KNOW THE CHEMISTRY YOU HOLD IN YOUR HANDS

TOTALLY BONDING

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DO:

KNOW YOUR BONDING SYSTEMS

Bonding resin systems are categorized by "Generations". Knowing the generation of the systems will help you better understand the steps to creating an unsurpassed hybrid layer. It is important to understand that not all systems, even though the same generation, are applied the same. The best words of wisdom for the clinician are to **follow the manufacturers recommended instructions.**

4th Generation (3 Steps)

These systems have been used in dentistry the longest and have had the most clinic testing. They have more steps but provide very high bond strengths and predictable hybrid layers which reduce the threat of leakage. The steps for application are as follows.

1.) Etch with phosphoric acid (35 – 38%) 20 seconds
*This is a conditioner or cleanser which removes smear layer completely and opens the dentinal tubiles and prepares the enamel
2.) Rinse and lightly air dry removing all signs of surface moisture without desiccating the tooth structure
3.) Prime

*This step is usually 2 liquids mixed together in a well and placed with applicator over the whole preparation and margins. Check how many applications are recommended by the manufacturer
*Recommended not to dispense until ready to use

4.) Air thin slowly and lightly to evaporate the solvent carrier

5.) Apply the bonding resin

*Completely cover prep and margin

6.) Air thin with light even pressure

7.) Cure for 20 seconds or whatever amount of time is recommended

You are now ready to fill the preparation with composite, cure and finish

DO:

*Store in a cool dry place

*Use plenty of primer and place until shiny and use equal amounts of "A" and "B"

*Place primers and bonding agent well over the margins, same for the etch

DON'T:

Place primers out into mixing well until ready to use (volatile properties will evaporate)

Over order product and pay attention to the shelf life / refrigerate if possible

5th Generation (2 Steps)

In 1997 the cosmetic trend started moving ahead in full gear. Dentists were getting very busy and requested something to make the bonding step go faster

and easier. 5th generation bond resins were introduced and bonding steps would be changed forever. Let's review the steps.

1.) Etch with phosphoric acid
2.) Rinse and lightly air dry / do not desiccate
3.) Apply bonding resin which now contains the primers
4.) Air thin (also evaporates carriers)
5.) Cure

Solvent carriers can be ethyl alcohol, acetone, and sometimes water

Why are they important and what should you know about them?

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Along with the faster new chemistry of the 5th generation bonding systems come **sensitivity.** Why? What are we doing wrong? What do we need to be aware of if sensitivity is an issue? How can we prevent this?

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DO:

Always use fresh product and store in cool dry place, refrigerate if possible

Slowly air thin the bonding agent to allow for proper evaporation of solvent carriers…start with light psi and then increase slightly

Throw away bonding resin when it becomes thick and yellow (no more than 3 months)

Keep preparation as moist as possible. Primers are hydrophilic and need to have water to chase to pull the resin into the dentinal tubiles

Use a wetting agent such as Consepsis™ to moisten the prep if over dried

Follow manufacturers recommendations for applications, pay attention to time and if repeating is necessary

DON'T:

Use a wetting agent that contains surfactants and detergents

Blast with air when thinning

Over dry (desiccate) the tooth

6th Generation (2 Steps)

The year 2000 brought us the newest bonding chemistry…no more phosphoric acid on the tooth. Instead it was incorporated in with the primers, hence the name "self-etching" primers. Even though it is a new generation of bonding it still has two steps like the 5th generation resins.

The new 6th generation systems were an instant hit. Doctors struggling with sensitivity love this resin system as their problems were solved.

Self-etching primers are less acidic and do not completely remove the smear layer, which some researchers contribute to the lack of sensitivity. However, does that mean that the bond strengths are lower? Let's review the steps.

1.) Apply self-etching primer (time dependent on manufacturer)
2.) Air thin (should still look shiny or wet)
3.) Apply bonding resin
4.) Air thin
5.) Cure

DO:

Shake bottles before dispensing

Watch the expiration date…keep refrigerated if possible

Keep tooth moist

Allow self-etching primer to sit longer on the enamel than the dentin, and in some cases to strengthen the marginal bond even more, use a phosphoric etch first, rinse and then apply self-etching primer

Recap bottles as soon as product is dispensed

Read and understand manufacturers recommended applications

DON'T:

Over purchase product, the fresher the better

Rush, applied for specified period of time

Blast with air, go slow and then increase and again…don't rush it

7th Generation

The year 2004 brought even more new science to resin bonding, or was it marketing? Are we now a marketing driven profession? Any way we can speed up the procedure and shorten the chair time is great, however if a product doesn't perform and the restoration fails we will have cost ourselves more time and money replacing it. Let's just think about it.

Primers are hydrophilic (they like water)

Resins are hydrophobic (they don't like water)

And don't forget about and etchant, something acidic

I like to think of it as boxers in a ring, beating each other up for their proper place

All of this chemistry in one bottle is questionable. The research is still being done so it may be beneficial to your practice to wait for more information to be provided.

1.) Apply to prep
2.) Air thin

3.) Cure

Let's review the difference in application between two "7th" generation systems

All-In-One™ by Kerr and Bond Force™ by Tokuyama Dental

DO:

Shake, shake, shake!

Read and apply as stated by the manufacturer…don't rush the time when applying

Carefully watch expiration date…use or discard within 30 days

Immediately re-cap after dispensing

Store in a cool dry place, preferably the refrigerator

DON'T:

Over purchase…you want fresh product

Rush the application or shorten application time

Use in a class 4 restoration or in any other prep that is going to have retention issues

8th Generation…UNIVERSAL BONDING SYSTEMS

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Let's quickly discuss photoinitiators

Camphorquinone has a yellow base and has been used for many years to polymerize resins.

With today's new lighter more translucent shades of composite some of the manufacturer's are using a Phenol based (PPD's) photoinitiator which provides a more colorless solution.

DO:

*If you are using a LED curing light, know the wavelength band, especially if you are using a bonding resin with a PPD photoinitiator

*Check halogen curing lights at least weekly to insure proper output

DON'T:

*Assume that all resins are cured by all LED's

LET'S TALK TROUBLESHOOTING

1.) Sensitivity
2.) Marginal leakage
3.) White line at margin in esthetic zone
4.) Dark staining
5.) What product to use
6.) Wavelengths and photoinitiators
7.) All bonding agents are different

LIGHT, CHEMICAL, OR DUAL CURED SYSTEMS

Having difficulty deciding what resin to use when performing something other than routine composite restorations? Let's review.

BisGMA based resin systems are all **light cured systems**

BisGMA resins are all compatible with each other (use different systems together)

1.) Resin bonding systems
2.) Composites
    a.) Flowables
    b.) Sealant materials
    c.) Hybrids, microhybrids, nano-filled

NTG – BisGMA systems are used when light curing is not an option / usually called self cure, chemical cure or dual cure

1.) Post and core
2.) Veneers
3.) Endo fillers and sealers

The NTG-BisGMA systems rely on chemistry to cure but also can be accelerated by using a curing light when light can get to it; usually the coronal portion so the clinician can proceed with prepping for the restoration.

In a veneer situation, the margins can be light cured to harden for finishing, while under the veneer the chemical cure will insure a complete cure as light can not get to it.

<u>Chemical cure, self cure and dual cure systems must be used with their specific bonding resins and primers to achieve the ultimate bond.</u>

1.) A BisGMA adhesive resin, if used with a NTG based luting resin can compromise the margins due to the film thickness of a cured layer of resin
2.) When using a NTG based resin, the primers are a chemical cure as well and are made specifically to go with that luting resin. No worries about proper setting of the in-direct restoration if this is followed properly

<u>DO:</u>

*Open, read, and review a luting or cementing NTG based system with your doctor/ dental assistant before using it on a patient

*Follow manufacturer's instructions for usage and delivery

*Keep product in cool dry place…try to keep the primers in the refrigerator

*Watch the expiration date as these systems are not used as often as BisGMA resins

DON'T:

*Mix systems

*Used expired product

*Don't use a light cured system where a chemical cure should be used…your restoration will fail

*Don't assume all systems are the same

Let's review some of the chemical cure procedures

Thank you for attending this adhesive presentation. I hope that you have picked up some good points and tips to follow to lengthen the life of your restorations, which in return will strengthen your practice.

Thank you for attending. If you have any questions, please feel free to contact me at

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