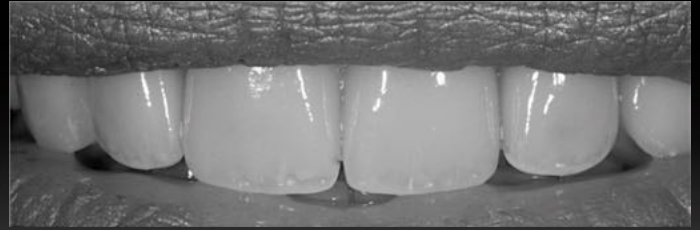


*Occlusion, All Ceramics @ CAD/CAM
State of the Art*



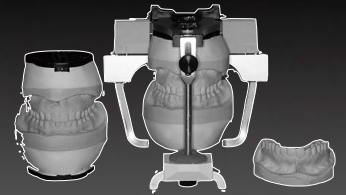
Gerard Kugel DMD, MS, PhD

Philosophy of Esthetic Dentistry

- Recolor
- Reposition
- Re-contour
- Reshape: Occlusal Equilibration
- Restore

Esthetic and Function

- Vertical dimension
- Anterior guidance
- “S-F” sounds
- Tooth shape



Occlusion Pathology

- ✓ Broken Teeth
- ✓ Worn Teeth
- ✓ Loose Teeth
- ✓ Periodontal Diseases
- ✓ Joint Pain
- ✓ Muscle Pain



Significance of Centric Relation



- CR is a *reproducible* position of the mandible relative to the maxilla.
- This position is reproducible irrespective of occlusal guidance.
- Patients with no teeth still have a centric relation.
- There is inter- and intra-operator reliability in finding CR.

Treatment Planning

- Check Contraindications
- Mounted Study Models
- Posterior Occlusion
- Protrusive Interferences
- Lateral Interferences
- Centric Anterior Lingual Contacts



Centric Occlusion (CO)

- Occlusion the patient makes when they fit their teeth together in maximum intercuspation.
- Intercuspation Position (ICP), Bite of Convenience or Habitual Bite.
- Occlusion that the patient nearly always makes when asked to close their teeth together; it is the 'bite' that is most easily recorded.

Conceptually

CR is the position of the mandible relative to the maxilla, with the articular disc in place, when the muscles that support the mandible are at their most relaxed and least strained position.

This description is pertinent to an understanding of 'ideal occlusion'.

The Journal of Prosthetic Dentistry, with the most recent publications advocating an anterior superior position of the mandibular condyles in the glenoid fossa—not a retruded posterior superior position.

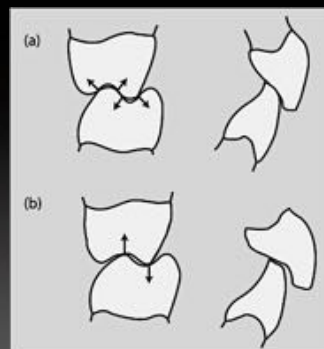
Significance of Centric Relation




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When to Make a Centric Relation Record?

- Restoring all posterior teeth in one or both arches
- Restoring all teeth in one arch
- Complete denture
- Occlusal equilibration



The coincidence of Centric Occlusion in Centric Relation (CO = CR), when there is freedom for the mandible to move slightly forwards from that occlusion in the same sagittal and horizontal plane (Freedom in Centric Occlusion)



Centric Relation

A patient who has a 5 mm overjet when occluding in centric occlusion and has a 10 mm overjet when in centric relation

Centric Occlusion

Examination is essential if misdiagnosis and incorrect treatment planning is to be minimized


BDJ 2001

Techniques for Recording Centric Relation

- Anterior Deprogrammers (Lucia jig, Leaf gauge)
- Self-guided
- Central Bearing Devices (Intra/Extra-oral devices), i.e., Coble tracer
- Chin point/One-handed techniques
- Bilateral Manipulation (Dawson Technique)
- Myomonitor

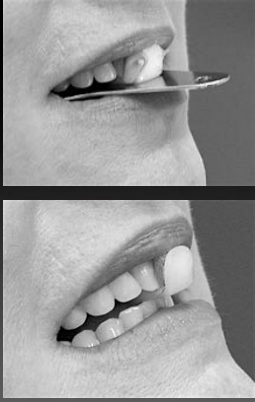


Lucia Jig To Aid in CR Determination




The Lucia Jig helps obtain centric relation by de-programming muscles and allowing the condyles to seat in the most superior position. "It separates the posterior teeth, and by separating the posterior teeth it allows the lateral pterygoid to release, and when the lateral pterygoid releases, the condyle seats...it's that simple,"

Dr. F Spear



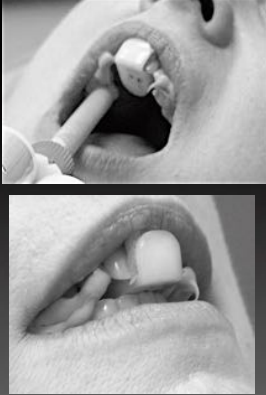
Place the jig on the upper centrals and place the Whale Tail directly beneath the jig. Ask the patient to bite down and hold. The Whale Tail levels and orients the jig to the occlusal plane.

Trim & place back on the patient's upper centrals. Ask the patient to bite down onto the jig, slide forward, slide back, and squeeze. Repeat. Ask the patient if he or she feels any tenderness or tension. If the answer is no, the pterygoid is relaxed and the joint can support load comfortably.



Using red articulating paper, confirm that the lower centrals are contacting the jig evenly. Place the red articulating paper between the jig and the lower centrals. Ask the patient to slide the lower incisors forward and back several times marking the jig.

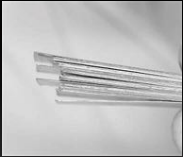
To determine the patient's most retruded position ask the patient to bite down, slide forward, back, and squeeze. Repeat and hold. Ask the patient to open slightly, place black articulating paper between the jig and the lower centrals and ask the patient to tap three times. The most retruded point of contact of the lower incisors has now been marked in black on the jig.



Ask the patient to open and inject an ample amount of the registration material starting on the second molars and work up to at least the cuspids on both sides.

Ask the patient to slowly close onto the marks and squeeze. The patient must squeeze firmly to seat the condyle by using the masseter, temporalis, and medial pterygoid muscles. If the patient's lower incisors are on the most posterior marks on the jig, you know the patient has closed into the correct position.

Leaf Gauge



- Place ten leaves between central incisors (0.1 mm/leaf)
- Instruct the patient to close "half hard" on back teeth
- Wait 20-30 seconds
- Ask the patient if they feel contact of their back teeth

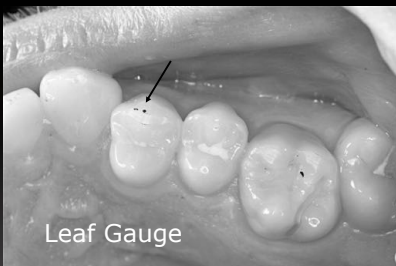


There is no such thing as an intrinsically bad occlusal contact, only an intolerable number of times to parafunction on it!

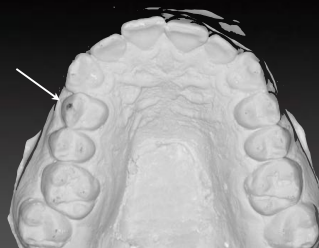
- Continue adding leaves until no posterior tooth contact is felt
- remove leaves one at a time to determine the first contact



- Record the number of leaves when the patient feels tooth contact.
- Record the location of the initial tooth contact and location on the teeth.



Leaf Gauge



Bilateral manipulation



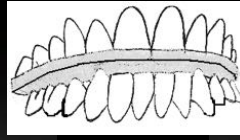
Full Contact Splint with Anterior Guidance



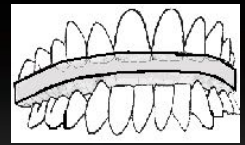
Flat Plane Splint



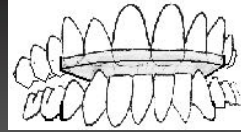
Splint Options



Soft, resilient



Thicker, increasing vertical dimension



Anterior Bite Plane



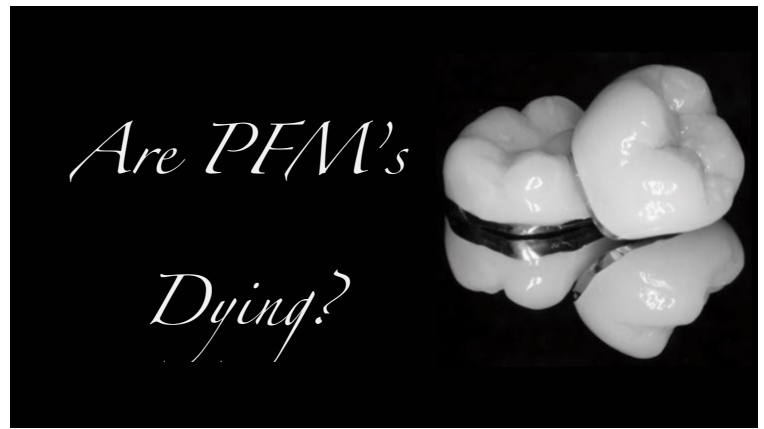
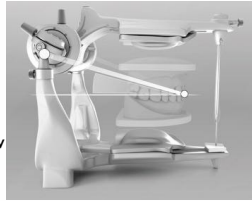
Flat Plane with cuspid guidance

Virtual Articulation

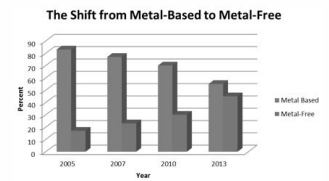
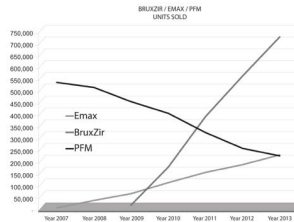
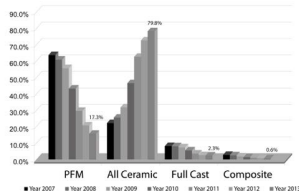
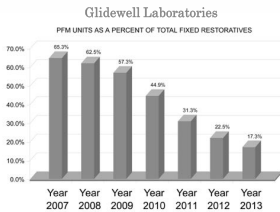


Virtual Articulation is turned on or off during the setup phase. If turned on it will take the in to consideration the jaw movements of the patient to render a better initial proposal.

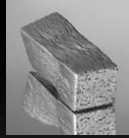
The articulator is an averaged based adjustable articulator, ranges may be changed if you have know values for the patient. Proper setting of the initial model axis is critical.



Glidewell Laboratories



WHAT IS ZIRCONIA?



Zirconia is the oxide of zirconium metal.

A white powder compacted into blocks & heated slowly to either a partially or fully sintered state.

Dental ZrO_2 is called yttria stabilized zirconium oxide.

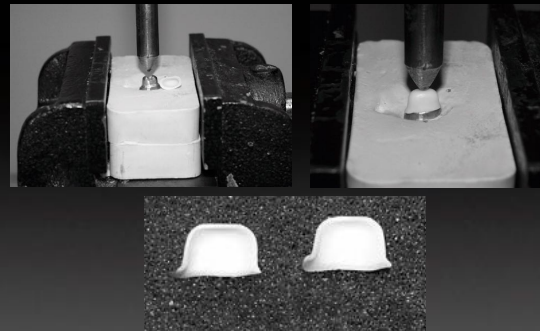
BruxZir Crowns



ZIRCONIA

Advantages:

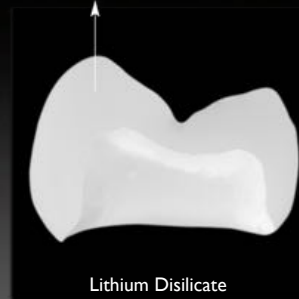
- Biocompatibility
- Eliminates metal sensitivity questions.
- Can have better esthetics and less expensive than PFM.
- Outsourced coping construction saves labs time & money.
- No dark line at margins or at chips or breaks.



Grinding on the core after sintering causes a monoclinic phase change and weakens the core.



360–400 MPa



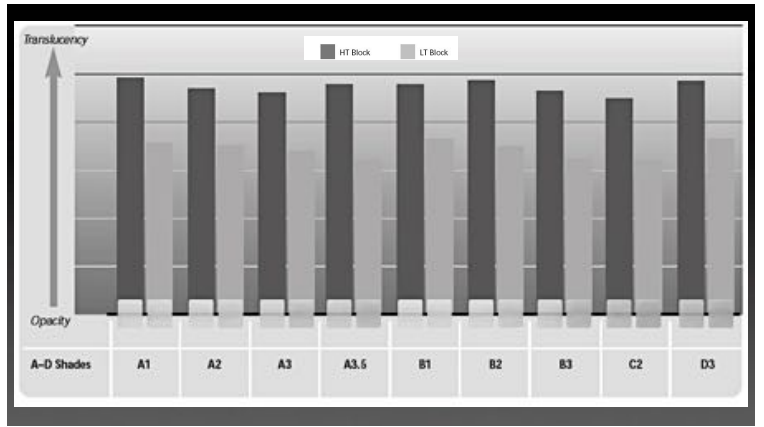
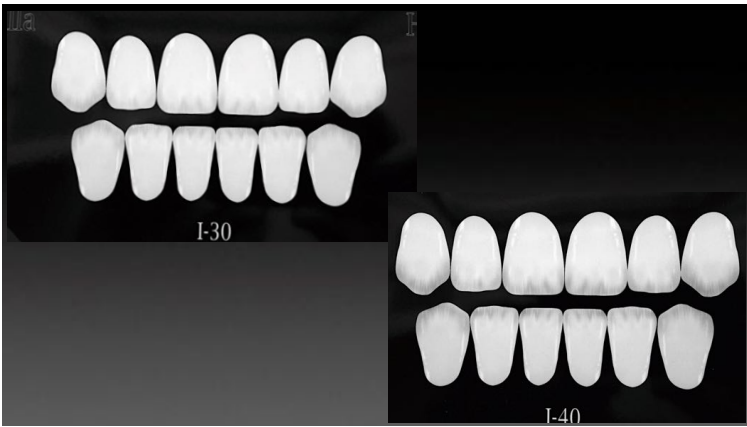
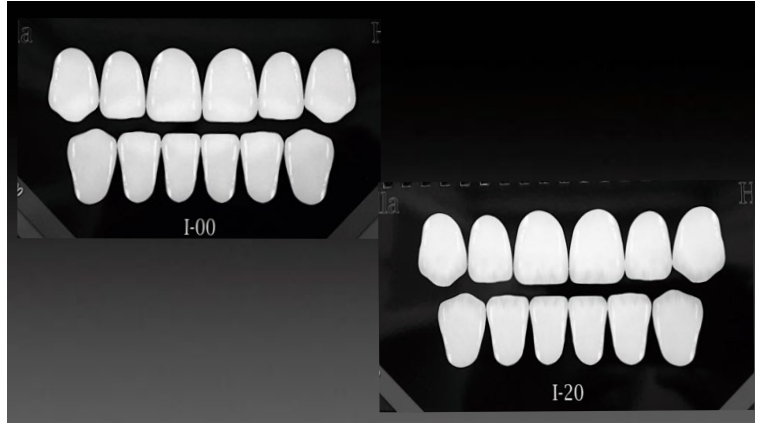
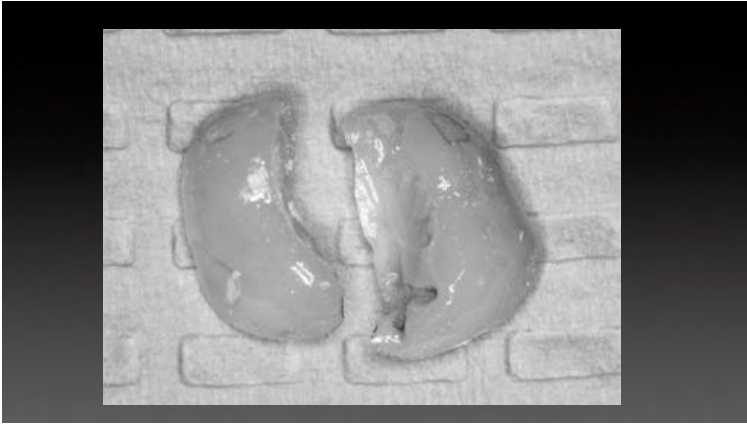
Lithium Disilicate

80–120 MPa

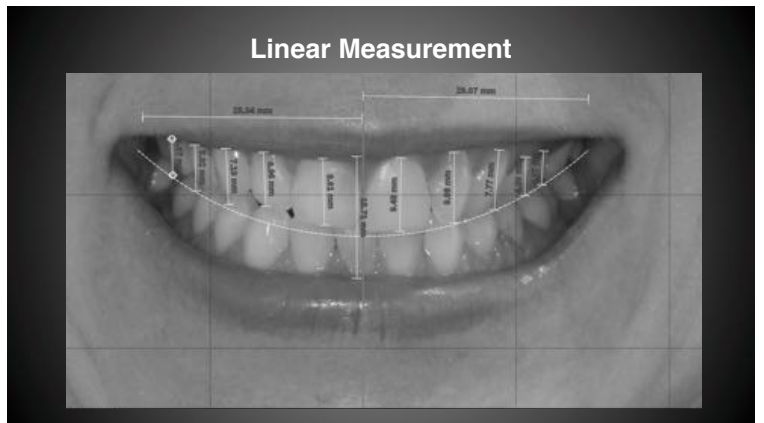


>900 MPa

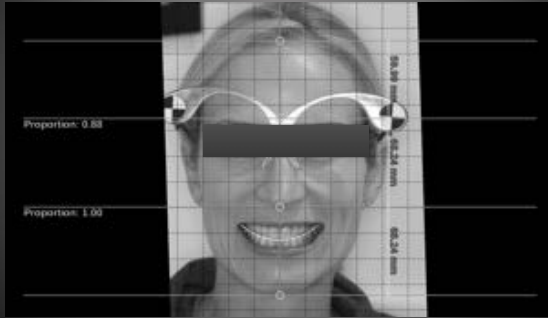
Zirconium Oxide



Digital
Smile Design
 Analytics



Facial Proportion upper pro 0,88.lower pro 1,00



Axis and Gingival level

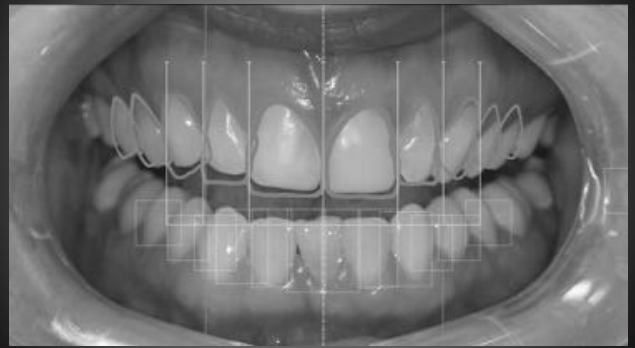


Golden Proportion



PERFECT2B

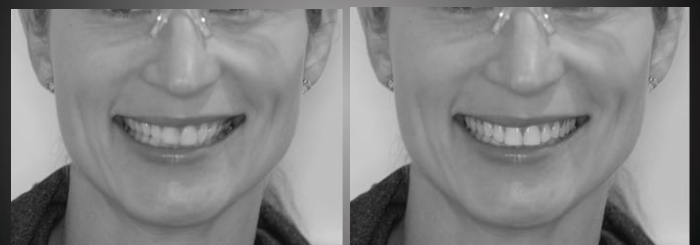
Alignment



Guideline



Final Result



Closeup View



Esthetic Evaluation in Wax

“F” & “S” sounds
& Incisal Edge position

Pre-glaze Try-in



Retaining or re-establishing Anterior Tooth Position is the most important factor in Esthetics and Speech

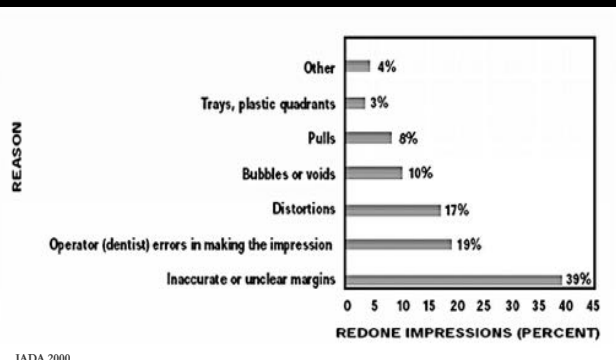
The Impression Market



- Approximately 50 million impressions are taken in the US each year
- 140 million impressions taken worldwide

In a 2005 LMT survey, laboratories were asked what is your number one challenge with incoming work from dentists?

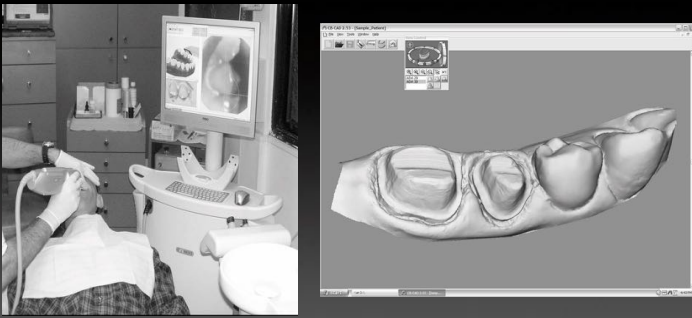
59% reported “inadequate impressions”



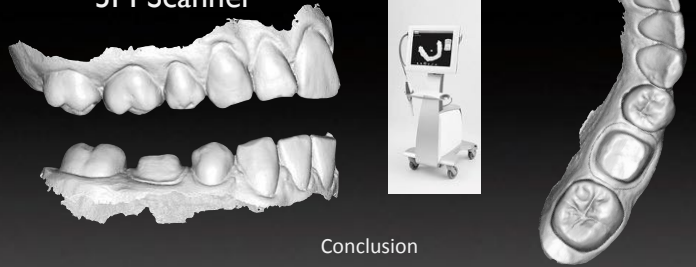
JADA 2000



The iTero Scanner



3M Scanner



Conclusion

The use of the scanner was equivalent to the PVS impressions. No statistical difference was noted

AADR abstract 1119, April 2008

Chairside CAD/CAM



How common is CEREC ?

12% of the dentists in the United States

50,000 World wide

76% of Dental Schools have at least one unit

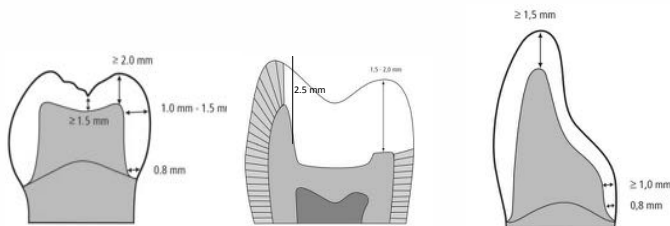
120 Government Sites

- ❖ Air Force, Army, and Navy Bases
- ❖ VA Hospitals
- ❖ Indian Health Clinics
- ❖ Dental Assisting Schools



Minimal Ceramic Thickness

Crowns inlay/onlay

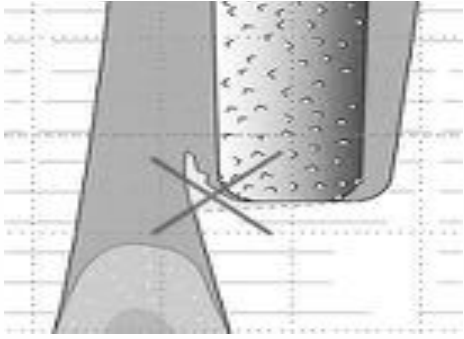


Largest Cause of Ceramic Failure UNDER-REDUCTION

MUST have a minimum of 1.5mm of porcelain
If unable to reduce at least 2mm, another material must be chosen

Note-PFM's require 2mm reduction for success

Study of over 1500 pfm & all ceramic crown preparations at Glidewell Dental Laboratory AVERAGE reduction in fossa.....75mm!!!



Avoid Sharp Corners

must be milled with 1 mm diamond

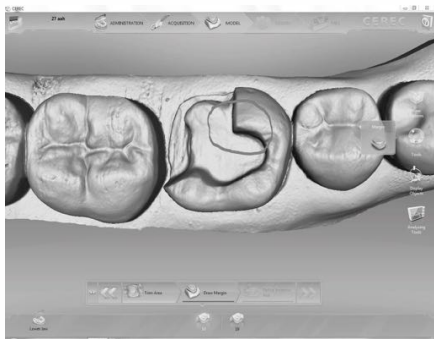
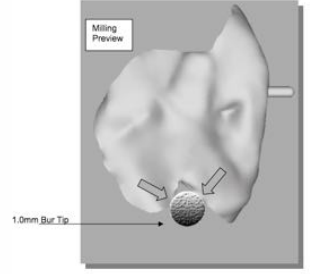
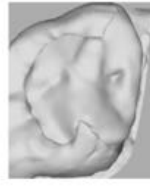
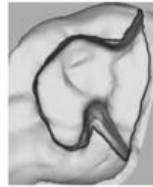


Fig. 5

Fig. 6

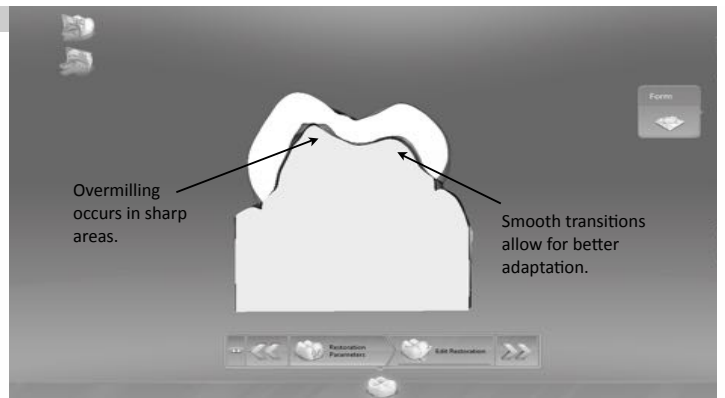
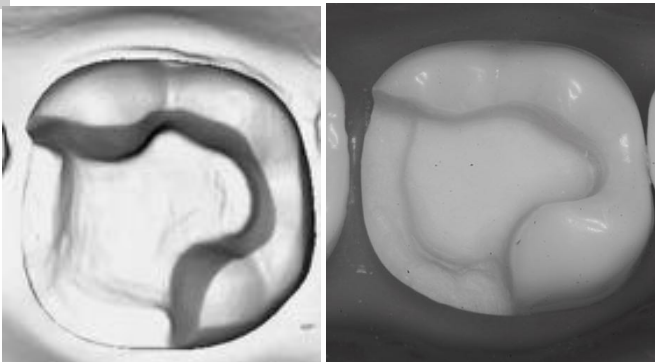
Fig. 7

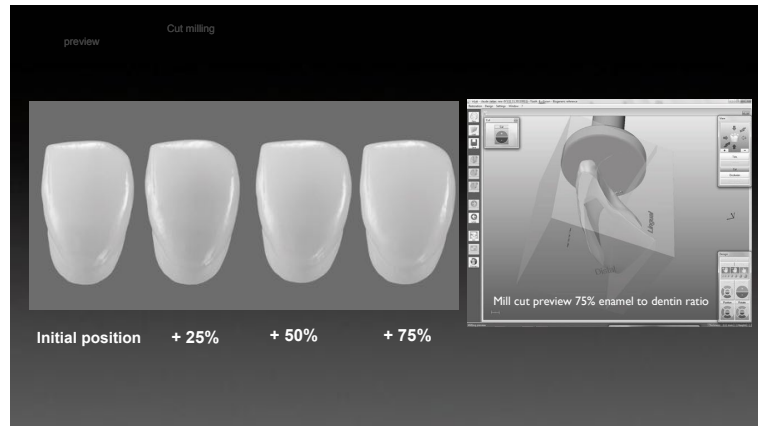
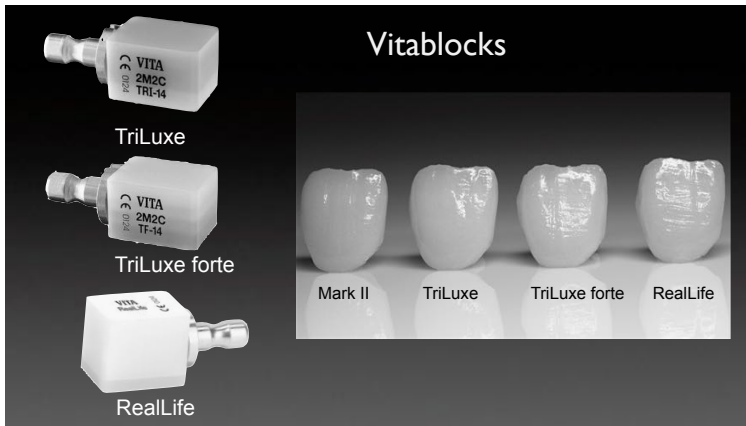
The burs cannot mill such a small artifact...

By design, the software will not overmill the margin...it will take away as little material as possible.

The result is a restoration that will NOT seat fully (Fig. 7)...you may have to manually adjust.


Recommendation: Remove all small defects on margin with fine/superfine diamond.





Vita Blocks

- Mark II
- TriLux
- TriLux Forte
- Real Life
- Enamic
- Suprinity
- Suprinity FC
- CAD- temp Mono Color
- CAD- temp Multi Color



Ivoclar Blocks

- IPS Empress CAD
- IPS Empress CAD Multi
- IPS e.Max CAD
- Telio CAD



Dentsply Blocks

- CELTRA CAD
- CELTR Duo

Heavily particle filled resin cured at high pressure & temperature ceramic

Material	Strength (SD) [MPa]	E modulus (SD) [GPa]	Hardness (SD) [GPa]
MarkII	137.8 (12.4)	57.2 (3.6)	6.24 (0.43)
PiCN1 (Enamic)	144.4 (9.61)	31.7 (1.4)	2.41 (0.08)
PiCN2	158.5 (7.14)	26.5 (1.1)	1.71 (0.01)
ICAlumina	402.1 (34.54)	211.8 (13.1)	11.76 (0.59)
VM9	121.6 (11.61)	57.1 (2.5)	6.29 (1.24)
YTZP	1358.5 (136.54)	184.2 (2.5)	13.91 (0.9)
emaxCAD	344.1 (64.5)	79.7 (4.9)	6.02 (0.21)

Pretreatment Recommendations

Material type	Pretreatment	Examples
Metal, PFM	Air Abrasion (< 50 μm), clean with Ethanol	
Glass ceramic (etchable)	1.) etching with hydrofluoric acid 2.) silane agent	IPS Empress 2, Paradigm C, e.max CAD/Press
Zirconia (non-etchable, high-strength)	Air Abrasion (< 50 μm), clean with Ethanol Alternatively: Treat with Rocatec and silane agent	Lava™ Crowns & Bridges BruxZir.
Alumina (non-etchable, high-strength)	Air Abrasion (< 50 μm) Alternatively: Treat with Rocatec and silane agent	Procera™ AllCeram
Composite	Air Abrasion, clean with Ethanol	Sinfony™, Artglass, Belleglass
Fiber reinforced composite post	RelyX Fiber Post: clean with Ethanol Other manufacturer: silane	RelyX Fiber Post

Impulse blocks

V1 V2 V3

The new Impulse blocks are available in three brightness values (Value 1, 2, 3) and two opalescent shades (Opal 1, 2).

