LASERS AND CLINICAL DENTISTRY IN THE MODERN DENTAL PRACTICE

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CATAPULT
EDUCATION
LASERS AND CLINICAL DENTISTRY IN THE MODERN DENTAL PRACTICE

REMEMBER DIP TANKS AND FILM?
REMEMBER WHEN YOU SAW…MORE?

REMEMBER HOW HARD THINGS USE TO BE?
REMEMBER TRYING TO CREATE A CONTACT?

OBSIDIAN SCALPELS OLDER THAN 2100 BC
ANCIENT GREEKS USING MODERN SCALPELS 500 BC
DISCOMFORT
WOUND CLOSURE
HEALING TIME
BACTERIA

ELECTROSURGERY

TISSUE REMOVAL
HEMOSTASIS
DEVITALIZATION
DEEP THERMAL DAMAGE
NECROSIS
HIGH SPEED DENTAL HANDPIECE CURETTAGE BUR

TRADITIONAL TECHNIQUES

Scalpel, electrosurgical / cautery device diamond bur
More aggressive
Delayed healing
Increased potential for infection
Increased post-operative discomfort
Increased risk for iatrogenic problems
Uncertainty of final tissue placement
Anesthesia required
Sutures?
How do you fix these?
**LASER VS SCALPEL, ELECTROSURGE**  
**CLINICAL BENEFIT REVIEW**

<table>
<thead>
<tr>
<th>LASER</th>
<th>SCALPEL</th>
<th>ELECTROSURGE</th>
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</thead>
<tbody>
<tr>
<td>CUTS</td>
<td>CUTS</td>
<td>CUTS</td>
</tr>
<tr>
<td>COAGULATES</td>
<td>NO</td>
<td>COAGULATES</td>
</tr>
<tr>
<td>PAIN FREE - NO SWELLING (HEAT AND HISTAMINE)</td>
<td>PAIN, SWELLING AND SUTURES</td>
<td>PAIN, SWELLING FROM HEAT [BURN]</td>
</tr>
<tr>
<td>FAST HEALING (DECONTAMINATES 4 WEEKS)</td>
<td>SLOW/PAINFUL HEALING</td>
<td>SLOW/PAINFUL HEALING</td>
</tr>
<tr>
<td>SAFE AROUND METAL – BRACKETS, MATRIX BAND, IMPLANTS</td>
<td>SAFE AROUND METAL BUT NEEDS CAUTION</td>
<td>NO!!!</td>
</tr>
</tbody>
</table>

**LASERS ARE GREAT FOR YOUR PRACTICE**

A laser is more precise, causes less pain, and prevents bleeding better than traditional tools used on soft tissues. The highly focused laser light cauterizes nerve endings, coagulates blood vessels, sterilizes the surgical site, and increases the speed of healing. Instantly cauterizing nerve endings greatly reduces pain during the procedure and after. Healing times can be as low as a few days where traditional surgical approaches can take several weeks.
LASERS

Seals nerve endings
No Histamine or Bradykinin release
Sterilized area
Biostimulation
Penetration at the cellular level
No or minimal post-op discomfort

SCALPEL & BURS

Immediate bleeding
Poor visibility
More aggressive
Delayed healing
Increased potential for infection
Increased post-operative discomfort
Increased risk for iatrogenic problems
Types of dental lasers used in 2016

**CO₂**
- Soft tissue or soft tissue/hard tissue/bone
- Gas-based
- Expensive ($40K+)

**Er,YAG**
- Hard tissue/soft tissue/hard tissue/bone/endo/perio
- Solid-state – uses an Erbium crystal
- Hard tissue cutting
- Cavity preps
- $50K+

**Er,Cr:YSGG**
- Hard tissue/soft tissue/hard tissue/bone/endo/perio
- Solid-state – uses an Erbium crystal
- Hard tissue cutting
- Cavity preps
- $50K+

**Nd:YAG**
- Solid-state – uses a Neodymium crystal
- Soft tissue surgery
- Perio/ LANAP
- Soft tissue
- Not common in ortho
- Very expensive ($85K)

**Diodes**
- Semiconductor diode
- Excellent for soft tissue
- Lots of brands
- ~25K installs in USA
- Affordable ($2K-$20K)

**LASERS IN DENTISTRY**
- Diagnostics
- Laser pointers
- Restorative Dentistry
- Aesthetics & Cosmetics
- Periodontics
- Oral Surgery
- Orthodontics
- Endodontics
- Pedodontics
- TMJ Therapy
WHY A LASER?

Safe, Fast & Effective
Affordable
Easy to use
Less trauma, bleeding & infection
Predictable tissue response
Increased precision
Safe around metals and implants
Little to no post-operative pain and discomfort
Effective marketing tool for the entire practice
Practice builder/increased productivity
Greater patient acceptance
**Light Amplification by Stimulated Emission of Radiation**

**LASER TISSUE INTERACTIONS**

*Four things can happen to laser energy*

- Reflected
- Transmitted
- Scattered
We want to focus on where it is absorbed. Lasers are tissue selective. Diodes—Melanin and Hemoglobin (pigmentation).

Power density is inversely proportional to the radius squared.

- 5 watts in 1 mm spot size: 637 W/cm²
- 400 microns spot size: 398,000 W/cm²
Cell Removal/Zone of Necrosis = Predictability

Residual tissue damage is minimized & impressions usually can be taken the same day as the soft tissue procedure.
# EFFECT OF TEMPERATURE ON TISSUE

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Tissue Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>37-60 °C</td>
<td>Warming, No visual change</td>
</tr>
<tr>
<td>60-100 °C</td>
<td>Protein denaturization &amp; coagulation, tissue shrinkage</td>
</tr>
<tr>
<td>100+ °C</td>
<td>Vaporization, tissue disintegration</td>
</tr>
<tr>
<td>400+ °C</td>
<td>Carbonization and burning</td>
</tr>
</tbody>
</table>

# ABLATION

Heat from the laser expands the cell until it vaporizes = ablation
Thermal Relaxation

The time that the laser energy is OFF is referred to as the thermal relaxation time, the time during which the target tissue is allowed to cool.

Laser Tissue Interactions

Pulsed
- Minimizes Thermal Damage & Pain

Continuous
- Maximizes Coagulation & Speed
EMISSION OF LASER ENERGY

- **P** (power)
- **PW** (pulsed)

**Relaxation Time:**
*Tissue cools down*

**EMISSION OF LASER ENERGY CONTINUOUS WAVE**

- **P** (power)

**Accumulated tissue heating**
PULSED EMISSION OF LASER AT 50% DUTY CYCLE

CONCLUSIONS

Temperature to underlying tissue related to power

Use minimum power that reaches treatment objective
No difference in cutting efficiency as power increases
More power does not mean more cutting

Photothermal Effects

• Coagulation ($60^\circ$ - $100^\circ$C)
• Vaporization (↑ $100^\circ$C)
THE DIODE WAVELENGTH IS ABSORBED BY PIGMENTED TISSUE, MELANIN, & HEMOGLOBIN. THE ER:YAG IS ABSORBED INTO WATER.

PORTABLE, FAST, DURABLE, INEXPENSIVE, & TRUSTED.
Features
• Number #1 dental laser in the world
• More power – 3 watts
• New easy to use presets
• New treatment timers for perio treatment
• Wireless foot control
• Optional battery pack
• Perfect for first timers or hygienists
• Affordable
• Disposable tips or fibers
• Certification included

PICASSO LITE PLUS MODES
• Gingival Troughing for Crown Impressions
• Gingivectomy & Gingivoplasty
• Gingival Incision & Excision
• Soft-Tissue Crown Lengthening
• Hemostasis & Coagulation
• Excisional & Incisional Biopsies
• Exposure of Unerupted Teeth
• Fibromal Removal
• Frenectomy & Frenotomy
• Implant Recovery
• Incision & Drainage of Abscess
• Leukoplakia
• Pulpotomy as an Adjunct to Root Canal Therapy
• Operculectomy
• Oral Papillectomies
• Reduction of Gingival Hypertrophy
• Vestibuloplasty
• Treatment of Canker Sores, Herpetic & Aphthous Ulcers of the Oral Mucosa
PERIDONTAL PROCEDURES

• Sulcular Debridement (Removal of Diseased, Infected, Inflamed, & Necrosed Soft-Tissue in the Periodontal Pocket to Improve Clinical Indices Including Gingival Index, Gingival Bleeding Index, Probe Depth, Attachment Loss, & Tooth Mobility)

• Laser Soft-Tissue Curettage

• Laser Removal of Diseased, Infected, Inflamed & Necrosed Soft-Tissue Within the Periodontal Pocket

• Removal of Highly Inflamed Edematous Tissue Affected by Bacteria Penetration of the Pocket Lining & Junctional Epithelium

LASER CERTIFICATION PROGRAM

• 6 HOURS CE CREDIT

• AGD/PACE APPROVED

• FREE OF CHARGE

• ITUNES

• AMDLASERS

• LOGIN: CLIENT

• PASSWORD: PICASSO
Lasers will become addictive!!
LASER TECHNIQUE

- Prepare the fiber properly
- Use light brush strokes
- Use lowest power possible, don’t char
  - Reduces collateral damage
  - Speeds healing
  - Decreases post-operative discomfort
- Scrub with 2-3% (OTC) Hydrogen peroxide to remove discoloration or a wet gauze

“Non-Initiated” or “Initiated”

Laser energy can be De-focused or Focused:

Non-Initiated = Treat
Absorbed 50-60 °C
Disinfects

Initiate = Carbonize = Ablate
100-800 °C
Photothermal energy to vaporize
Activating Fiber

How do you manage tissues?
**Fluid/Tissue Management**

**ASTRINGENTS**
- Superoxol
- Epinephrine
- Ferric Sulfate
- ViscoStat 20%
- Astringent 15.5%
- Aluminum Chloride
  - Viscostat Clear 25%
  - Expa-syl
  - Hemostasyl
- Aluminum Sulfate
  - Tissue Goo 25%
- Various Cords
- Comprecaps

**RETRACTION CORDS**
- Numerous Sizes
- 1 & 2 cord technique
- Placed below margin
- Moisten prior to retrieval
- If bleeding, try hemostasis
**Fluid/Tissue Management**

- Enhancing Moisture Control

**RETRACTION CORDS**

- No guarantee of success
- Necessitates use of other liquids, pastes, caps, etc...

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**Fluid/Tissue Management**
Fluid/Tissue Management

Connective Tissue Attachment: 1.07 mm
Junctional Epithelium: 0.67 mm
Sulcus: 0.56 mm

Fluid/Tissue Management

Connective Tissue Attachment: 1.07 mm
Junctional Epithelium: 0.97 mm
Sulcus: 0.69 mm
Therapeutic goals
Avoid intra / post-operative bleeding & infection
Decrease sulcular fluids
Reduce pockets
Reduce bulk
Cosmetic recontouring
Improve impressions

Time??
ROI??

INDIRECT RESTORATIONS
GINGIVECTOMY

INDIRECT RESTORATIONS

GINGIVECTOMY

INDIRECT RESTORATIONS
GINGIVECTOMY
INDIRECT RESTORATIONS

Time??
ROI??

GINGIVECTOMY
INDIRECT RESTORATIONS
GINGIVOPLASTY

Long term failure occurs at gingival margin.
Laser energy is not attracted to cementum or dentin.

INDIRECT RESTORATIONS

Flow or GI?

Composite

GINGIVAL TROUGHING

Therapeutic goals
Avoid bleeding
Decrease sulcular fluids
Improve impressions
Improve longevity of resin restorations
IMPRESSIONS?

Laser Troughing

Benefits:
• Predictable margins
• No tissue recession
• No bleeding
• No discomfort
• Faster procedure

Settings:
Power: 1.6W
Mode: Continuous
Tip: Initiated
PICASSO TROUGHING
ADHESIVE DENTISTRY
Aesthetic Contouring

Settings:
• Power: 0.6-1.2W
• Mode: CW
• Tip: Initiated
PICASSO GINGIVECTOMY

Aesthetic Contouring
Aesthetic Contouring

Connective Tissue: 1.07 mm
Attachment: 1.07 mm
Junctional Epithelium: 0.87 mm
Sulcus: 0.53 mm

Time??
ROI??
Panasil Initial Contact (VPS)

VISALYS TEMP - KETTENBACH

- BPA Free
- Highest Strength
- Fluorescence
- Low air inhibition layer
- Easy trimming & polish
AMD PICASSO LASER TISSUE RECONTOURING & IMPRESSION

GINGIVAL TROUGHING - ANTERIOR
MAKE CASES EASY
Implant Recovery

Benefits:
• No sparks
• No heating of implant
• No discomfort
• No bleeding

Settings
Power: 1.6W
Mode: CW
Tip: Initiated

Lasers in Orthodontics

Cuspid Exposure
Molar exposure

Treatment of Hyperplasia
Frenectomy
LASER SURGERY

This video can be found in "AMD LASERS KOL Kit 2012/Clinical Videos/LaserSurgery.mov"

BIOPSY/EXCISIONS

Therapeutic goals
Avoid intra / post-operative bleeding
Eliminate / decrease infection
Decrease trauma
Increase healing
No suturing
Cosmetic recontouring
CASE 1

Benefits:
• Anesthetic
• Little to no discomfort
• Bloodless
• No scarring

Settings
Power 1.6W
Mode: Continuous
Tip: Initiated
Treatment Day 10

PICASSO – FIBROMA - NO BLOOD OR SUTURES
CASE 2

Benefits:
• Topical Anesthetic
• No discomfort
• Bloodless
• No scarring

Settings:
Power 1.6W
Mode: Continuous
Tip: Initiated

Frenectomy

Benefits:
• No sutures
• No bleeding
• No discomfort
• Rapid healing

Settings:
Power: 1.4W
Mode: CW
Tip: Initiated
HINT: Use tissue pen to darker fibrous band
Frenectomy

Frenectomy
APHTHOUS ULCER TREATMENT

Therapeutic goals
- Instant pain relief
- Improved healing
- Faster recovery
- $45-$85 per appt
  - (10 min)
- 99% success rate

Settings:
- Power: 1.8W
- Mode: Pulsed
- Tip: Non-initiated
- Non-contact
"Non-Initiated" or "Initiated"

Laser energy can be De-focused or Focused:

Non-Initiated = Treat Absorbed 50-60 °C Disinfects

Treatment Day 1

Treatment Day 3
This video can be found in AMD LASERS KOL Kit 2012 Clinical Videos Decontamination.mov
LASER-ASSISTED PERIODONTAL THERAPY

1. Review Health History, pocket depths
2. Anesthesia as needed
3. Pre-procedural rinse with chlorhexidine
4. Full Mouth LBR-Laser Bacterial Reduction
5. Ultrasonic Scaler / Hand Held Instrumentation
6. Laser Curettage 4+mm pockets
7. Retreat any area previously treated with laser at 1 mm shallower depth than last visit
8. Laser Bacterial Reduction (2\textsuperscript{nd} time)
9. Lavage / Irrigate with Iodine
10. Place vitamin E on all lased areas
11. Give post-op instructions OHI
12. Schedule next visit and dismiss patient
Therapeutic Goals Of Periodontal Therapy

• Eliminate microbial etiologies
• Addressing risk factors
• Arresting progression of the disease
• Preserving the dentition

Laser use is an adjunct to standard therapy, not a replacement

Goals Of Non-Surgical SRP

• Decontamination-
  • Reduction of bacterial biofilm
• Removal of necrotic tissue
• De-epithelialization of the sulcus

Laser’s therapeutic result:
• Decreased inflammation
• Biostimulation
• Coagulation
• Attachment gain
• Decreased pocket depth
LASER ASSISTED PERIODONTAL THERAPY (LAPT)

• LAPT protocol, use the PicassoLite+ diode laser with an uninitiated tip (as removed from the package) set at 1.5 W, pulsed at 30/30 m/s and use for 5 seconds per tooth area to reduce bacteria in the sulcus prior to mechanical debridement of the pocket.

Laser Bacterial Reduction (LBR) or Sulcular Decontamination

Benefits:
• Reduces bacteria in pockets
• Reduces risk of bacteria entering blood
• No anesthetic required
• Improves effectiveness
• At 50°C bacteria are deactivated
• At 60°C the healthy tissue beneath is not affected
LASER ASSISTED PERIODONTAL THERAPY (LAPT)

- The diode is set at 0.5 W in a continuous mode for 30 seconds per tooth and/or pocket to selectively remove the diseased epithelium lining and allow healthy tissue to regenerate during healing.

Laser Curettage or Sulcular Debridement

Removes diseased epithelial lining without causing damage to underlying healthy tissues.
PRACTICE LASER ADVANTAGES

- Improves clinical outcomes, promotes faster healing
- Simple to implement and use
- Precise and Predictable results
- Great patient acceptance
- Marketing practice builder
- Saves time & less invasive
  - No gingival recession so fewer visits
  - Minimal bleeding so easier restoration placement
  - More predictable impression and cementation
- More treatment options
- Simple and Fast ROI

REVENUE GENERATION / ROI

- Gingivectomy/Gingivoplasty
  - CDT 04211 <4 teeth ($150-350)
  - CDT 04210 4+teeth ($350-1,500)
- Frenectomy
  - CDT 07960 ($300-800)
- Operculectomy
  - CDT 07971 ($300-500)
- Biopsies/Tissue Removal – CDT Code
- Hygiene department utilization – additional $$
- Aphthous Ulcer – Instant relief $$
- Cord replacement
  - Priceless

Time savings, practice building & marketing
INTRODUCING YOU TO THE LITETOUCH
Absorption
Er:YAG
Laser energy is rapidly absorbed by free & interstitial $\text{H}_2\text{O}$ & selected tooth structures

The water is heated into steam and an acoustical-mechanical shock wave / disruption is created removing a small amount of tissue without collateral tissue damage

Er:YAG Dental Laser Clinical Indications
- Teeth Augmentation
- Tissue Augmentation
- Bone Augmentation
- All ages
Benefits of Hard-Tissue Laser Procedures

- Virtually no pain, smoke, vibration
- Less treatment requiring anesthetic*
- Greater precision, selectivity for caries
- Conserves tooth structure
- Enhances cosmetic bonding
- Post-operative sensitivity reduced
- No post-op numbness

LITETOUCH HARD/SOFT TISSUE LASER

RESTORATIVE DENTISTRY
• Exceptional Visibility: Non-contact work
• Microsurgery: Precise & selective ablation of carious lesions; avoids unnecessary ablation of healthy tissues; enables class 2, 3, and 4 restorations without damage to surrounding teeth
• No vibration: No micro cracks. Etched surface, for better composite adhesion
• Bactericidal effect: Due to thermal characteristics of laser energy
• LiteTouch™'s unique versatility & special accessories allow access to any oral area
• Desensitization of sensitive teeth and root exposure
• Restorative treatment can frequently be performed without anesthesia, perfect for pediatric and phobic patients

OPERATIVE DENTISTRY
(NO ANESTHETIC)
LITETOUCH HARD/SOFT TISSUE LASER

IMPLANTOLOGY

• Ergonomic & comfortable for transmucosal implantation
• Increased bone-implant contact rate: Laser encourages bone growth factors
• Precise & minimally invasive: The target tissue is disinfected without injuring the bone
• Low impact on implants: Second stage surgery without harming implants
• The most effective treatment modality for peri-implantitis and implant decontamination
• Biostimulation for better bone and soft tissue healing
• Safe when working around implants and other intraoral metals. Ideal for implant uncover and soft tissue modification

VENEER REMOVAL
HARD TISSUE CLINICAL ADVANTAGES

- MINIMALLY INVASIVE DENTISTRY
- Most cases use no or little anesthetic
- No heat, no vibration, no microfractures
- Safe around implants
- Excellent bonding strengths
- Decontamination of prep site
- Gentle and effective at osseous surgery – almost no heat or vibration to bone
- Removal of necrotic tissue in perio pockets
- Excellent endo shaping and decontamination
- Veneer removal, closed flap osseous
- Uses combination of air, water and laser energy to cut.
- Uses: Enamel, Dentin, Decay, Composite, GIC, Bone, Soft Tissue, Endo, Perio
- Cannot cut metal or porcelain

LITETOUCH USES CONTINUED

PERIODONTICS

- Effective and unrivaled pocket debridement: Bactericidal effect (disinfection)
- Excellent surgical precision: Precise & selective granulation tissue ablation avoiding unnecessary damage of healthy tissues
- Effective and selective calculus removal
- Faster healing of surrounding tissue and bone: Minimal postoperative swelling and discomfort, leading to fewer follow-up visits

PEDODONTICS

- The preferred method for treating children: No fear factor; shorter procedures; less noise; no vibrations
- Preventive Dentistry: Precise and delicate treatments; minimally invasive; enables microsurgery (pits and fissures) that preserves healthy tissue
- Friendly equipment: Well-accepted by kids
- Ideal for hard or soft tissue crown lengthening either open field or closed through the sulcus
- Improves treatment of periodontal disease by sterilization of the pocket, granulation removal and stimulation of the crestal bone
LITETOUCH USES CONTINUED

AESTHETIC DENTISTRY
• Precise manipulation: Gingival re-contouring, smile design & depigmentation of natural melanin deposits
• Excellent for debonding porcelain veneers: Allows dentists to reuse veneer while maximally preserving tooth substance
• Anesthetic free treatment makes patient management easier on staff, doctor and patient

ENDODONTICS
• Minimally invasive opening preparation: No thermal damage or microcracks
• Bactericidal efficiency: Removes smear layer and cleans root canals; Venturi effect even results in clean dentinal tubules
• Apicoectomy: Performed with unique accessories
• Sterilizes the canal system and improves Endodontic irritants killing both aerobic and anaerobic bacteria

GINGIVECTOMY
CLASS II W/ GINGIVECTOMY

LiteTouch application in Orthodontics
Frenectomy with respect to existing periodontal disease

Laser-assisted crown lengthening by bone surgery
Chronic periodontitis: Removal of inflamed gingival tissue and calculus 1.5 W (50mJ/30Hz)

Before treatment

After treatment
**ONLY 9.3 MM CO₂ LASER CLEARED TO CUT HARD, SOFT AND BONE**

Vaporizes
Enamel, Dentin, Bone, & Decay

Vaporizes
Soft Tissue

- **RELIABLY** anesthesia-free (>90%)
- Near-drill speed
- Little to no sensation
- Every classification of filling, including Class II’s, Amalgams, and Composites

- Virtually blood-free
- No anesthesia (typically only topical)
- No sutures
- Faster healing
- Better clinical results

**WHAT MAKES THIS LASER ANESTHESIA-FREE**

9.3 µm Wavelength
Vaporizes Hydroxyapatite and Water

HA H₂O
WHAT ELSE MAKES SOLEA UNIQUE

- Single Setting for Hard and Soft Tissue
- Rheostatic Foot Pedal
- Software Updates Delivered via Wifi

CLASS V
GINGIVAL CONTOURING

FIBROMA REMOVAL
Maxillary Frenectomy with Solea

Procedure by Dr. Lawrence Kotlow

MAXILLARY FRENECTOMY (CHILD)
MAXILLARY FRENECTOMY (CHILD)

MAXILLARY FRENECTOMY (CHILD)
MAXILLARY FRENECTOMY (CHILD)

DEEP CAVITY PREP #16 (LASER-ONLY)
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.

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.
Tooth-colored resin restorations have an average replacement time of 5.7 years due to secondary caries precipitated by bond failure.

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
Factors that compromise bond durability in restorative dentistry

Hydrophilic dentin bonding (1956 - present)

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

Factors that compromise bond durability

Hydrophilic dentin bonding (1956 - present)

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)
Bond Degredation


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

Abfraction Lesions & Class V Restorations

Latin words, ab – "away", fraction – "breaking"

- Pathological loss of tooth structure caused by biomechanical loading forces.
- Static and cyclic flexural overloading of tooth structure ultimately leading to fatigue and failure of tooth structure away from the point of loading.
Resin Modified Glass Ionomers (RMGI)

- Light cured & Dual cured
- High flexural strength
- Lower compressive strength than conventional G.I.
- Good polishability
- Excellent wear
- Hydrophillic
- Fluoride release
- No microleakage
- No adhesives
- Acid resistant layer
- Reduces sensitivity
- True chemical adhesion

Resin Modified Glass Ionomer Restoration

Post-Op Photo – notice unlike typical class V composite RMGI restorative material.
Restorative Therapy - Case

Typical treatment involves the placement of a #00 retraction cord on each tooth followed by a shade selection. Roughen tooth structure with air abrasion. Place cavity conditioner on all areas to be restored for 10 seconds, then wash and dry.

Restorative Therapy - Case

Mix RMGI and syringe into place. Utilize hand instruments to shape and remove gross excess. Cure each tooth for 20 seconds. Remove excess and contour using a handpiece with fine diamond burs. Teeth should be isolated from saliva.
Restorative Therapy - Case
After contouring the restorations can be coated with a self etch adhesive coating, and cure for 10 seconds.

Restorative Therapy - Case
Six year post-op photos show the integrity of the material is still excellent. Note the lack of marginal microleakage stain often present with composite restorations.
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].
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

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

Pulpal Proximity
CONVENTIONAL GLASS Ionomer
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

Red dye indicates marginal leakage

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

Methods: Fifty extracted teeth were prepared as Class II MODs. Two canals were prepared, 2 mm apical depth, 2 mm axial wall depth, 3 mm gingival margin below CEJ. Teeth were randomly divided into three groups of twelve (groups 1, 2, and 3 = glass ionomer; group 2 = flowable resin; group 3 = resin-based composite). All groups were primed with Clearfil SE Bond primer and Bond X-a-cure. All samples were then restored using GC nano-hybrid CompoSet (GDC), and then placed under a 37°C incubator for 24 hours. Samples were then removed, mouthwashed, rinsed, and stained with 1% methylene blue for 2 minutes. Samples were then dried, mounted, and scored independently by four evaluators for microleakage at the occlusal and proximal-cusp surfaces under a 40X stereo microscope.

Results: The Kruskal-Wallis test revealed no statistically significant difference in microleakage between the three groups at the occlusal-cusp surfaces. Group 1 had the highest microleakage at the occlusal-cusp surfaces, while Group 2 showed no leakage at all. Group 3 revealed no leakage at the occlusal-cusp surfaces.

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

Representation of 1/2 intercuspal distance
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

GLASS Ionomer INTERFACE
RESIN TO DENTIN HYBRID ZONE

Glass Ionomer Bulk Fill

A3.5  A3  A2
EVERYDAY GO TO MINIMALLY INVASIVE BURS

DISPOSABLE SINGLE USE DIAMONDS

NEODIAMOND NEOBURR

Buy 4 Get 1 Free!
Any Combination of NeoDiamond & NeoBurr

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I Want This!
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

Caries control/quadrant dentistry

(Class II, III, V & core buildup)
GC AMERICA

EQUIA TECHNIQUE GUIDE

Prior to use, carefully read the instructions for use.

2. Rinse and gently dry.
4. Click once to activate.
5. Mix for 10 sec.
6. Capillary.
7. Click twice to prime capsule.
8. Dispense within 22 sec.
10. Final finish after 2-3 mm, 30 mm from start of mix.
11. Dispense a few drops of EQUIA Coat. Do NOT... AIR BLOW. Close cap immediately.

Light cure for 20 sec.
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

SDI
VOCO

ENDODONTIC SANDWICH TECHNIQUE
ENDODONTIC SANDWICH TECHNIQUE

ENDODONTIC SANDWICH TECHNIQUE
ENDODONTIC SANDWICH TECHNIQUE
Open Sandwich with glass ionomer & nanohybrid composite

Glass Ionomer vs. Open Sandwich
Glass Ionomer vs. Open Sandwich

• 7 years later.
Comparison of Filler Technology

**Filtek Supreme Ultra**
- Silica filler: 20nm
- Zirconia filler: 4 - 11nm
- Zirconia/silica cluster: 0.6 – 10nm

**Clearfile Majesty ES-2**
- Organic filler: 700nm
- Conventional organic-inorganic complex filler

**Estelite Sigma Quick**
- Spherical filler: 200nm
- Conventional organic-inorganic complex filler

**G-aenial Sculpt**
- Barium glass filler: 300nm
- New organic-inorganic complex filler

**G-aenial Universal Flo**
- Strontium glass filler: 200nm

**G-aenial Flo**
- Strontium glass filler: 400nm

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3 Body Wear Test (100,000 cycle)

Data on file, GCC R&D

![Graph showing 3 Body Wear (µm)](image)
Even in areas that are difficult to polish, G-aenial Sculpt obtains gloss with daily brushing.

Class III
G-Premio BOND™

SBU, ABU, CUB, and XTR show low bond durability to ceramics and precious metal.

G-Premio BOND shows high bond durability to all materials.

#600 Grit, 5000 Thermocycles

Data on file, GCC R&D

GC America Inc. Confidential Information
NiTi only spring

Anatomically shaped tines

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

Built in lip for increased stability in forceps
TrioDent has developed Narrow V3 Ring in addition to the Universal V3 Ring to ensure ideal separation on smaller teeth.

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

Pin-Tweezers
Tab can be bent 90° for contra-angle placement.

Holes designed to fit with positive grip Pin-Tweezers.

by TrioDent
PALODENT PLUS-DENTSPLY
Identical except for color
Remember the old appointment book? How long did it take to answer a question about balances, forgotten appointments?
TEAMWORK

- Auto confirms appointments and adds to the Practice Management Software
- Auto Birthday Messages
- Auto propagation of messages
- Easy to implement with minimal time to use.
- Improve business opportunities dramatically
- Cuts down on current employee time by streamlining many tasks
- Saves money on traditional procedures
  - Less postage
  - Less paper goods
  - Less employee time

ONLINE REVIEWS

- A recent study reported 88% of people trust online reviews
- 2011 33% reported they did not trust online reviews.
- 92% or internet users read product reviews
- 89% said it influences their purchases
- 74% of internet users said they would most likely not do business if there was a negative review
WEAVE REVIEWS VIA CELL PHONE MESSAGE

WEAVE REVIEWS VIA CELL PHONE MESSAGE
WEAVE REVIEWS VIA CELL PHONE MESSAGE

WEAVE MOBILE APP

-Same functionality
-From anywhere you have a wifi or cell connection.
THE POWER OF ACTIONABLE METRICS

TWO WAYS TO INCREASE PRODUCTION

PATIENT Visits PRODUCTION on Visits
NEW PATIENTS
HOW MUCH DO WE REALLY LOVE THEM?

RECAPTURED PATIENTS

47 → $65,114
$167,400 increase through Actionable Metrics
THE DAYS SCHEDULE

- What did I accomplish for the day?
- What do we need to follow up on?
- If it's before the day starts where are my opportunities and the staff's?

Slipping Through The Cracks
Delivering Best Dentistry
37% Increase in Production In One Year!

ACTIONABLE MONITORING DRIVES GROWTH

FIND OUT WHERE YOUR BUSINESS IS AT.

CHECK YOUR PRACTICE – FIRST 15 DENTISTS GET A FREE EVALUATION ($1000 VALUE)
What % of your Active Patients do you believe have a Future Appointment?

- Top 10%: 73%
- Average: 54%
- Median: 53%
- Bottom 10%: 34%
What % of your Hygiene Visits leave with a return Hygiene Appointment?

- Top 10%: 93%
- **Average**: 76%
- Median: 78%
- Bottom 10%: 52%
What is your Annual Attrition Rate?

- Top 10%: 3%
- **Average**: 17%
- Median: 16%
- Bottom 10%: 40%
TEXT “DATA”

to 77453
(to waive $1,000 fee)

Free for first 15 ppl

www.DENTOOLZ.com
Free Handouts, marketing information, offers, social media links & More
THANK YOU!

Todd C. Snyder, DDS, AAACD