The Nuances of

In Dentistry

2702

David S. Hornbrook, DDS, FAACD

OCCLUSION DEMYSTIFIED

DR. DAVID HORNBROOK

Do you have a system your whole team understands to diagnose, treat and

present to patients based on occlusal

This program is a 3 day investment in expertise, profitability and peace

of mind. It is for those practicing real world dentistry, desiring to improve

aesthetics, eliminate failures and

predictably restore patients in ideal

disease?





WITH

SPECIAL GUEST

STEVE ANDERSON

MARCH 3-5, 2017 SALT LAKE CITY, UT

OCTOBER 6-8, 2017 SAN DIEGO, CA

TUITION: \$1495 \$250 DISCOUNT FOR DENTISTS IN PRACTICE LESS THAN 5 YEARS

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TOPS INSTITUTE

A PORTION OF TUITION FOR CROWN COUNCIL MEMBERS IS DONATED TO SMILES FOR LIFE

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HORI

TEST YOUR KNOWLEDGE ...

What came first

the decay or the

cause?

abfraction? How often

that look like this and

didn't determine the

have you restored cases



Is this erosion, parafunctional wear, or bulimia?

What is the long-

\$1495

(\$ 250 discount for new dentists)



term effect of an anterior open bite on the posterior tooth anatomy?



Some think this is acid reflux and others think it is occlusal abfraction. What is your diagnosis?

How many times have you restored cases like this and never knew how to address the underlying cause?

WHAT YOU WILL LEARN

- The science behind tooth contacts and muscle harmony
- The 5 steps to functional success with every patient
- Hands on clinical records, recording bites and facebows for case planning.
- How to accurately diagnose wear, severe wear and post treatment triggers
- Understand the 3 most critical factors in your new patient exam
- Deprogramming methods; when to use and why
- Diagnosing the asymptomatic patient
- . How to avoid "red flags" that will compromise the outcome of a case
- How to establish Occlusal Vertical Dimension, when to make changes and why
- Hands on critical case finishing that will prevent post-treatment challenges
- Successful treatment planning and model evaluation
- Evaluation and deliberate occlusal equilibration, "stop chasing dots"

Functional Anterior Aesthetics Program

BRING YOUR OWN PATIENT Give them the smile of their dreams!





This program consists of two

clinicians provide their own

ceramic crowns.

weekends, 4 weeks apart where

patient, and with the guidance of a clinical mentor, perform handson, preparation and cementation

of approximately 8-10 anterior all



MAY 5-7 PREP WEEKEND JUNE 2-4 SEAT WEEKEND LOCATION: SALT LAKE CITY, UT

DR. DAVID HORNBROOK DR. MARK MONTGOMERY

\$ 3995 per doctor includes one assistant

\$ 500 discount for dentists in practice less than 5 years \$ 395 per additional team member

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www.uvdl.com March 19-21 Prep Weekend May 3-5 Seat Weekend

STEVE ANDERSON

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Six Day, Live Patient Course

The Goal

The goal is to provide attendees with a unique hands-on, live-patient educational experience and the opportunity to explore various case scenarios. The combination of clinical, communication, marketing, and management skills addressed in this course will not only increase the enjoyment of dentistry, but will also create a level of clinical success and confidence never dreamt possible.







The Nuances of Anterior Smile Design

YOU WILL LEARN

A complete understanding of adhesive dentistry: New materials and techniques for success

- Avoiding sensitivity and eliminating microleakage with bonded restorations.
- Case planning, both aesthetically and functionally, of anterior restorative dentistry
- Preparation steps that follow a predictable and systematic approach
- Understanding functionally why things work, while others fail
- A thorough understanding of the new restorative materials and their applications
- Veneer provisionalization that's amazingly fast and aesthetic
- Laboratory communication to ensure success
- Cementation principles designed for predictable placement of multiple units
- Creative marketing to attract the "aesthetic" patient Case Acceptance

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Private Practice, San Diego, CA Educator on Aesthetics, Implants, Materials, Smile Design, Occlusion, Dental Photography Clinical Director of Education and Technology, Utah Valley Dental Lab

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Dental Lab

www.utahvalleydentallab.com 800-927-6967

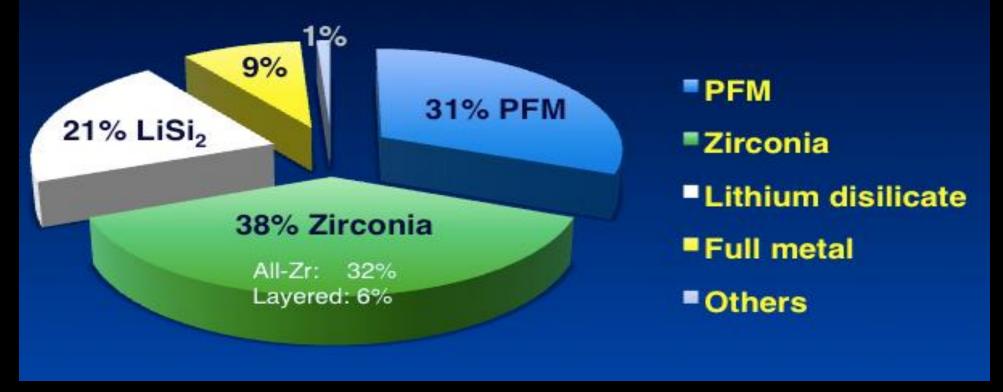


By definition, "a nonmetallic, crystalline ceramic dioxide"



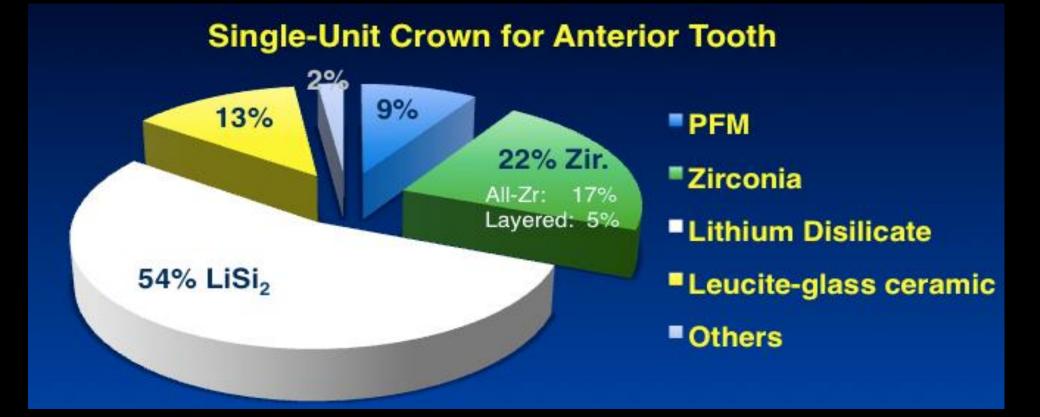
Materials for Indirect Restorations

Single-Unit Crown for Posterior Tooth



Survey 2000 dentists: J Dent 2016; 55:40-47

Materials for Indirect Restorations

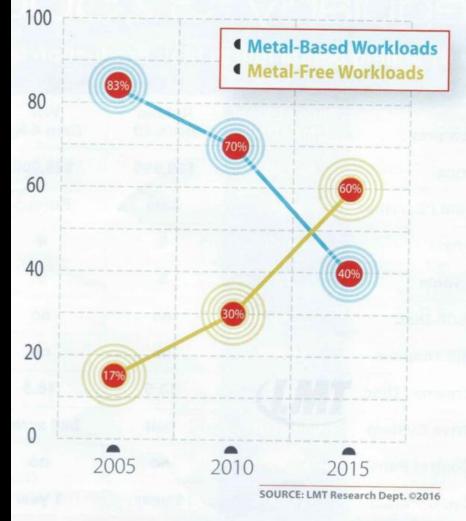


Survey 2000 dentists: J Dent 2016; 55:40-47

ZrO2

♦49 % of indirect restorations are monolithic ZrO2

*60 % of indirect restorations utilize ZrO2 Ten years ago, metal-based units made up 83% of laboratory casework. Since then, metal-free restorations have grown in popularity and—for the first time in 2015—metal-free units eclipsed metalbased workloads, 60% vs. 40%, respectively.

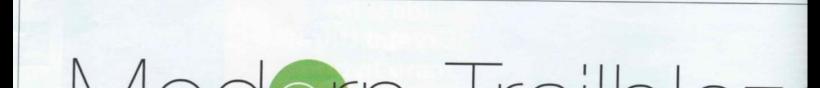


for the dental laboratory industry. It provides labs with a set of processes that ensure a common-sense approach to management and compliance with the FDA's Good Manufacturing Practices (GMPs).

The UK Dental Laboratories Association developed the DAMAS Standard in the mid-90s as an alternative to ISO Certification and to provide a quality system specific to dental laboratories. The NADL owns the rights to the DAMAS system in North America and sells the sy fications. In most cases, it's suggested that laborator consultant to help integrate the system. Laboratories certification by completing a third-party audit of cor

What is PEEK?

Poly-Ether-Ether-Ketone (PEEK) is a thermoplastic technopolymer that's been used for more than a decade for implantable medical device applications. Suitable for patients with metal allergies, the biocompatible material has an elastic modulus similar to that of bone, is X-ray transparent and can be built on with acrylic. Now becoming popular in dentistry for a variety of applications, including full and partial dentures, implant frameworks and overdentures, it's mainly used for milling but some brands also offer a pressing formulation. Related technopolymers include PEKK—polyether ketone ketone—and a thermoset technopolymer reinforced with fiberglass.



2011

Data from Glidewell Dental Lab

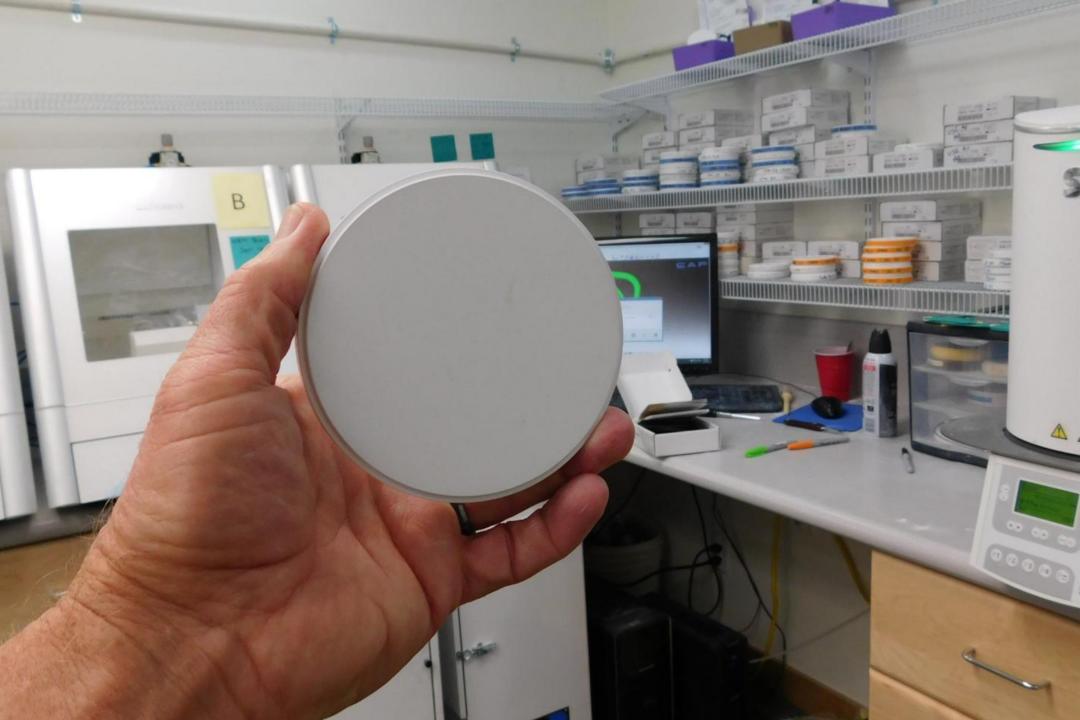
◆170 K ZrO2 ◆100 K E.Max ◆350 K PFM



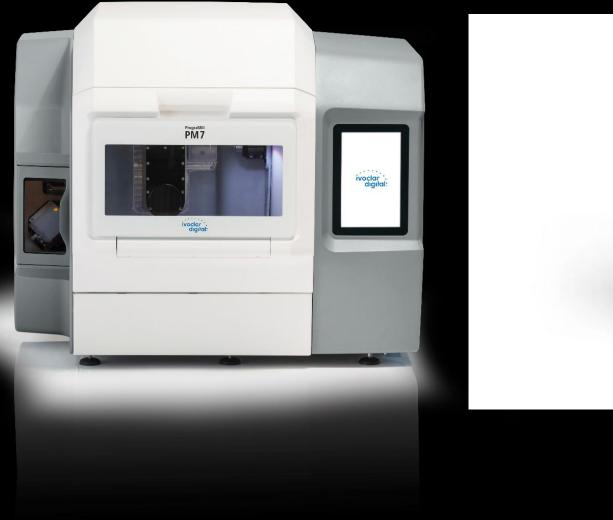
Data from Glidewell Dental Lab

1 Million ZrO2 (170K) 225 K E.Max (100 K) 175 K PFM (350 K)

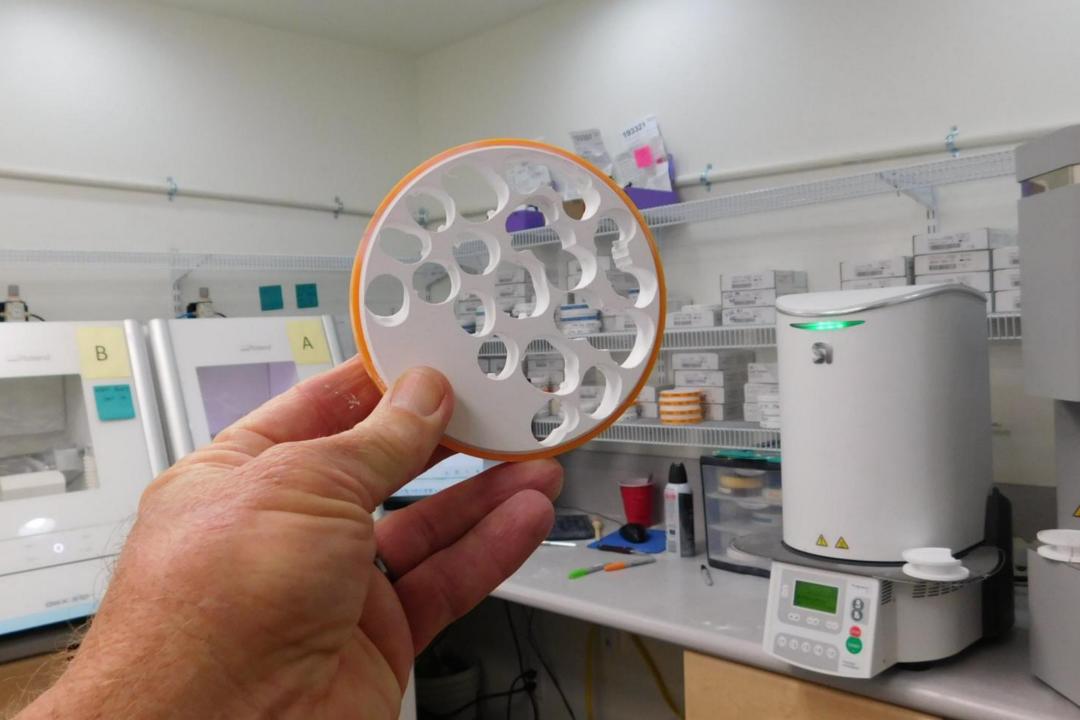
Fabrication Techniques









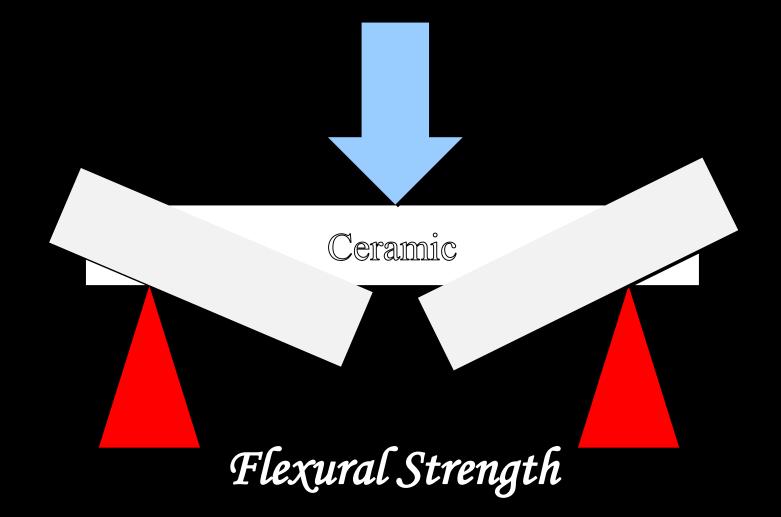






ZrO2 in Dentistry Tetragonal High Strength ♦ Opaque Low strength

Translucent

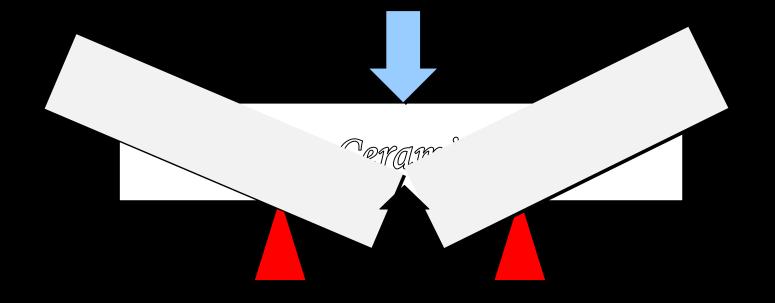


Flexural Strength

Powder/liquid ceramic: 100 mPa
IPS Empress: 200 mPa
E.Max: 400 mPa
ZrO2: 550-1500 mPa

Fracture Toughness

In materials science, fracture toughness is a property which describes the ability of a material containing a crack to resist fracture, and is one of the most important properties of any material for many design applications



Fracture Toughness

IPS Empress: 1 K1c
Composites/Hybrid ceramics: 1.5 K1c
E.Max/Celtra Duo: 2.0-3.0 K1c
Lava Esthetic: 3.5-5.0 K1c
Tetragonal ZrO2: 5.0+ K1c (Lava Plus, Katana STML, Bruxzir, etc)



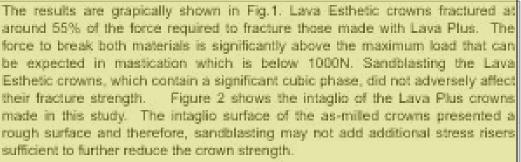
Fracture Strength of Zirconia Crowns with and without Alumina Abrasion

J. Burgess DD \$* ¹, N. Lawson DMD¹, PhD, G. Morris, PE² 1 - University of Alabama at Berningham School of Dantatry, 2 - 3M Ond Care Solutions

Objective

ISO 6872:2015 class 4 zirconia dental or phase. Although they have increased 1 when sandblasted is seen compared to te the fracture strength of zirconia crowns be without sandblasting the intaglio crown su universal testing machine. Fracture strength was recorded as the load at which the crowns failed.

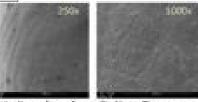
Results



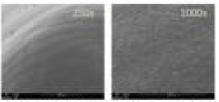


Grown Fracture Testing





integlio surface of as-milled Lava Plus crown



Integlio surface of sandblasted Lava Plus crown

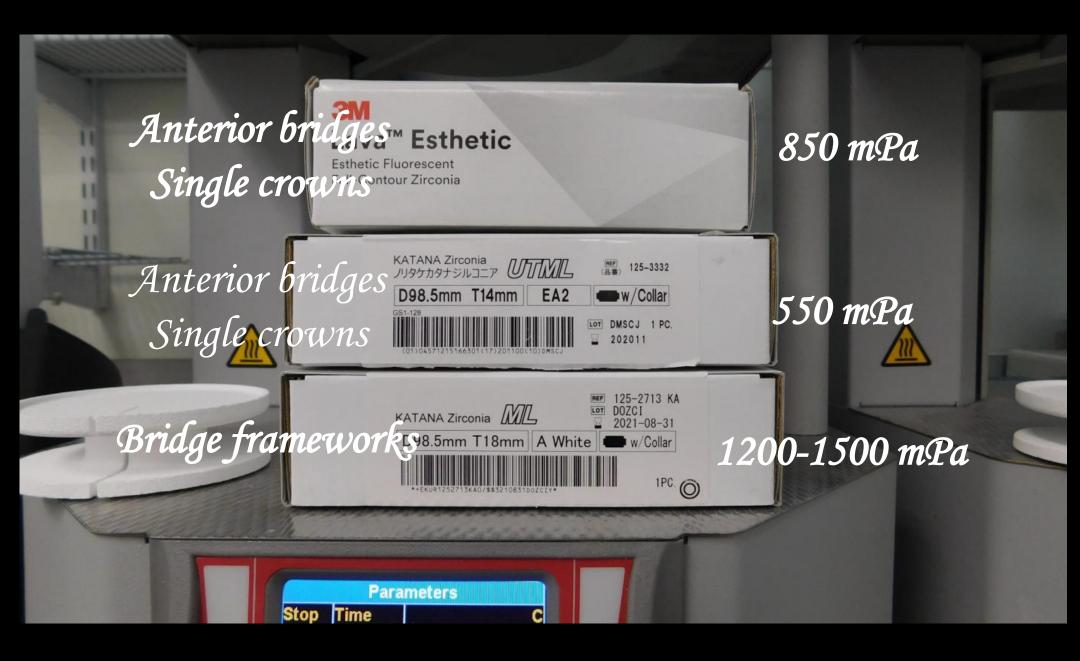
Fig. 2: SEM Images of Intaglio of Lava Plus crowns Before and After Sandblasting

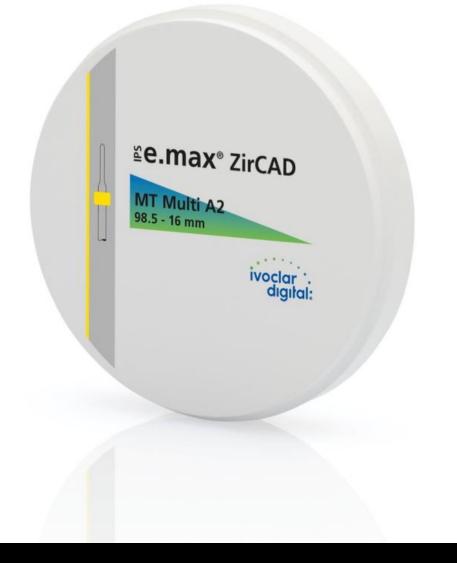
Fig. 1: Fracture strength of bonded zirconia crowns.

Conclusions

- 40µm (280 mesh) alumina particle abrasion did not reduce the fracture strength (p>.05) of the bonded zirconia crowns in this limited in vitro study.
- 2. The fracture strength of translucent zirconia was significantly lower than Lava Plus an essentially non cubic containing zirconia.
- All restorations were bonded which may have increased the fracture resistance of the restorations.

2002





4109 3068 2429 1863 Fracture 1814 1 mm Zirconia Strength 1308 1.5mm 1.5mm 1.2mm 1mm .8mm .6mm zirconia zirconia zirconia zirconia zirconia e.max

Crown

(N)

Data source: Dr. Burgess (UAB)



F

Disc 985-

CE E

Caution: U.S. Federal Law restricts this device to sale by or on the order of a dental professional.

197A01 4 2017-04 Scale-F 1.234

14 PLC

UISC 985-74

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e Blank

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Itschland GmbH

`erma

Products

ich Ctr. 1

3 mm Enamel Shade

3 mm Transition Zone

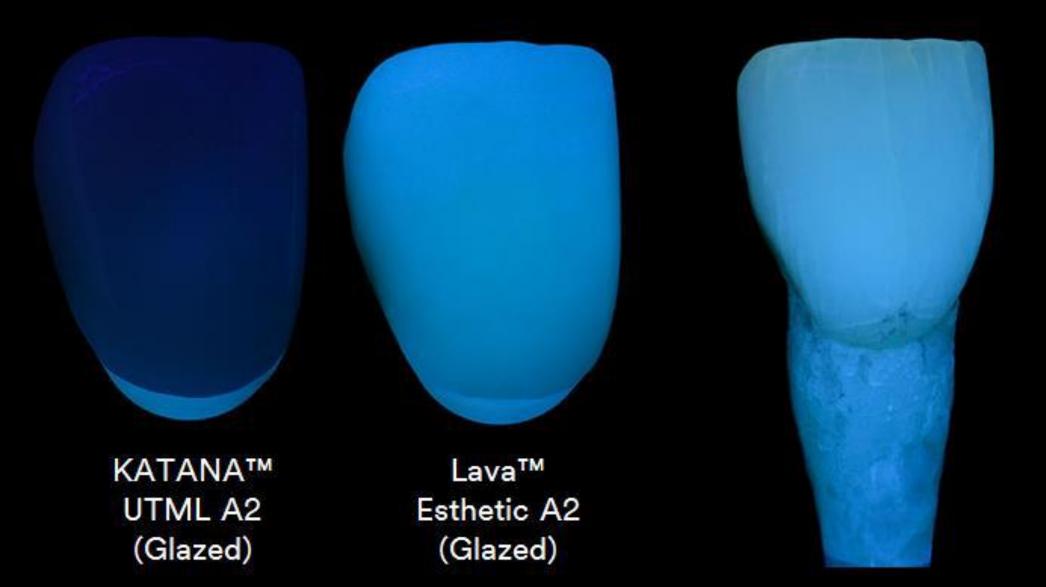
8, 12, or 16 mm Body Shade



Available Heights: 14 mm 18 mm 22 mm

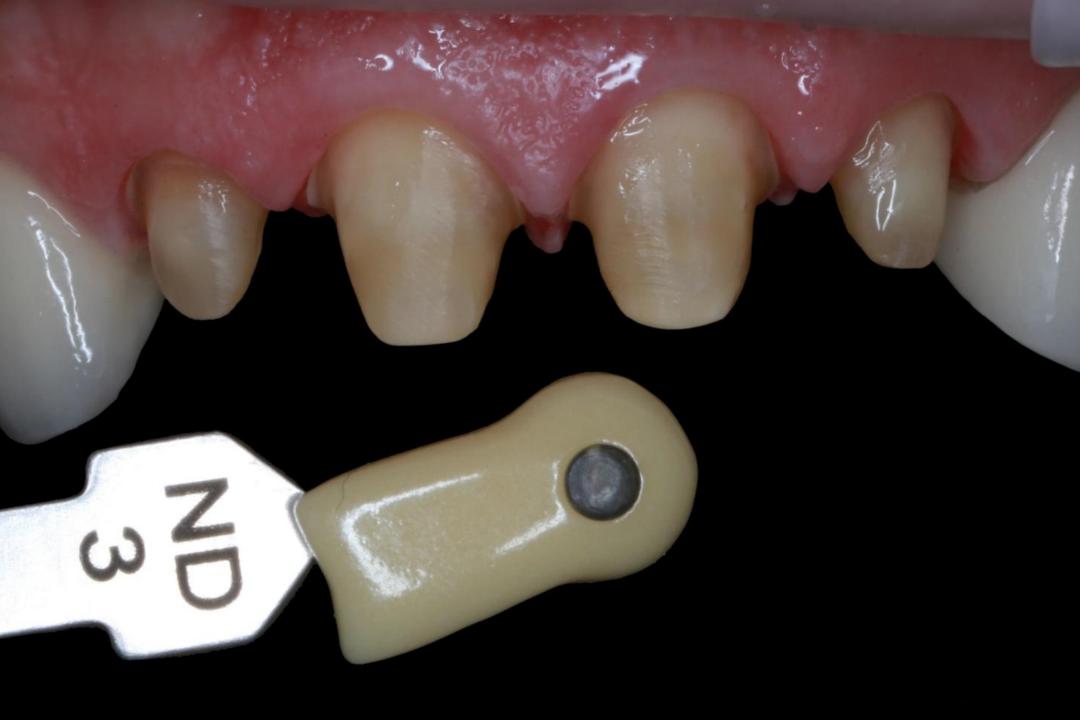
Lava Esthetic ZrO2

Bleach A1 A2 A3 A3.5 B1 C1 D2



*****Tetragonal

- Monolithic crowns on destroyers
- Framework for bridges
- *Monolithic or framework for All-on= "X"s"*
- Implant abutments
- Cubic/Tetragonal (HT, UT)
 - Monolithic crowns (both anterior and posterior)
 - Anterior 3-unit bridges
 - Framework for anterior crowns



ENatural Die Material Natural Die Prep Shade Guide (Ivoclar)

ND

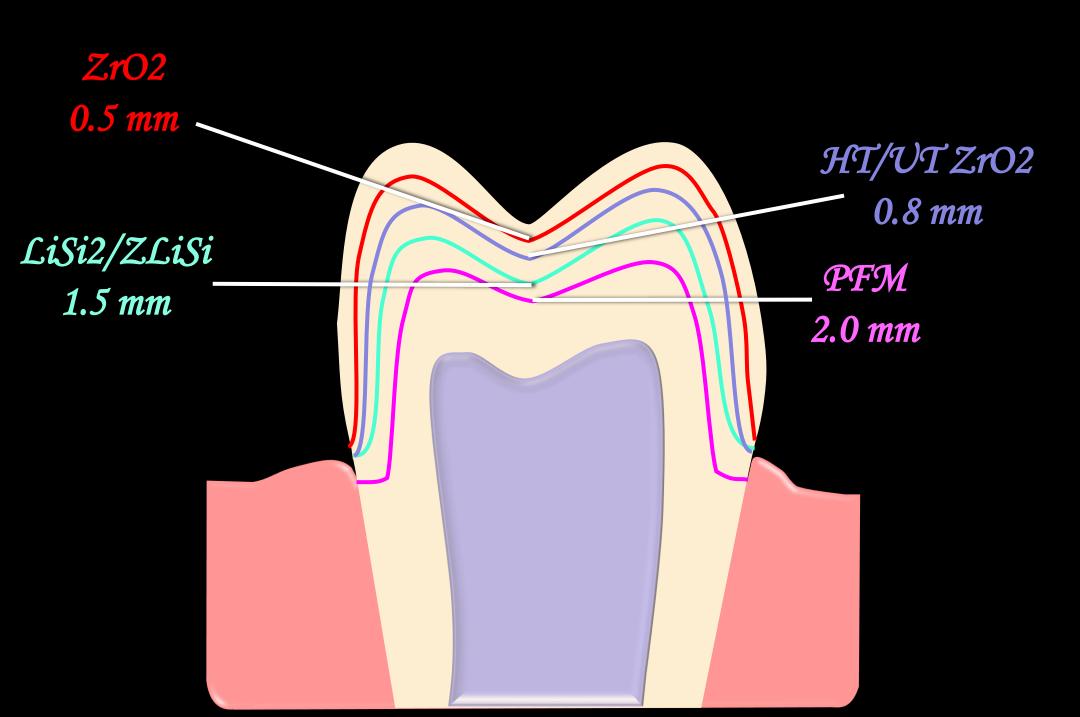
ND

ND

ND

ND





Axial thickness ↔ 0.6 mm



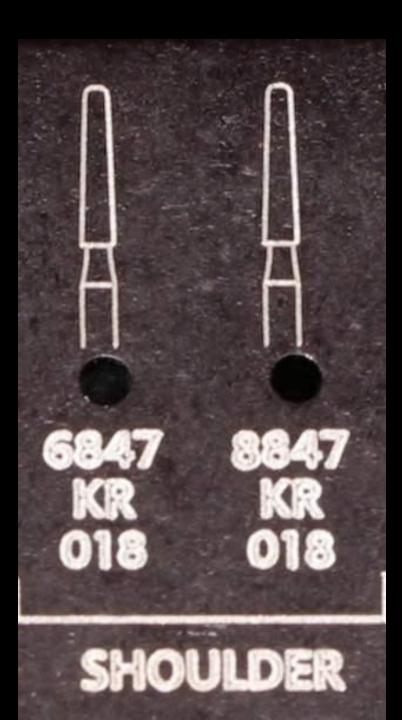
Depends upon degree of translucency desired Minimum of 1.0 mm

Axial thickness Minimum of 0.6 mm



Marginal preparation Butt joint Deep Chamfer Light Chamfer Internal line angles must be rounded





What do we cement them with?

Depends upon prep design, amount of retention, and ability to isolate Two surfaces we bond (or attempt) to: ******Tooth structure* *****Dentin Enamel *Restoration



Resin Cements with DBA: (Anterior & Low retentive preps)



Light Cure Resin Cements

Variolink Esthetic LC (Ivoclar)
Choice 2 (Bisco)
NX3 (Kerr)
Calibra (Dentsply)



Dual Cure Resin Cements

Variolink Esthetic DC (Ivoclar)
Duolink Universal (Bisco)
NX3 DC (Kerr)









Resin Cements with DBA: (Anterior & Low retentive preps) Self-etching Resin Cements:

(Posterior with adequate retention)



Cements

Resin Cements with DBA: (Anterior & Low retentive preps)

 Self-etching Resin Cements: (Posterior with adequate retention)
 RMGI: (Posterior with alequate retention) Veneers, anterior crowns, and low retentive preparations

✤Tooth

Etch enamel followed by dentin*
Rinse, lightly air dry
Apply Hema/water/glutaraldehyde solution*

Gluma (Heraeus)
Telio Desensitizer (Ivoclar)
G 5 (Clinicians Choice)
MicroPrime G (Danville)

Effect of Remoistening Water vs. Desensitizer/Rewetting Agent

Product Water-blotted dry Water-wet Gluma Desensitizer HurriSeal Telio CS Desensitizer MicroPrime Aqua-Prep

Dentinal Bond 22.8 19.2 22.3 20.125.8 20.118.1

Anterior crowns, and low retentive preparations \bullet Tooth

Etch enamel followed by dentin*

Rinse, lightly air dry

- Apply Hema/Water/ Glutaraldehyde solution*
 Blot dry
- Apply multiple coats of primer
- Air dry

Light cure

On the restoration (After try-in)
 Sandblast with 50 micron AlO2 at 20-40 psi
 Use Alkaline cleanser solution
 Use ZrO2 primer

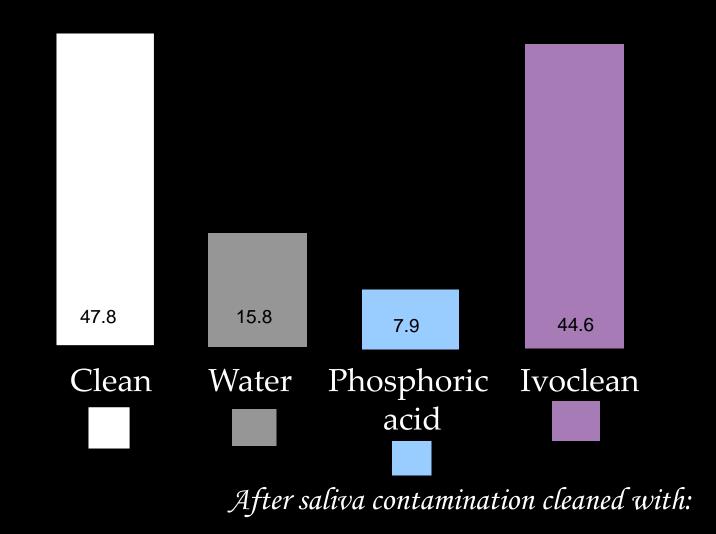




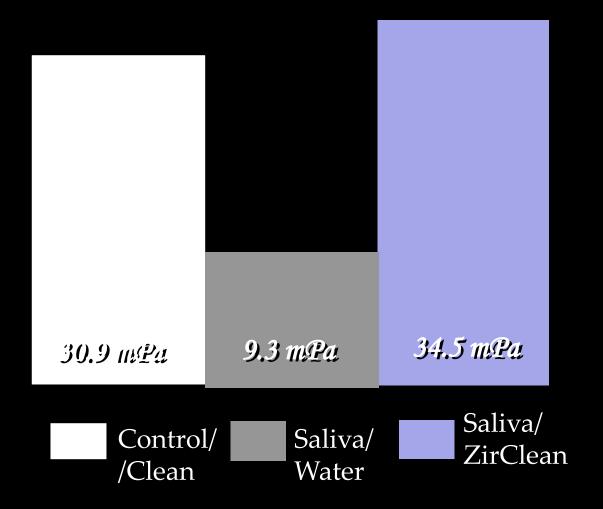
Alkaline-based Cleaners

Zirconium oxide

[IPS E.Max ZirCAD, blasted]



ZrO2 before and after Saliva Contamination Chen L, Gleave C, Fuessle, Suh BI. CED-IADR 2017



IADR Abstract Archives

Removal of Zirconia's Saliva Contamination with Z-Clean

Objectives: Phosphate-monomer containing primers and cements chemically bond to zirconia ceramics. However, zirconia restorations are susceptible to saliva contamination during intraoral try-in. The phosphates in saliva chemically bond to zirconia internal surface and difficult to remove. The purpose of this study is to investigate the effects of saliva contamination on zirconia bond strength, and to investigate whether a new zirconia cleaning agent, Z-Clean, is able to minimize the adverse effects of zirconia contamination.

Methods: Zirconia ceramic was lightly sandblasted and randomly divided into 6 groups. Group 1 and 4 (Control) were not contaminated with saliva. Group 2,3,5,6 were contaminated with saliva-1min, then either cleaned by water, or by a zirconia cleaning gel (Z-Clean, Bisco). Group 1-3 were then directly cemented with a Calcium-releasing and MDP-containing self-adhesive resin cement, TheraCem (Bisco) (n=5). Group 4-6 were treated with an MDP-containing zirconia primer, Z-Prime Plus (Bisco), and then cemented with a dual-cure resin cement (Duolink Universal, Bisco) (n=6). Shear bond strength was tested using the ISO 29022:2013 (Notched-edge shear bond strength, bonding area 4.5mm²). The specimens were then stored in de-ionized water (37°C/24hours), and tested by Instron tester (crosshead-speed 1mm/min). The data were analyzed statistically by one-way ANOVA and Student t-test (p<0.05).

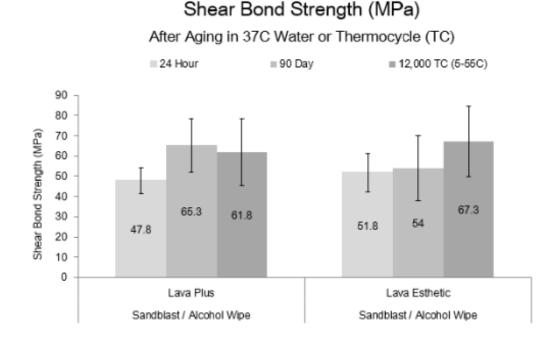
Results: Mean shear bond strength in MPa (standard deviation) are shown in Table. Means with different letters are statistically different (p<0.05).

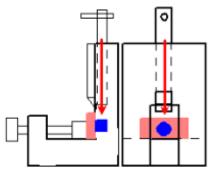
Conclusions: Saliva contamination significantly decreased zirconia bond strengths. Cleaning with a zirconia cleaning gel (Z-Clean) was the effective methods to eliminate the adverse effects of saliva contamination.

TABLES

Group	Contamination	Cleaning	Cement	Bond Strength Result
1	None	None	TheraCem	26.3 (5.3), b
2	Saliva	Water	TheraCem	9.0 (5.6), c
3	Saliva	Z-Clean	TheraCem	29.0 (1.8), b
4	None	None	ZPrime – Duolink U	31.9 (4.8), ab
5	Saliva	Water	ZPrime – Duolink U	9.3 (2.3), c
6	Saliva	Z-Clean	ZPrime – Duolink U	34.5 (5.0), a

Cementation - 3M[™] RelyX[™] Unicem 2 Cement Equivalent Bond Strength – 3M[™] Lava[™] Plus High Translucency Zirconia or 3M[™] Lava[™] Esthetic Fluorescent Full Contour Zirconia







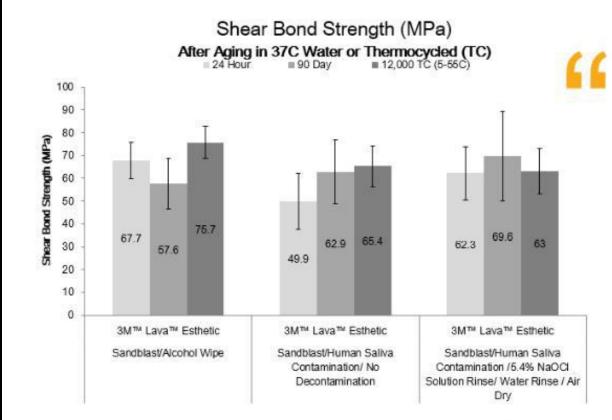


Source: Prof. Martin Rosentritt, University of Regensberg J Dent Res Vol # 96 (Spec Iss A): 2552, 2017



Cementation - 3M[™] RelyX[™] Ultimate Adhesive Resin Cement When Higher Bond Strength is Needed and 3M[™] Scotchbond[™] I





The use of self-etching or adhesive bonding together with cleaning and decontamination guaranteed efficient bonding to Lava Esthetic"

Prof. Martin Rosentritt

University of Regensberg Source: Prof. Martin Rosentritt, University of Regensberg J Dent Res Vol # 96 (Spec Iss A): 2552, 2017





NaOH2/KOH2 on ZrO2



Light cure resin cements (Anterior)

Relyx Veneer Cement (3M)
Choice 2 (Bisco)
Variolink Esthetic LC (Ivoclar)
NX 3 (Kerr)

Dual Cure resin cements

Relyx Ultimate (3M)
Duolink Universal (Bisco)
NX 3 (Kerr)

**Variolink Esthetic DC (Ivoclar)*



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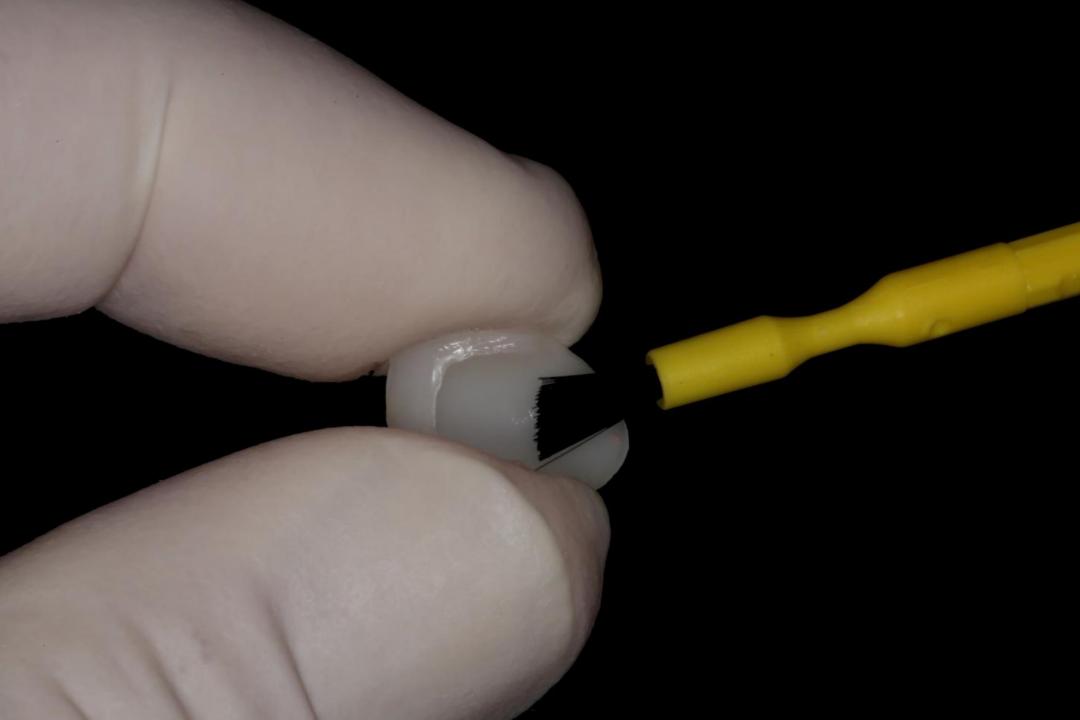






































Retentive Prep Cementation

✤Tooth

Clean tooth with Chlorahexadine Pumice (Consepsis Scrub; Ultradent)

Restoration

- Sandblast or Alkaline Cleanser
- ✤ ZrO2 Primer

Use self-etching resin cement

- ✤ Unicem 2 (3M)
- TheraCem (Bisco)
- Activa cement (Pulpdent)





LavaTM Esthetic Fluoresc

11:586

3

Aleach

LOT 642806

Scale-F 1.2314

Bleach

-Conty

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23

2370

1908249 Light

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3M Deutschland GmbH Dental Products Carl-Schurz-Str. 1 41453 Neuss – Germany

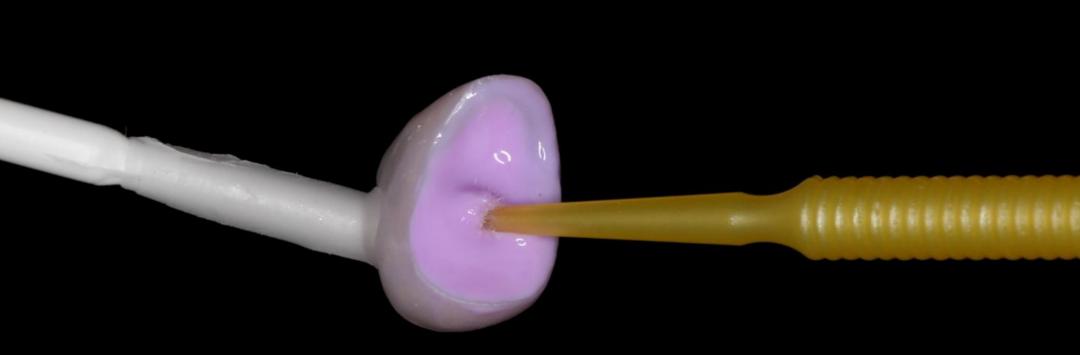
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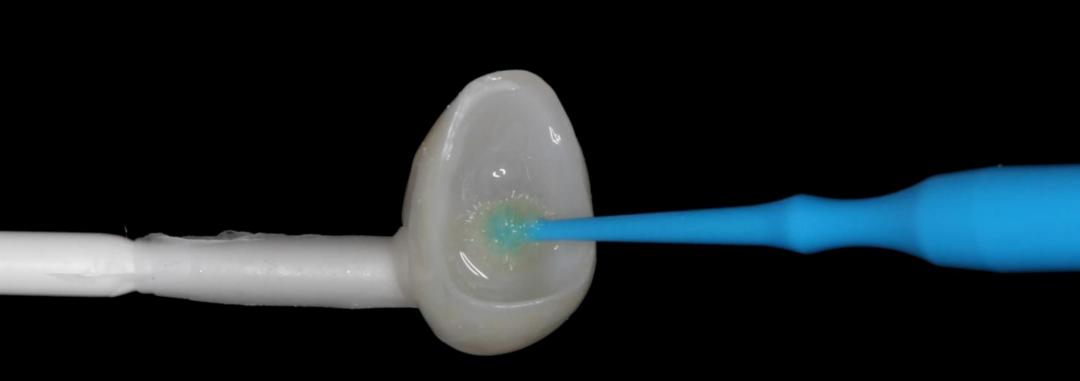




After try-in, clean with Ivoclean



Rinse and dry thoroughly



Apply Z-Prime + (Bisco)

Load with Unicem 2 cement



Tack for 10 seconds

Wave margins for 5 seconds

Remove excess with Scaler

Floss through contacts

Place glycerin around margins (DeOx; Ultradent)

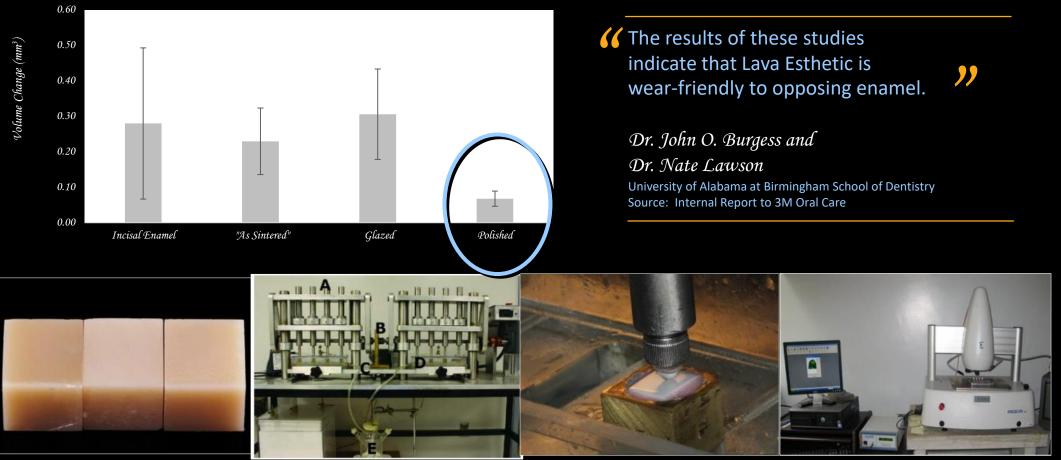
1954 N finishing strip (3M)



What do we adjust and polish with?



Wear of Enamel Against Antagonist Incisal Enamel with Lava Full Contour



From Left to Right, "As Sintered", Glazed, Polished

Alabama Wear Tester

Sample Being Tested

Sample Being Measured

Abrasive wear of monolithic LavaTM Plus zirconia crowns: Two Year Report Investigators

Prof. S. Reich, University of Aachen, Germany Prof. U. Lohbauer, University of Erlangen-Nuremberg, Germany

Aim of the Study

The aim of this study was to evaluate the amount of abrasive wear on the antagonist occlusal surfaces of clinically placed monolithic Lava Plus premolar and molar crowns.

Study Design at a Glance

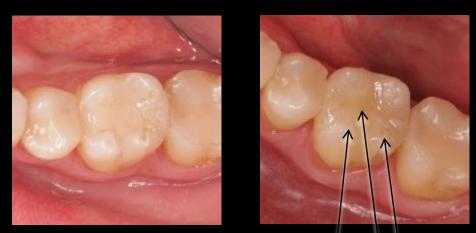
Design: longitudinal, prospective, two-center, clinical study

Materials: Lava Plus Monolithic Zirconia Crowns, RelyX Unicem Selfadhesive cement (3M ESPE)

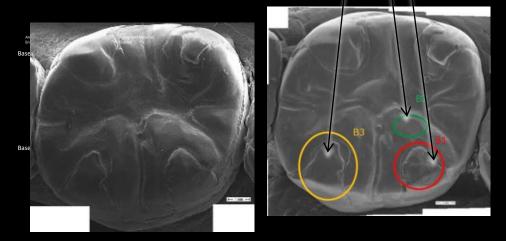
Number of Lava Plus crowns included: 14 crowns (9 molars, 5 premolars)

Number of antagonist teeth available for wear analysis: 15 teeth (7 molars, 8 premolars) with 22 analyzed contact areas.

Evaluation Criteria: Monolithic zirconia crowns were placed at Aachen University and VPS impressions were taken. Maximum vertical loss and volume loss at the occlusal surfaces of Lava Plus crowns and antagonists were quantified by optical profilometry (CT100, Cybertechnologies) based on replica. Relevant contact points on enamel or ceramic of the antagonists were visually identified and qualitatively analyzed on replicas using scanning electron microscopy



Occlusal situation with respective contact points on antagonist. First lower molar with ceramic inlay.



SEM images of epoxy replicas of antagonist tooth, circles showing the wor areas on enamel and ceramic after 24 month.

IADR 2015, Boston, #512



IADR 2015, Boston, #512

3M "Health Care Academy

3M Oral Care

Abrasive wear of monolithic Lava[™] Plus zirconia crowns: Two Year Report

Investigators

Prof. S. Reich, University of Aachen, Germany Prof. U. Lohbauer, University of Erlangen-Nuremberg, Germany

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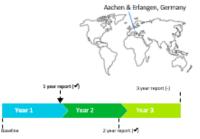
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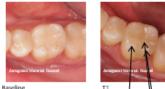
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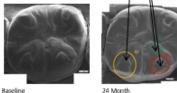
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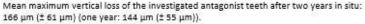
Occlusal situation with respective contact points on antagonist. First lower molar with ceramic inlay.

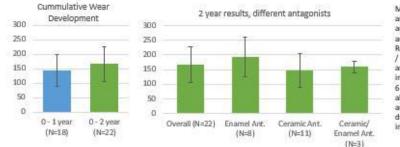




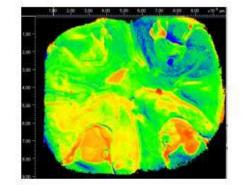
SEM images of epoxy replicas of antagonist tooth, circles showing the worn areas on enamel and ceramic after 24 month

Results





Maximum Vertical Loss on antagonist teeth in µm at 1 and 2 years and on different antagonists at 2 years. Reasons for excluding teeth / contact areas from analysis were nonocclusion, intra-oral adjustment after 6 month or chippings. Not all study teeth could be analyzed at the 1 Year recall due to insufficient impressions and replicas.



•	200,00 µm
•	100,00 µm
•	50,00 µm
•	25,00 µm
-	0.00 µm
-	-25,00 µm
-	-50,00 µm
	-200,00 µm

Differential image (lower first molar as an example) of antagonist from Baseline and 12 month recall replicas using the Software Surfer 9 (Golden Software, Co, USA). Worn areas in orange/red.

Conclusions from Report

- The measured wear rates are comparable with other studies are in the normal physiological range.
- No significant difference was found between natural enamel antagonists and ceramic restorations.
- The monolithic zirconia restorations did not seem to be affected by wear in the first two years.

Related Clinical Evaluations

Esquivel-Upshaw JF, Rose WF Jr, Barrett AA, Oliveira ER, Yang MC, Clark AE, Anusavice KJ. Three years in vivo wear: core-ceramic, veneers, and enamel antagonists. Dent Mater 2012;28:615-621.

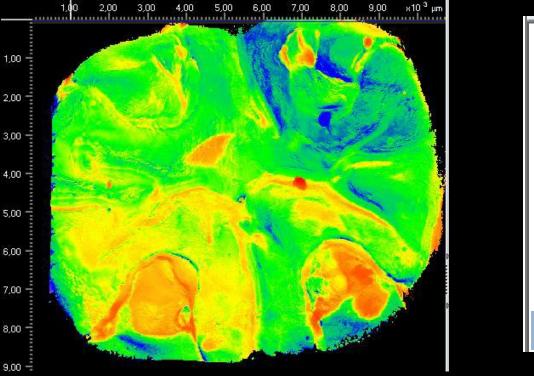
Preis V, Schmalzbauer M, Bougeard D, Schneider-Feyrer S, Rosentritt M. Surface properties of monolithic zirconia after dental adjustment treatments and in vitro wear simulation. J Dent 2014

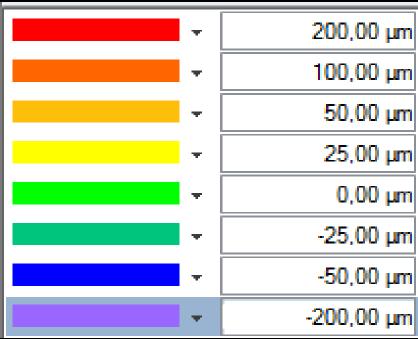
Stober T, Bermejo JL, Rammelsberg P, Schmitter M. Enamel wear caused by monolithic zirconia crowns after 6 month of clinical use. J Oral Rehabil 2014;41:314-322.

2-year report to 3M Oral Care (internal)



3M Deutschland GmbH ESPE Platz 82229 Seefeld Freedal: 0800-2753773 Freeday: 0800-3293773





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Roughness, Gloss and Opposing Enamel Wear of Translucent Zirconia

Authors:

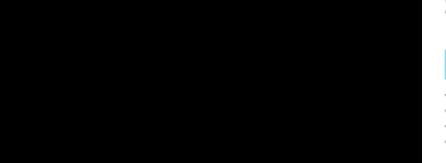
Sung Joon Kwon (Presenter), University of Alebeme Birminghem Preston Beok, University of Alebeme et Birminghem John Burgess, University of Alebeme et Birminghem Netheniel Lewson, University of Alebeme et Birminghem

Abstract:

Objectives: To compare wear, antegonistic enamel wear, gloss and roughness of as-sintered, polished and glazed 3M" Lave" Esthetic Fluorescent Full-Contour Zirconia.

Methods: Pre-sintered ziroonia blanks were out using a dry sew and hand-sanded with P2500 sand paper. Samples were sintered by heating for 10°C/min to 1500°C and holding at temperature for 2 hours. Three sets of specimens (n=8) were prepared as follows: 1) "As-sintered", 2) glazed with IPS e.max[®] Ceram following the manufacturer's IFU and 3) hand polished with NTI[®] CeraGlaze[®] Polishers (ocarse, fine, and super fine) at 10,000 RPM followed by an Intraoral DiaShine Fine paste using a soft bristle brush. Wear against maxillary central incisor enamel was measured as a reference. Specimens were mounted in the Alabame Wear Mechine against modified human premolar antagonists and tested for 300,000 cycles (20N, 2mm sliding distance, 1Hz frequency, and 33% glycerin lubrication). Volumetrio loss of zirconia and opposing enamel was measured using non-contact light profilometrey (10µm resolution). Surface roughness (R) was measured with a non-contact, light profilometer. A 4mm length was measured with 0.8mm outoff length, and 136 surface filter number. Gloss was measured with a glossmeter (Novo-Curve). Data for each property was analyzed using individual 1-way ANOVAs and Tukey post-hoo analyses (alpha=0.05).

Conclusions: Polished and as-sintered Lava Esthetic ziroonia had no detectable wear while glazed specimens only showed wear of the glaze. Polished Lava Esthetic ziroonia created the least amount of opporting anomal wear. Enamel glazed and as-sintered specimens were in the same range. Polishing or glazing Lava Esthetic and decreased its roughness. Project sponsored by 3M.



Roughness, Gloss and Opposing Enamel Wear of Translucent Zirconia (cont.)

Sample	Roughness (R_)	Gloss (GU)	Volumetric Wear (mm²)	Enamel Wear (mm³)
As-is	0.158A	28.1A	0	0.230A±0.094
Glazed	0.055B	78.3B	0.058±0.014	0.306A±0.128
Polished	0.027C	180.9C	0	0.0688±0.021
Enamel	-	-	0.142±0.148	0.280A±0.213

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