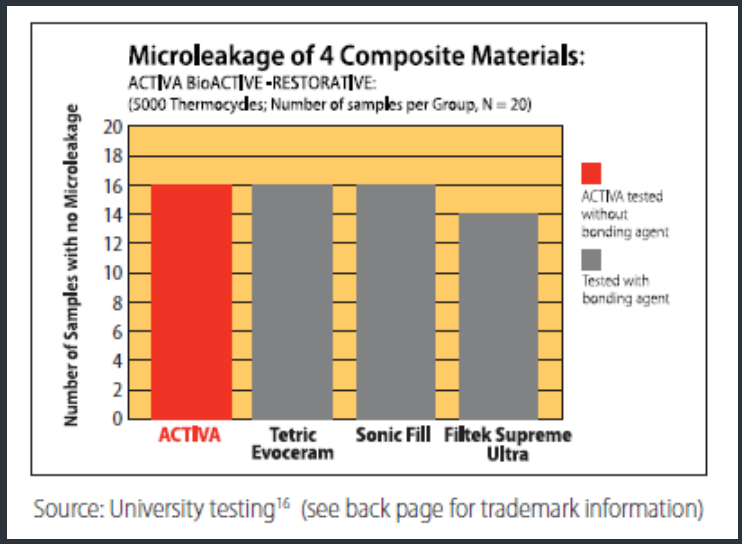
194

Bulkfill Self Cure Material

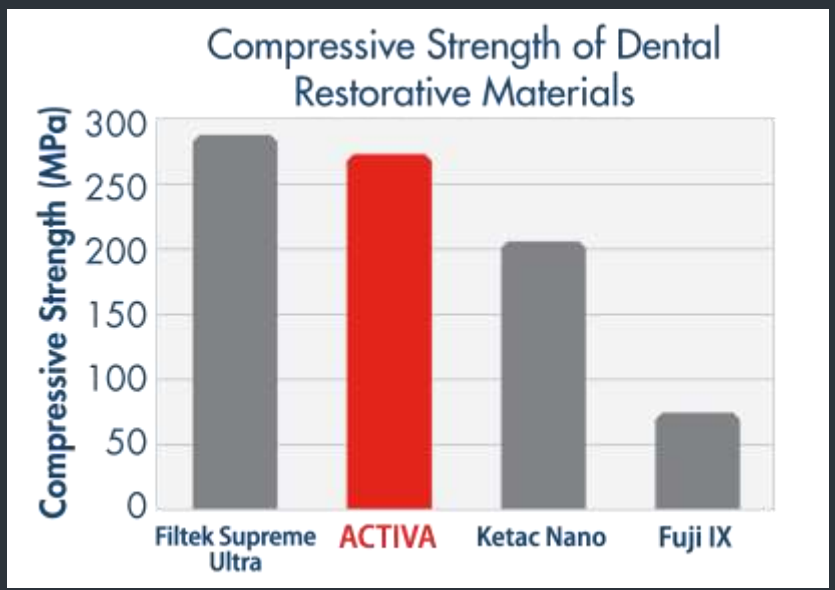
Releases/recharges calcium, phosphate and fluoride
Chemically bonds and seals tooth

195

- No Bonding agent necessary
- No layering bulkfill
- No polymerization stress
- Bioactive
- Bioavailable
- No sensitivity



196



197

6 YEARS LATER

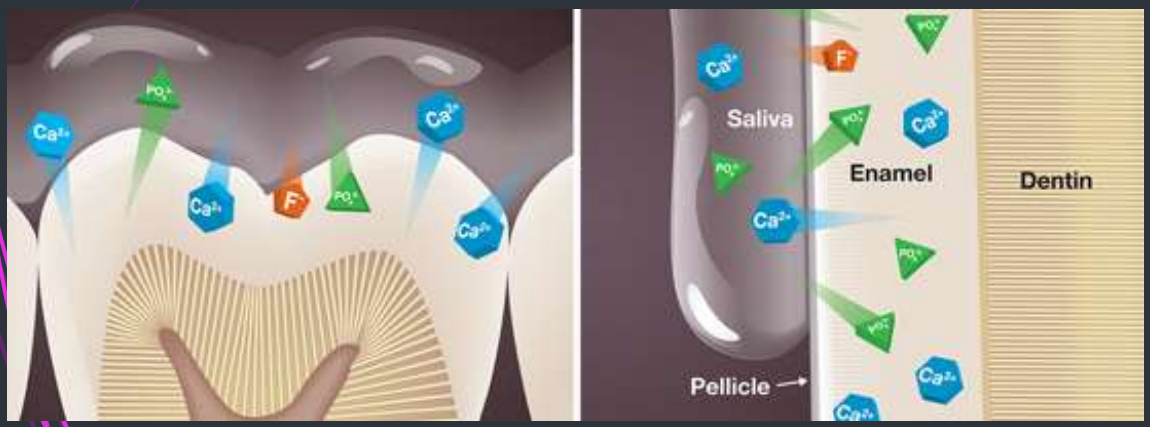
- They see a durable material that is more fracture-resistant than traditional composites. We know this is due to the rubberized-resin molecule in the Activa resin matrix. They report that biofilm does not attach as strongly to Activa and is more easily removed than with traditional composites. The diffusion of ions passes through universal bonding agents and is capable of stimulating mineral formation at the material-tooth interface in the presence of saliva or a saliva substitute. Perhaps the most interesting finding is that Activa inhibits dentinal endogenous proteases (MMPs) and the process that degrades the adhesive hybrid layer and dentin-resin interface. That means it helps prevent the breakdown of the bonding agent and hybrid layer that leads to microleakage, brown lines and restoration failure.

2019 6 Year update

198

199

Tooth Protection & Healing, not just A filling



200

DO Restoration Tooth #29

201

Class V and Class II Tooth #31

ACTIVA™

202

Lots of options
What works best for your practice and skills?
How much time do you have?
Bond Strengths?
Risks and Longevity?

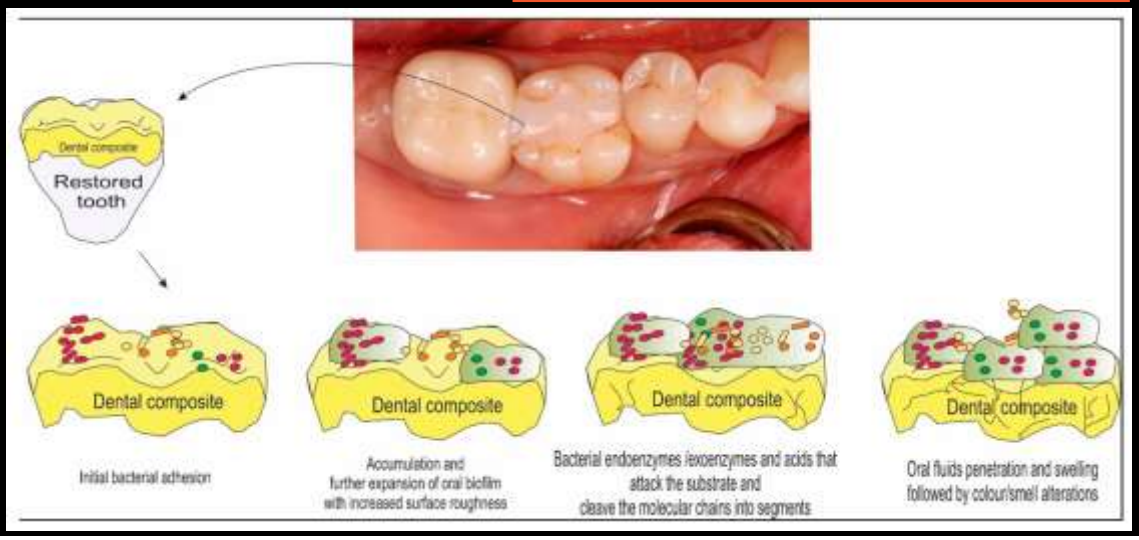
203

How are you restoring

these different preparations

204

ORAL BACTERIA DEGRADATION OF RESIN RESTORATIONS



205

MORE RESEARCH

American Journal of Dentistry Oct 2017

- https://www.researchgate.net/publication/321184952_The_role_of_adhesive_mat
- erials_and_oral_biofilm_in_the_failure_of_adhesive_resin_restorations

206

Why Glass Ionomers?

- Bioactive material
  - affinity to tooth structure. when placing a glass ionomer a weak acid or conditioner is used to aid in releasing calcium and phosphate ions from the tooth structure. These calcium and phosphate ions combine into the surface layer of the glass ionomer and form an intermediate layer called the interdiffusion zone. This bond layer can be very strong and significantly reduce the microleakage that would occur at the margins of the restoration.
- Very good fluoride and ion release helps remineralize tooth structure in the remineralization–demineralization process that naturally occurs in the oral cavity.
- They bond to enamel, dentin, and metals.

207

Why Glass Ionomers?

- They produce good marginal integrity.
- They shrink only one ninth the amount of composite material.
- They are fluoride-rechargeable.
- There are no free monomers in the material.
- The cavity preparation can be bulk-filled, making the materials easy to place.
- They exhibit excellent biocompatibility.

208

(RFA-DE-10-004)
"Tooth-colored resin restorations have an average replacement time of 5.7 years due to secondary caries precipitated by bond failure."

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3148178/

209

Van Meerbeek B, et al. Relationship between bond-strength tests and clinical outcomes. Dent Mater (2009), doi:10.1016/j.dental.2009.11.148

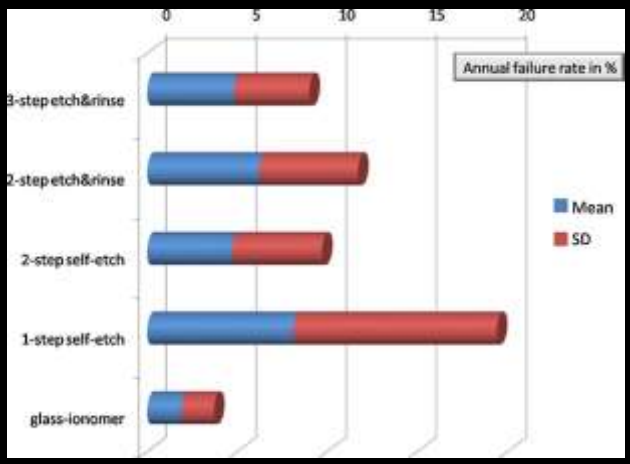
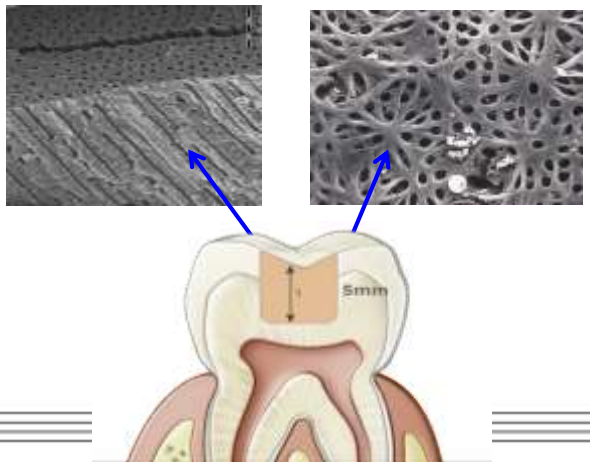


Fig. 15 – Graph representing the mean annual failure rates per adhesive class, determined according to a systematic review of Class-V clinical trials of adhesives during the period 1998–2004 [2].

210

Deep Preparations

- **Bonding Agent & Flowable composite**
- **Conventional Glass Ionomer or GI then Composite**

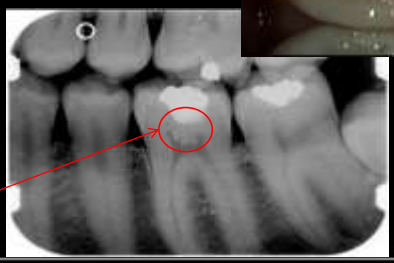


- **Fluoride Release**
- **High compressive strength**
- **Hydrophillic**
- **Insoluble**
- **True chemical adhesion**
- **Minimizes microleakage**
- **No sensitivity**
- **Acid Base Resistant Zone**
- **Decreased gap formation & C Factor**
- **Coefficient thermal expansion similar to dentin**

211

LARGE SIZED LESIONS (>2MM)

- Mostly dentin
- Dentin has more moisture and less substanc
- Open and Closed defects
- Complications & Risks are higher
- Porous, Wet, Dentin Available
- Interproximal concerns
- Increased Occlusal Loading
- Remaining Tooth Structure



Pulpal Proximity

212

GETTING TO THE FINISH LINE... ACCURACY, CONSISTENCY & SPEED

TheraCal™ LC

Resin-Modified Calcium Silicate Pulp Protectant/Liner

Seals & Protects the Pulp:

- For Direct & Indirect Pulp Capping
- Light-curable, Radiopaque Liner
- Significant Calcium Release:
  - Stimulates Hydroxy Apatite & Dentin Bridge Formation.

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GETTING TO THE FINISH LINE... ACCURACY, CONSISTENCY & SPEED
TheraCal™ LC

214


GETTING TO THE FINISH LINE... ACCURACY, CONSISTENCY & SPEED
THERACAL LC (BISCO)
CONVENTIONAL GLASS IONOMER

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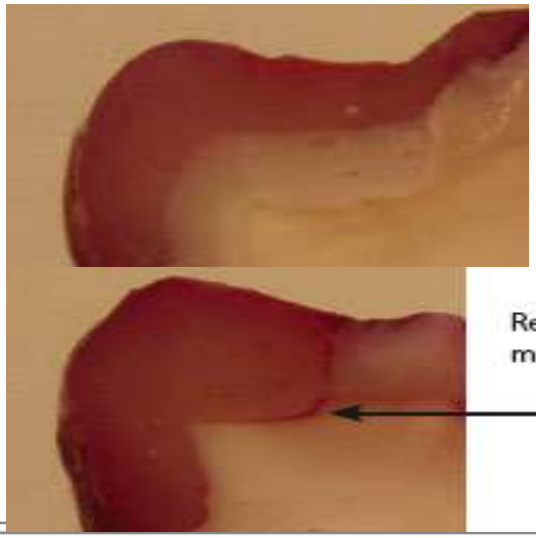
GLASS IONOMER SANDWICH



- Class I, II, III & V posterior restorations
- Open & Closed Sandwich techniques
- Composite replacement
- Amalgam replacement
- High caries risk patients
- Pediatric patients
- Geriatric patients
- Special needs patients
- Long term resistance to microleakage

216

microleakage testing in vitro using three different bases under composites

T. DUONG, L. TRAN, R. PERRY , G. KUGEL, Special Issues of the Journal of Dental Research. ABSTRACT #0366
> Tufts University School of Dental Medicine, Boston, MA, USA.

abstract:

Objective: To compare Class II microleakage in vitro of three different bases placed under composite restorations.

Methods: Thirty-six extracted molars were prepared as Class II MO/DO: 2mm occlusal depth, 2mm axial box depth, 3-5mm gingival box width, and 1mm gingival margin below CEJ. Teeth were randomly divided into three groups of twelve (groups 1-2 = glass ionomer; group 3 = flowable resin): Group 1-Riva Light Cure GI (SDI), Group 2-Riva Self Cure GI (SDI), Group 3-Esthet-X Flow (DENTSPLY Caulk). All groups were primed with Clearfil SE Bond Primer and Bond (Kuraray). All samples were then restored using ICE nano-hybrid Composite (SDI), finished and polished. Restorations were thermocycled for 300 cycles between 5°C and 55°C with a dwell of 30 seconds and then placed in 0.5% aqueous basic fuchsin dye for 24 hours at 37°C. Samples were sectioned mesiodistally and scored independently by two evaluators for microleakage at the occlusal-cavo and proximal-cavo surfaces under a 40x stereomicroscope.
Dye penetration was evaluated using a scoring system:
0 = no penetration, 1 = penetration in enamel/cementum, 2 = penetration at the axial wall, 3 = penetration beyond the axial wall.

Results: A Kruskal-Wallis test revealed no statistically significant difference in microleakage between the three groups at the occlusal-cavo surface ($p>0.05$). Group 3 was found statistically different at the proximal-cavo surface. Group 3 yielded the most microleakage at both interfaces while Group 2 showed no axial wall penetration at either interface.

Conclusion: Both light-cured and self-cured glass ionomers were more resistant to microleakage than a flowable resin on both occlusal-cavo and proximal-cavo surfaces.

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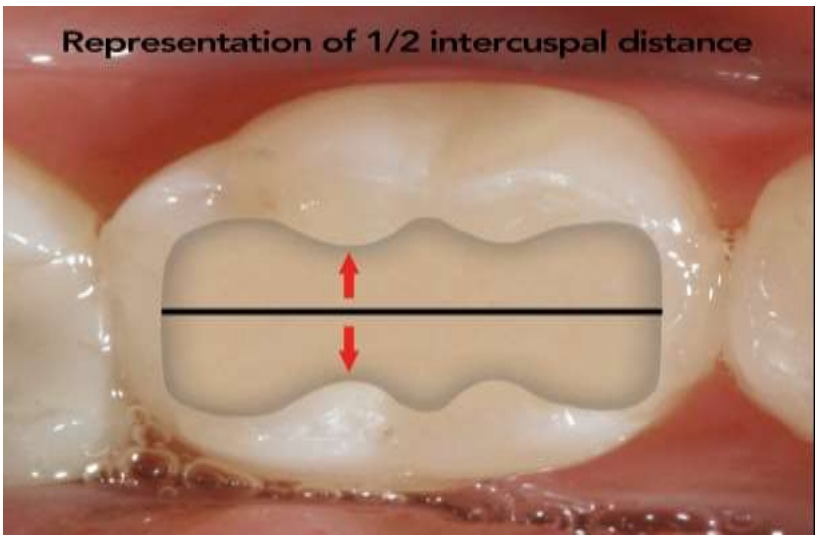
GLASS IONOMER MATERIALS

- Dentsply-ChemFil Rock Restorative
- SDI-Riva LC, light cure HV, Riva SC, self cure HV
- G.C. America-Fuji II LC, Equia Fil (Fuji IX)
- VOCO-Ionolux, Ionofil Molar AC
- 3M/ESPE-Ketac Nano, Photac Fil Quick, Vitremer, Ketac Molar Quick, Ketac Fil Plus
- Shofu- FX II

218



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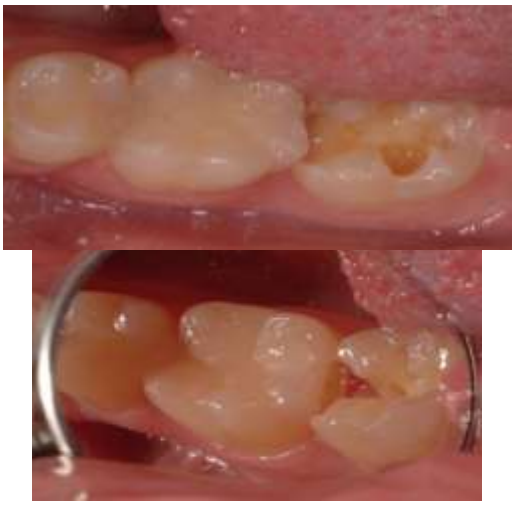
COMPRESSIVE STRENGTHS

- GC EquiaFil Compressive Strength 255mpa
- Equia Forte 280mpa
- Riva SC compressive strength 271mpa
- Chemfil Rock Compressive 200mpa
- Voco Ionolux had higher compressive strength than Equia Fil or Chemfil Rock
- Surefil SDR compressive strength 220mpa
- Dentin 280mpa-297mpa
- Enamel 384mpa
- Grandio SO HF has compressive 417mpa
- Fuji II LC 170mpa (RMGI) Compressive strength

220

GC AMERICA

221



222

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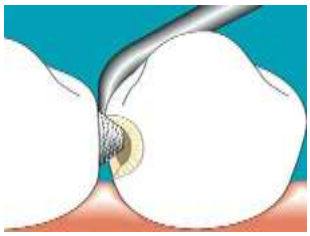
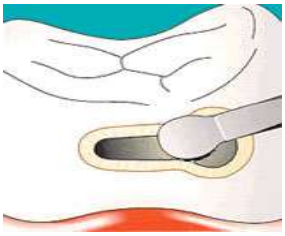
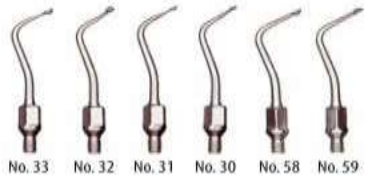
Komet & Kavo



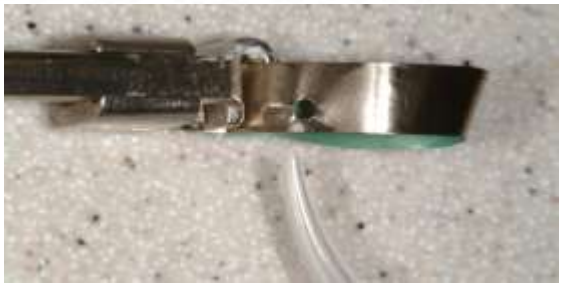




224

Komet SF1LM

225



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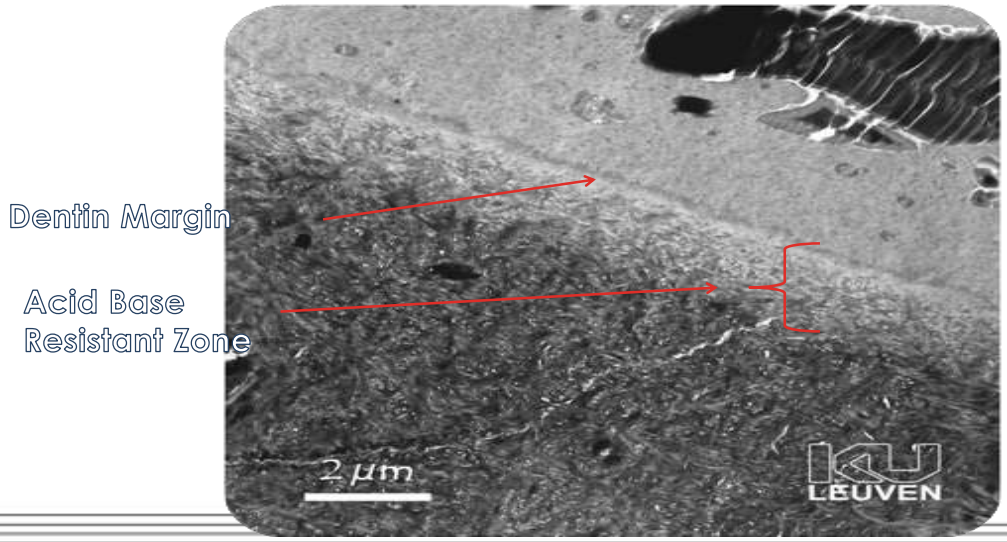
GLASS IONOMER INTERFACE

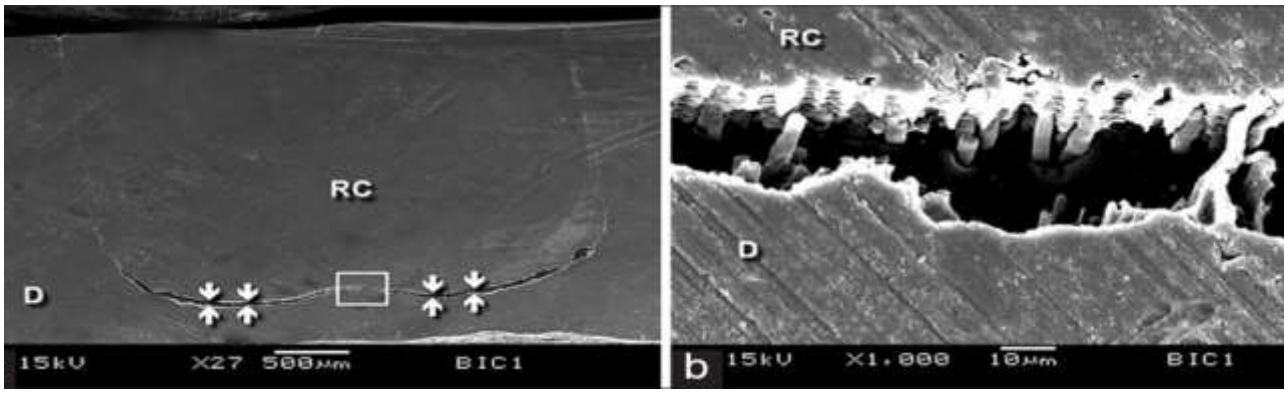


Interface Analysis (TEM)

CARDOSO et al. J Dent 2010

228

RESIN TO DENTIN HYBRID ZONE



229

Glass Ionomer Bulk Fill

230

EQUIA FORTE

EQUIA™ FORTE is a complete system that is an ideal solution for posterior restorations:

- *Class I, II, III and V posterior restorations*
- *Composite replacement*
- *Amalgam replacement*
- *High caries risk patients*
- *Pediatric patients*
- *Geriatric patients*
- *Special needs patients*
- *Buildups*
- *Long term provisionals*

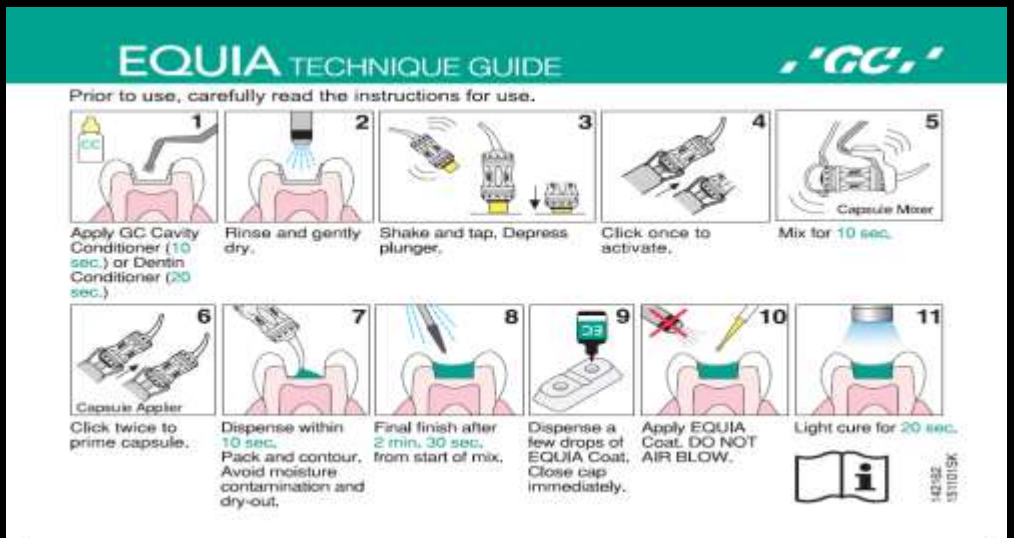
231

EQUIA FORTE

Caries control/quadrant dentistry

(Class II, III, V & core buildup)

232



233

WHAT DOES EQUIA COAT DO?

Fill porosities to increase physical properties of the restoration and offers a much smoother surface…

Some voids are observed

A smooth surface is obtained

234

SDI

235

VOCO

236

ENDODONTIC SANDWICH TECHNIQUE

237

ENDODONTIC SANDWICH TECHNIQUE

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ENDODONTIC SANDWICH TECHNIQUE

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ENDODONTIC SANDWICH TECHNIQUE

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ENDODONTIC SANDWICH TECHNIQUE

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ENDODONTIC SANDWICH TECHNIQUE

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ENDODONTIC SANDWICH TECHNIQUE

243

ENDODONTIC SANDWICH TECHNIQUE

244

ENDODONTIC SANDWICH TECHNIQUE

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Open Sandwich with glass ionomer & nanohybrid composite

246

Glass Ionomer vs. Open Sandwich

247

Glass Ionomer vs. Open Sandwich

- 7 years later.

248

249

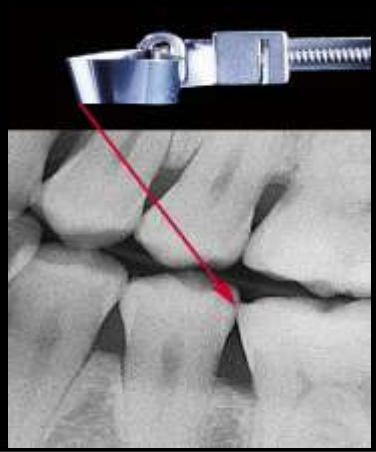
Interproximal concerns & Issues

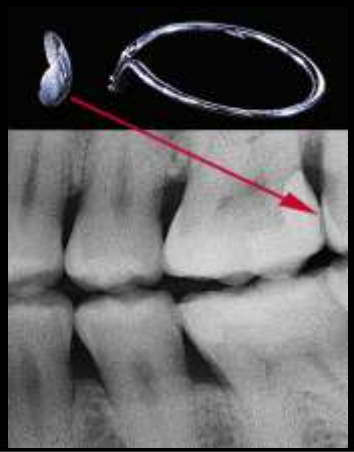
- Voids
- Sensitivity
- Condensing
- Shape
- Flash
- Contact
  - Position
  - Tightness

250

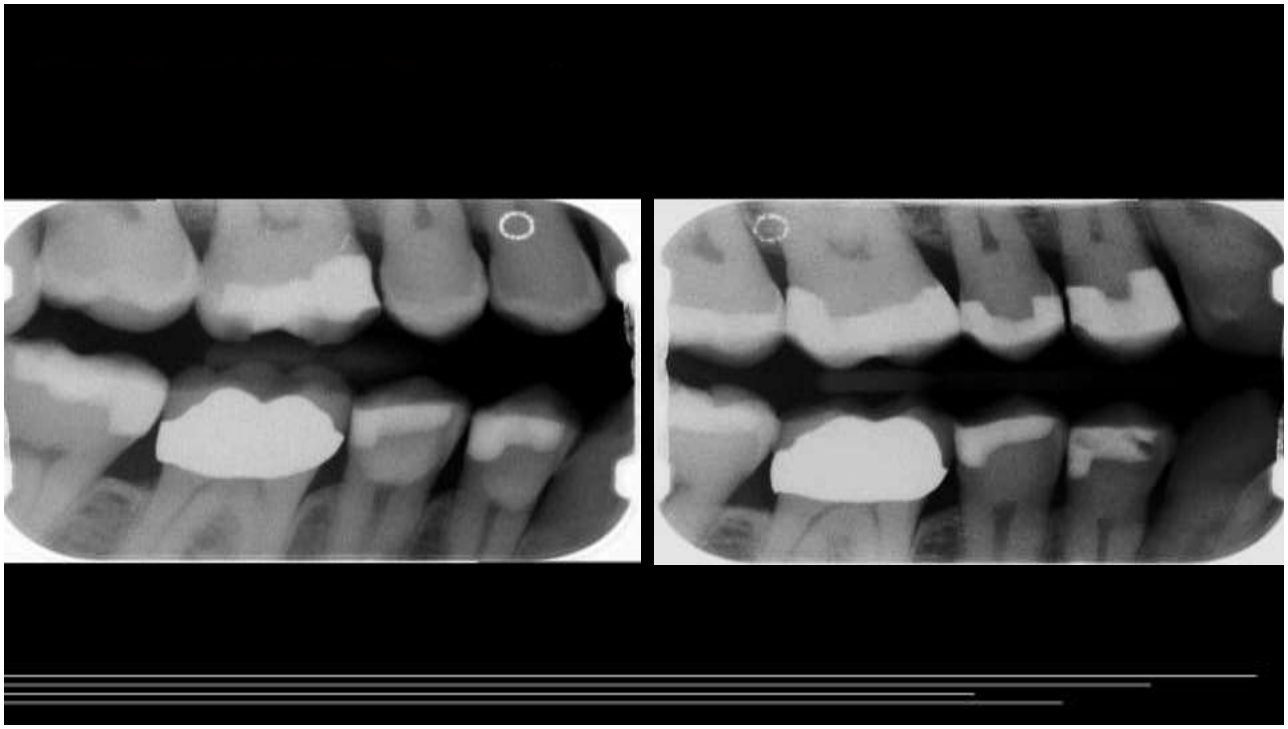
Problem & Solution

Tofflemire vs. Sectional Matrices





251



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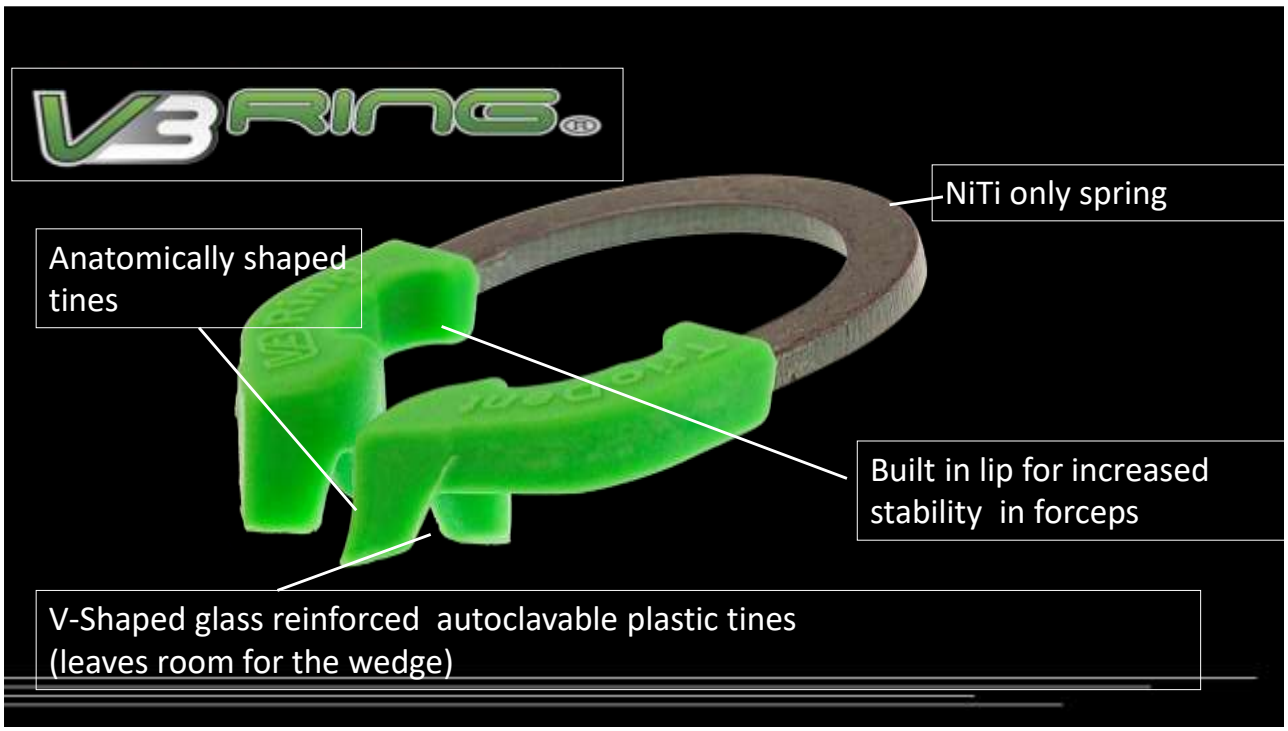
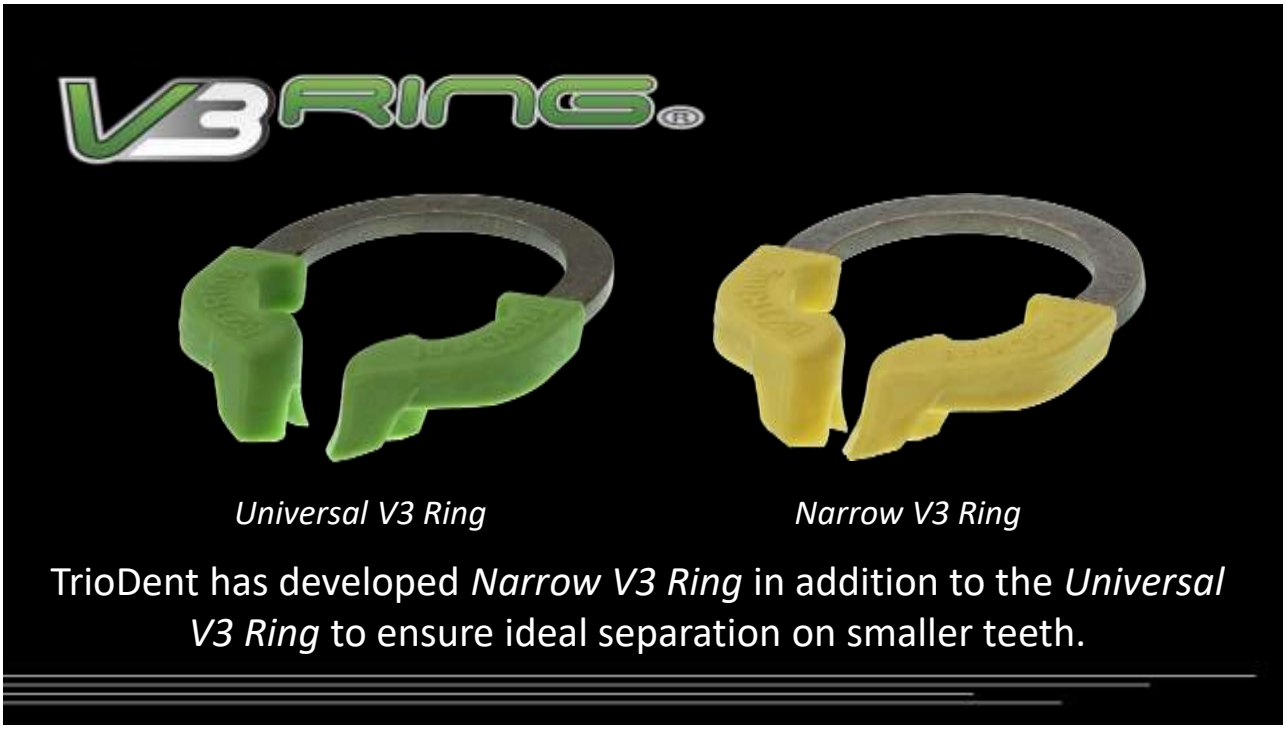

V3 RING
NiTi only spring
Anatomically shaped tines
Built in lip for increased stability in forceps
V-Shaped glass reinforced autoclavable plastic tines (leaves room for the wedge)

253



254

Note how the anatomical shape of the V3 Ring matches the lingual contour of the molar while engaging the gingival undercut

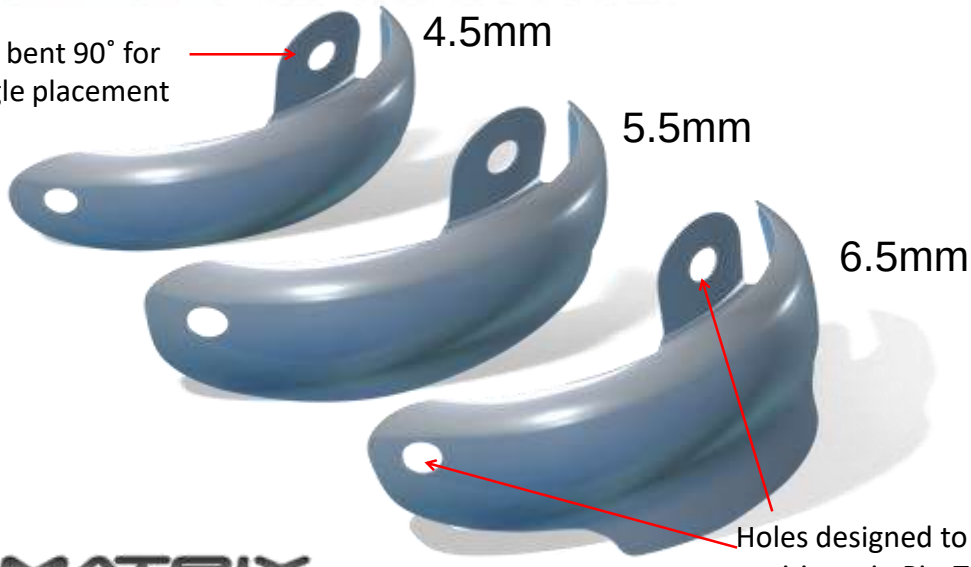
255

Wave Wedge

Hole to fit with positive grip Pin-Tweezers

Inter-proximal contour for a better gingival seal and V-shaped concavity to protect the papillae

256



257

by TrioDent

258

by TrioDent

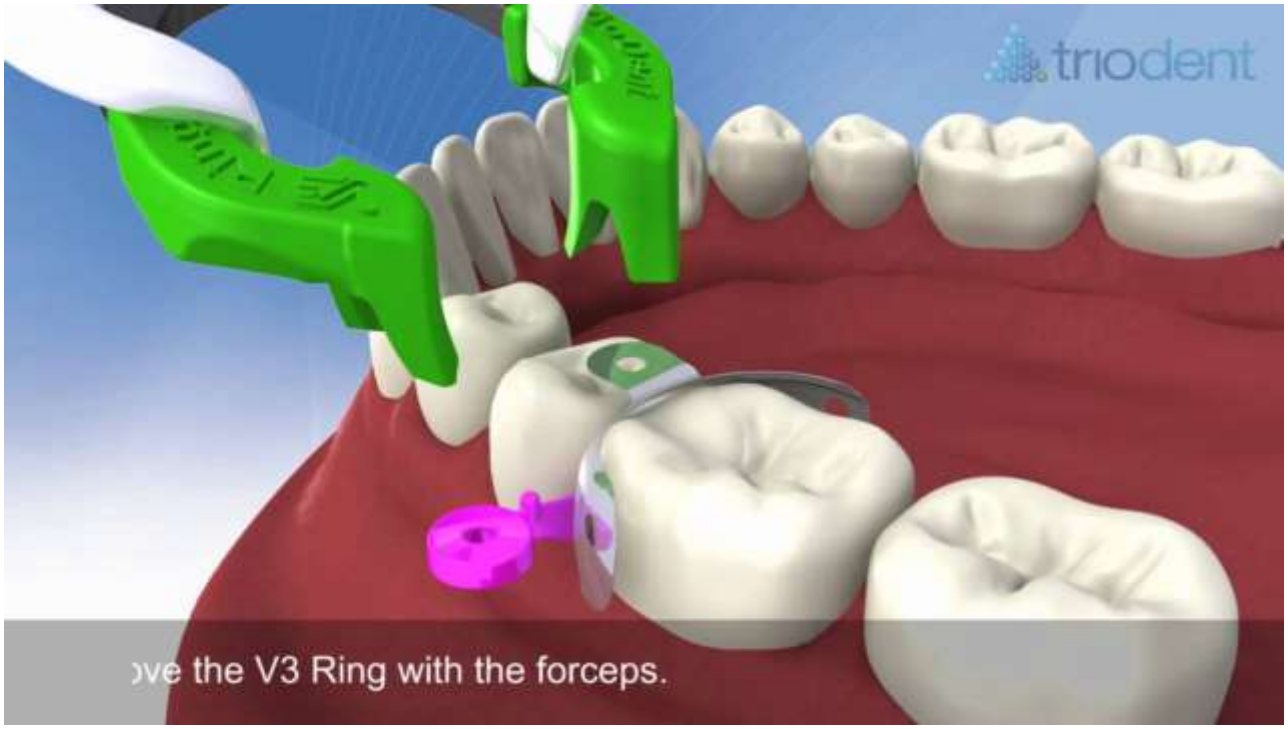
259

by TrioDent

260

by TrioDent

261



262

triodent

263

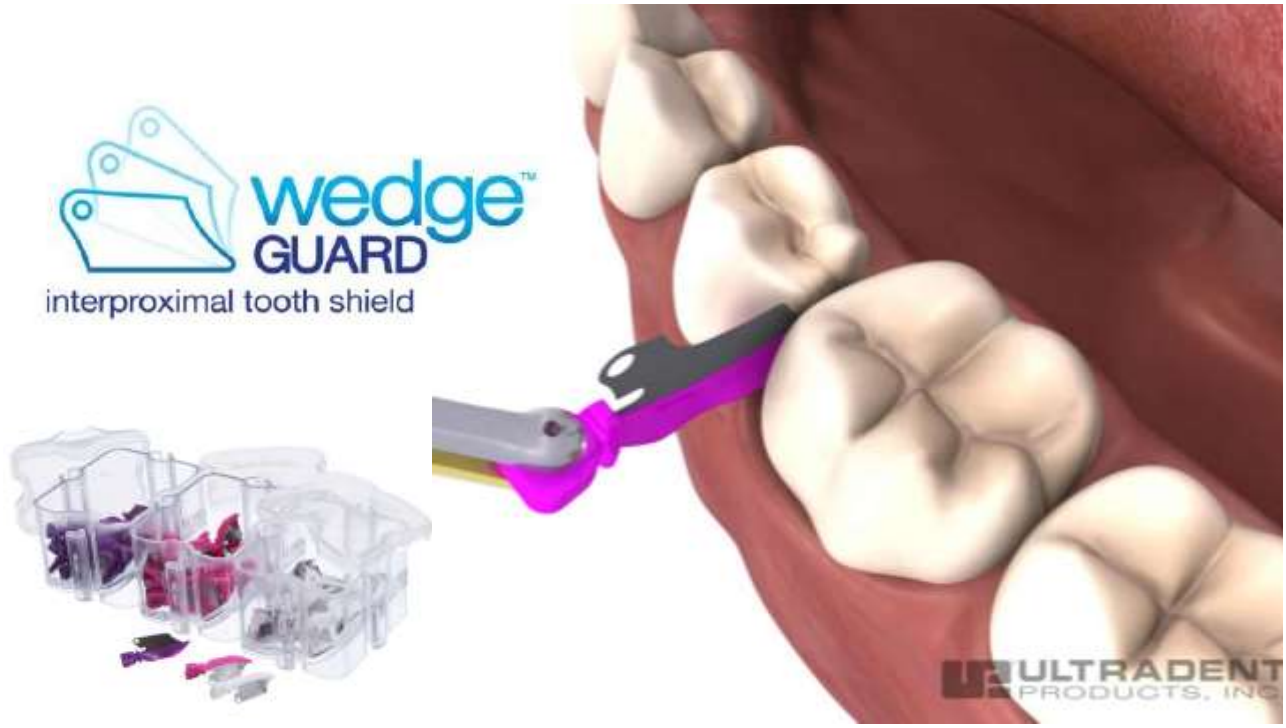
264

SuperCurve

Super snug, non-stick

- Micro-thin – 35-38µ (0.0014”)
- Color-coded for easy recognition and re-ordering
- Matrix very stable after placement
- Less risk of catching matrix wings during ring placement, especially with a back-to-back MO/DO

265


wedge™
GUARD
interproximal tooth shield
ULTRADENT
PRODUCTS, INC.

266

267

268

Palodent Plus-Dentsply

Identical except for color

269

Clinician's Choice

270

271

272

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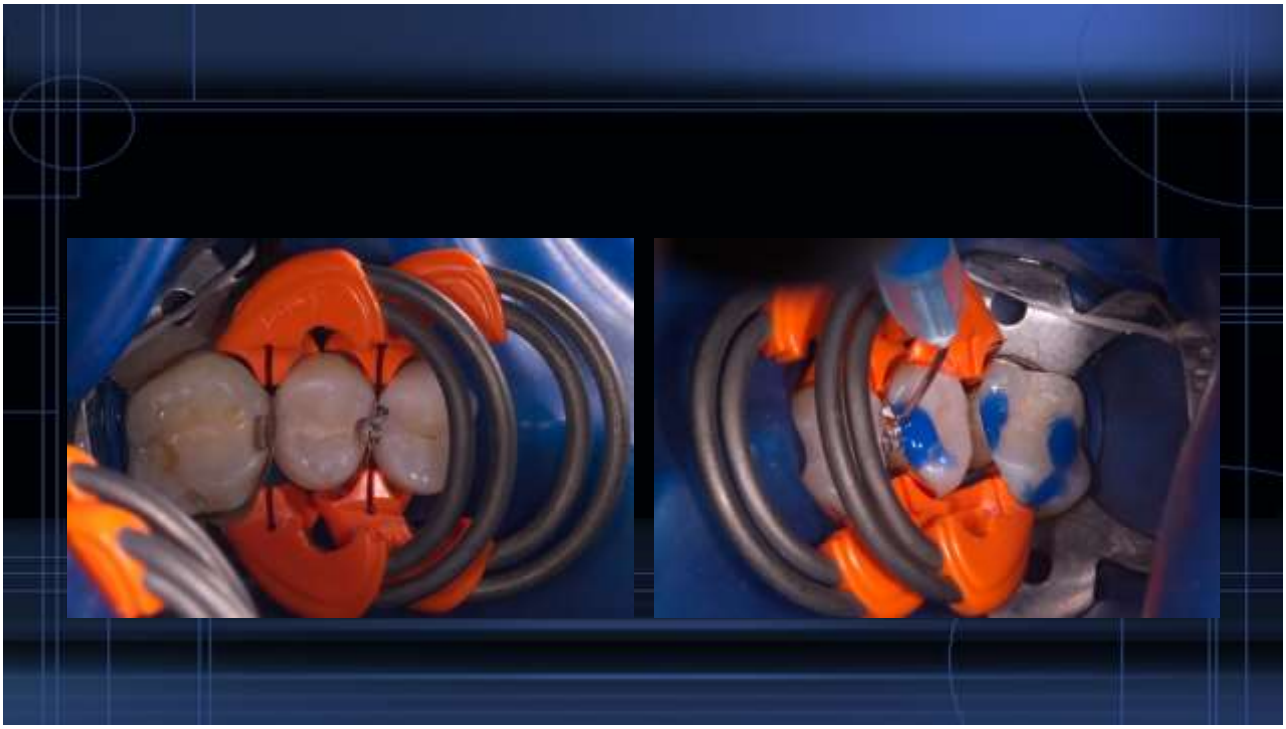

274

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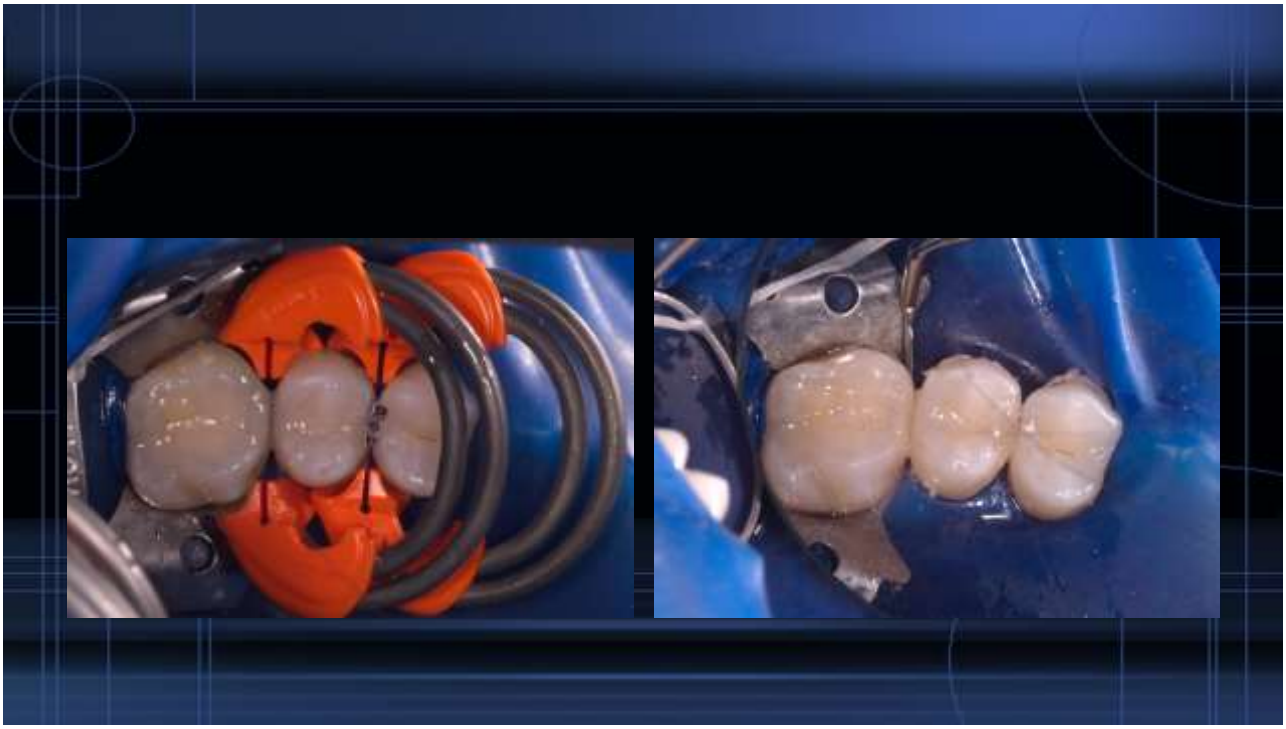
Evanesce™ flow
flowable restorative

276

nano-enhanced
Evanesce™
universal restorative

277



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Composite Ninja

280

Composite Ninja

281

Composite Ninja


282


283

Garrison Dental 3D Ring System

284

285

286

287

VOIP System Integrates with your Practice Management Software

288

289

Weave Mobile App

-Same functionality

-From anywhere you have a wifi or cell connection.

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REVIEW

Kavo CariVu –Diagnostic System

Quantum Technologies'- Canary System

-Pulpdent's Activa BioActive Self Curing Bulkfill Composite

-Troll Dental's Troll Foil

-Weave's Creative Super Software to Create & Grow Business

-Clinical Research Dental- VALO curing light, Evanesce Composite, Ninja

-GC America- Equia Forte

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TODD SNYDER

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