Efficiency in tooth restoration

Cementation Sanity
Simplifying indirect restoration choice, bonding, and cementation
2014-2015

Thank you for choosing to spend your time with us. We know that there are many choices in continuing education and we sincerely want this to be one of the best experiences in dental CE today. Our goal is to help you gain greater understanding, confidence, and skill that will allow you to take your restorative practice to the next level in dentistry......making your practice more efficient.

Please let us know if there is anything we can do to help you as we take a journey down the road of long term restoration success together.

If you don’t know where you are going, any road will take you there.

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Cementation Sanity

How do we keep our restorations stuck to the teeth as long as possible? How do we choose materials that last for many years without sensitivity, leakage, fracture, or failure?

So many materials, so little time. With a myriad of newer restorative materials and seemingly endless choices in luting materials and bonding systems could this stuff be any more confusing? There are excellent materials today that can help us minimize sensitivity, decrease de-bonding, stop micro-leakage, and reduce problems we may have with indirect restorations. They key is having an arsenal that is versatile and almost universal in application and understanding how and when to use them. When do we etch, bond, cement, rinse, blow, cure......? Ever had a patient say “Doc, that tooth was never a problem until you fixed it”? Let’s stop the madness.

We will learn indications for newer indirect materials such as Lithium Disilicate and Zirconia with preparation and placement methods for each. These 2 materials are the workhorse for many practices because they work. Even our rehabilitation are combinations of these 2 materials with great success.

Course outline:
1. New indirect materials…. The strongest, most durable and best looking ever
2. Lithium disilicate and zirconia... when and how to use to revolutionize your practice success
3. Cement types... what to buy, how to use
4. Bioactive cementation
5. Impression techniques... is it time to go digital?

Indirect restorations:
They are sexy, they are strong. For many viable reasons lithium disilicate and zirconia have had most of the headlines for indirect restorations in the past few years. There are good reasons for this. They work extremely well if used in the right cases with the right preps and cementation techniques.

The vast majority of restorations we place feature one of these 2 materials. If used correctly, we are seeing successes passing everything except all gold restorations. There are certainly some things to understand for maximum performance. Let’s go over them...
Monolithic: mon-o-lith·ic [mon-uh-lith-ik] (from dictionary.com)
1. of or pertaining to a monolith.
2. made of only one stone: a monolithic column.
3. consisting of one piece; solid or unbroken: a boat with a monolithic hull.
4. constructed of monoliths or huge blocks of stone: the monolithic monuments of the New Stone Age.
5. characterized by massiveness, total uniformity, rigidity, invulnerability, etc.: a monolithic society.

In dentistry, we are talking about a material with no layering porcelain. The weak link with many of our indirect materials is the add-on porcelain which increases esthetics but gives us only 80-150 MPa of bond to the substrate. Chipping, de-lamination, fracture and other problems are associated with this layering stuff. We have all seen many cases where the porcelain has broken off of the metal of a PFM crown or zirconia framework.

The material choice comes down the strongest we can find that meets the minimum cosmetic needs of the patient.

Why monolithic lithium disilicate or zirconia crowns:
1. More esthetic than metal
2. Higher tensile strength than other tooth colored materials
3. Conservative tooth preparation similar to gold
4. Sufficient esthetics to decrease need for layering porcelain
5. Can be bonded or cemented
6. Can have very fast turnaround from lab or in office milling
7. Versatile materials

Lithium Disilicate – e.max
A glass with lithium disilicate fillers which is perhaps the most versatile indirect material we have today. It comes in a pressable form (e.max Press, Ivoclar) or as a CAD/CAM block (e.max CAD, Ivoclar). As a monolithic restoration, we have a flexural strength nearly 400MPa and 6 choices in material opacity. Most of the “LiDi” crowns from the lab are used in a pressed form. In office CAD/CAM systems like CEREC and E4D use the material in a block form in a non-crystalized state often called a “blue block”. They become tooth colored and hardened when placed in an oven under vacuum = crystallization. They can be cemented or bonded in place and in the posterior or anterior... this makes it versatile a very versatile material. We bond in all with less than perfect retentive preps or when esthetics is critical. We non-adhesively cement very few.

2 reasons to cement/bond:
1. Retention
2. Strengthen the restoration
Categories of cements:
1. Non-adhesive cement: examples RMGI, Glass Ionomers, Zinc Phosphate. **Easy to clean up, least retention, no restoration strengthening.**
2. Self-Adhesive resin cement: examples BeautiCem, SpeedCem, Unicem, MaxCem. **Tack cure, need better isolation, moderate retention and restoration strengthening.**
3. Adhesive resin cement: examples – MultiLink/ Primer A+B, eCement Dual cure/All bond Universal, Ultimate/ScotchBond Universal. **Separate bonding agent applied, need great isolation, highest retention and restoration strengthening.**

Cementation considerations:
1. The weaker the restoration (i.e. veneers, thin crowns), the more adhesion strength needed
2. Within each category, clinical results are very similar but handling/clean up may not be
3. Tack cure for clean up – 2-3 seconds from 2-3 inches – peel off facial/lingual floss interproximal
4. Universal bonding agents and easier clean up luting materials make it more efficient

**Great bonding cannot overcome a poor prep.**

**Lithium Disilicate (e.max):**

Ideal prep:
- 4-8 degrees taper
- 3-4 mm axial wall height
- 1.5-2.0 mm occlusal clearance
- 1.0-1.5 rounded shoulder or chamfer
- No sharp internal angles
- Veneers … 0.3 mm reduction

**Zirconia (i.e. Bruxzir, Zirmax):**

Ideal prep:
- 4-8 degrees taper
- 3-4 mm axial wall height
- 1.0 1.5 mm occlusal clearance
- 0.5-1.0 mm rounded shoulder or chamfer
- No sharp internal angles

**Adjusting zirconia, lithium disilicate, or porcelain:**
1. Fine diamond
2. Light pressure
3. Concentric turbine
4. Water
5. Polish

Despite its hardness, zirconia is the easiest of these to polish. All of these materials have the potential to have craze lines or cracks develop if not handled correctly. Polish with rubber points (CeraMaster. Shofu) to achieve a surface less likely for cracks to propagate and less wear of opposing teeth.
Lithium Disilicate

Restoration cementation – adhesive or non-adhesive

Cementing is either adhesive or non-adhesive. A major clinical advantage of zirconia and lithium disilicate is that they can be cemented or bonded in place depending upon the resistance of the preparation and preference of the dentist. In those cases where preparation design is retentive in nature, cementation is a viable option with the amount of surface area and degree of divergence of the prepared walls can provide sufficient micromechanical retention. Resin reinforced glass ionomer cements like RelyX Luting (3M ESPE) or GC Fuji Plus (GC America) and newer bioactive cements like Ceramir (Doxa) have been popular choices because of lower reported sensitivity, ease of use, and long term clinical success on retentive preparations. These cements are often more opaque and less esthetic than the resins and so the more translucent the e.max the more this matters.

The 2 critical junctions during definitive placement of any restoration is first the bond of the luting material to the internal surface of the restoration and secondly to the tooth. When preparations are short, overly tapered, or occlusal forces heavy, resin bonding is indicated and would provide maximum restoration retention, microleakage prevention, and increased fracture/fatigue resistance of the restorative material itself. Failure most often occurs at the cement/restoration interface and not at the cement/dentin interface.

Important points:

- **UNIVERSAL BONDING AGENTS**: (i.e. All Bond Universal, Bisco; Scotchbond Universal, 3M) have changed our bonding protocol...simpler and better. These are giving us the best all around bond strengths ever to a variety of surfaces whether dry or wet, etched or not etched, metal or porcelain.
- **CLEAN after try in**: Ivoclean (Ivoclar) does this better than anything and conditions the surface for better bonding (particularly zirconia). If silica based ceramic you must reapply silane after Ivoclean use.
- **If there is little or no enamel, we don’t etch**: The universal bonding agents are terrific non-etch adhesives on dentin or prepped enamel... both Bisco and 3M have dual cure universal DBA’s to insure set under opaque restorations. If lots of enamel, selectively etch it first.
- **Research is showing** less long term breakdown of dentin bonds by protease/enzymes (MMP’s) if we use something to kill bacterial like chlorhexiding or benzalkonium chloride (BAC) prior to bonding. We use an etch (Etch 37 with BAC, Bisco) when we etch. Certainly an antimicrobial scrub (Concepsis, Ultradent: Cavity Cleanser, Bisco) makes sense as well.
- **Self-adhesive dual-cure resin cements** Like RelyX Unicem (3M), SpeedCem (Ivoclar), SmartCem (Dentsply) show very good retention, little sensitivity, and ease of use as long as the retention of the prep is good. While these cements are popular, the retention and microleakage is not nearly as good as a separate bonding agent applied to the tooth and restoration followed by a dual cure resin cement like All Bond Universal+DuoLink Universal (Bisco) or Scotchbond Universal+RelyX Ultimate (3M).
Adhesive protocol for *maximum* lithium disilicate dependability (crowns, veneers, etc):

1. Limit layering porcelain where not needed for esthetics
2. Retentive preps – 4-8 degree taper, minimum 3-4mm walls, strong core
3. e.max press – make sure the lab has etched and silanated
4. e.max CAD in office – 20 second 5% HF etch, rinse well, silane, resin depending on system used for luting
6. Universal bonding agent applied to restoration. Air thinned. NO CURE.
7. Isolate tooth. Clean dentin…alcohol on microbrush or aluminum chloride scrub or chlorhexidine, or pumice
8. Universal bonding agent applied to tooth. Air thinned. NO CURE.
9. Luting material…dual cure resin for crowns or opaque anterior, light cure only resin for thin veneers or translucent anterior (to avoid shade shifting)

Try in, clean....................Universal DBA on porcelain and tooth......air thin both......................place resin cement

**Esthetics of LiDi is at the limit of the ceramist.** With proper cut back and addition of layered porcelain, esthetics can be as good as any material out there. Again, lab selection is the determining factor. Blocking dark color is not quite as dependable as more opaque materials like metal and zirconia. Remember, a monolithic piece of LiDi has much less chance of failure than one with layering porcelain, but for highly esthetic cases we use this material for almost all of them. The combination of strength and esthetics with e.max is unsurpassed in aesthetic dentistry today. The case above is e.max press, moderate translucency, cut back and customized.

**Important points of interest:**

1. Always show lab the color of the tooth so they can use the correct opacity. There are 6 different opacities of e.max press ingots.
2. Sand blasting with AlO3 may cause tiny fractures which may grow and IS NOT RECOMMENDED by Ivoclar
3. Cementation is allowed for retentive preps, but bonding improves retention and may strengthen porcelain by reducing crack propagation from inside and other iatrogenic problems
4. Don’t over etch ... *slightly frosty, not chalky*... only 20 seconds with 5% HFI, rinse well, silanate
5. Not strong enough for posterior or high stress anterior bridges
6. Adjustments should be done with high speed finish diamonds, water, light pressure. Polish done with a porcelain polish system. Polish paste on chamy or felt wheel optional.
7. For veneers a minimal prep is supported by Ivoclar...as little as 0.3mm
**Zirconia**

The quest for stronger, longer lasting esthetic restorations has continued since the practice of dentistry began. Today our goal is to combine ease in prep and placement, accepted esthetics, and predictable clinical longevity all at an in a manner that increases practice efficiency in a troubled economy. As we balance the functional performance of a material with the heightened esthetic standards of today, we sometimes have to think about taking a cosmetic step backward to gain more strength and durability.

Layering porcelain can be added to a zirconium coping to heighten esthetics but the weak adherence of the stacked or pressed layer has been a common area of clinical failure if the layering material is in function. **Monolithic zirconia can meet the minimum cosmetic need of 80-90% of molars.** It should be considered in at least parafunctional cases, minimal occlusal clearance preps, and particularly 2nd molars.

**It is certainly less opaque and better looking than it has been in years past.**

Esthetic limitations for monolithic zirconia are overcome these days by using some of the less ugly newer zirconia formulations plus the external staining of the lab. With flexural strengths exceeding 1000MPa, the ability to withstand mastication forces is extremely good with proper prep and impression techniques. **The newer less opaque zirconias have made the PFM obsolete in many practices**. The fit is fantastic and the longevity is unsurpassed by anything but gold.

**Cementation of zirconia**

“Bio-regenerative” cementation This cement may be the easiest to clean up on the market. We bioactively cement 90% of zirconia restorations (Ceramir, Doxa). Resin reinforced glass ionomer cements like Relyx Uting (3M ESPE) or GC Fuji Plus (GC America) have also been popular choices because of lower reported sensitivity, ease of use, and long term clinical success on retentive preparations. These cements are often more opaque and less esthetic than the resins and so as zirconia gets less opaque, this may become a factor when higher esthetics is warranted. **No primer, silane, or bonding agent** is needed with these materials.

**Adhesive cementation** gives us the most dependable bond at both cement interfaces. Dual cure resin cements that are bonded both to the zirconia and the tooth are warranted in cases with excessively tapered preps, short preps or small teeth, or questionable occlusal forces. **In these cases it is prudent to maximize bonding**. A primer (z-Prime Plus, Bisco) should be used with dual cure resin cements if not light curing and a Universal Bonding Agent (All Bond U, Bisco; Scotchbond U, 3M) if light curing for maximum strengths.
Bonding to zirconia:

- Zirconia (ZrO2) is a silica-free, acid resistant, polycrystalline ceramic making glass etching treatments such as hydrofluoric acid (HFl) followed by silane USELESS.
- To bond, sand blast then metal primer (Z-Prime Plus, Bisco)
- Clean tooth, selective etch, universal DBA, dual cure resin cement.

Adhesive protocol for maximum monolithic zirconia dependability:

1. Limit layering porcelain where not needed for esthetics
2. Retentive preps – 4-8 degree taper, minimum 3-4mm walls, strong core
3. Light sandblasting of zirconia
4. Clean zirconia after try in with Ivoclean – primes surface for bonding
5. Zirconia/metal primer
6. Isolate tooth, clean dentin
7. Universal dual cure DBA, air thin, no cure
8. Use dual cure resin cement – always light cure the margin for highest conversion rate

Success is where preparation meets opportunity.
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