MODERN DENTAL MATERIALS:
A PRACTICAL REVIEW FOR
THE RESTORATIVE DENTIST

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I. Isolation

A. Rubber dam
   1. Rubber dam materials
      a. Hygenic, Coltène-Whaledent – thin, medium, heavy, extra heavy; several colors
      b. Ivory, Heraeus Kulzer – medium weight; green or blue
      c. Non-latex – Hygenic, Coltène-Whaledent
   2. Rubber dam clamps (Ivory, Heraeus Kulzer)

<table>
<thead>
<tr>
<th>Clamp #</th>
<th>Ivory Description</th>
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<tr>
<td>00</td>
<td>For small lower anteriors and premolars that are irregularly positioned</td>
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<tr>
<td>2</td>
<td>General purpose lower bicuspid clamp</td>
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<tr>
<td>27N</td>
<td>Universal bicuspid clamp</td>
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<tr>
<td>7</td>
<td>General purpose lower molar clamp</td>
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<tr>
<td>8</td>
<td>General purpose upper molar clamp</td>
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<tr>
<td>14</td>
<td>For partially erupted or undersized teeth</td>
</tr>
<tr>
<td>56</td>
<td>For all large molars</td>
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<tr>
<td>212</td>
<td>Anterior cervical clamp</td>
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B. Retraction cord – Ultrapak (Ultradent) – size range: #000-#3
C. Expandex lip retractor (Parkell)
D. OptraGate (Ivoclar Vivadent)
II. Enamel bonding

A. Basic concepts
   1. Microscopic roughening; increased surface area; resin tags
   2. Adequate etch can be achieved with 15-sec application of 35-40% phosphoric acid, but 30 sec might be better.
   3. Beveling increases surface area, improves blending of restoration, and might reduce “white line margins.”
   4. Variations
      a. Primary vs. permanent – primary enamel (and young permanent enamel) requires a longer etching time.
      b. Fluorosis – fluorosed enamel requires a longer etching time.
      c. Ends vs. sides of enamel rods – bond strengths to the sides of enamel rods are lower than those to rod ends.
      d. Cervical enamel – bonding to cervical enamel is less effective than bonding to other areas.

B. Products
   1. Onyx (Centrix)
   2. Scotchbond Etching Gel (3M ESPE)
   3. Tooth Conditioner Gel (Dentsply Caulk)
   4. Ultra-Etch (Ultradent)

C. Relationship with dentin bonding
   1. "One-bottle" adhesives bond equally well to moist and dry enamel.
   2. Most self-etch adhesives do not etch enamel as well as phosphoric acid.

III. Dentin bonding

A. Basic concepts
   1. Bonding to dentin is inherently more difficult (and less predictable) than bonding to enamel.
   2. Resin adhesion to dentin is primarily micromechanical.
   3. Polymerization contraction force of composite resins is the biggest obstacle to effective bonding (as measured by retention, marginal seal, and lack of post-operative sensitivity).
   4. Proper clinical technique (following directions, understanding the product and process) is critical to success with any adhesive.

B. Available methods
   1. Total-etch, or etch & rinse
      a. Three-step (etch/prime/bond) (“fourth-generation”)
      b. One-bottle (etch/prime+bond) (“fifth-generation”)
   2. Self-etch
      a. Self-etching primers: etch+prime/bond
      b. Self-etching adhesives: etch+prime+bond (“all-in-one”)

C. Examples of products
   1. Etch/prime/bond adhesive systems
      a. Adper Scotchbond Multi-Purpose Plus (3M ESPE)
      b. All-Bond 2 (Bisco)
      c. OptiBond FL (Kerr Corporation)
   2. One-bottle adhesives
a. Adper Single Bond Plus (3M ESPE)
b. Excite (Ivoclar Vivadent)
c. Gluma Comfort Bond & Desensitizer (Heraeus Kulzer)
d. One-Step Plus (Bisco)
e. OptiBond Solo Plus (Kerr Corporation)
f. Prime & Bond NT (Dentsply Caulk)

3. Self-etching primer systems
   a. AdheSE (Ivoclar Vivadent)
   b. Clearfil SE Bond and Clearfil Protect Bond (Kuraray America)
   c. NanoBond (Pentron Clinical)
   d. OptiBond Solo Plus w/ self-etch primer (Kerr Corporation)
   e. Simplicity (Apex Dental Materials)
   f. Tyrian SPE (Bisco)

4. All-in-one
   a. Adper Prompt L-Pop (3M ESPE)
   b. Brush & Bond; Touch & Bond (Parkell)
   c. Clearfil S3 Bond (Kuraray America)
   d. G-Bond (GC America)
   e. iBond (Heraeus Kulzer)
   f. One Up Bond F (Tokuyama)
   g. Xeno III; Xeno IV (Dentsply Caulk)

D. Criteria for selecting a bonding system
   1. Clinical performance (retention, margin quality, etc.)
   2. Laboratory performance (particularly bond strength)
   3. Your need for versatility ("universal" vs. direct composite only)
   4. Ease of use
   5. Cost per application

IV. Prevention of hyperalgesia; pulp protection and therapy

A. Pulp protection/prevention of post-op sensitivity
   1. Never desiccate dentin with strong, continuous blasts of compressed air.
   2. Under amalgam restorations, use an adhesive or desensitizer (Gluma Desensitizer, Heraeus Kulzer). In very deep preparations, recent studies suggest that calcium hydroxide liners may improve pulpal response.
   3. Options for composite restorations (especially Class I and II)
      a. RMGI liner (Vitrebond, 3M ESPE)
      b. Flowable composite on floors
      c. Self-etching adhesive system
   4. For bonded crowns, allow some self-curing of resin cement before light activation.

B. Direct pulp capping
   1. Use clinical judgment – is it worth attempting or not?
   2. Very important – stop the hemorrhage! Use NaOCl or chlorhexidine.
   3. Place calcium hydroxide (Dycal, Dentsply Caulk) on exposure area.
   4. Place RMGI liner (Vitrebond) for strength and seal.
   5. Use adhesive to seal the preparation.

C. Partial – or Cvek – pulpotomy
1. Remove superficial 1-2 mm of pulp tissue using sharp diamond rotating at high speed with water spray.
2. Follow direct pulp capping procedure.

D. Hyperalgesia (dentinal hypersensitivity)
1. Prevention with crown preparations
   a. Adhesive: brief etch (5-10 sec), apply one-bottle adhesive and blow very thin. Do this after impression and temporary have been made.
   b. Desensitizer (Gluma Desensitizer)
   c. Use RMGI cement (see section XI)
2. Treatment (e.g., exposed cervical dentin)
   a. Adhesive: very brief etch (5 sec) or clean with hypochlorite or pumice, apply adhesive or similar material (e.g., Seal & Protect, Dentsply Professional). Adper Prompt L-Pop (or other self-etch system) is another option.
   b. Desensitizer (Gluma Desensitizer)
   c. Crystal precipitation to seal tubules (D/Sense II, Centrix)
   d. Fluoride varnish (Duraphat, Colgate Oral Pharmaceuticals)
   e. At-home option: KNO₃ dentifrice (Sensodyne, GSK)

V. Direct composite resins

A. Classification of composite materials
1. Macrofill (conventional)
   a. Particle size: 15-50 μm
   b. Advantage: strength
   c. Disadvantages: wear resistance, polishability
2. Midifill (fine particle)
   a. Particle size: ~ 5 μm
   b. Advantage: strength, better wear and polishability
   c. Disadvantages: wear resistance, polishability
3. Minifill
   a. Particle size: ~ 1 μm
   b. Advantages: strength, much better wear and polishability
   c. Disadvantages: stiffness
4. Microfill
   a. Particle size: 0.04 μm
   b. Advantages: excellent polishability, translucency, wear, flexibility
   c. Disadvantages: polymerization shrinkage, high thermal expansion coefficient, water sorption, chipping and fatigue fracture
5. Nanofill
   a. Newest development in composite technology
   b. For reference, 1 nm = 0.001 μm
6. Hybrid
   a. Particle sizes: “macro” (~1 μm) plus "micro" (0.04 μm)
   b. Advantage: universal materials
   c. Disadvantage: retain polish less than microfills
7. Micro-hybrid (or “extended range” micro-hybrids)
   a. Particle size: less than traditional hybrids (e.g. Point 4 = 0.4 μm)
b. Advantages: better optical properties and polishability
c. Disadvantage: somewhat reduced strength

8. Flowable
9. Packable

B. Examples of products
1. Conventional: Adaptic, Concise
2. Midifill: Prisma-Fil (Dentsply Caulk)
3. Minifill: Z250 (3M ESPE)
4. Microfills
   a. Durafill VS (Heraeus Kulzer)
   b. Epic TMPT (Parkell)
   c. Renamel (Cosmedent)
   d. Heliomolar (Ivoclar Vivadent) – only microfill OK for Class I and II
5. Nanofills
   a. Filtek Supreme Plus (3M ESPE)
   b. Premise (Kerr), Simile (Pentron), TPH³ (Dentsply Caulk), Tetric EvoCeram (Ivoclar Vivadent) (technically “nano-hybrids”)
6. Hybrids
   a. Charisma (Heraeus Kulzer)
   b. Prodigy (Kerr Corporation)
   c. Tetric Ceram (Ivoclar Vivadent)
   d. TPH (Dentsply Caulk)
   e. XRV Herculite (Kerr Corporation)
7. “Extended range” micro-hybrids
   a. Esthet-X (Dentsply Caulk)
   b. Gradia Direct (GC America)
   c. Point 4 (Kerr Corporation)
   d. Venus (Heraeus Kulzer)
   e. Vit-l~scence (Ultradent)
   f. 4 Seasons (Ivoclar Vivadent)
8. Flowables – many are available, including:
   a. Flow-It (Pentron)
   b. Esthet-X Flow (Dentsply Caulk) – thixotropic
   c. Tetric Flow (Ivoclar Vivadent) – most radiopaque
   d. Heliomolar Flow (Ivoclar Vivadent) – microfill
9. Packables
   a. ALERT (Pentron)
   b. Filtek P60 (3M ESPE)
   c. Prodigy Condensable (Kerr Corporation)
   d. Solitaire 2 (Heraeus Kulzer)
   e. SureFil (Dentsply Caulk)

C. Anterior (Class III, IV)
1. Bevel for retention and blending. Scallop the bevel to improve blending on Class IV’s.
2. Extent of preparation is determined by size of defect; mechanical retention usually is not necessary.

D. Posterior (Class I, II)
1. Isolation is critical, and rubber dam is the standard method.
2. Size of defect determines preparation size.
3. There is no consensus about beveling of occlusal margins.
4. Post-operative sensitivity is more likely in Class I than in any other composite restorations. See section IV-A for information about prevention.
5. Matrix choices
   a. Tofflemire type, 0.010": Ho bands (Young Dental), Omni-Matrix (Ultradent, disposable)
   b. Sectional w/ bitine ring – Composi-Tight (Garrison Dental), Palodent (Dentsply Caulk), Contact Matrix (Danville Materials).
6. WedgeWands (Garrison Dental)
7. Gingival increment of Class II – use flowable material (composite or compomer), RMGI, or compomer.
8. Place and cure composite incrementally, not in bulk.
9. After finishing and occlusal adjustment, can use a resin surface sealer to correct white line margins, or to seal margins as a matter or routine (BisCover, Bisco; OptiGuard, Kerr; PermaSeal, Ultradent).

E. Cervical (Class V)
1. Rubber dam with 212 clamp can be used for isolation, but cotton roll and retraction cord are usually more convenient.
2. Bevel enamel for retention and blending.
3. If desired, a small retention groove can be placed at gingival aspect using #1/4 round bur, but is usually not necessary.
4. Can use a sable artist’s brush to help contour and smooth the composite.
5. Avoid aggressive finishing of the composite gingivally. This can damage the cementum and cause post-operative sensitivity.

F. Composite placement instruments
1. Microfil Contouring Instrument #1 (Almore International)
2. IPC interproximal carver (GC America)
3. Compo-Sculp instruments (Suter Dental)

G. Visible light-curing
1. Available light sources
   a. Conventional quartz-tungsten-halogen (QTH) (Optilux 501, Demetron/Kerr; Spectrum 800, Dentsply Caulk)
   b. High-intensity QTH (Optilux 501 boost mode w/ TurboTip)
   c. Plasma arc curing (PAC) lights
   d. Argon lasers
   e. LED units (from many manufacturers)
2. Curing methods
   a. Continuous standard or high-intensity (most conventional QTH units, PAC lights, lasers)
   b. Stepped (Spectrum 800 has manual step mode)
   c. Ramp cure (Elipar TriLight, 3M ESPE)
   d. Pulse delay (VIP, Bisco)
3. Check light intensity output periodically using the unit’s built-in radiometer, or a hand-held radiometer (Curing Radiometer, Demetron/Kerr)
4. LED lights require specially calibrated radiometer (Demetron)

H. Finishing and polishing
1. General “tips”
   a. Move from material toward tooth.
   b. Use discs at incisal edges, restoration margin.
   c. Use rubber cups for gingival margins, resin veneers, etc.
   d. Use rubber points for lingual and occlusal surfaces, etc.
   e. Polishing pastes improve shine, at least initially.
2. Carbide finishing burs
   a. #7406, 7801, 7901 (Dentsply Professional)
   b. ET burs (Brasseler)
   c. RAPTOR style (Bisco, Brasseler)
3. #12 scalpel blade (generic)
4. Abrasive rubber/point/cups
   a. Astropol Finishers/Polishers (Ivoclar Vivadent)
   b. Enhance and PoGo (Dentsply Caulk)
   c. D-Fine Polishers (Clinician’s Choice)
   d. Diacomp (Brasseler)
   e. FlexiPoints, FlexiCups (Cosmedent)
   f. Jiffy Polishers (Ultradent)
5. Finishing strips
   a. Compo Strips (Premier)
   b. Epitex Strips (GC America)
   c. Sof-Lex Finishing and Polishing Strips (3M ESPE)
6. Finishing discs
   Sof-Lex and Sof-Lex XT Pop-On Discs (3M ESPE)
7. Polishing brushes: Clinician’s Choice, Ultradent, Kerr, 3M ESPE

VI. Other tooth-colored direct restorative materials

A. “Continuum” of tooth-colored restorative materials
   1. Glass ionomers: acid/base reaction; fluoride release
   2. Resin-modified glass ionomers: acid/base reaction plus methacrylate polymerization; fluoride release
   3. Polycrystalline composites (“comomers”): primarily methacrylate polymerization; some fluoride release
   4. Composite resins: methacrylate polymerization; little or no fluoride release
B. Resin-modified glass ionomers
   1. Fuji II LC (GC America)
   2. Photac-Fil Quik (3M ESPE)
   3. Vitremer (3M ESPE)
C. Comomers
   1. Compolass F (Ivoclar Vivadent)
   2. Dyract eXtra (Dentsply Caulk)
   3. F2000 (3M ESPE)
D. Indications
   1. Class V restorations (use RMGI for most fluoride release)
   2. Primary tooth restorations (Class I and II)
   3. Small crown build-ups and block-outs
   4. Gingival increment of Class II posterior composite
5. Temporary restorations

VII. Indirect composites

A. Basic concepts
   1. Despite some of them being called “ceromers” or “polyglass” materials, these are simply laboratory-processed composites.
   2. Processing typically includes some combination of vacuum, pressure, nitrogen atmosphere, light, and heat.
   3. Processing improves physical properties somewhat, and because most of the polymerization shrinkage occurs in the laboratory, these restorations could potentially out-perform similar direct restorations – but clinical studies have not proven that.
   4. Fiber-reinforcement is used for bridges and some other types of restorations made with these materials.
   5. Examples: belleGlass (Kerr), Concept (Ivoclar Vivadent), Tescera (Bisco)

B. Clinical use
   1. Case selection – limited applications; probably best suited as an alternative to ceramics when wear of the opposing dentition is a concern.
   2. Bonding of resin cement to processed resin is difficult. The interior surface of the restoration should be air-abraded (sandblasted) using 50-µm aluminum oxide particles.

VIII. Ceramic inlays and onlays

A. Types of materials available
   1. Feldspathic porcelains – but these are weak, and other materials are better.
   2. Hot pressed ceramics (IPS Empress, Ivoclar Vivadent) – can be etched with HF acid and bonded to the tooth.
   3. Various industrially-fabricated “blocks” for CAD/CAM milling

B. Preparation guidelines
   1. Use a flat-ended diamond with rounded edges to provide rounded internal line angles (e.g., Two-Striper #587.4, Premier) and butt-joint cavosurface margins.
   2. Pulpal depth, occlusal isthmus width, and cuspal coverage should all be about 2 mm.
   3. Opposing walls should diverge more than those for gold inlays (perhaps as much as 5-15°).

C. Bonding – use a dual-cure resin cement (Dual Cement or Appeal Posterior, Ivoclar Vivadent; Rely-X ARC, 3M ESPE). Do not hurry to light-activate (rapid application of curing light could contribute to post-op sensitivity). Remove excess before light activation.
IX. Porcelain veneers

A. Basic concepts
1. These are designed to be conservative restorations – preparation is necessary, but should be restricted to enamel as much as possible. Clinical studies indicate that enamel preparations provide the greatest success.
2. Shade selection – A1 works most of the time, but can use other shades, especially in canines and cervical areas.
3. To block out discolored teeth, ask the lab to use opaque porcelain; do not try to do this with the cement or opaque resins, which give unpredictable results.
4. If cervical area of teeth is not discolored, ask lab to use translucent porcelain in this area for best blending with tooth (“contact lens effect”).

B. Tooth preparation
1. As a general rule, 0.5 mm of labial enamel should be removed (slightly less in cervical areas). Remove 0.7 mm from discolored teeth. (For pressed ceramics, more reduction is necessary – lab prefers 1.0 mm in most areas.)
2. Finish line is a definite chamfer, which should approach, but not break, proximal contacts.
3. Preparation diamonds include:
   a. Two-Striper #767.78 (Premier)
   b. 850-016 (Nixon kit, Brasseler)
   c. LVS #3 and #4 (LVS kit, Brasseler) – two-grit; finer at tip
4. Depth gauge diamonds (Brasseler) are recommended.
5. Shorten tooth to accommodate 1.0 mm of porcelain at incisal edge.
6. Lingual finish line is a chamfer no farther than 1.0 mm from incisal edge.
7. Check proximal contacts. If tight, lighten using CompoStrips (Premier) or VisionFlex Strips (Brasseler). Do not open the contacts.

C. Provisionals – two methods
1. Spot-etch enamel; free-hand direct composite veneers.
2. Use pre-op impression or vacuum-formed matrix.

D. Try-in and cementation
1. Remove provisionals, if any. Clean teeth with pumice.
2. Try in each veneer individually – and dry – to check for fit.
3. Try in all veneers together wet, to check color and overall fit.
4. If necessary, check again with the resin cement (work quickly to avoid setting) or appropriate try-in paste. Always check versus a translucent shade; the translucent will work most of the time.
5. Veneers should have been etched by the lab already. If any areas appear unetched, treat briefly with HF acid gel (Pulpdent, Ultradent).
   Use a silane coupling agent, which can improve bond of resin to ceramic by about 25%. Follow manufacturer’s instructions.
6. Cement veneers two at a time, beginning with the central incisors.
7. Appropriate cements include:
   a. Calibra (Dentsply Caulk)
   b. Nexus 2 (Kerr)
   c. Rely-X Veneer Cement (3M ESPE)
d. Variolink II or Appeal Anterior (Ivoclar Vivadent)
e. Any restorative composite extruded through a “ribbon tip” (Centrix) to thin it, or flowable composite.

8. As a general rule, do not “mix and match” adhesives and cements from different manufacturers.

9. Remove excess cement before light activating. Desired goal in clean-up is simple removal using a #12 scalpel blade.

10. Remember that porcelain attenuates the curing light. Make sure to use adequate curing times, as the veneer cement (except for extremely thick veneers) is cured only by visible light.

11. Check occlusion carefully, including excursions, and adjust as needed.

12. Minimize finishing, but some will be necessary, particularly at lingual margins. Use – in order, microfine diamonds, 30-fluted carbide finishing burs, rubber porcelain polishers (Brasseler), diamond polishing paste (Truluster, Brasseler)

X. All-ceramic crowns

A. Types of materials available

1. Hot pressed ceramics (IPS Empress, Ivoclar Vivadent) – can be etched with HF acid and bonded to the tooth.

2. Alumina-reinforced high strength ceramics (InCeram, Vident; Procera AllCeram, Nobel Biocare) – these cannot be etched effectively.

3. Zirconia-based high-strength ceramics (Cercon, Dentsply; Lava, 3M ESPE) – these cannot be etched effectively.

4. Selection of material is based on need for strength and translucency/opacity. The pressed ceramics will allow more of the underlying tooth shade to “shine through”. Use an alumina or zirconia ceramic when the tooth is discolored, or a metal post is present.

C. Preparation guidelines

1. Use a flat-ended diamond with rounded edges to provide rounded internal line angles (e.g., Two-Striper #587.8, Premier) and a 1.0-mm circumferential butt-joint shoulder margin.

2. Incisal reduction should be 1.5-2.0 mm.

3. Lingual clearance should be at least 1.5 mm.

4. Facial reduction should be 1.0-1.5 mm.

5. “Minimal reduction” crown preparations (“360° veneers”) are OK in some instances. These crowns must be bonded.

C. Cementation/bonding

1. IPS Empress – use a dual-cure resin cement. Do not hurry to light-activate (rapid application of curing light could contribute to post-op sensitivity). Remove excess before light activation.

2. Alumina ceramics – theoretically, any cement could be used. Panavia (Kuraray America) is an adhesive resin cement shown in clinical trials to be a particularly effective luting agent for these ceramics.

3. Zirconia ceramics (Lava, Cercon) – theoretically, any cement could be used. RelyX Unicem (3M ESPE) looks particularly promising for these ceramics.
XI. Ancillary materials for indirect restorations

A. Impression materials and techniques
   1. Current precision impression materials
      a. Polyvinylsiloxanes (PVS) (addition silicones) – Aquasil Ultra (Dentsply Caulk), Virtual (Ivoclar Vivadent), Affinity (Clinician’s Choice), Examix (GC America), Honigum (DMG), Imprint II (3M ESPE), Take One (Kerr), many others
      b. Polyethers – Impregum, Impregum Soft, Permadyne (all 3M ESPE)
   2. Choosing a class of material – either type is fine!
      a. PVS: more products and variations available; possibly slightly better physical properties
      b. Polyether: more hydrophilic; better “true” working time
   3. Automatic mixing/dispensing devices
      a. Pentamix 2 (3M ESPE)
      b. MixStar (DMG)
      c. Ivoclar Vivadent hand-held dispensing gun
   4. Dual-cord retraction technique
      a. Prepare tooth to gingival margin.
      b. Pack small (000, 00, or 0) cord; complete preparation.
      c. Place larger second cord dipped in hemostatic solution of choice; leave in place 5-10 minutes.
      d. Rinse, leave wet, remove top cord, and dry with compressed air.
   5. Tips for impression making
      a. Use tray adhesive; allow to dry for at least 10 minutes.
      b. Place syringe tip close to margin.
      c. Push, don’t pull material.
      d. Use a “stirring” motion; go around prep twice if possible.
      e. Never remove tip from material.
      f. Observe working and setting times.

B. Provisionals
   1. Types of resin provisional materials
      a. Acrylic (polymethlymethacrylate) – e.g., Crown and Bridge Resin (Dentsply Caulk)
      b. Acrylic (polyethylmethacrylate) – e.g., Snap (Parkell)
      c. Bis-acryl composites – Integrity (Dentsply Caulk), Luxatemp (DMG), Cool Temp ( Coltène Whaledent), Temptation (Clinician’s Choice)
   2. Types of provisional cements
      a. ZOE – TempBond (Kerr)
      b. Non-eugenol – TempBond NE (Kerr)
      c. Resin – TempBond Clear (Kerr)

C. Cements
   1. Types
      b. Resin-modified glass ionomers – Rely-X Plus (successor to Vitremer; 3M ESPE), FujiCem (GC America)
      c. Composite resins
         i. Conventional (classified by curing method)
– self-cure: Comspan (Dentsply Caulk), C&B Luting (Bisco)
  – dual-cure only: see section VIII-C
  – VLC w/ dual-cure option: see section IX-D-7

ii. Adhesive resins
  – phosphates: Panavia F or 21 (Kuraray), Multilink (Ivoclar)
  – 4-META: C&B Metabond (Parkell), M-Bond (Tokuyama/Morita)
  – new self-adhesive: Rely-X Unicem (3M ESPE), Maxcem (Kerr)

2. Which cement for specific clinical indications?
   a. Conventional crown and bridge: conventional or resin-modified
glass ionomer
   b. Resin-bonded bridge or metal restoration needing extra retention:
adhesive resin cement
   c. Porcelain veneers: VLC resin cement
   d. Ceramic or composite inlays, onlays, and crowns: dual-cure resin,
or an adhesive resin cement (note: resin bonding is not required for
high-strength ceramics)

XII. At-home bleaching

A. General considerations
   1. All ADA-approved products (to date) contain 10% carbamide peroxide.
   2. Bleaching is time- and dose-dependent.
   3. Concentrations ranging from 15% to 30% are now available. Higher
concentrations bleach faster, but final result is same and these tend to
have more side effects.
   4. For reference, 10% carbamide peroxide = 3.3% hydrogen peroxide.
   5. Yellow/brown stains respond more quickly than gray stains. Tetracycline
stains can be bleached, but this takes many months.

B. Products available
   1. Hydrogen peroxide
      a. Crest Whitestrips (Procter & Gamble) – OTC & Supreme kits
      b. Day White (Discus Dental)
      c. Perfecta Bravo, Perfecta REV (Premier)
   2. Carbamide peroxide
      a. Nite White Classic, Nite White Excel (Discus Dental)
      b. Nupro White Gold (Dentsply Professional)
      c. Opalescence (Ultradent)
      d. Platinum, Platinum Overnight, Platinum Gentle Plus (Colgate Oral
Pharmaceuticals)
      e. Trio (Premier)

C. Treatment of tooth sensitivity (primary side effect of bleaching)
   1. Passive approach – discontinue bleaching for a day or two, then resume
with shorter application times
   2. Active approach – apply a desensitizing gel (Ultra-Eze, Ultradent)
containing fluoride and potassium nitrate, or use desensitizing toothpaste
(can be used before bleaching as a preventive measure)
### Directory of Manufacturers

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Address 1</th>
<th>Address 2</th>
<th>Phone</th>
</tr>
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<tbody>
<tr>
<td>3M ESPE</td>
<td>Building 225-45-11, 3M Dental Products Center</td>
<td>St. Paul, MN 55144</td>
<td>800-634-2249</td>
</tr>
<tr>
<td>Almore International (direct)</td>
<td>P.O. Box 25214</td>
<td>Portland, OR 97225</td>
<td>800-547-1511</td>
</tr>
<tr>
<td>Bisco, Inc. (direct)</td>
<td>1100 W. Irving Park Road</td>
<td>Schaumburg, IL 60193</td>
<td>800-247-3368</td>
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<td>Brasseler USA (direct)</td>
<td>One Brasseler Boulevard</td>
<td>Savannah, GA 31419</td>
<td>800-841-4522</td>
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<td>Centrix, Inc. (direct or dealer)</td>
<td>770 River Road</td>
<td>Shelton, CT 06484-5458</td>
<td>800-236-8749</td>
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<td>Clinician’s Choice (direct)</td>
<td>P.O. Box 1706</td>
<td>New Milford, CT 06776</td>
<td>800-265-3444</td>
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<td>Colgate Oral Pharmaceuticals</td>
<td>1 Colgate Way</td>
<td>Canton, MA 02021</td>
<td>800-225-3756</td>
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<td>Coltène-Waledent</td>
<td>750 Corporate Drive</td>
<td>Mahwah, NJ 07430</td>
<td>800-221-3046</td>
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<td>Cosmedent (direct)</td>
<td>401 N. Michigan Ave., Suite 2500</td>
<td>Chicago, IL 60611</td>
<td>800-621-6729</td>
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<td>Danville Materials</td>
<td>2021 Omega Road</td>
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<td>800-822-9294</td>
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<td>DMG/Zenith</td>
<td>242 South Dean Street</td>
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<td>800-662-6383</td>
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<td>Demetron/Kerr</td>
<td>21 Commerce Drive</td>
<td>Danbury, CT 06810</td>
<td>800-537-4634</td>
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<td>Den-Mat Corporation (direct)</td>
<td>P.O. Box 1729</td>
<td>Santa Maria, CA 93456</td>
<td>800-445-0345</td>
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<td>Dentsply Caulk</td>
<td>P.O. Box 359</td>
<td>Milford, DE 19963</td>
<td>800-532-2855</td>
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<td>Dentsply Professional</td>
<td>P.O. Box 7807</td>
<td>York, PA 17404-0807</td>
<td>1-800-989-8825</td>
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<td>Discus Dental (direct)</td>
<td>8550 Higuera Street</td>
<td>Culver City, CA 90232</td>
<td>800-422-9448</td>
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<tr>
<td>Garrison Dental Solutions (direct)</td>
<td>77 Enterprise Drive</td>
<td>Ann Arbor, MI 48103</td>
<td>800-959-0153</td>
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<tr>
<td>GC America</td>
<td>3737 W. 127th Street</td>
<td>Alsip, IL 60803</td>
<td>800-323-7036</td>
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800-431-1785

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Wallingford, CT 06492
800-243-3969

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Premier Dental Products
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888-670-6100

J. Morita USA, Inc. (direct or dealer)
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Procter & Gamble
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Mason, OH 45040
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Kerr Corporation
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Orange, CA 92667
800-537-7123

Pulpdent Corporation
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Watertown, MA 02272
800-343-4342

Kuraray America
101 E. 52nd Street, 26th Floor
New York, NY 10022
800-879-1676

Suter Dental (direct)
P.O. Box 1329
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916-893-8376

LaserMed (direct)
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West Jordan, UT 84088
800-903-2873

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South Jordan, UT 84065
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714-961-6200

Parkell, Inc. (direct)
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P.O. Box 376
Farmingdale, NY 11735
800-243-7446

Young Dental
13705 Shoreline Court E.
Earth City, MO 63045
800-325-1881
References on Materials in Esthetic and Adhesive Dentistry

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