

# Simplifying Implant & Restorative Dentistry

Toronto Crown & Bridge Study Club

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## Lecture Hand-Out Notes:

### Understanding adhesives

#### Total etch vs Self etch

**4<sup>th</sup> generation:** 3 steps: total etch, separate primer placed then adhesive (multi bottle)

Pros: Enamel and dentin etched simultaneously, very good bond strengths to uncut and cut enamel and dentin

Cons: Multiple steps, technique sensitive, moist dentin required for bonding, possibility of over etching dentin with phosphoric acid

**5<sup>th</sup> generation:** 2 step: total etch, primer and adhesive combined into 1 bottle.

Pros: Fewer steps, comparable bond strengths to 4th generation adhesives

Cons: Technique sensitive, moist dentin required for bonding, possibility of over etching dentin with phosphoric acid

No difference bond wise between 4<sup>th</sup> and 5<sup>th</sup> generation adhesives, 5<sup>th</sup> generation less technique sensitive as they are single component.

**6<sup>th</sup> generation:** 2 steps: self etch, primer is acidic so etches as it primes, followed by adhesive.

Pros: Uses a non-rinse acidic monomer to etch and prime the dentin simultaneously, less technique sensitive, excellent dentin bond strength, decreased nanoleakage, less post operative sensitivity

Cons: Longer etch time required for enamel, does not bond well to enamel if not etched well or to unprepared enamel. Lower bond strengths than 4th or 5th generation adhesives.

**7<sup>th</sup> generation:** 1 step: acidic primer is combined with the adhesive.

Pros: Least technique sensitive, less postoperative sensitivity

Cons: A difficult mixture of both hydrophilic and hydrophobic monomers in a highly concentrated solvent, HEMA-free 1 step adhesives are prone to phase separation, produces generally low bond strengths. Lower bond strengths than 4th or 5th generation adhesives.

**8<sup>th</sup> generation:** 1 step: acidic primer is combined with the adhesive but no solvent (acetone or alcohol) is present so dose to dose is consistent from the package.

Pros: Least technique sensitive, less postoperative sensitivity, consistent dose to dose as no solvent to evaporate from the container. More consistent results than 7th generation adhesives. No mixing.

Cons: Lower bond strengths than 4th or 5th generation adhesives.

### Selection of adhesives:

Total etch for veneers and can be used in all other applications

Self etch not to be used with veneers due to lower bond strength than total etch adhesives, can be used for all other applications.

Total-etch technique removes the smear layer and the adhesive penetrates the dentinal tubules.

Self-etch materials require that the smear layer is not removed and the adhesive penetrates through the smear layer fixing it to the underlying dentinal tubules. Removal of the smear layer when using a self-etch adhesive will weaken the bond strength.

How moist should the tooth be before bonding? As the resins are hydrophilic, the dentin should be moist but not wet. Dentin should not have pooled water but be glistening indicating its moist. Bond strengths drop when bonding to dry dentin as collagen fibrils collapse and resin cannot penetrate.

Chlorhexidine (CHX) will not affect bond strength and can be used to disinfect the preparation prior to bonding.

Sodium hypochlorite (NaOCl) and peroxide both will lower bond strength if applied before adhesive application. If these are to be used for disinfection, rinse the preparation with water then air dry to remove excess moisture prior to adhesive application.

## **Self-etch Self-adhesive resin cementation**

Can be used to lute everything except: feldspathic porcelain restorations, veneers (bond strength not high enough).

Ideal for post cementation as it eliminates the need for etching and adhesive use.

Use of the opaque white is recommended for post cementation, as if endo needs retreatment it is easier to identify where the cement is and the dentinal walls are so less chance of perforation.

Less potential sensitivity when luting crowns and inlay/onlay than when total etch adhesives are used.

## **Improving fiber post cementation**

Steps:

- Try in the post to ensure seating to the apical of the post prep before cementation.
- Silanate the post for 30 seconds then air dry.
- Paint adhesive on the post and light cure it.
- Simplify the procedure by luting with a self etch self adhesive resin cement.

Always try in the post prior to luting to ensure that it inserts to depth.

Use of an intracanal tip on the syringe of luting material will allow placement of the luting resin at the apical depth of the post preparation and back filling of the space without air bubble entrapment and a resulting void in the resin.

Always use a dual-cure resin cement when luting posts. Light cure resins may fail to fully cure in the apical of the post due to inaccessibility of the light to these areas.

Fiber posts must be cemented with a resin cement, glass ionomers can not be used as they do not bond to the fiber post.

Silane significantly improves bond strength and is it recommended when luting fiber posts, ceramics and indirect resins. Silane is placed on the restoration in a dappen dish and allowed to sit for 30 seconds then is air dried. Do not rinse the silanated restoration before luting. Silane has no effect on bond strength to metal based restorations or metal posts.

Placement of an adhesive followed by light curing on the posts surface will provide a good surface for the luting resin to bond too.

Tapered posts are better then parallel as they remove less tooth in the apical of the prep and thus don't weaken the tooth. Parallel posts should be reserved for maxillary central incisors, all cuspids, palatal canals of maxillary molars, distal canals of mandibular molars.

If using a total-etch technique for post cementation, it is important to remove the etchant from the post preparation. Check the post preparation with a paper point. If any blue is present on the paper point's tip then etchant remains in the apical of the post preparation and additional rinsing and drying is needed.

Use of a luer lock tip on a high volume suction makes it easier to remove any fluid from the apical of the post preparation.

## **Restorative Ferrule:**

The purpose of a post in an endodontically treated tooth is to retain the core.

A ferrule is the band of natural tooth that the crown contacts at the margin.

Do not rely on the adhesion of the core to the dentin to resist displacement of the crown off the core. A ferrule is needed to resist this displacement and provide long term success.

It is important that when a crown is to be placed on a tooth with a post/core or core buildup that the margin of the preparation extend at least 2mm beyond the most apical termination of the restorative material.

Ferrule is very critical on the maxillary anterior teeth due to the direction load is applied to these teeth when the teeth contact each other. When preparing the lingual ferrule the wall should be parallel to the tooth's long axis to resist tipping of the crown off the preparation.

If you are unable to get 2mm of ferrule on a tooth consider crown lengthening or orthodontic forced eruption to get more natural tooth coronal to the crestal bone.

Always visualize how much tooth will be present after crown preparation before preparing the tooth to determine if a post will be needed or a core buildup will be adequate for an endodontically treated tooth.

If insufficient tooth will remain after crown preparation determine if intentional endodontics will be needed to retain the core and provide form for the crown.

In teeth with multiple canals, consider placement of a post in each canal to “lock” the core to the remaining tooth structure and decrease the chances of the crown being displaced off the tooth with the core in the crown or fracture of the post itself.

Use of pins and pot holes increase retention of the core to the tooth. But always place these inside the dentin-enamel junction so that after crown preparation they are completely surrounded by tooth structure.

Placement of interproximal box preparations can compensate for less than ideal ferrule but should not be relied on in place of adequate ferrule.

## **IMPORTANT:**

Not all materials are used the same way (same steps) know the materials your using and when, how and why they are used.

Read the directions with every product before using them to ensure the proper results.

Do not expect to get the desired results if the directions on how to use the material are not closely followed!

### **Pre-Endodontic Buildups:**

Used when significant coronal tooth is missing or placement of the rubber dam clamp may damage the tooth.

Canal Projectors are tapered plastic cones used on an endo file to allow a core buildup to be fabricated and leave access into the canals.

Steps to use:

1. Identify the canal orifices
2. Place circumferential matrix band around tooth.
3. Place Canal Projector on a #20 hand file and insert into canal. File at this stage does not need to go to working length.
4. Place an adhesive into the prep making sure to coat all dentin surfaces and light cure for 40 seconds
5. Fill core area with a dual-cure resin filling from the bottom up and making sure to inject between Canal Projectors in multi canal teeth. Then light cure for 40 seconds.
6. Allow to finish self-cure mode for 4 minutes.
7. Remove files leaving Canal Projectors in the canals.
8. Remove matrix band
9. Using a diamond reduce the occlusal surface to be out of occlusion with the opposing arch.
10. Place rubber dam
11. Using a size 34 or larger file thread the file into the Canal Projector and tug it from the core.
12. You now have individual access into each canal and Endo tx can proceed

If endo tx is not to be completed at that visit after instrumentation, irrigation, drying the canals and placement of CaOH in the canals, shorten the Canal Projector from the coronal end and reinsert into the canal and seal with Cavit or other temp material. At the next visit, remove the temporary

filling with a large round bur and use a 35 or greater hand file to engage the Canal Projector to remove it.

Available from CJM Engineering <http://www.cjmengineering.com>

### **Implant Cad/Cam bar-dentures and hybrids:**

Impression is the key to accuracy of the finished prosthetics.

Multiple implants: Open tray impressions more accurate than closed tray impressions.

*Verification stents:* Used to verify the accuracy of the impression. Can be done two ways.

*Lab fabricated:* Open tray impression sent to the lab which fabricates a soft tissue model and then fabricates an acrylic verification stent which is returned to the DDS to try intraorally and verify accuracy of the soft tissue model.

*In-office fabricated:* Titanium temporary cylinders placed on the implants intraorally, floss loosely looped between the cylinders and Triad gel is incrementally applied and cured in small segments to minimize polymerization shrinkage. Stent is removed and reinserted to ensure passive fit. If necessary section and relute. The stent is then picked up in an open tray style impression. (Easier method and decreases treatment time)

Impression materials for open tray implant impressions: Light body PVS injected at the gingival and tray filled with putty PVS. After inserting the tray wipe the excess putty away with your finger and make sure all long pins are visible. Hold until set then remove pins and then the impression.

Treatment steps:

1. Denture wax setup approved by patient.
2. Verification stent and open tray impression.
3. Try-in Cad/Cam structure
  - a. Bar-overdenture: try-in bar, verify passive fit with radiographs, try in modified denture wax try-in, verify occlusion.
  - b. Hybrid: try-in frame, verify passive fit with radiographs, verify occlusion.
4. Delivery of final prosthetics
  - a. Bar-overdenture: insert bar and torque fixation screws to manufacturers recommended Ncm. Insert processed overdenture and check retention to the bar. Check and adjust occlusion.
  - b. Hybrid: insert prosthesis and torque fixation screws to manufacturers recommended Ncm. Check and adj occlusion. Place resilient material (ie GP) into bottom of the screw channel over the screw head. Fill access hole with composite and light cure. Check and adj occlusion.

Titanium vs chrome cobalt: Titanium has 1/3 the weight of chrome cobalt. Titanium is the material of choice for cad/cam milled overdenture bars and hybrid frames when resin or denture teeth will be placed on them. If porcelain is to be fired to the frame, then chrome cobalt has fewer issues than titanium. Titanium is more difficult to fire porcelain to as the oxide layer creates a dark tint under the ceramic which does not occur with chrome cobalt.

\*Implant torque wrenches must be recalibrated on a yearly basis to ensure that the Ncm you think your going to is that number. Torque wrenches may over time provide less or more than the value you think it is reading. Send back to the manufacturer of the wrench. If you purchased the wrench from an implant company send back to them for recalibration.

## Mini-Implants

Two basic styles:

- “Ball” head which takes “O” ring.
- Mini ERA attachment

“Ball” head mini implants require more interarch space than mini ERA.

“Ball” head mini implants need to be parallel or stress placed on the implants which could lead to failure and lead to premature wear of the “O” rings. No angle correction available for these implants as they are one piece.

ERA mini implant is one piece in 2.2mm and 3.25mm but also offered in a 3.25 with angled heads in 0, 5, 11 and 17 degrees. These heads are luted into the mini implant after the mini is placed and alignment is corrected between the fixtures in the heads.

Due to the lower profile of the ERA mini and availability of the angle correction parallelism is not critical and can be overcome.

Important with any mini implant retained denture no matter what brand used, that the implants are placed to lie within the confines of the denture. This avoids the possibility of esthetic or structural issues by the part of the attachment showing through the denture. This can be done by duplication of the current denture with a Lang Denture duplicator and alginate using clear acrylic. Pieces of paper clip are luted to the facial at the sites intended and a Panoramic radiograph is taken (preferable). One can then determine if the sites interfere with any anatomical structures. If not then holes drilled through the duplicated denture on a model and verified that they lie over the center of the crest. If the intended sites are contacting anatomical structures then the sites can be moved accordingly before pilot holes drilled in the surgical stent (duplicated denture).

Transfer of the implants to the denture to prepare the receiving wells can be simplified by making a stent. This helps avoid excessive removal of denture acrylic. Using a PVS putty place it into the denture to fabricate a quick model. After setting using a vacuformer and thin material (used for stent for temporary crown fabrication) vacuform over the model. Trim to replicate the shape of the denture. After implant placement carry the stent to the mouth and place over the arch. Using a sharpie marker make a dot over each implant. Remove from mouth and drill holes through the stent. Take back to mouth and make sure the implants fit through the holes when the stent is inserted. Next, place in the denture and using a sharpie mark each site through the holes in the stent to leave a mark on the denture base. Relieve these spots to create receiving wells. Place a piece of dam over each implant to avoid any resin from being forced between the implant and gingival. Place the denture part of the attachment onto each mini implant and try the denture in to make sure that it seats fully without contact with the implant attachments. Fill each receiving well with sufficient resin and insert the denture. Guide patient into occlusion and have them lightly bite. As the patient will be anesthetized they will not have sensation and tend to drift open. Place a finger under the chin to help keep them occluded. After setting remove the denture and trim any excess resin and check denture fit.

Mini vs standard implants for removable or fixed: Always maximize the volume of bone for best more predictable results. If finances are a consideration and improved denture retention is desired mini implants can be used but use a minimum of 5 in the maxilla and 4 in the mandible. More is better.

In the maxillary arch with mini implants always best to retain at least the anterior 2/3 of the palate for better stability. If the patient has not gagging issues maintain the entire palate, if they do have some gagging issues the posterior 1/3 of the palatal coverage can be removed.

Mini implants for fixed applications: Work well for lower incisors and upper lateral incisors when width of bone will not allow a standard fixture to be placed. IMHO placement in premolar and molar areas is a big compromise and this is being done to reduce cost of treatment and does not follow engineering or protocols for the loading these will have to tolerate.

### **Misc. Items mentioned:**

Chu instruments

Available from Hu-Friedy

<http://www.hu-friedy.com/innovation/innovation.aspx?alias=aesthetics>

Eclipse (denture resin)

Available from Dentsply Prosthetics

Thermoflex (acetyl material for denture clasps and partial denture frames)

Available from Dentsply Prosthetics

Locator Attachment

Available from Zest Anchors or dental implant companies

[www.zestanchors.com](http://www.zestanchors.com)

Guide Rite surgical sleeves (for implant surgical stents)

Available from Deplaque

<http://www.deplaque.com/ShopOurProducts/tabid/78/c/professional-products/Default.aspx>

Zirconia cutting diamonds

Available from Komet

[http://www.kometusa.com/fileadmin/user\\_upload/pdfs/Konnect/zr\\_diamonds\\_09\\_2011\\_net.pdf](http://www.kometusa.com/fileadmin/user_upload/pdfs/Konnect/zr_diamonds_09_2011_net.pdf)

Titanium abutment modification carbides (APB Kit 4475)

Available from Komet

<http://www.kometusa.com/>

Cad/Cam milled hybrid and overdenture bars

Available through your lab from Dentsply Compartis ISUS

<http://www.dentsply.com/en/solutions/us/prosthetics/>

Radica (long term prosthetic resin)

Available through your dental supplier from Dentsply

<http://www.dentsply.com>

Triad Gel and TranSheet light curable resin

Available through your dental supplier from Dentsply

<http://www.dentsply.com>

ERA mini implants

Available from Zimmer Dental

[http://www.zimmerdental.com/Implants/im\\_eraMiniDental.aspx](http://www.zimmerdental.com/Implants/im_eraMiniDental.aspx)

Co-Axis implant

Available from Southern Implants

<http://www.southernimplants.us/html/co-axis.html>

CAS- Kit (crestal sinus lift kit)

Available from Hiossen

<http://www.hiossen.com/data/caskit.pdf>

**IF YOU WANT THE EXPECTED RESULTS, YOU NEED TO READ AND FOLLOW THE MANUFACTURERS INSTRUCTIONS. DON'T ASSUME ONE MATERIAL IS USED LIKE SIMILAR MATERIALS!**

**Have a question from the lecture? Need some help with a case?**

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**or find me on Facebook at <http://www.facebook.com/ImplantCosmeticDentalCenter>**

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