Techniques and principles reviewed in this all-day program are derived from my personal teaching and clinic experience. They do not constitute a guarantee for success, the attendees should form their own opinion.

Gerard Chiche L.L.C.
PLEASE NOTE

1. PROPER LENGTH
2. INCISAL PROFILE
3. SMILE LINE DESIGN
4. TOOTH PROPORTIONS

Esthetic Design
Treatment Plan
From Incisal Edge UP

Central Length
Short Face: 10.0 mm.
Medium Face: 10.5 mm
Long Face: 11.0 mm & up
II. Incisal Profile

VERIFY INCISAL LENGTH & PROFILE
The Science and Art of Porcelain laminate veneers
G. Gurel Quintessence Pub. 2003

INCREASED FLEXURE — ADDITIVE MATRIX

BEST STRATEGY IF INCREASED RISK / FLEXURE

ALL-ENAMEL BONDING

II
Ceramic Crowns Techniques
- 1 Emax (No Discoloration)
- 2 Lower Incisors
- 3 Thin Teeth, Large pulps

5850-016
- 1 Zirconia (Layered)
- 2 Emax Discoloration ++
- 3 PFM

Glass Ceramics
- 1 Best Translucency
- 2 Reduced Facial Thickness
- 3 Convenient & Versatile
- 4 Combines with Veneers
- 5 Plan Masking Strategy
CONSENSUS: LITHIUM DISILICATE for ANTERIORS ZIRCONIA for POSTERIORS

Zirconia Ceramics
1. Discolored Teeth.
2. No Bonding Required.
3. Fixed Partial Dentures.
4. Full-Contoured Molars.
5. Full-Arch Implant FPD's

Procera Zirkon / CZR

LAYER FACIAL ASPECT OF PROCOAT
Consecutive Case Series of Monolithic & Minimally Veneered Zirconia Restorations on Teeth & Implants Up to 68 Months.
M. Moskovich 2015
Enamel vs Polished zirconia
Zirconia Polished and aged 400,000 cycles
(18.4 mos Swallow Tooth Contacts)

Courtesy Dr. J. Burgess UAB

1. LAYER FACIAL ASPECT ONLY
2. ADEQUATE TOOTH REDUCTION OF ANTERIORS
Same as PFM 1.3 - 1.5 mm

3. Add fluorescence to restorative materials with non-fluorescent properties
High fluorescence = increase in value in restorations

[Images of zirconia restorations and fluorescence]
ASC Technology Advantages

- Refined Screw Axis
- Increased Retrievalability
- Increased Zirconia Wall Thickness
- Additional Room for Layered Facial Porcelain

D. Morton 2008
X. Vela-Nebot 2011
S. Chen 2008
H. Weber 2012
H. Katsuyama 2012
F. Vailati 2007
T. Mankoo 2008
9.0 mm² Post. FPD 1 Pontic
7.0 mm² Ant. FPD 1 Pontic
6.0 mm² Ant. Cantilever
12.5 mm² Post. FPD 2 Pontics

Zirconia Connector Size

8.0 mm² Ant. FPD 1 Pontic
12.0 mm² Ant. FPD 1 Pontic
16.0 mm² Post. FPD 1 Pontic

Lithium Disil. Connector Size

16.0 mm² Post. FPD 1 Pontic
12.0 mm² Ant. FPD 1 Pontic
8.0 mm² Ant. Cantilever


Recommended Body Firing Temperatures

- Cerabien CZR: 930 – 940 Deg. C
- Vita VM9: 910
- Wieland Zirox: 900 – 930

A Clinical Comparison of Zirconia, Metal and Alumina Fixed-Prosthesis Frameworks Veneered with Layered or Pressed Ceramics: A Three-Year Report
R. P. Christensen and B. J. Ploeger
J. ADA 2010;141;1317

...CZR Press veneer ceramic for zirconia was the exception with a performance comparable with that of veneer ceramics for metals...
Edentulous Maxilla - Fixed Restorative Options

1. Fixed Hybrid: Economical, Practical, Versatile.
2. Full Zirconia: Additional Strength for Bruxer.
   More Esthetic.
   More Color Stable.
Materials Selection

Provide occlusal guard.

Provide occlusal guard & mandibular metal-acrylic hybrid.
1. PROVIDE OCCLUSAL GUARD
2. MANDIBULAR METAL-ACRYLIC HYBRID

3. INCISAL EDGE DESIGN

1. All functional areas in zirconia include incisal edges.
2. Occlusal Guard Mandatory.
3. Mandibular Opposing Hybrid.
4. Minimum 2 mm. Surrounding Screw Channels.
5. Maximize Incisal Edge Thickness.
7. Maintain gold in occlusal area.
Flexural Strength

BruxZir Anterior Cube X2 Alumina
Yttrium to stabilize cubic phase

Vickers Hardness test

Phase Transformation in ZrO2 Squeezes the Crack Cubic phase Content Cubic phase Content does not Transform

Transformed ZrO2: Such inhibited & Crack isle self-repaired base
• Transformed ZrO2 has higher flexural strength at 98K MPa, limit at 550 MPa, reduced by 40 MPa.
• Clinical significance of this difference is uncertain or unknown.
• Transformation toughening improves in fact crack propagation and increases toughness (not an advantage for other materials).
TRANSLUCENT ZIRCONIA

Resin Ionomer

IF WANT TO CEMENT
MEASURE THICKNESS
FIRST
Light Cure 1-2 Sec.  
Rinse Interprox.  
Apply Heavy Glycerine  
Finish Flossing  
Verify No Cement  
Light Cure

Marko  
PG 1st Year

VDO Opening for Sequential Treatment

1. Minimum Wax Up on Occlusal Surfaces  
   Uncovered Areas = Vertical Stops
2. Etch Every Other Tooth H3PO4 – HF on Porcelain (W. Hall)

3. Bond and Load Clear Matrix with High-Filler Load Flowable Composite

4. Clear Silicone Matrix has Occlusal Stops & Small Vent Holes (W. Hall)
4. Small Vent Holes Over Lingual Cusps Minimize Excess on Adjacent Teeth

5. Split Clear Silicone Matrix at Mandible to Facilitate Isolation

New VDO After Occlusal Refining – Ready for Quadrant Work
1. Prepare Anterior Teeth
2. Complete & Bond Anterior Crowns
3. Prep. & Complete Posteriors

Composite Buildups
Hold VDO Ceramic Crowns
Hold VDO

Drs. M. Tadros & Mr. A. Torosian

Katana Monolithic
STML
Emax

B
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High Strength
Translucent (HT)

Medium Strength
Translucent Zirconia

BruxZir Ant., Cube X2

Maximum Translucency

1st MOLARS
FPD

ANTERIOR
TEETH

flexural strength
Accelerated aging of zirconia for monolithic restorations, up to 200 hrs at 134°C and 2 bars.


22.0mm X 3.0mm X 0.2mm
(Steam Hydrothermal Treatment - 1 hr. Simulates 1 yr.)

“The decrease in flexural strength was related to the increase in monoclinic phase from long-term degradation”

Translucent Zirconia

(Translucent, Thick, Thin, Connectors, Controversial)

1. Strength vs Cement vs Bonding vs Simplicity.
2. Cementing is more realistic if gingivitis or deep margins.
3. Anterior region for Bruxer.
4. Translucent zirconia FPD with adequately designed Connectors.
5. Esthetic Transition from Emax incisors to FPD from Canines back.

The Journal of Cosmetic Dentistry April 2016

III
CEMENTS & ADHESIVES
for
ALL-CERAMIC CROWNS

WEBBED PROPHY CUP
Bonding Strategy

Ca-10-MDP salt

Relationship between bond-strength tests and clinical outcomes
B. Van Meerbeek et al
Dental Materials 2010

Paired SE Adhesive / Cement Examples

LITHIUM DISILICATE
Dual-Cured Cement paired with Self-Etch Adhesive
Paired SE Adhesive / Cement Examples
"Ca-10-MDP salt is one of the most hydrolytically stable salts" (Perdigao 2013)

Lithium Disilicate Crowns

FLOSS INTERPROXIMAL FIRST
LIGHT-CURE 1-2 SECOND / Tooth
PEEL OFF & FLOSS

LIGHT-CURE 1-2 SECOND

FOR BEST BOND AVOID MICRO-MOVEMENTS 6' DURING CLEANING

HOLD RESTORATION DOWN, WHEN CLEAN ! NEED FINGER PRESSURE !

Courtesy Dr. John Burgess
SIMPLICITY

1. Resin Ionomer
2. Adhesive Cement
   if Need More Retention

ZIRCONIA

Crown Retention

In vitro comparative bond strength of contemporary self-adhesive resin cements to zirconium oxide ceramics with and without air-particle abrasion.

SELF-ADHESIVE RESIN CEMENTS

1. RELIX UNICEM 2
2. PANAVIA SA CEMENT *
3. ABSOLUTE
4. BISFIX SE
5. BREEZE

REALITY RATINGS
* November 2013

Cleaning Zirconia Prior to Cementation

TOOTH
1. PUMICE
2. SANDBLAST (27-30 mic.)
3. TRY - IN
4. US CLEAN 5'
5. SANDBLAST (30-50 mic. Al)
6. IVOCLEAN
7. CERAMIC PRIMER

ZIRCONIA CROWN AL2O3 SANDBLASTED

Courtesy Dr. J. Burgess UAB

Efficacy of silane after thermal-fatigue on bond-strengths degradation in zirconia
ZIRCONIA
1. Resin Ionomer
2. Adhesive Cement if Need More Retention
3. Same Paired SE / Cement if want just One Bond system

SIMPLICITY

Dual-Cured Cement paired with Self-Etch Adhesive
Paired SE Adhesive / Cement Examples

Emax
Emax
Zirconia
Zirconia

Emax
Emax
Zirconia
Zirconia
**Glass Ceramics**

- 1. Best Translucency
- 2. Reduced Facial Thickness
- 3. Convenient & Versatile
- 4. Combines with Veneers
- 5. Plan Masking Strategy

**THINNER the CERAMIC THE BETTER it will MASK**

**Alvaro**
Esthetic Fellow

**Cantilever Connector Size**

- LiSiO2 H.4.0mm X 2.0mm Tsitru 2012
- LiSiO2 H.3.6mm X 2.8mm Sun 2013
1. MIPP “Crowns”

Type of finish line (0.3mm-0.8mm.) did not significantly influence mean fracture strength of pressed lithium disilicate crowns. May not necessitate invasive finish line preparations to ensure adhesion or wear.


Choosing the Esthetic Angle of the Face: Experiments with Laypersons & Prosthodontists

D. Behrend et al.
J. Prosthet Dent. 2011; 106:102
2. Anterior Three-Quarter Crown
   
   Indications
   . Diastema Closure
   . Proximal Composites
   . Short Papilla & Black Hole
   . Space Redistribution

   Maintains Peripheral Enamel

3. Posterior ¾ Crown
IF ONLAY = ENAMEL PERIPHERY
Effects of a Peripheral Enamel Margin on the Long-term Bond Strength of Composite/Dentin Interfaces with Self-Adhesive and Conventional Resin Cements

Buccal Three-Quarter Crown

NO ENAMEL PERIPHERY = NO ONLAY
All-Ceramic Crowns

Final Thickness for Ceramic Selection

Sufficient if Adhesively Bonded (Ivoclar – Vivadent 2016)
Group 1: 2.0 mm. Group 2: 1.0 mm. Group 3: 1.5 mm. Group 4: 0.5 mm.
Specimens adhesively luted to die.
Dynamic cyclic loading (380 to 390 N)
In aqueous environment until failure.

Reasonable to consider 1.5 mm or greater crown thickness for milled monolithic lithium disilicate crowns for posteriors.
**Fracture Strength of All-Ceramic Restorations after Fatigue Loading**


**MAXIMUM BITE FORCE**
- 500 N
- 700 N
- 1100 N

1. Round Line Angles.
2. Final Thickness > 0.6 mm.
3. Occlusal Reduction: 1mm - 1.5 mm.
4. Rounded Shoulder – No Chamfer

**Zirconia Preparations Specifications**

- Round Line Angles.
- Final Thickness > 0.6 mm.
- Occlusal Reduction: 1mm - 1.5 mm.
- Rounded Shoulder – No Chamfer
### Monolithic Zirconia Crowns

#### Thickness for Safety

<table>
<thead>
<tr>
<th>Tooth Reduction</th>
<th>1.0 mm. and above</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness</td>
<td>Fracture Strength</td>
</tr>
<tr>
<td>0.8 mm.</td>
<td>J Lee</td>
</tr>
<tr>
<td>1.0 mm.</td>
<td>G Jang</td>
</tr>
<tr>
<td>1.0 mm.</td>
<td>S Jang</td>
</tr>
<tr>
<td>1.0 mm.</td>
<td>C Johanson</td>
</tr>
<tr>
<td>1.0 mm.</td>
<td>S Ting</td>
</tr>
</tbody>
</table>

Tooth Reduction: 1.0 to 1.5 mm.

**Expected Longevity?**

---

## Porcelain Veneer Techniques
Classic Preparation
Main Advantage
Intra-enamel Most of Times

0.3 mm.
0.5 mm.
0.6 mm.
0.7 mm.
0.8 mm.

NO DISCOLORATION
MODERATE DISCOLORATION
Classic Preparation
Potential to Expose Dentin
When Thin Enamel
Or if Need Deeper Prep

100% Removal Facial Enamel = 91% Flexure Increase

Feldspathic Veneers Best Indicated if Low Flexure Situation.
1. Bonding Substrate All Enamel
2. Minimum Porcelain Extension
3. Low Occlusal Function

Lithium Disilicate Veneers Best Indicated if High Flexure Situation.
1. Bonding Substrate Dentin ++
2. Significant Porcelain Extension
3. High Occlusal Function
4. Complex Preparation
“Low-Prep” Veneers

Undersized + Retrusive Incisors

1. Thicker Incisal Edge Tolerated.
3. Line Angles Control Tooth Width.
Additive & Low Veneer Preps

Advantages
- Provides Maximum Enamel
- Increases Veneer Strength

Precautions
- Need Additive Wax-up
- Needs Precise Technique
- Needs Esthetic Try-in
"Low-Prep" Veneer

Advantages:
- Minimum / No Enamel Reduction

Precautions:
- Need Room for Line Angles
- Need Room for Labial Embrasures
- Needs Esthetic Try-in
REALITY RATING

LIGHT/DUAL CURE
1. INSURE / INSURE LITE
2. NX3
3. VARIOLINE II
4. LUTE-IT
5. CALIBRA

LIGHT CURE ONLY
1. Rely X Veneer CEM
2. VARIOLINE VENEER
3. DA VINCI
4. ACCOLADE PV
5. CHOICE 2

Clear
White

THIN VENEERS
(B 0.5 or TR)

THIN VENEERS
(B 0.5 or TR)
Limited Treatment – Level I

- Veneer Ceramics: Lithium Disilicate
- Bonding Substrate: Maintain Enamel
- Available Thickness: Augment Labial Volume
- Required Compliance: Occlusal Guard
- Difficult Cases: Test Drive w. Composites
"Low-Prep" Veneers

Increase in VDO = Low-Prep Mandibular Veneers
Safety of Increasing Vertical Dimension of Occlusion: a Systematic Review
J. Abduo. Quintessence Int 2012

- Patient Adapts: Resolution 1-2 weeks (2 days - 3 mo.). Carlson, Rivero, Abekura, Tryde.


VENIER CEMENT SELECTION
1. Thin vs. Thick Veneer
2. Tissue Health
3. Number of Veneers
4. Sticky Viscous Cement
5. Low Viscosity Cement
Shear Bond Strength of Porcelain Laminate Veneers to Enamel, Dentine and Enamel-Dentine Bonded with Different Adhesive Luting Systems

Ozturk, Bolay, Hickel, Ilie

Journal of Dentistry 41 2013

1. Etch
2. Adhesive on Dentin
3. Adhesive on whole prep
4. LIGHT-CURE
5. LIGHT-CURE
BONDING PRECAUTIONS

1. Microblast or roughen Dentin
2. Retraction String
3. Cure 5th Gen. Adhesive separately
Priorities
- CEJ Location
- Gingivectomy: ONLY if > 3 mm. Periap.
- Veneer Extent.
- CEJ Location
- Gal Margin – Bone Crest
- Gingivectomy > 3 mm.
- Root Length
- Bone Resection.

1. WHERE IS THE CEJ?
2. INTRUSION vs. CROWN LENGTHENING?
1. CEJ Location
2. Root Length
3. Restoration Type

All-Ceramic Crowns, Veneers & Bonding Update