



Fast, Furious and Fabulous Direct Posterior Composites

**Jeff T. Blank, DMD
Private Practice
Rock Hill, South Carolina**

**The contents of this manual are the exclusive right of Jeff T. Blank, DMD and
New Millennium Education. Publication, distribution, or duplication of this
material is prohibited.**

1. Indications for Direct Posterior Composites:

- a. Patient desires an esthetic alternative to amalgam
- b. Patient desires and mercury free restoration
- c. History of low caries and good oral hygiene
- d. Conservative class I, class II, class V restorations
- e. High probability of all margins will be in enamel and supragingival
- f. Able to adequately obtain moisture control, preferably with a rubber dam

2. “Clinical presentations of stress distribution in teeth and the significance in operative dentistry.” Milicich, G. Rainy JT. *Pract Periodontics Aesthet Dent*. 2000 Sep;12(7):695-700

- a. GV Black Class II preparations destroy the natural stress distribution within teeth (mainly the “peripheral rim”)
- b. Combined with rigid amalgam, stress is now propagated internally rather than externally
- c. Interproximal crack propagation occurs
- d. “Prepare a GV Black occlusal amalgam prep...get an MOD.”

3. Anecdotal additions:

- a. Increasing the esthetic awareness of posterior teeth increases the patient’s awareness of anterior esthetic issues
- b. Automatically increases the quality of care delivered by the practice because direct composites should NOT be used to rebuild badly broken down teeth.
- c. Clearly demarcates the segmentation of direct fillings, indirect inlays and onlays, and full coverage restorations
- d. “Doctor, can’t you just fill it?”
 - i. Fillings fill holes. Crowns, inlays and onlays repair badly broken down teeth.”

4. Direct Composites on Cementum Leak Like Sieves

- a. Shu-Fen C, Ying-Tai J, et al. Effects of lining materials on microleakage and internal voids of class II resin-based composite restorations. *Am J Dent* 2003; 16(2):84-90
- b. Andersson-wenckert I, van Dijken J, et al. Modified Class II Open Sandwich Restorations: Evaluation of interfacial adaptation and influence of different restorative techniques. *Eur J Oral Sci* 2002; 110: 270-275
- c. Dietrich T, Kraemer M, et al. Influence of dentin conditioning and contamination on the marginal integrity of sandwich class II restorations. *Oper Dent* 2000; 25(5): 401-410
- d. Dietrich T, Kraemer M, et al. Marginal Integrity of large compomer class II restorations with cervical margins in dentine. *J Dent* 2000; 28(6): 399-405.
- e. Aboush Y, Torabzadeh H. Clinical performance of Class II restorations in which resin composite is laminated over RRGI. *Oper Dent* 2000; 25(5): 367-373.
- f. Malmstrom H, Schlueter M, et al. Effect of thickness of flowable resins on marginal leakage in class II composite restorations. *Oper Dent* 2002; 27(4): 373-380.
- g. Santini A, Plasschaert A, Mitchell S. Effect of composite resin placement techniques on the microleakage of two self-etching dentin bonding agents. *Am J Dent* 2001; 14(June): 132-136.

5. Preparation Guidelines for Direct Posterior Composites

- a. Suspicious fissures full of organic debris should be debrided and sealed

6. The “Preventative Restoration”

- a. Fluoride uptake is mineral dependent. Enamel is more mineralized than dentin therefore more ion exchange occurs during development. Enamel is therefore

more resistant to decay than dentin, and small breaches in enamel may lead to blunderbuss cavitations within dentin upon access.

- b. Recommend using Total Etch, single-bottled primer/adhesive products (not self-etching systems due to reduced enamel bond strengths)
 - i. **Prime & Bond NT – Dentsply/Caulk,**
 - ii. **One Step – Bisco**
 - iii. **Gluma Comfort Bond – Heraeus**
 - iv. **Single Bond – 3M**
- c. **Kavo Diagnodent** (Kavo) – uses spectral emission resonance to detect “iceberg” cavities based on a numerical scale.
- d. **Caries Disclosing Dye (CDD)** – D & C dye in an aqueous base
 - i. **Seek** – Ultradent
 - ii. **Sable** – Ultradent
- e. **Fissurotomy Burs** (SS White)
- f. **Premiere Two Striper** Flame Shaped Diamonds
- g. **Flowable Composites**
 - i. Recommend using only 20 gauge needle tips to control application
 - 1. **TPH3 Flowable** – Dentsply/Caulk
 - 2. **Esthet-X Flowable** – Dentsply/Caulk
 - 3. **Venus Flow** – Heraeus
 - 4. **Artiste Flow** – Pentron
 - 5. **Flow-It** – Pentron

7. “Bonding in Sealants”

- a. Salivary contamination during sealant placement is common
- b. 1 second exposure of saliva creates a layer that closes many of the pores created by etching
- c. Bond strengths are reduced 50-100% due to this contamination
- d. Primer/Adhesive systems with solvents such as acetone and ethanol are effective at reducing residual moisture in fissures, and increase enamel bond strengths when contaminated by saliva
- e. Hebling J, Feigal R. Use of one-bottle adhesives as an intermediate bonding layer to reduce sealant microleakage on saliva contaminated enamel. *J Am Dent* 2000; 13(4): 187-191.

8. Protective “Bases” for direct posterior

- a. Dentinal tubules become wider and closer together as preparations approach the pulp.
- b. The literature supports using “**hybridization**” in indirect and direct pulp capping with either TE or SE adhesives (Kanca, Cox and others) but is disputed by others (Pamejier and others). Secondary dentin bridge formation through hybridization is well documented.
 - i. However, it is imperative that if a TE adhesive is used, opened tubules must be sealed. Complete polymerization is mandatory. Unset monomers may illicit a pathological response by the pulp.
 - ii. In “deep” situations, SE adhesives may represent a safer option
- c. Protective Bases – Resin Reinforced Glass Ionomers (RRGI’s) – light cured
 - i. **Fugl Lining Cement** – GC America
 - ii. **Vitrebond** – 3M/ESPE

iii. **Ionosit** – DMG Zenith

d. **Direct Pulp Capping**

- i. **Dycal** – (Dentsply) is still supported in direct pulp exposures
- ii. Hemostasis is imperative to assure proper pulp capping
 - 1. Recommend using 35% Hydrogen Peroxide as hemostatic agent and disinfectant
 - 2. **Opalescence Xtra**- Ultradent (gel) on a microbrush to “cauterize” and disinfect the wound area
 - a. Also an excellent hemostatic agent for gingival irritation and crevicular fluid management

9. Bur Block For Composite Placement

- a. **Composite Preparation and Finishing per Jeff T. Blank, DMD - Axis**

10. Class I and II Preparations for Direct Posterior Composites

- a. GV Black amalgam preparations designs are not necessary for properly bonded DPC's
- b. Box Preps – Used for incipient – moderate interproximal lesions
 - i. No “extension for prevention”
 - ii. No extension into the “self-cleansing” area necessary
 - iii. The extent of “breaking contact” is dictated by the matrix system selected. If you don't cut it away, you don't have to replace it.
 - iv. Author anecdotally recommends retentive grooves not at the expense of the axial wall for resistance form when occlusion exists on marginal ridge preoperatively.
 - v. Do not senselessly destroy centric stops unless dictated by decay

11. Beveling Cavosurface Margins

- a. Goal is to remove unsupported enamel prisms and expose the ends of the enamel rods for maximum adhesion to resist polymerization stress of the composite
- b. If margin is in the middle 1/3 of the tooth, beveling is NOT indicated
- c. As margin approaches the cusp tip, deep beveling IS indicated
- d. Typically, interproximal walls of small to moderate lesions should be beveled
- e. Bevel the axial floor of the interproximal box only when at least 1mm of supporting enamel remains after the bevel.
- f. “**White Lines**” are caused by both a failure to properly bevel (remove unsupported prisms) and failure to manage polymerization stress during the placement of the composite.
 - i. Enamel prisms are cohesively fractured from the interprismatic substance due to stress of polymerization
 - ii. This leaves an optical disruption (white line) which may contribute to marginal staining or leakage.
- g. Reference: Lecture presentation by Dr. Graeme Milicich, New Zealand (Milicich@wave.co.nz)

12. Managing Polymerization Stress

- a. The process of “polymerization” or hardening of composite is an act of “shrinking”

- b. Carbon double bonds are converted to carbon single bonds by attack of free radicals (photoinitiators like camphorquinone and PPD) – The atomic distance of a single bond is shorter than the atomic distance of a double bond: Polymerization is a chain shortening phenomenon.
- c. Polymerization shrinkage ranges from 1-4% depending on the composite formulation
- d. The greater the volume of composite, the greater the “stress” placed on the adhesive during polymerization.
- e. With most composites, vertical incremental filling in increments of 2 mm is recommended.

13. C-Factor (Cavity Configuration)

- a. Composites DO NOT “shrink toward the light” as once thought.
- b. As composites polymerize, they “shrink” toward the bonded surface and “relaxation” or diffusion of stress occurs on the un-bonded free surface
- c. **C-Factor = # of Bonded Walls/ # of Un-bonded Walls**
- d. Class IV – type cavity preps = 2/4...or a C-Factor of 0.5
- e. Class I “Pothole Preps” = 5/1...or a C-Factor of 5
- f. The higher the C-Factor, the greater the polymerization stress on the bonded walls
 - i. Note: This is why we rarely have post-operative sensitivity (bonds pulled out of tubules) with anterior cavity preparations. Most have low C-Factors
 - ii. Note: The “pit” composite on molars are the most likely to cause sensitivity

14. The “Hydrodynamic Theory” of post-operative sensitivity (Brannstrom)

- a. Open Tubule” theory –Brannstrom
- b. Open, unsealed tubules release the normal vacuum that stabilizes fluid movement
- c. The dentin liquid moves in the dentin tubules in response to stimulus
- d. The stimulus is transmitted via the fluid columns in the tubules to nervous receptors, allocated on the cell body of the odontoblasts.
- e. Interfacial “gaps” in the bonding layer caused by the failure to manage polymerization stress place permit “suction” or “positive pressure” on the fluid columns within dentin tubules
 - i. Fluid movement within the tubules = PAIN
 - 1. Thermal insult
 - 2. Bite stimulation
- f. **The primary causes of post-operative sensitivity (assuming proper use of the adhesive) are:**
 - i. Bulk filling
 - ii. Ignoring C-Factor
 - iii. Rapid light curing??? (Pulse curing is holding ground in the literature, ramp curing is not. However, the role of the speed of light curing is still debated)

15. The “Elastic Wall” Theory (Unterbrink, Meerbeek, Liebenberg, Labella and others)

- a. Using flowable composites as an “elastic buffer” under stiffer hybrid composites may serve reduce the polymerization stress.
- b. Flowable composites are typically “under-filled” versions of their hybrid counterparts (fill % vol = 40-50%....compared to fill % vol of hybrids = 75-85%)
- c. Flowables have a lower elastic modulus than hybrids (more flexible)
- d. Technically, flowable composites shrink “more” than hybrids, but produce less “stress” or strain on the bond.
- e. When used as a “liner” or “base” under hybrids in DPC’s, several things occur:
 - i. Low elastic modulus may buffer polymerization stress of the overlying hybrid
 - ii. Flowables naturally adapt better to the irregular margins we create when prepping DPC’s
 - iii. Curing flowables are less likely to pull adhesive out of the tubules – reducing the chance of hydrodynamic fluid flow – ie post-operative sensitivity.

16. Proper Use of Total Etch and Self Etch Adhesive Systems:

- a. For a detailed handout of this section, please download from my website at:
 - i. www.carolinasmilecenter.com
 - ii. Click on “Seminars”
 - iii. Click on “Handouts”
 - iv. Click on “Blueprints for Esthetics”
 - v. The first section of this handout is entitled “The Basics of Adhesion: An Intimate Connection.” This is where you will find the lecture material.

17. Light Emitting Diodes (LED’s)

- a. Rather than a tungsten filament that physically “burns” (it can also “burn out!”), LED’s create light through the transition of electrons through a semiconductor
- b. Widely used for years in other industries, the “blue” wavelength has become available in the past 5-10 years
- c. Extremely durable, long lasting
- d. Unlike quartz tungsten halogen lights, LED’s emit a very narrow wavelength of light (not as narrow as a laser which is technically 1 specific wavelength).
 - i. The bulk of halogen light emission is in the unusable range of ultraviolet and infrared...or so called “black body radiation” which is useless in curing composites
 - ii. The primary photoinitiator in composites is camphorquinone (CQ). It has a peak absorption of 472 nm. Blue wavelength LED’s produce spectral emissions in a bell curve around this wavelength.
 - iii. A more recent photoinitiator, phenylpropane dion (PPD) is used in some composite systems due to it’s more translucent color than CQ (which is somewhat “yellow”). The peak absorption of PPD is 412 nm.
 1. Therefore, composites utilizing PPD as their photoinitiator will not cure with LED lights

- iv. It is incumbent upon YOU to investigate the photoinitiator system in the composite systems you use.

18. Miscellaneous Light Curing Facts

- a. The farther the distance from the target, the lower the irradiance
- b. Certain light guides actually scatter the light beam away from center
- c. LED's normally don't register the high outputs of halogens on radiometers since radiometers measure total irradiance...ie black body radiation and heat.

19. The “Vertical Incremental or Anatomic Technique” of Layering DPC’s

- a. Flowable Layer (A2)
- b. Body Layer (A2 or A3)
- c. Enamel Layer (GE or YE)



20. Universal Composites for Vertical Increment DPC’s

- a. **Esthet-X**- Dentsply/Caulk
- b. **TPH3**- Dentsply/Caulk
- c. **Tetric EvoCeram** - Ivoclar
- d. **Venus**- Heraeus
- e. **Filtek Supreme** – 3M/ESPE
- f. **4 Seasons** – Ivoclar
- g. **Premise** – SDS/Kerr
- h. **Simile** – Pentron

21. Favorite Vertical Increment Placing Instrument

- a. **Hu-Friedy “Mini 4”** (a small IPC instrument)

22. Creating Interproximal Contacts

- a. **Palodont Sectional Matrix and Bitine Ring** – Dentsply/Caulk
- b. **Composi-Tight Gold** – Garrison Dental Solutions
- c. **Wedge Wands** – Garrison Dental Solutions
- d. **Dryer Pliers** – www.dryerpliers.com
- e. **Tri-Clip** – www.triclip.com
- f. **V-Ring** – www.RodTheIdeaGuy.com
- g. **TriMax** – www.tinmandental.com or dental supplier
- h. **Contact Pro** – CEJDental
- i. **AutoMatrix**- Dentsply/Caulk
- j. **Hawe/Kerr**
- k. **Tofflemeire Matrix** – 0.015 gauge

23. Internal Pit Stain

- a. Placed in uncured translucent enamel
- b. **Kerr Kolor Plus** – Shade Ochre (SDS/Kerr)
- c. #8 Endo file

24. Finishing and Polishing

- a. **Bur Block** – „Composite Preparation and Finishing Kit per Jeff T. Blank, DMD - Axis
- b. **Enhance** – Dentsply/Caulk
- c. **Jiffy Polishing Brushes** – Ultradent
- d. **Biscover** – BisCo

- e. **PDQ- Axis**
 - f. **Brasseler Diacomp** – Brasseler
- 25. Viscous Composite Technique**
- a. While vertical incremental filling is ideal for controlling polymerization stresses... it can be prohibitively time consuming in larger restorations (amalgam replacement)
 - b. Placing highly filled (Viscous... “packable”) products in horizontal increments permits a more rapid filling option
 - c. The viscous composite can be used as a “dentin replacement” material, or to fill the entire cavity
 - d. Should be used with a flowable composite “liner” to reduce the likelihood of voids due to increased viscosity
 - e. Should be limited to 1-2 mm horizontal increments – with each layer light cured to manufacturer’s specifications
- 26. Favorite “Dentin Replacement” Composites for the VCT:**
- a. **Surefil** – Dentsply/Caulk
 - b. **Alert- Pentron**
 - c. **Prodigy Packable** – Kerr
 - d. **Quixx- Dentsply/Caulk**
- 27. Overview of VCT**
- a. **Place a flowable liner**
 - b. **Select “A” shade**
 - c. **Place viscous composite in 1-2 mm horizontal increments**
 - d. **Cure each increment for 20 seconds (depends on light – check specs with each light)**
 - e. **Stop at DEJ**
 - f. **Place final layer of tinted translucent enamel in increments defined by remaining tooth structure – light cure**

Dr. Jeff Blank can be reached at jblank@comporium.net or by phone at (803) 327-3240