CEMENTATION OPTIONS

- Temporary cements
- Conventional(Non-adhesive) cements
- Resin based (Adhesive) cements

IDEAL PROPERTIES FOR PROVISIONAL CEMENTS

- Low strength
- No effect on dental pulp
- Easy to use
- Easy to remove
- Don’t interfere with definitive cementation

TEMPORARY CEMENTS

- Mostly based on Zinc Oxide
- With or without Eugenol
- Introduced in the late 1800's

CEMENTS CONTAINING EUGENOL

- Have an anodyne effect on the pulp

- **BUT**- Eugenol inhibits free radicals which are necessary to initiate addition polymerisation of resin-based composite and dentine bonding systems

- NB That includes IRM (Polymer reinforced ZnOE)

DEFINITIVE CEMENTS

Conventional or Adhesive

Cementation (Luting)

vs

Bonding (Adhesive)

CONVENTIONAL CEMENTS (LUTING CEMENTS)

- Zinc phosphate
- Zinc polycarboxylate
- Conventional GIC
- Resin modified GIC
- (? Glass hybrid cements)

ZINC PHOSPHATE

STRENGTHS

- Used for 100 years
- Application is less technique sensitive

WEAKNESSES

- Low hardness
- High solubility
- No bonding to tooth
- Acidic- occasional post op sensitivity
- Mixing is technique sensitive (powder liquid)

ZnO + phosphoric acid

ZINC POLYCARBOXYLATE

POLY-F PLUS, DURELON, HY-BOND, POLY ZINC+

STRENGTHS

- 100+ years of use (Since 1890's)
- Some fluoride ion release
- Adhesion to tooth substance
- Low post-op sensitivity
- Easy to use

WEAKNESSES

- Medium hardness
- Somewhat soluble
- Some weak bonding to tooth

ZnO + polyacrylic acid

GIC

STRENGTHS

- 30+ years of use
- Fluoride ion release
- Bonding to tooth
- Dimensionally stable
- Adequate strength

WEAKNESSES

- Low pH occasional post-op sensitivity
- Possible marginal dissolution if not protected from moisture during setting phase

RMGIC

STRENGTHS

- Easy to use
- Bonding to tooth
- Low solubility
- Adequate strength
- Less technique sensitive than composite cements
- Low post-op sensitivity

WEAKNESSES

- Shorter shelf life
- Hygroscopic swelling with exposure to water
- Not suitable for weaker ceramic restorations due to hygroscopic expansion with time.

COMPOSITE RESIN CEMENTS

STRENGTHS

- 10 years of use
- Good adhesion (With bonding and self-etch)
- Bonding to ceramic (With appropriate pre-treatments)
- Good aesthetics

WEAKNESSES

- 10 years of use
- Multi step
- Technique sensitive
- ? Bonding with deep subgingival margins
- Excess difficult to remove
- Some post-op sensitivity
- No fluoride release

RESIN CEMENTS

- Composite based and can be:
  - Self cure
  - Light cure
  - Dual cure
- Adhesive (separate bonding steps)
- Self adhesive (Self etching, no separate bonding steps)

CEMENTS

What

Why

When

how

RESTORATIVE MATERIAL

- Metal (Precious/Non-precious)
- PFM (Metal Ceramic) (PBM) (615= Full Crown-veneered-indirect) (VMK)
- Glass ceramic (Monolithic/layered)
- Zirconia (Monlithic/layered)

FIRST DECISION

CEMENT **OR** *BOND*

FOR ALL RESTORATIVE MATERIALS CONVENTIONAL CEMENTATION

Conventional cementation is the most straightforward, simplest and most reproducible with the fewest steps involved.

Provided you have:

Sufficient retention/resistance for your restoration

Sufficient restoration thickness and strength

PRECIOUS AND NON-PRECIOUS METALS

- Precious (Gold) alloys (>60% noble metal)
- Semi-precious (>25% noble metal)
- Non-precious (<25% noble metal. Nickel, Cobalt, Chromium, Beryllium)

4g approx. $500-600 vs $40

GOLD AND NON-PRECIOUS METAL ALLOYS

- Cement with any cement if sufficient mechanical retention

If there in insufficient mechanical retention:

- MDP primer will bond resin cements to noble alloys, but the bond is more reliable with nonprecious alloy.
- MDP is not new (Introduced 20+ years ago)
- MDP is a functional monomer which bonds to HA, Metal Oxides (Zirconia), metal alloys
- Present in Monobond Plus, Panavia primer and cement, Scotchbond Universal and many other "Ceramic or universal primers"

GLASS CERAMICS (e.max)

- Because of its reduced strength compared to zirconia consider bonding e.max
- If it's thick enough with adequate mechanical retention especially with subgingival margins, it can be cemented conventionally.
- Pressed glass is stronger than milled particularly when bonded
- Mechanically unretentive restorations require bonding with adhesive cement

Glass ceramics (e.max) CROWNS AND ONLAYS

To achieve bonding with a resin cement

- Ask lab to air abrade and etch fit surface with hydrofluoric acid (Chairside is preferable)
- Clean with Ivoclean after trying in
- Silane on fit surface
- Bond with resin cement- self etching or with dentine bonding

SILANE BONDING AGENTS

- Bifunctional (Bipolar) molecules
- Hydrolysable group (X) Organofunctional group (R)
- X bonds to alkoxy groups (Glass/silica)
- R bonds to organic groups (Epoxy/methacrylate)

Prime and bond options at OHCWA

	Monobond Plus	Panavia Metal Primer	Scotchbond Universal
Manufacturer	Ivoclar Vivadent	Kuraray Noritake	3M (Solventum)
Key Chemistry	MDP, silane, sulphide methacrylate (tri-functional),ethanol solvent	MDP + VTD (vinyl thiol derivative), acetone solvent	MDP, silane, HEMA, Vitrebond copolymer, ethanol solvent
Primary Substrates	Zirconia, silica-based ceramics, metal, composite, alloys	Base/precious metal alloys, metal oxide surfaces like zirconia	Enamel, dentine, plus zirconia/metal/composite
Silane	Yes	No	Yes
MDP	Yes	Yes	Yes
Application **Film thickness**	Single coat, universal 'one-bottle' conditioner before cementation Negligible (<1 µm)	Applied to cleaned/airborne-abraded metal surface before Panavia cement Negligible (<1 µm)	Either 2 step etch-and-rinse or self-etch dentin/enamel adhesive AND indirect restoration primer but film thickness 5-10 µm

BONDING ZIRCONIA

ZIRCONIA
CEMENT OR BOND?

WE CAN CEMENT WHEN THERE IS

- A retentive preparation
- Sufficient occlusal/palatal thickness

WE SHOULD BOND WHEN THERE IS

- A lack of retention/resistance
- Thin occlusal/palatal area
- Any concern with strength/parafunction

PROBLEM IS….

Unlike Lithium Disilicate, Silane doesn't bond to zirconia

Attempts to attach a layer of silica to zirconia by sandblasting with Rocatec (3M) may be beneficial.

MDP does bond to metal oxides including zirconia

How to Bond Zirconia: The APC Concept

Markus B. Blatz, Marcela Alvarez, Kimiyo Sawyer, Marco Brindis

Research output: Contribution to journal › Article › peer-review

Abstract

Zirconia has become one of the most popular materials in dentistry. New high-translucent zirconia ceramics have favorable optical properties and can be applied as monolithic full-contour restorations in various clinical indications for posterior and anterior teeth. However, having reliable cementation protocols is fundamental for clinical success of indirect ceramic dental restorations, including those made from zirconia materials. Resin bonding supports ceramic restorations and is necessary for onlays, laminate veneers, and resinbonded fixed dental prostheses. The APC zirconia-bonding concept is based on decades of research on how to achieve high and long-term durable bond strengths to high-strength ceramics. It includes three practical steps: (A) airparticle abrasion, (P) zirconia primer, and (C) adhesive composite resin. This article discusses the history and development of high-translucent zirconia and explains the necessity for proper cementation. The rationale and science behind a simplified zirconia-bonding concept is explained and illustrated with a clinical case presentation.

Original language	English (US)
Pages (from-to)	611-618
Number of pages	8
Journal	Compendium of continuing education in dentistry (Jamesburg, N.J. : 1995)

APC CONCEPT

Air abrasion of fit (Intaglio) surface

Primer (Containing MDP)

Composite cement

BONDING TO TOOTH STRUCTURE


bond
light
unfilled
total etch
Etch
wet
dry
Step
step
cure
etch
prime
setp
bottle
clear
self etch
filled
prime+bond
tinted
dual cure
Universal
self cure
two
acetone
bondstrengthethanol
etch+prime
unidose
biobase
lollipop

Evolution of adhesive dentistry

Enamel etching (1955) to today

Acid etching enamel	1955 discovery (Buonocore); clinical adoption through the 1960s
Generation 1 (1960s-70s)	Weak dentine bond, ionic/chelation attachment
Generation 2 (1970s-80s)	Smear layer left intact, unreliable bond. **Fusayama total etch + caries dye 70's**
Generation 3 (late 1980s)	Separate dentine priming step introduced.
Generation 4 (early 1990s)	Total-etch, 3-step: etch + prime + bond — gold standard.
Generation 5 (mid 1990s)	Total-etch, 2-step: combined primer/adhesive
Generation 6 (late 1990s)	Self-etch, 2-step: self-etch primer + separate bond
Generation 7 (2000s)	Self-etch, 1-step, all-in-one adhesive
Generation 8 (2010s-present)	Universal / multi-mode adhesives, any etch strategy

OUR TRADITIONAL THINKING/TEACHING IS

ENAMEL BOND GOOD

DENTINE BOND NOT SO GOOD

DEPENDS ON WHO YOU LISTEN TO AND WHAT YOU BELIEVE

Decoupling with time

Decoupling with fibre and split increment

Hierarchy of bondability

DECOUPLING WITH TIME

- Dentine bond does not reach maximum strength immediately, it takes time to develop
- The dentine bond improves as the hybrid layer starts to mature
- Depends on the quality of substrate

Lu H, Stansbury JW, Bowman CN. Towards the elucidation of shrinkage stress development and relaxation in dental composites. Dent Mater. 2004 Dec;20(10):979-86.

HIERARCHY OF BONDABILITY

- Superficial dentine – 50MPa
- Inner carious dentine – 30MPa
- Outer carious dentine – 15MPa
- Enamel – 30MPa

IMMEDIATE DENTINE SEALING (IDS)

The dentine of your preparation is sealed immediately following preparation before everything else including impression taking/scanning.

PERCEIVED BENEFITS OF IDS

- Prevents dentine contamination.
- Allows maturation of the hybrid layer.
- Improves bond strength.
- Avoids gap formation.
- Protects the tooth against bacterial leakage.
- Prevents retention of temporary cement remnants
- Eliminates fit issues caused by pooling of dentine bonding resin at fit stage

IDS PROCEDURE

- Dentine bonding with a more filled resin

- +/- a thin layer of flowable composite (*The so called "Resin coating")= Reinforced IDS or IDS Plus*

HEATED COMPOSITE FOR CEMENTATION OF INDIRECT RESTORATIONS???

Uncured bond applied to tooth and fit surface of the restoration and heated composite used as the cement

DEFINITIVE CEMENTS RECAP

- Zinc phosphate
- Zinc polycarboxylate
- Conventional GIC
- Resin modified GIC
- Resin cements

CEMENTS AVAILABLE OHCWA CLINIC 1

- Tempocem NE
  - Composite
  - Composite
  - Composite
- *(Zinc phosphate)*

ZINC PHOSPHATE

COMPOSITE OPTIONS

- Rely-X Unicem (3M)
- Panavia (Kuraray)
- Variolink (Ivoclar)

RelyX UNICEM

RelyX UNICEM

- Dual-cure
- Self-adhesive resin cement

PANAVIA F 2.0


PANAVIA F 2.0
OXYGUARD II
6mL
PANAVIA F 2.0
A
PASTE
PANAVIA F 2.0
2.3ml(4.6g)
6G0126
B
PASTE
PANAVIA F 2.0
ED PRIMER II
Liquid A 4ml
PANAVIA F 2.0
ED PRIMER II
Liquid B 4ml


ALLOY PR

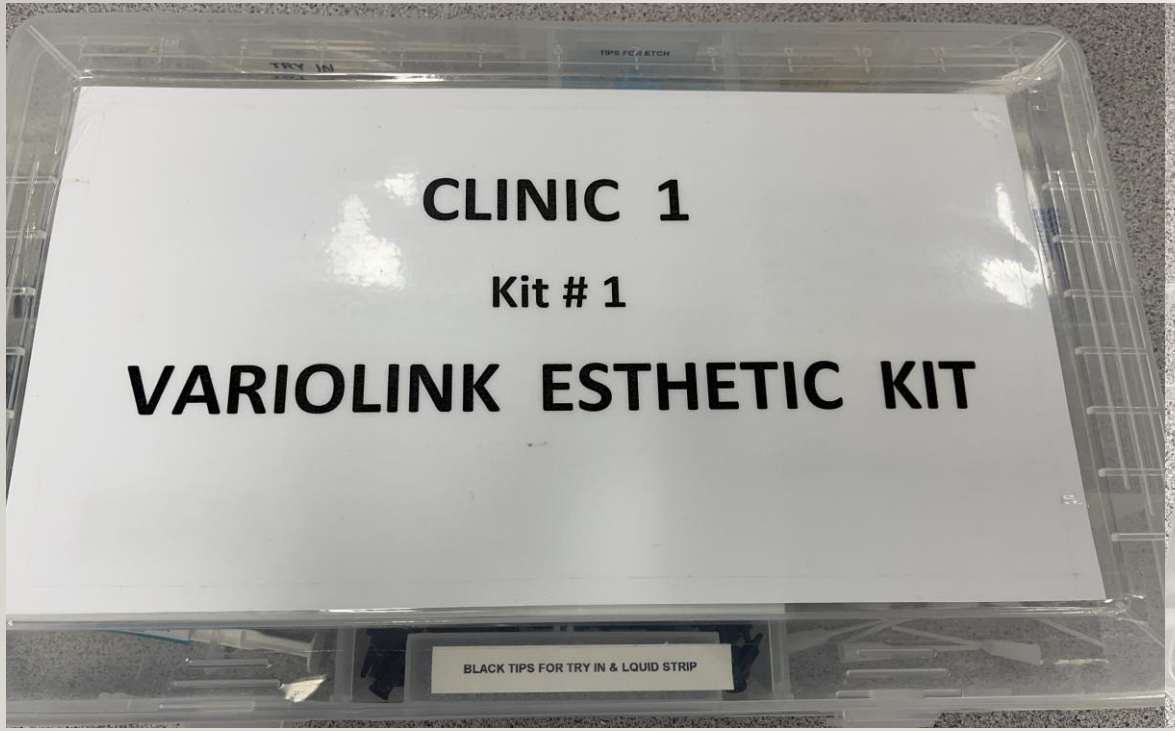

PANAVIA F 2.0
ED PRIMER II
Liquid A 4ml
PANAVIA F 2.0
ED PRIMER II
Liquid B 4ml

PANAVIA F 2.0

Dual cure resin cement

Requires separate self-etching primer system (A+B) as initiator for chemical curing

VARIOLINK ESTHETIC



VARIOLINK ESTHETIC

Dual-cure resin cement

Requires combined primer/bond dentine bonding agent (Adhese universal)

Monobond plus “Universal primer” has MDP and silane

VARIOLINK ESTHETIC

MY SUGGESTIONS BASED ON PERSONAL PREFERENCE

All restorations with adequate mechanical retention and strength

RelyX Unicem

e.max

VARIOLINK

- Unretentive restorations (Onlays, tabletop etc)
- Below minimum thickness
- Supragingival margins

RelyX

- Unretentive restorations (Onlays, tabletop etc)
- Below minimum thickness
- Subgingival margins

Remember the etching, cleaning and silane primer of the restoration

Zirconia

VARIOLINK

- Unretentive restorations (Onlays, tabletop etc)
- Below minimum thickness
- Supragingival margins

RelyX

- Unretentive restorations (Onlays, tabletop etc)
- Below minimum thickness
- Subgingival margins

Remember the air abrasion, cleaning and MDP primer of the restoration

METAL WITHOUT SUFFICIENT MECHANICAL RETENTION

Panavia

Non-precious metal vs Precious

VENEERS

Variolink

Ideally LC only if available

(Amine DC initiator causes yellowing over time)

VENEERS

Try in paste

Water soluble, non setting

Same shade, opacity/translucency as the resin cement

CEMENTATION PROCEDURE

When all else fails follow the manufacturer's instructions (IFU)

With all resin cements:

Do not attempt more than 2 units at a time

Tack cure 2-4 seconds only- remove excess with a probe and floss interproximal excess thoroughly before final light curing

If you light cure you probably don't need oxygen inhibitor (Oxyguard, liquid strip) but there is an oxygen inhibited layer.

DO NOT leave any excess-you will regret it because it is a nightmare to remove later