You probably already know 98% of what I will say, but I hope some of it will be from a different perspective.
We live in the "Age of Information".

"An echo chamber of half-truths and complete lies."

David Carr       Editor, New York Times 2011
Decisions about materials and techniques

Anterior Restorations
direct and indirect

Posterior Restorations
direct and indirect

WHY?
Anterior Restorations

Preparation must prevent crack propagation to avoid endodontics or an unrestorable fracture.

The fracture extends into dentin.

9 year old boy

Composites have improved dramatically, but before I talk about new materials, a quick look back.
Wave Bevels

Cases done > 20 years ago

flowables

dentine

enamel
My daughter: age 8
After midnight, and several beers ... (me, not her)
After 19 years: incisal wear, small marginal defects, rough surface, too opaque
2012: decided to let this "obsolete composite" celebrate another birthday

20 years
refinished
"Filtek Supreme Plus failed to produce acceptable integration."
Magne P, So WS. Quintessence Int 2008

"Dyract extra was superior to Filtek Supreme in color stability"

New composites: the chemists can make them very transparent
It's not just transparency, the refractive index should also match the enamel

enamel less transparent
totally useless

very opaque dentin
can be useful
Aesthetic results are better than standard composites only if layer thicknesses are well controlled.

Layer like the technicians with ceramic?

Opaque dentins and transparent enamels

If you have not heard these lecturers, you should

Jackson
Fahl
Vaninni
Lenhard
Sprefaico
Dietsche
Marcos Vargos

I don't have their hands or eyes. More time means a higher fee. How much is a composite worth?
Difficulties with Transparency

Note enamel opacity from drying

The extent of change is extremely variable

It will take about three hours to return to normal

If it looks good immediately after placement, it is probably wrong

Artiste A3 dentin, A enamel
Enamel dries quickly and becomes more opaque
Select shades and transparencies before any drying

It is only easy if you always use shade AACD and restore all visible teeth

Shade would be easy, except that transparency changes the shade

A3.5 → A2

Artemis A5D

4 years

AACD

dried < 5 minutes
How do we determine transparency? We guess!

16 years old

Endo both centrals
Temporary restorations 12, 11, 21

22 restored "properly"

22: Artemis: A2 dentin, A2 enamel, clear
Transparency loss occurs with every composite (the biggest change during the first three to the seventh month).

Venus Diamond: 33-36%
Tetric EvoCeram: 25-43%
Filtek Supreme Plus: 38-40%

Opacity with water storage increased during the entire five years of this study.

I did not guess high enough
14 year old boy: treated twice as emergency in Berlin
Perforated both times, distal and labial: never found the canal

By the time he came to me, he was really in pain
Four appointments: Ca(OH)$_2$, MTA, endodontic obturation, FRC Postec

How can a dentist start endo on an unrestored tooth four weeks after the beginning of orthodontic treatment?
Two years later, orthodontics completed Empress direct - A3 Dentin, A2 Enamel, Opal
Are the shades and transparencies correct? You won't know until the next appointment.

Will the dentin get darker?

will lose transparency, > 30% in two months
My guess for incisal transparency was fairly good (should have brought the dentin closer to the incisal edge)
The cervical one third is gray
(deeper preparation and an opaquer or perhaps A4D?)
Halo effect
The halo effect is not created with a different shade.

No halo?
The incisal edge is too thick, not transparent enough, or at the wrong angle.

White composite on the incisal edge?

Opal

NO!

10 months
Patient did not want to spend the money for ceramic, and did not want the diastema closed.

before bleaching A3.5
bleached to A2

2002: restored with Artemis
A2 dentin and enamel
Modern composites have less wear and less transparency shift

"Major" problem is loss of surface characterization.
In this case the surface wear is unusual.
Modern composites have less wear and less transparency shift.

12 months

More wear on the proximal than on the incisal edge?

69 months

She is right handed.
Why did I do direct composite on 11?

Because of the biggest problem in dentistry!

New veneer: Empress direct (after two months)

Opened a bottle with her teeth

Empress FPD 21-23
Heliomolar veneer 11

22: trauma, failed endo, no labial bone = extraction

Empty pockets
Why did we do direct composite on 11?
Because of the biggest problem in dentistry!
new veneer
Empress direct
(after two months)
Direct composite crown
A3.5 Dentin, A2 Enamel, I-Bleach

"Orthodontic Crown"
traumatic occlusion in centric and protrusive
Periodontal complications

Widen the cervical with angled matrix

6 years
Bioclear Diastema Matrix
bioclearmatrix.com
Dr. David Clark
Establish new contour and "compress" papilla
Open gingival embrasures (black triangles)
level of crestal bone to proximal contact

If sulcus depth < 4 mm papilla will generally remain stable,
> 4 mm expect recession

5 mm = none
6 mm = 44%
7 mm = 73%

You can compare a papilla to a balloon. It gets longer when you squeeze it.

If I had been smarter earlier, then I might have done this case correctly.

Diastemas and black triangles require a subgingival margin

Stay $\pm 1$ mm from depth of sulcus

0.5 mm per millimeter of width increase

Black triangles
Proximal contact "down"

Diastemas
Proximal contact "down and back"
Technician
Gerald Ubassy

Empress Veneer: 0.4 mm

Proximal contact moved palatally and gingivally
Rubber Dam: Clinical Literature

- No differences with fissure sealants or Class 3's.
- Trend toward better results when placing direct Class 2's.
- Trend toward worse results when placing direct Class 5's.
- No clinical studies concerning indirect restorations.

Anyone who tells you that you cannot do adhesive dentistry without rubber dam is an idiot.
Class 5: I almost never use a rubber dam or a matrix or a retraction cord

Avoid trauma during preparation

Some finishing trauma is unavoidable
If no discolouration, a standard opacity composite to replace dentin has little effect on aesthetics and reduces technique sensitivity.

Tetric Ceram A1

Artemis A2E

You need A-Enamels and highly transparent incisals.

It's nice to have the A-Dentins to mask discolouration.

B and D shades are unnecessary. C shades are only useful to match bad crowns.
Buccal composite: Empress direct A5D
(and it is still too light, I should have used A6D)

2nd premolar restored with Evetric A2

This patient had begun to chew tobacco, helped him reduce to < 60 cigarettes per day.
62 year old patient has always had a diastema and has always hated her teeth.

90 minutes later

Restored with Empress direct: A4D, Opal

Putting the midline in the middle is difficult without orthodontics.
90 minutes later

Restored with
Empress direct: A4D, Opal

Putting the midline in the middle is difficult without orthodontics

Closing a 5 mm diastema with a 3 mm sulcus depth on the mesial of the centrals is basically impossible

I admit, the contour on the mesial of the right central incisor is not very good
I made her less symmetric because it was faster, cheaper and easier.

My AACD certificate

MADE BY MONKEYS

Not very good, but he tries.

Before I die, I want to fulfill all criteria for automatic membership exclusion.
A seamstress who bites off threads

Endodontics  
FRC Postec / Variolink 2  
Tetric Ceram  
Artemis

One Year  
Two Years  
Five Years  
Nine Years
2001: Fracture 22
Endo, FRC Postec, Artemis

2010: Fracture 12
Endo, FRC Postec, crown "recemented"

Direct composite crown with FRC post after 11 years

"Recemented" crown with FRC post after 2 years

Note root fracture
His dentist recommended a crown (and said a "filling" was impossible)

The dentist lives on the moon (and probably would have used metal-ceramic)

The patient is 12 years old

Empress direct: A2D + Opal

15 minutes. Fee: < 20% of a crown (my earnings per hour are the same)
Fractured lateral three days before his daughter's wedding

Postec
Syntac
Variolink 2

Tetric Ceram A2

Artemis A2E

Using a standard composite instead of an opaque dentin reduces technique sensitivity

Of course you can sell him a crown,
but considering his periodontal situation it would not be ethical.

If the gingiva was healthy, would a crown be better?
and most of them look like shit.

I see a lot of anterior crowns
Metal-ceramic can function for a long time: a fifteen year old case!

Life would be easy if every patient wanted this kind of smile.
and I think everyone can agree that this is really the absolute minimum

Maxillary Incisors

Minimal reduction for metal-ceramic or zirconium

1.0 mm labial, 0.5 mm palatinal

Every crown preparation must be ANATOMIC
The only things that are wrong are circled or underlined in red

Company guidelines for bovine dentistry

You can follow these recommendations for the patient in the middle
Maxillary Incisors
Minimal reduction for metal-ceramic or zirconium
a more typical recommendation for zirconium

Lava Prep Guide
3M-Espe

Table 1: Design Criteria for Tooth Preparation for Zirconia Restorations

- Uniform, circumferential, tooth reduction of 1.0 mm to 1.5 mm
- Circumferential chamfer
- Occlusal reduction of 2 mm
- Rounded line angles
- Reduce linguals of anterior with football diamond—create a concave lingual


other companies use similar graphics
Maxillary Incisors

Minimal reduction for metal-ceramic or zirconium

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Lava Prep Guide
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Other companies use similar graphics.
What is the probable cause of death?

... and I thought dogs resembled their owners!

Lava Prep Guide
3M-Espe

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- Uniform, circumferential, tooth reduction of 1.0 mm to 1.5 mm
- Circumferential chamfer
- Occlusal reduction of 2 mm
- Rounded line angles
- Reduce linguals of anterior teeth with football diamond—create a concave lingual


Maxillary Incisors

Minimal reduction for metal-ceramic or zirconium

round the incisal edge

if midaxial = 1.0–1.5 mm

then incisal = 4 to 5 mm

other companies use similar graphics
Even the minimal preparation leads to an incisal reduction of 3 - 4 mm.

Incisal reduction cannot be defined. "You get what you get"
We don't want to kill the pulp or have the teeth break and conventional crowns need retention form, but we don't want to destroy the gingiva.

The aesthetic, biological, and mechanical requirements are in conflict.

Incisors should only be restored with conventionally cemented crowns when all other options are impossible.
Basically, this is NEVER

It's time to put anterior metal-ceramic crowns into the history books instead of patient's mouths

In my opinion, zirconia is NOT a sensible alternative

One month previously, this patient paid 3000 Euros for teeth that do not look like teeth
Endodontically treated lateral with metal post / amalgam (post could not be removed)

e-max LT, 1.2 mm, Multilink automix
M. Burgmeier, Liechtenstein
Trough technique with opaquer
Fiber post cervîcal "overcontour"
Another overcontoured crown in traumatic occlusion

Preparation
Labial
0.8 - 1.0 mm
Proximal and palatal
0.6 - 0.8 mm

Note the attrition of the antagonists in approximately three years.
Did inadequate palatal reduction precipitate bruxism?
Five unit metal ceramic FPD in situ less than one year

The fee for this FPD was > $6000. Seems like an expensive way to get ugly.

How can any dentist still use metal ceramic for anterior teeth?
How can a patient look in a mirror and then pay for this?
What will this look like in five to ten years?
Am I the only one who finds this frightening?

Countless hours of continuing education and years of practice guarantee a successful outcome.
Dentists doing metal-ceramic or zirconium crowns on incisors should find a job with fewer intellectual challenges.
I would suggest becoming a shepherd.
(You can do the same thing to the sheep that you are doing to your patients.)
ADHESIVE Full Ceramic
requires **LESS** preparation than metal-ceramic or conventionally cemented full ceramic!

Meier A, et.al. DZZ 1996
Burke FJT. Dental Materials 1999
Kelly JR. J Prostheth Dent 1999
Fenske C, et.al. DZZ 1999

I did this case in 1988, still thinking too conventionally.
Today I would prepare even less, and also completely differently.
original Empress: 22 year recall

Root has discoloured
Change in surface texture
(but less than most metal-ceramics)

Show me a 22 year old metal-ceramic crown that is better!
Clinical study with Empress crowns (adhesive cementation)

Survival rate after 11 years

**Anterior:** 98.9%, **Posterior** 84.4%


---

Clinical studies with E-max (anterior and posterior)

<table>
<thead>
<tr>
<th>Study</th>
<th>Duration</th>
<th>Survival Rate</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boening (2006)</td>
<td>3 years</td>
<td>97%</td>
<td>(conventional)</td>
</tr>
<tr>
<td>Fasbinder (2010)</td>
<td>3 years</td>
<td>100%</td>
<td>(CAD, adhesive)</td>
</tr>
<tr>
<td>Nathanson (2008)</td>
<td>3 years</td>
<td>97%</td>
<td>(adhesive or self-adhesive)</td>
</tr>
<tr>
<td>Dental Advisor (2010)</td>
<td>4 years</td>
<td>99%</td>
<td>(self-adhesive)</td>
</tr>
<tr>
<td>Beuer (2011)</td>
<td>4 years</td>
<td>100%</td>
<td>(CAD, adhesive or self-adhesive)</td>
</tr>
<tr>
<td>Gehrt (2010)</td>
<td>8 years</td>
<td>92%*</td>
<td>(conventional and adhesive)</td>
</tr>
</tbody>
</table>

* includes failures after endodontics, 2° caries, and marginal staining (3.3%)
Trauma

11: endodontics and FRC Postec.

21: remained vital

Preparation for adhesive full ceramic (equigingival on labial and proximal)

note "automatic" incisal reduction

0.7 mm

0.5 mm
Preparing the palatal margin down to the gingiva is traditional stupidity

**WHY?**

e-max Press, cementation with Syntac and Variolink-II

If the patient can afford it, this is optimal treatment, but direct composites would be better than conventional crowns.
Adhesive techniques require a different preparation, and permit significantly less reduction than conventional techniques.

This is not new information!

Original Empress placed in 1993

Technician: J. Seger
Under ugly crowns you almost always find terrible preparations
A labial preparation in a single plane will either compromise the pulp or turn your patient into a rabbit.
A palatal preparation in a single plane will either compromise the pulp or create protrusive interferences. No dentist would ever prepare this way?
Tooth murder by preparation

FDP < 3 years old
All three abutments mobile and nonvital

not to mention 16 mm distal cantilever and poor accuracy
Where is the pathology that required this?

Another minor point: Has the patient signed the "Bugs Bunny consent form"?
If surgeons did diagnosis and treatment like dentists, the solution for this smashed thumb might be this robot arm.
Proximal defects ignored, another defect created
Incorrect preparation for closing the diastema, proximal shelf
Accuracy questionable
What is missing for the "total clown makeover"?
Overcontoured, opaque metal-ceramic bridge (<3 years in situ)

Treatment suggestion:
Soft tissue graft 11
Gingival recontouring 12
Orthodontics 22

Patient decided against this plan
But for a new bridge
Only bondable and translucent ceramics give us real advantages

FPD: e-max Press with Multilink automix. Veneer: e-max Esthetic with Syntac and Tetric EvoFlow

Cementation time: ca. 45 minutes

Technician: M. Burgmeier, FL
A "Minor" Complication
Temporary C+B materials shrink slowly and can cause "orthodontic" tooth movement

post cure temporary bridges for 60 seconds in hot water
readjust before cementation

22mm. 1% residual shrinkage = 0.22 mm
Metal-ceramic 12-21, placed (by me) in the mid-90's

The classic compromises: 12 overcontoured, opaque at the cervical margin

E-max adhesive bridge placed in 2007
Failure three years later: plastic deformation of post despite ferrule?
(almost every time I have not removed a metal post, I have regretted it later)

April 2010

This appointment
The endodontics I tried to avoid >15 years ago

New FPD on these two teeth?
(21 with thin walls after removal of caries in canal space)

59 year old female: refused implant
Three days later
FRC Postec 12 and 21

Preparation of
"Veneer Crown" 22
(previous mp and dp composites)
and
Class III Inlay 13

Temporary bridge
(not including 13)
E-max adhesive bridge, try-in
(the canine is now an abutment for two bridges)

An implant and three individual crowns would cost about the same as this FPD, and the patient would have needed a temporary for at least three months.
Try-in
Instructions for technician

Correct emergence angle of 21, reduce cervical 11

Labial embrasure 11/21 slightly deeper (mesial 11) and stain to A4

Recontour distal incisal edges of centrals
Characterized with the patient in the laboratory
(I did not really like it, but they are not my teeth)

13 is now an abutment for two FPD's
Trauma
horizontal root tip fracture
(several months earlier)

We considered endo/perio Tx and apicoectomy.

Class III inlays, e-max FPD

try-in
bonded with Syntac + Evo-Flow

minimally invasive
no periodontal or pulpal complications
and easy…
Both centrals have two angular cervical fracture lines
(In 2006 I could see them on 21 but not 11)
If these fractures progress,
(and pocket depth increases on the mesial of the centrals)
I will need to change my preparation

Kois J. J Esthet Dent 1994;6:3-9

Biological width and black triangles

Gingival sulcus
0.69 mm

Biologic width
2.04 mm

Junctional epithelium
0.97 mm

Connective tissue
attachment
1.07 mm

Periodontal ligament

Cementum

Bone
If these fractures progress, (and pocket depth increases on the mesial of the centrals) I will need to change my preparation.

If these fractures progress,
(and pocket depth increases on the mesial of the centrals)

I will need to change my preparation
I decided to leave the margins supragingival and simulate the CEJ.
Cementation with Syntac EvoFlow A1

Palatal preparation to endodontic access opening

Two days later
Headlight dentistry

Instant recognition by opposing traffic
This graphic is almost correct, except you cannot define incisal reduction and the bur angle is not optimal.


1.0-mm to 1.5-mm incisal reduction

27.4 kg

16.4 kg

23.7 kg
With incisors, a labial reduction of 0.7 mm = ca. 2-3 mm incisal reduction
With incisors, a labial reduction of 0.7 mm = ca. 2-3 mm incisal reduction

Prepare a palatal chamfer and round the edge again?
The easy way to get a positive incisal stop

Smales RJ, Etemadi S. Long-term survival of porcelain veneers using two preparation designs.
Int J Prosthodont 2004; 17: 324-6
I do not do many veneers, this one is from 1996.

She only wanted to look better, not perfect.
Ceramic opaque and porous
Asymetric, poor form
Margins: combination of materials and techniques?

Teeth are vital
Right central "repaired" on the palatal
(and the dentist charged him for it)

Veneers ca. 3 years old

Failure rates: veneers

- Fradeani 6 yr 6%
- Probster 4 yr 6%
- Wiedhahn 10 yr 6%
- Kern 10 yr 10%
- Dumfahrt 5 yr 3%
- Groten 7.5 yr 3%

< 1%/year

Private practice failure rate
Burke FJT 10 yr 47%

5 years

Margin repair

Technician: C. Seger
Anterior Restorations

Composites have technical limits, but modern materials are extremely good

11 repositioned, elastic splint (10 days)

3 weeks later

Empress direct

Conventionally cemented crowns are malpractice
Indirect anterior restorations can always be done with adhesive techniques
Posterior Restorations

Direct or indirect?

18 years
### Failure rates per year of posterior restorations

<table>
<thead>
<tr>
<th>Material</th>
<th>Failure Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amalgam</td>
<td>3.3%</td>
</tr>
<tr>
<td>Direct Composites</td>
<td>2.2%</td>
</tr>
<tr>
<td>Gold Inlay/Onlay</td>
<td>1.2%</td>
</tr>
<tr>
<td>Ceramic Inlay/Onlay</td>
<td>1.1%</td>
</tr>
<tr>
<td>- Onlays fewer failures than inlays</td>
<td></td>
</tr>
<tr>
<td>Metal-ceramic crowns</td>
<td>1.1%</td>
</tr>
</tbody>
</table>

- Onlays fewer failures than inlays

> 300 clinical studies (> 3 years)


---

If composites are done correctly, they are better than amalgam

A poorly placed composite is a catastrophe
Problems with posterior composites?

Margin quality, sensitivity, proximal contacts, efficiency
Blow the adhesive as thin as possible, apply a layer of flowable composite on dentin, then cure

Flowable resin composites as “filled adhesives”: Literature review and clinical recommendations

Gary L. Unterbrink, DDS* William H. Liebenberg, BSc, BDS**

Those who criticized this technique because of volumetric shrinkage or (assumed) poor wear resistance only proved they do not understand clinical dentistry or material science

Clinical Study: Class 2 Restorations
Gradia or Gradia flow only
No differences in any category at 2 years

Impact Fatigue Resistance

Blow the adhesive as thin as possible, apply a layer of flowable composite on dentin, then cure.

Those who criticize this technique because of volumetric shrinkage or (assumed) poor wear resistance prove they do not understand clinical dentistry or material science.

Clinical Study: Class 2 Restorations
Gradia or Gradia flow only
No differences in any category at 2 years
I do not want my radiographs to look like this

Adhesive: blow thin

Layer thicknesses (in μm) with "gentle" air dispersion
SE-Bond, S. Heintze 2002

<table>
<thead>
<tr>
<th></th>
<th>MOD preparation</th>
<th>Crown preparation</th>
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</thead>
<tbody>
<tr>
<td>Axial</td>
<td>10-40</td>
<td>Axial</td>
</tr>
<tr>
<td>Gingival</td>
<td>100-350</td>
<td>Gingival</td>
</tr>
<tr>
<td>Occlusal</td>
<td>0-15</td>
<td>Occlusal</td>
</tr>
</tbody>
</table>

Thick layers
- increased gaps if > 100 μm -
- weaker interface at enamel margins -
- wrong refractive index for aesthetic margins -
- radiographic diagnosis -
If you blow the adhesive very thin, you MUST use the flowable.
Adhesive: blow thin

Only on dentin
Thin layer

Adhesive + Flow

Bulk fill flowables?

A thick adhesive layer must be polymerized to establish a bond!
Radiographic diagnosis and other problems remain.

If you live in a public toilet, you are happy when it stinks less
Post-operative Sensitivity
Class I Restorations, SB-MP and P50, n = 16

Microleakage (0-4)
Attar N, et.al. Oper Dent 2004

Reduced microleakage with flowable
What contributes to efficiency?

- Fuji IX fast set: conventional GIC!
- A light-curing GIC is no help
- Rubber dam can help
- and glass ionomer as well
The best way to improve efficiency?

Look at construction sites

Matrix Technique
The matrix is also critical for proximal contacts and contours

Wedging hard produces some separation, but only temporarily
O-rings produce separation which is stable but unpredictable
(dependents on tensile force and contact angles)

Therefore, normally I use both
Thin sectional matrix, wedge, O-ring
A loose wedge = insufficient separation + proximal excess

Bonded Wedge / Matrix stabilizes separation and adaptation
Finishing and polishing is where we lose time with direct composites (i.e. waste time)

Intrinsic Roughness after a few months, it doesn't matter how well you polished

Check / adjust occlusion, make it reasonably smooth.
The patient completes the polishing at home.

When you remove the matrix, it is almost time to send the patient home

I cheat
How can anyone still claim that amalgam is faster than composite?

Application and polymerization takes less time than condensation and carving. Matrix technique reduces finishing time.

No risk of fracture during matrix band removal, low risk during occlusal adjustment.
Small to medium class II's (at least for me) require less time than amalgam!

After curing the adhesive/flowable bulk fill is acceptable for restorations of this size (or a bit larger)
Bulk fill?

No  No  No  Yes  Yes  Yes

and only after polymerizing the adhesive/flowable layer!

Ivoclar-Vivadent
Bulk Fill

SonicFill™
The new, fast and easy
Composite Filling System for posterior restorations.

Discover the new
time-saving composite
Shrinkage stress is low enough today to reduce the requirement for layering, but layering can still be useful to reposition the matrix!

In this clinical situation, I intentionally place flowable on the gingival margin.
Optimizing bond strength to enamel is still a priority.

Black margins make aesthetic dentistry a bad joke.
Note angle of bur when finishing oral to vestibular margins
There are differences between materials (this is Evo-Ceram) but marginal stability is the key to aesthetic stability.

The key to marginal stability is preparation technique.
Everything!
if you think that the preparation
technique for amalgam and composite
is the same, please use amalgam
occlusal (vertical)
gingival (flat)

I quit doing clinical dentistry for several years
and this patient had the OM axial wall done in a different place.
The dentist told him that sensitivity with posterior composites is normal.

What is wrong with this preparation?
Axial wall (unsupported prisms)
if you think that the preparation
is the same, please use amalgam
Preparation is the first key to success and the other things are only details.

12 year recall
(the other composites are 15-20 years in-situ)

SonicSYS did not exist

contouring the wedge
<table>
<thead>
<tr>
<th>Adhesive</th>
<th>Beveled</th>
<th>N</th>
<th>Mean ±(StD) MPa</th>
<th>Debonds</th>
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<tbody>
<tr>
<td>Clearfil-SE</td>
<td>Yes</td>
<td>14</td>
<td>19.8±9.7</td>
<td>3</td>
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<tr>
<td>Clearfil-SE</td>
<td>No</td>
<td>3</td>
<td>7.1±4.0</td>
<td>17</td>
</tr>
<tr>
<td>Excite</td>
<td>Yes</td>
<td>21</td>
<td>28.2±6.1</td>
<td>0</td>
</tr>
<tr>
<td>Excite</td>
<td>No</td>
<td>5</td>
<td>19.2±5.7</td>
<td>13</td>
</tr>
<tr>
<td>PQ1</td>
<td>Yes</td>
<td>18</td>
<td>30.0±9.6</td>
<td>0</td>
</tr>
<tr>
<td>PQ1</td>
<td>No</td>
<td>5</td>
<td>6.6±4.4</td>
<td>17</td>
</tr>
</tbody>
</table>

Hinoura, et.al. Operative Dentistry 1988
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Cheung, et.al. Quintessence Int. 1990
Guenther J, Haller B. DGZ 1997
80% of 2° caries occurs at proximal margins (Mjor, Burke, etc.)
Diamonds with a average grit size >80 μm at high speed cause significant prism derangement in subsurface enamel.

Xu HH, Kelly JR, Jahanmir S, Thompson VP, Rekow ED
Enamel Subsurface Damage Due to Tooth Preparation with Diamonds

Enamel fractures from preparation instruments
super course diamond = new carbide
>> course diamond >> fine diamond > extra fine diamond

Conclusions

Finishing with either 15 μm or 40 μm is acceptable.

No justification for diamonds larger than 80 μm.

female dentists may disagree.
Always remove aprismatic surface enamel, even when etching

Fine diamond (40 μm) dry

Rubbing the adhesive on etched enamel reduces bond strength

Moll K, et.al. 1997
Stoll R, et.al. 1999

Bond to subsurface (i.e. prepared) etched enamel was superior to unprepared etched enamel.

31.2 MPa vs 47.9 MPa

Haddad R, Hobson RS, McCabe JF. Dent Mater. 2006
Contact Time (Infiltration Time)

Important on dentin ... and also on enamel.
"Unfilled resin on etched enamel requires more than 30 seconds for complete penetration."
Chosak and Eidelmann, 1988

Confocal microscope photo courtesy of T. Pioch
Compromises with direct composites

Multiple enamel fractures, margins on cusp tips, thin mesial marginal ridge

Three options
- direct Class I
- direct MOD-Onlay (mp and dp)
- indirect Onlay (all cusps)

The cost ratios
- direct Class I / direct onlay ca. 1:4
- direct onlay / indirect ca. 1:3
- direct Class I / indirect is 1:12

Risk of unrestorable fracture?
Compromises with direct composites

Thin distobuccal enamel but no occlusal contact, fairly low fracture risk

White line at margin, but "only" an aesthetic problem
Very large Cl II
"oblique layering technique"
(after curing the bond + flow)

Easier to model the correct anatomy
Reduces cusp deformation
Useful to control matrix adaptation

Curing times with 600 mW/cm²
My assistant has the light, so it
does not really cost me much time

Intensity / Time relationship is not linear,
it is logarithmic
Albers 1999

2 mm depth
In the only clinical situation when curing depth can be a problem, i.e. with opaque composites, more intensity doesn't really help you!
Assume that 50 mW/cm² is necessary.

Difference in curing depth

Turbotip
Normal Tip

<table>
<thead>
<tr>
<th>mm</th>
<th>Turbotip</th>
<th>Normal Tip</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 mm</td>
<td>1014 / 682</td>
<td></td>
</tr>
<tr>
<td>1 mm</td>
<td>310 / 215</td>
<td></td>
</tr>
<tr>
<td>2 mm</td>
<td>129 / 91</td>
<td></td>
</tr>
<tr>
<td>5 mm</td>
<td>11 / 8</td>
<td></td>
</tr>
</tbody>
</table>

Light attenuation is linear!

Price RB, Murphy DG, Derand T
Q1 2000; 31:659-667
Shrinkage stress and light intensity

A few others determined that higher light intensity increases shrinkage stress.

Reinhardt, Goracci, Unterbrink, Suh, Uno, Kanka, Sakaguchi, Mehl, Bouschlicher, Aarnts, Frommater, Ernst, Garcia-Godoy, Yoshikawa, Brand, Feng, Watts, Choi, Lahlsingh, Walker, Loesche, Matsutani, Glockner, Feilzer, Davidson

Maybe all of them are idiots.

Correlation of hardness and conversion rate

- **Low Intensity**
  - 250 mW/cm²
  - "High" Intensity
  - 450 mW/cm²

- Surface to 5 mm
- Argon atmosphere
- 40 s curing time


Koran & Kuerschner
American Journal of Dentistry 1998
"Total energy dose"
only tested surface hardness
and did not even consider postcure behavior
Correlation of hardness and conversion rate

When there is no inhibition from oxygen, light intensity has very little influence on the final hardness despite lower conversion.

I assume that nobody here is into necrodontia.
Huge differences after primary curing become much smaller after post-curing.

Fracture strength with variable curing times
72 hr. at 37°C

Fracture Resistance

MPa

Demetron 500
Heliomolar-RO

5 s. 10 s. 20 s. 30 s. 40 s. 60 s.
Müssner R, Unterbrink G
J Dent Res 1995

Degree of Conversion

Storage temperature
23°C, 37°C

Oxygen exposure
none, reduced, normal

Secondary inhibition
(inhibition of postcure)
FTIR samples are secondarily inhibited and dramatically exaggerate the effect of light intensity.

Müssner R, Unterbrink G
J Dent Res 1995
Only free surfaces are secondarily inhibited (inhibition of post-curing)

Inhibition effects with gaps depend on gap size and fluid exchange rates

Toothbrush Abrasion: 8 hours
Dual Cement (microfilled composite)

Baseline temperature: 22° C
Rubber point at 20,000 rpm, 10 gram
At 0.1 mm depth after 15 s: 80° C
0.5 mm under surface: 25° C
Conversion: curing time and heat
Clinical wear

13 microns in 3 years!

5 year clinical recall
(shade intentionally incorrect)
Very large Cl II
"oblique layering technique"
(after curing the bond + flow)

dentin layer(s)
to level of fissure
(or GIC)
Class 2
Centripital technique (outside in)

thin layer applied against matrix
Centripital Technique
MOD's, especially when I know it will bleed

Doing the entire restoration with a circumfirential matrix or both sectional matrices in place frequently leads to light or open contacts

Wirsching E, et.al. J Dent 2009
With MOD's
I no longer place both rings at the same time

or bond wedges with adjacent proximals

solution for contacts
Distal then mesial

Distal wedged hard and bonded,
mesial wedged lightly

Remove distal matrix, wedge mesial firmly, O-ring
after removal of amalgam (most of it)

marginal finishing

finishing distal proximal margin
An indirect onlay would be better but a crown would be worse.

If remaining cervical wall thickness > 2 mm, you should not do a crown.

Krifka S, et.al. Oper Dent 2009

etching enamel (self-etch adhesive)

Bond + flowable, then initial vertical layer(s)

final layer
22 year old male

Emergency: pain 14

The next appointment with his dentist was for extraction of 14, 16 and 46

had already extracted 24, 26, 27, 35, 36 and 37 on the left side

His former dentist is "holistic"

The dentist's website

Why would you want to keep something dead in your mouth?

Is enamel a living tissue?

Does ceramic respire?
22 year old male

Emergency: pain 14

The next appointment with his dentist was for extraction of 14, 16 and 46

had already extracted 24, 26, 27, 35, 36 and 37 on the left side

His former dentist is "holistic"

The dentist's website

Why would you want to keep something dead in your mouth?

I don't know, maybe so that I can still chew my food.
His former dentist is "assholistic"

FRC posts 1.25 mm (buc+pal), Variolink-II, EvoCeram A2
His former dentist is "assholistic"
Limits?

Preparation is a compromise to simplify application technique

Thin cusps not reduced to provide a guide for modelling the occlusal anatomy

Ceramic inlay failed because of a stupid preparation

Inlays in general are not very sensible
This is not easy dentistry but it helps illustrate the quality of today's composites.
In my opinion, crowning this tooth would be even dumber.

the first layers must be done without a matrix

46 direct composite
Conventional dentistry

Patient requested recementation of her "new" crown.

Refused extraction to wait for her dentist to return from vacation.

"He must be incompetent if he can't even recement a crown."

Conventional crowns: failure rates without ferrule ca. 800% higher

Sorensen JA, Engelmann MJ. J Prosthetic Dent 1990
Her marriage had eliminated all financial problems. Time for crowns?
Margin inaccessible with floss. The first molar must be cemented first!

An FRC post and core + crown for the first molar is an option, but not for the second molar.
We will always see changes over time: risk analysis

This patient smokes, bruxes, and has ± hygiene

Previously restored with amalgam, I made compromises with the preparation

Does not smoke or brux, good hygiene

Actually three separate composites (reduces cusp flexure from occlusal load)
Maxillary molars: save as much of the oblique marginal ridge as possible
Why do we see so many composites that look like this?

Poor preparation technique, inferior materials, contamination?
How long has the MOD restoration in 36 been in function?

Six weeks
Done at an Austrian government dental clinic

Replacement due to post-op sensitivity
(and the patient had to pay me also)
Political Axis of Evil

North Korea
Iraq
Iran
Political Axis of Evil II

other political opinions may be equally valid
Political Axis of Evil

North Korea

Iraq

Iran
Thanks to my sponsor…

Dental Axis of Evil

lecturers
Iraq
Iran

the good, the bad, and the ugly
They pay very low fees for restorative dentistry.

Thanks to my sponsor... the good, the bad, and the ugly.

Dental Axis of Evil

lecturers
insurance
Iran

They pay very low fees for restorative dentistry.
They pay very low fees for restorative dentistry

Thanks to my sponsor…

Dental Axis of Evil
lecturers
insurance companies

the good, the bad, and the ugly

Fast and easy is fine, except when they are combined with bad
Dental Axis of Evil

lecturers
insurance
companies

G-bond contains no HEMA

the really ugly

They pay very low fees for restorative dentistry

FAST and EASY

Sponsor a lecturer who is ignorant or will lie for you
Indirect Restorations
Inlay indications are limited (whether gold, ceramic, or composite)
< 60% of ICD: direct composite,
> 70% of ICD: adhesive onlay and not an inlay.

The "Robin Hood" indication for inlays
Rich patients when your bank account is empty
Direct composite placed in 2007 (first molar)
Inlay done in 2010 in Singapore (second molar)

When I removed the rest of the inlay.
No bond between ceramic and cement, very low bond of cement to both enamel and dentin.
Direct composite placed in 2007 (first molar)
Inlay done in 2010 in Singapore (second molar)

When I removed the rest of the inlay.
No bond between ceramic and cement, very low bond of cement to both enamel and dentin.
Two vertical fractures demands preparation of OM
These inlays fractured before or during cementation.
If we are not replacing an old crown, we usually do not have to do the first one.

Ceramic onlays are frequently easier and certainly better.

New materials with old techniques

Bumps are for camels, not adhesive onlays.
Posterior teeth

if buccal and lingual enamel is intact and cervically > 2 mm

a crown is never indicated!

In general, do an onlay when margins are near the cusp tips (depends also on occlusion)

Would you think about crowning this tooth?
Failure rates are lower than with metal ceramic crowns!

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Kraemer</td>
<td>8 yrs</td>
<td>8%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Proebster</td>
<td>5 yrs</td>
<td>3%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Guess</td>
<td>3 yrs</td>
<td>3%</td>
<td>1.0%</td>
</tr>
</tbody>
</table>
| Edelhoff| 5 yrs | 2%    | 0.4%  *
| Guess  | 3 yrs  | 1.3%  | 0.4%  *

¹ Empress  * E-max press
Deep subgingival margins or previously overreduced axial walls?

Metal ceramic is the best option (not zirconia).

Replacement of metal-ceramic crown

If the margins are easily accessible, and there was minimal axial reduction, (anatomic occlusal reduction still possible)

Adhesive full ceramic is my choice

E-max LT
Zirconia demonstrates stress corrosion like all ceramics

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Initial</th>
<th>Stressed</th>
<th>% Change</th>
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<tbody>
<tr>
<td>Polished</td>
<td>1208 ± 97</td>
<td>748 ± 88</td>
<td>-38%</td>
</tr>
<tr>
<td>Particle abrasion (50 μm)</td>
<td>1131 ± 131</td>
<td>655 ± 155</td>
<td>-45%</td>
</tr>
<tr>
<td>Particle abrasion (110 μm)</td>
<td>720 ± 187</td>
<td>388 ± 193</td>
<td>-67%</td>
</tr>
</tbody>
</table>

Flexural strength

- **$K_{IC}$**: fracture toughness
  - (relates strength to defect size)

- "$n$": slow crack growth coefficient
  - (susceptibility to hydrolysis)

Acid solubility

Aboushelib MN. Long Term Fatigue Behavior of Zirconia Based Dental Ceramics. Dent Materials 2010:3:275-85
Zirconia demonstrates stress corrosion like all ceramics

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Aboushelib MN. Long Term Fatigue Behavior of Zirconia Based Dental Ceramics. Dent Materials 2010;3:275-85

Internal adjustment at the cementation appointment and a hydrophilic cement give you this strength!

Anyone who calls zirconia "white steel" should be banned from lecturing for their entire life.
A "full-arch" FDP cemented about four years earlier (multiple veneer fractures prior to this framework fracture)

This brown stuff is the cement. At the margins the cement had dissolved. The scratches are from a blunt spatula.
Correct use of conventional cements; glass ionomer or zinc oxyphosphate
Maintain isolation during initial setting: ca. 10 minutes (high solubility)
Wait an additional 5-10 minutes before checking occlusion (cement is still very weak)
Tooth Colored Restorations: Harry Albers

The technique is easy, but not fast if done correctly.
Correct use of conventional cements; glass ionomer or zinc oxyphosphate

Maintain isolation during initial setting: ca. 10 minutes (high solubility)
Wait an additional 5-10 minutes before checking occlusion (cement is still very weak)

Tooth Colored Restorations: Harry Albers

Any wonder that failures like this occur?
The reason is the solubility of the cement!
Anyone who tells you that you cannot do adhesive dentistry without rubber dam is an idiot.
Contamination with blood or saliva during cementation?

With conventional cements this is a problem!

Make an inlay for an extracted tooth. Seat it but do not cure or remove excess. Put it in a glass of water (or blood). Take it out later, cure and finish.

What happens?

With hydrophobic composite cements.

Nothing!

With conventional cements this is a problem!

The only critical time is between etching and seating (two minutes)
Patient came immediately after fracture. I did not do anything but wash off the blood.

Where is the cement?

Yes, it took more than ten years, but the decision to use a conventional cement (and a tapered metal post) led to extraction.
Zirconia: a classic case of substitution marketing
(do everything the same but with zirconia instead of metal)

What kind of dentists are cementing zirconia with conventional cements?

OLD FASHIONED ONES
making believe they are modern?

OR

BRAIN DEAD
My opinion: Zirconia has a limited indication, and then only with adhesive techniques.

Adhesive cementation increases strength and reduces stress corrosion.

Goebel R, et.al. Q Zahntech 2009

Zirconium crowns: Fracture strength

<table>
<thead>
<tr>
<th>Rely X Unicem</th>
<th>Variolink-II</th>
</tr>
</thead>
<tbody>
<tr>
<td>self-adhesive</td>
<td>true adhesive</td>
</tr>
</tbody>
</table>

Goebel R, et.al.
Q Zahntech 2009

2 years
Implant suggested, patient decided on metal-free FPD
Distal connector fracture is primary risk factor

Adequate connector dimension
Partial crowns
Deeper preparation distal (resistance form)

(Yes, I know zirconium is a metal)
ZirPress
high strength, good aesthetics, and bondable!

ZirPress ca. 50% stronger than seven competitive products.
Stawarczyk B, et.al. J Dent Res 2010

Lower "chipping" rates in clinical studies with pressed veneering ceramics.

CAD-ON might be better
Loss of retention of a metal-ceramic crown: vital tooth. Can you get enough mechanical retention for conventional cementation?

What about RMGI or self-adhesive cements?

**Fatigue performance of gold crowns luted with resin cements.**

Calibra = C+B Opaque > Panavia F > Rely X Unicem = Zinc Oxyphosphate

Uv JN, et.al. J Prosthet Dent. 2006
Loss of retention of a metal-ceramic crown: vital tooth. Can you get enough mechanical retention for conventional cementation?

What about RMGI or self-adhesive cements?

**Indication**
- full coverage crowns
- with adequate mechanical retention
- and good accuracy
  (in these cases, they are better than conventional cements)

Prepare subgingivally?
Surgical crown lengthening?
Elective endodontics and post?
Hope the patient moves?

How many crowns do you do for low caries risk patients?
Loss of retention of a metal-ceramic crown: vital tooth. Can you get enough mechanical retention for conventional cementation?

What about RMGI or self-adhesive cements?

<table>
<thead>
<tr>
<th>Material</th>
<th>Dentin bond strength (light-cured)</th>
<th>MPa</th>
</tr>
</thead>
<tbody>
<tr>
<td>SpeedCEM²</td>
<td>Rzanny, University of Jena, 2009</td>
<td>13.1</td>
</tr>
<tr>
<td>RelyX™ Unicem¹</td>
<td></td>
<td>6.7</td>
</tr>
<tr>
<td>Multilink® Automix</td>
<td></td>
<td>33.0</td>
</tr>
</tbody>
</table>

What about RMGI or self-adhesive cements?

Clinical technique for all three is similar: brief cure and fracture off the excess. Why accept the lower bond strength?

<table>
<thead>
<tr>
<th>Material</th>
<th>Bond Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multilink</td>
<td>26.6 ± 9.0</td>
</tr>
<tr>
<td>G-cem</td>
<td>3.8 ± 3.4</td>
</tr>
</tbody>
</table>

Ritter R, et.al. J Dent Res 2010

Prepare subgingivally? Surgical crown lengthening? Elective endodontics and post? Hope the patient moves?
Adhesive cementation reduces all of the risks. Yes, you do need an adhesive and a silane. This takes about three minutes.

The rest of the technique saves you at least fifteen minutes!

No waiting on initial setting: brief cure, remove excess, finish curing. No requirement for long isolation; low solubility immediately. No risk when checking occlusion; very high early strength. **Significantly better retention.**

Hydrophobic: helps prevent stress corrosion / long-term fractures.
Bonded gingival increment prior to impression  
(could not get floss below margin)

Time for bond maturation and completion of shrinkage  
Bond of composite cement to gingival increment  
depends on free radical decay, i.e. time  
(A technique I suggested for Cerec in the early 1990's)
Decoupling Technique


Application of "temporary separator" on gingival layer

Dentin Adhesit polyurethane varnish catalysed by water with setting expansion

Four year clinical results: everything Alpha
No matter which cement you use, the requirements for a good result are the same.

A clear and sharp preparation margin and an accurate impression!

207 publications about dentist/technician cooperation during the last 30 years

Hatzikyriakos A, et.al.
Journal of Prosthetic Dentistry 2006;96(5):362-6

Laboratory Evaluation

30% of impressions absolutely unusable
80% of models with at least one preparation with unclear margins
How does it really look with dentist/technician cooperation?

Every job needs a supervisor
No matter which cement you use, the requirements for a good result are the same.

A clear and sharp preparation margin and an accurate impression!

Without accuracy, conventional cementation is a bad dream, but adhesive cementation is a real nightmare for both the dentist and the patient!

Emergency endodontics 17, patient decided to stay with our practice
Without accuracy, conventional cementation is a bad dream, but adhesive cementation is a real nightmare for both the dentist and the patient!

No matter which cement you use, the requirements for a good result are the same.

A clear and sharp preparation margin and an accurate impression!

When the patient complained about problems with flossing, the dentist told her: "It's not necessary, we have eliminated the risk."
Acceleration of Setting Reaction

Quantity of Adhesive

Multilink / Multilink Adhesive
Variolink-2 / Excite DSC
Panavia F / ED Primer

Do not use a dentin adhesive from one system and a cement from a different one

All manufacturers are aware of this: read the instructions for use
Acceleration of Setting Reaction: Good or Bad?

Metal ceramic or opaque ceramic crowns

Initial contact with adhesive during seating.

In this situation, acceleration of setting is an advantage.
Acceleration of Setting Reaction: Good or Bad?

FRC posts, inlays, etc.

Acceleration is **BAD**

Whenever you will put the cement on or in the tooth first

Rotating path of insertion
Acceleration of Setting Reaction: Good or Bad?

FRC posts, inlays, etc.

Acceleration is BAD

Whenever you will put the cement on or in the tooth first

Use a combination without acceleration
or reduce the effect by extreme thinning of the adhesive
(reduce further by adding a layer of unfilled resin and air thin again)
"Chipping" sounds pretty harmless.

The bond of veneering ceramic to zirconia is 30-60% of the bond to metal.

Guess PC, et.al. Dent Mater 2008
Saito A, et.al. J Prosthet Dent 2010

Which sentence from this paper will be quoted?


"The survival of both kinds of FDP's was 100%."
Fractures of the veneer have been the main problem with zirconia phase transformation? lack of interdiffusion zone? thin core + thick veneer = stress inversion?

<table>
<thead>
<tr>
<th>Veneer failures / year</th>
<th>5 yr</th>
<th>10 yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nozaki</td>
<td>0.8%</td>
<td></td>
</tr>
<tr>
<td>McLaren</td>
<td>1.2%</td>
<td></td>
</tr>
<tr>
<td>Tinschert</td>
<td>1.2%</td>
<td></td>
</tr>
<tr>
<td>Oden</td>
<td>1.5%</td>
<td></td>
</tr>
<tr>
<td>Walter</td>
<td>1.6%</td>
<td></td>
</tr>
<tr>
<td>Bind</td>
<td>1.8%</td>
<td></td>
</tr>
<tr>
<td>Roediger</td>
<td>3.0%</td>
<td></td>
</tr>
<tr>
<td>Sailer</td>
<td>3.1%</td>
<td></td>
</tr>
<tr>
<td>Sailer</td>
<td>3.2%</td>
<td></td>
</tr>
<tr>
<td>Edelhoff</td>
<td>3.2%</td>
<td></td>
</tr>
</tbody>
</table>

A linear failure rate over ten years is frightening!
Fractures of the veneer have been the main problem with zirconia

Veneer failures / year

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Duration (yr)</th>
<th>Failure Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nozaki</td>
<td>5</td>
<td>0.8</td>
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</tr>
<tr>
<td>Walter</td>
<td>5</td>
<td>1.6</td>
</tr>
<tr>
<td>Bind</td>
<td>3</td>
<td>1.8</td>
</tr>
<tr>
<td>Roediger</td>
<td>4</td>
<td>3.0</td>
</tr>
<tr>
<td>Sailer</td>
<td>5</td>
<td>3.1</td>
</tr>
<tr>
<td>Sailer</td>
<td>10</td>
<td>3.2</td>
</tr>
<tr>
<td>Edelhoff</td>
<td>3</td>
<td>3.2</td>
</tr>
<tr>
<td>Christensen</td>
<td>2</td>
<td>26.3%*</td>
</tr>
</tbody>
</table>

phase transformation?  
lack of interdiffusion zone?  
thin core + thick veneer = stress inversion?

* Private practices

Cercon 32/18, Lava 32/19, Everest 33/14

Improper preparations?  Adjusted and not polished?  Non-anatomic frameworks?  Slow cooling?
In the land of aesthetic excess, zirconia without veneering it

Naming it BruxZir is brilliant
Veneer fractures are not our fault, you didn't do a proper diagnosis

Nearly all companies have copied this concept, indirect proof that all of them have problems

Unfortunately, most cases presented in web sites look like this.
Crowns were unnecessary, the result is frighteningly ugly, and does not even address the problem of parafunction.

What do dentists find attractive about "inverted tin can" dentistry?
In the land of aesthetic excess, zirconia without veneering it

Naming it BruxZir is brilliant.

Veneer fractures are not our fault, you didn't do a proper diagnosis

Don't do veneered zirconium crowns for any patient with wear facets

Cercon FPD's on implants
3 years

No framework fractures but
34% with veneer fractures.

Larsson C, von Steyern V, Nilner N.
Int J Prosthodont 2010;23(4):364

Veneer fractures with 4 of 6 crowns
< 2 years
Cyclic fatigue load to failure

Load in Newtons

Cycles to fracture (x1000)

90% of samples with veneer fractures

250% higher load
80% more cycles
No fractures

ZirCAD/Ceram *

350
100

900
180

e-max CAD

* Same results with LAVA and Cercon

Website pictures from "America's holistic dentist" in CA

This part of the preparation is good

prepared but not restored?

wrong angles for bond to enamel

margins ending outside cusp tips

finished? (flat and fractured)

Balancing contact
No resistance form

the technician increases fracture risk with deep embrasures

He thinks adhesive dentistry is magic
Adhesive dentistry is a modern interpretation of tradition. It requires the same attention to detail as traditional techniques and is still dependent on classic mechanical principles.

Buying an adhesive should not automatically delete all brain files.
Adhesive dentistry is a modern interpretation of tradition. It requires the same attention to detail as traditional techniques and is still dependent on classic mechanical principles.

Despite continuous attempts, fashion designers cannot ruin women.
Combining tradition with adhesive advantages

Adequate connector dimensions
Correct angles for bonding to enamel
Resistance form!

Preparing these teeth for metal-ceramic or zirconia crowns would be insane!
This is not experimental dentistry!

2.5 years
So much simpler than preparing crowns, and much less traumatic for the teeth.

Fewer difficulties with gingival retraction and impression techniques.

Retention of temporaries can be a nuisance.
Crowned ca. 2 years ago
Two weeks previously his dentist told him everything was fine!

Even if we ignore the questionable endo, the poor fit of the crown, and the overhangs on the amalgams, how can any dentist still use threaded posts?

the palatal root is screwed
Crowned ca. 2 years ago
Two weeks previously his dentist told him everything was fine!

Wear facet Resistance Form!
Who could seriously consider preparing either of these teeth for a crown?
Who could seriously consider preparing either of these teeth for a crown?
66 years old
A perfect patient

I want nice front teeth and
I don't care what it costs

Excellent hygiene
Intelligent

Crowns: e.max press
(adhesive)

Veneers
Empress Esthetic

Direct composites
Artemis
8+ year recall  
(March 2012)

State of the Art

The least invasive possible treatment which produces the desired result

At a political dinner, I suddenly realized that I was the only woman at our table with teeth that look like teeth.
8+ year recall
(March 2012)

State of the Art
The least invasive possible treatment which produces the desired result

Take care of yourself.
I want a ten year recall picture
A short list of things which a good dentist does not use

Metal posts (especially "screw posts")

zirconia and carbon fibre posts are also pretty stupid

If you have these posts in your practice, buy a garbage bag on your way home

A short list of things which a good dentist does not use

Metal posts (especially "screw posts")

Metal ceramic or zirconium for anterior teeth

Think about the "daughter principle"
(Do you want her to look like this in five years?)

Courtesy of
Dr. Kaneko
A short list of things which a good dentist does not use

Metal posts (especially "screw posts")
Metal ceramic or zirconium for anterior teeth
Single component bonding agents
(self-etching will work, but you must etch the enamel and add the flowable)

How can you ignore the experts and clinical study results?

Van Meerbeck B. Ernst C-P. Frankenberger R. Perdigao J. Peumans N. Unemori M. etc.
A short list of things which a good dentist does not use

Metal posts (especially "screw posts")

Metal ceramic or zirconium for anterior teeth

Single component bonding agents

Amalgam

The "big bang" restorative

Gamma-1 to beta-1 phase shift and eternal expansion
A short list of things which a good dentist does not use

Metal posts (especially "screw posts")
Metal ceramic or zirconium for anterior teeth
Single component bonding agents
Amalgam

If you use these materials, you are automatically a member of the FDI

Federation of the Dumb and Ignorant
A short list of things which a good dentist does not use

Metal posts (especially "screw posts")

Metal ceramic or zirconium for anterior teeth

Single component bonding agents

Amalgam

And, a good dentist will try to avoid

Traditional crown preparations

Conventional cements
Dentists should hate doing crowns because there is almost always a better alternative.

Anyone doing more than a few initial crown preparations per month can award themselves two extra titles:

Dr. Igno Ramus, MID, DTD.
Master of Iatrogenic Dentistry
Doctor of Tooth Dust

Retrolunar Avenue 6
Tradition Square, I-ma-Cretin
The primary function of the brain is to cool the blood.

Aristotle
Maybe he had been at his dentist's office on the day he wrote this.

Another way your garbage bag can contribute to quality in dentistry.
Maybe he had been at his dentist's office on the day he wrote this.

The primary function of the brain is to cool the blood.  
Aristotle

You cannot convince your opponents, you can only wait for them to die.  
Max Planck

thanks for your attention  
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