Crown and Bridge Cements: Clinical Applications

Authored by Sabiha S. Bunek, DDS, and John M. Powers, PhD

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LEARNING OBJECTIVES
After participating in this CE activity, the individual will learn:
• Advantages, disadvantages, indications, and contraindications of traditional crown and bridge and resin cements.
• Recommended uses of cements for metal, ceramic, and laboratory composite restorations, and general guidelines for surface treatment of silica- and zirconia-based ceramic restorations when using resin cements.

ABOUT THE AUTHORS
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Disclosure: Dr. Bunek is an owner of Dental Consultants, Inc (publisher of The Dental Advisor).

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Disclosure: Dr. Powers is owner and senior vice president of Dental Consultants, Inc (publisher of The Dental Advisor), and receives funding from 3M ESPE, Pentron Clinical, Kerr, Ivoclar Vivadent, Kuraray America, GC America, and BISCO Dental Products.

INTRODUCTION
For many years, dentistry has relied on metal and metal-ceramic restorations. Luting of these restorations was often accomplished with traditional water-based cements such as zinc phosphate, polycarboxylate, and glass ionomer (GI) cements. Oil-based cements containing zinc oxide were also used.1,2 With the advent of all-ceramic restorations based on feldspathic, leucite-reinforced, and lithium disilicate ceramics, bonding replaced luting. These restorations required priming of both the tooth structure and the silica-based ceramic surface for successful bonding.1-3 Zirconia-based copings, frameworks, and full-contour restorations are becoming more popular. This restorative material requires a different approach to cementation.3-7

This article focuses on the most commonly used traditional crown and bridge cements (GI and resin-modified glass ionomer [RMGII]) for metal and metal-ceramic restorations and resin cements used for all-ceramic restorations. Advantages, disadvantages, indications, and contraindications of cements are listed in Table 1.1,2 Recommended uses of cements for metal, ceramic, and laboratory composite restorations are listed in Table 2.1,2 General guidelines for surface treatment...
of silica- and zirconia-based restorations when using resin cements are listed in Table 3.1-3

CEMENT CHOICES: TRADITIONAL VERSUS RESIN-BASED CEMENTS

Traditional Cements—Glass Ionomers and Resin-Modified Glass Ionomers

GIs were developed in the early 1970s and are still used as luting cements, primarily for the cementation of metal and metal-ceramic restorations.1,2 The cement sets due to an acid-base reaction between glass powder (basic) and water-soluble polyacrylic acid. GIs are hydrophilic in nature and tolerate a moist environment, making them ideal in situations where isolation is challenging.8 The self-cured material releases significant amounts of fluoride and is rechargeable, providing an excellent anticariogenic effect.9 This type of cement also exhibits low film thickness, helping to ensure proper seating. A unique advantage of GI cements is their ability to bond chemically to tooth structure. Some drawbacks to GIs are low strength, short working time, long setting and maturation time, and solubility when moisture is present during the initial setting period.10 They are available in powder-liquid and encapsulated versions.

RMGs were developed in the late 1980s in an attempt to retain the benefits of traditional GIs (adhesion and fluoride release) and to reduce some of the problems (hydration sensitivity, delayed set, and poor early strength).1,2 Major advancements in GI technology were due to the

Table 1. Advantages, Disadvantages, Indications, and Contraindications of Cements

<table>
<thead>
<tr>
<th></th>
<th>Glass Ionomer Cement</th>
<th>Resin-Modified Glass Ionomer Cement</th>
<th>Aesthetic Resin Cement</th>
<th>Adhesive Resin Cement</th>
<th>Self-Adhesive Resin Cement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td>High fluoride release, rechargeable</td>
<td>Fluoride release, rechargeable</td>
<td>Highest bond strength</td>
<td>No etching of tooth structure is needed</td>
<td>No etch or primer</td>
</tr>
<tr>
<td></td>
<td>Low chemical bond to tooth</td>
<td>Low-medium chemical and micromechanical bond to tooth</td>
<td>Minimal shade shift over time, if light-cured</td>
<td>Easy to use</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adhere in wet environment</td>
<td>Less technique sensitive than resin cements</td>
<td>Highly aesthetic</td>
<td>Low postoperative sensitivity</td>
<td>Less technique sensitivity</td>
</tr>
<tr>
<td></td>
<td>Low film thickness</td>
<td></td>
<td></td>
<td>Easy cleanup</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low technique sensitivity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Disadvantages</strong></td>
<td>Sensitivity may occur if tooth is over-dried</td>
<td>Moisture-sensitive technique</td>
<td>Sensitivity may occur if tooth is over-dried</td>
<td>Limited availability of shades</td>
<td>Can have shade shift over time</td>
</tr>
<tr>
<td></td>
<td>Time (24 hours) is required to develop maximum strength</td>
<td>Sensitivity may occur if tooth is over-dried</td>
<td>Most technique sensitive</td>
<td>May require oxygen inhibition gel</td>
<td>Not as strong as adhesive resin cements</td>
</tr>
<tr>
<td></td>
<td>Low strength</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water sensitive during setting phase</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Indications</strong></td>
<td>Metal and ceramic-metal restorations</td>
<td>Metal and ceramic-metal restorations</td>
<td>All-ceramic crowns and veneers in aesthetic zone</td>
<td>All-ceramic crowns, onlays, inlays, bridges</td>
<td>All-ceramic crowns, onlays, inlays, bridges</td>
</tr>
<tr>
<td></td>
<td>High-strength ceramic (zirconia) crowns and bridges</td>
<td>High-strength ceramic (zirconia) crowns and bridges</td>
<td>Laboratory composites</td>
<td>Metal or ceramic-metal crowns/bridges</td>
<td>All-metal or ceramic metal crowns/bridges</td>
</tr>
<tr>
<td></td>
<td>Posts (metal)</td>
<td>Laboratory composites</td>
<td>Posts</td>
<td>High-strength ceramic (zirconia) crowns, bridges, inlays, onlays</td>
<td>High-strength ceramic (zirconia) crowns, bridges, inlays, onlays</td>
</tr>
<tr>
<td></td>
<td>Laboratory composites</td>
<td>Implant restorations</td>
<td>Posts (cast metal, ceramic, fiber-reinforced resin)</td>
<td>Posts (metal and fiber)</td>
<td>Posts (metal and fiber)</td>
</tr>
<tr>
<td><strong>Contraindications</strong></td>
<td>All-ceramic restorations</td>
<td>Thin all-ceramic restorations</td>
<td>Opaque all-ceramic restorations</td>
<td>All-ceramic veneers</td>
<td>Ceramic veneers</td>
</tr>
<tr>
<td></td>
<td>Posts</td>
<td></td>
<td></td>
<td>Crown or bridge with poor retention</td>
<td>Crown or bridge with poor retention</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Resin-bonded bridges</td>
<td>Resin-bonded bridges</td>
</tr>
</tbody>
</table>
addition of resin. Modern RMGIs remain popular because they possess slightly higher strengths, shortened set time, longer working time, and are less soluble in the oral environment than GIs. Compared to GIs, these cements are more resistant to water contamination during the setting reaction. They are available in powder-liquid and paste-paste formulations.

**Aesthetic Resin, Adhesive Resin, and Self-Adhesive Resin Cements**

Dentistry is rapidly evolving from the cementation of metal and metal-ceramic restorations using traditional cements to the bonding of all-ceramic aesthetic restorations using resin-based adhesive cements. Resin cements are composed of diacrylate resins and glass filler that contain light activators, chemical initiators, or both. They form a micromechanical bond to tooth structure as well as to the restoration and are insoluble in oral fluids. Currently, resin cements can be classified into 3 categories: aesthetic resins (bonding based on total-etch or self-etching adhesives), adhesive resins (bonding based on self-etching primers), and self-adhesives (no separate etching or primer of teeth or restorations). There are several distinct types of all-ceramic restorations—silica-based ceramics (feldspathic, leucite-reinforced, and lithium disilicate) and high-strength ceramics based on zirconia and alumina.

Aesthetic resin cements are tooth-colored or translucent cements based on diacrylate resin. They are often provided with water-soluble try-in pastes. They have high flexural strength and high bond strengths to enamel and dentin. These cements typically require etching the tooth with phosphoric acid, followed by priming of the restoration and application of resin cement. Recent aesthetic resin cements utilize self-etching bonding agents. Aesthetic resin cements require a separate primer for bonding to ceramic, metal, and tooth substrates. Some examples are: RelyX Veneer (3M ESPE), Lute-It! Esthetic Luting System (Pentron Clinical), NX3 Nexus Third Generation (Kerr), and Variolink II (Ivoclar Vivadent).

Adhesive resin cements are based on acrylic or diacrylate resin with incorporated adhesive monomers that bond well to metal substrates. This class of cements requires the application of a self-etching primer to the tooth before cementation. Some examples are: Multilink Automix (Ivoclar Vivadent), Panavia F 2.0 (Kuraray America), RelyX Ultimate Adhesive Resin Cement (3M ESPE), and NX3 XTR (Kerr).

Self-adhesive resin cements are the latest advancement in resin technology. These dual-cured materials contain an acidic adhesive monomer in the cement, eliminating the need for separate bonding agents or primers to achieve bonding to tooth structure or the restoration. Self-adhesive cements appeal to many clinicians as they are quick, easy to use, and
decrease technique sensitivity. Cleanup is also easy with these cements. The lack of a separate etching gel and bonding agent often allows for metal-based and ceramic restorations to be bonded without the use of anesthetic. Self-adhesive resin cements are most commonly available in universal, translucent, and opaque shades.

One drawback of self-adhesive resin cements is lower bond strengths when compared to other resin cements. Self-adhesive cements are not indicated in preparations where there is little retention; aesthetic or adhesive resin cement should be used to assure an optimal bond.

Many self-adhesive cements are now available in automix delivery systems, but encapsulated and auto-dispensed products are still available. Some examples of self-adhesive resin cements include RelayX Unicem 2 Automix Self-Adhesive Resin Cement (3M ESPE), Maxcem Elite (Kerr), PANAVIA SA CEMENT (Kuraray America), G-CEM (GC America), BisCem (BISCO Dental Products), and SpeedCem (Ivoclar Vivadent).

**CEMENT SELECTION—WEIGHING THE OPTIONS**

Numerous factors influence the dentist's decision regarding cement selection. Ease of use, cost, strength, solubility, and postoperative sensitivity are just a few. To add to the confusion, there are a large variety of cements to choose from. One type/category of cement is not ideal for every situation; therefore, it is imperative to understand the difference in the physical and mechanical properties, as well as handling characteristics. The following recommendations are based on the clinical experience of Dr. Bunek.

**Metal or ceramic-metal restorations:** GI or RMGI cements are excellent choices, especially if the patient is a high-caries-risk patient and could benefit from fluoride release.

**Metal posts:** GIs are the best choice because they are self-cured.

**Veneers:** Total-etch, light-cured aesthetic resin cements are the best choice. Self-adhesive resin cements can have a slight color shift over time that may affect the aesthetics of a veneer. Since veneer preparations often have little retention form, the extra bond strength that total-etch resin cements provide is important for longevity of the veneer. In addition, working time is not limited with light-cured aesthetic resin cements.

**Silica-based inlays and onlays (leucite-reinforced and lithium disilicate):** Adhesive resin cements are best for this category, especially when retention is an issue. Silica-based ceramics require treatment with silane (Table 3). Cements with higher bond strengths are required to guarantee a durable bond.

**Silica-based crowns (leucite-reinforced and lithium disilicate):** If the indirect restoration is not in the aesthetic zone, adhesive resin cement is indicated. However, if isolation is difficult and the preparation is retentive, self-adhesive resin cement is a good choice. If the indirect

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**Table 3. General Guidelines for Surface Treatment of Silica- and Zirconia-Based Restorations When Using Resin Cements**

<table>
<thead>
<tr>
<th>Restorations Type</th>
<th>Surface Treatment</th>
<th>Primer/MDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica-based glass ceramic restorations</td>
<td>Hydrofluoric Acid Etch</td>
<td>Laboratory will generally etch; no need to etch a second time</td>
</tr>
<tr>
<td>Silica-based glass ceramic restorations</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Silica-based glass ceramic restorations</td>
<td></td>
<td>No, unless the primer also contains silane</td>
</tr>
<tr>
<td>Zirconia-based restorations cemented with self-adhesive and adhesive resin cements</td>
<td>No</td>
<td>No, unless the primer also contains silane</td>
</tr>
<tr>
<td>Zirconia-based restorations cemented with aesthetic resin cements</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adhesive and self-adhesive cements usually contain an acidic monomer (MDP)—no need to use a ceramic primer if the preparation is retentive</td>
</tr>
</tbody>
</table>

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*Table 3. General Guidelines for Surface Treatment of Silica- and Zirconia-Based Restorations When Using Resin Cements*
restoration is in the aesthetic zone, the use of an aesthetic resin cement is recommended.

**Zirconia-based restorations:** Zirconia-based restorations with good retention can be cemented with traditional crown and bridge cements or self-adhesive resin cements. If retention is not ideal, then the zirconia-based restoration should be primed with ceramic primer and bonded using aesthetic or adhesive resin cement.3,7

**Ceramic or fiber posts:** Self-adhesive resin cements are favored because they can be placed into the canal easily, and there is no need to worry about seating issues due to the pooling of the bonding agent. Some self-adhesive resin cements come with self-mixing tips that allow the clinician to place cement directly into the canal.

**Implant crown:** For permanent cementation of an implant crown, RMGI is a good choice because of its low film thickness and relatively easy cleanup. For temporary cementation of an implant crown, temporary cements can be used.

**SURFACE TREATMENT FOR SILICA- AND ZIRCONIA-BASED RESTORATIONS**

Clinicians are often confused regarding the best way to treat the intaglio surface of silica- and zirconia-based restorations before cementation. Surface treatments of indirect restorations are a crucial step in adhesion as they improve the bond strength at the ceramic-cement interface by micromechanical and chemical bonding.3-5

**Micromechanical interlocking** is achieved by increasing the surface area of indirect restorations. This can be done by etching with hydrofluoric (HF) acid or sandblasting.3-5 As a general rule, all silica-based restorations need to be etched with HF gel or sandblasted with alumina, regardless of the resin cement being used.3-5 If a silica-based restoration is fabricated through a laboratory, the technician will etch the restoration with HF gel, so there is no need for the clinician to etch it a second time unless the crown is exposed to saliva during the try-in. If the silica-based restoration is fabricated utilizing a chairside mill, the clinician or assistant needs to etch the internal surface with HF gel before cementation. For nonetchable, zirconia-based restorations, sandblasting the intaglio surface with 50 µm alumina dramatically increases the bond strength.3-5

**Chemical bonding** is achieved through the use of silane or ceramic primers. Silane has been used to bond HF gel-etched silica-based ceramics for many years. It is important to note that all silica-based restorations require the use of a silane-coupling agent.14 Silane does not produce a stable bond for zirconia-based restorations because zirconia is silica-free. Note that silane products mixed by the dentist have a limited shelf life. Stabilized silane primers are premixed and have a longer shelf life.4,5

Zirconia requires specific primers to promote the chemical bond at the nonsilica oxide-cement interface when the retention/resistance form is compromised.15 These primers (ZPrime Plus [BISCO Dental Products]) contain an acidic monomer and are compatible with dual-cured resin cements.15 Some ceramic primers (CLEARFIL CERAMIC PRIMER [Kuraray America]; Monobond Plus [Ivoclar Vivadent]; Scotchbond Universal [3M ESPE]) will bond to both silica- and zirconia-based restorations.4,5

**CLINICAL STUDIES**

Nine hundred sixty-three zirconia-based ceramic restorations (Lava Crowns and Bridges [3M ESPE]; 43% premolar crowns, 33% molar crowns, 18% anterior crowns, 5% bridges, and 1% implants) were evaluated at 8 years.16 Most of these restorations were cemented with self-adhesive resin cement (Relyx Unicem Self-Adhesive Resin Cement [3M ESPE]). Ninety-eight percent of the zirconia restorations were rated excellent for resistance to marginal discoloration.

One thousand ninety-four restorations of more than 6,300 restorations (ceramic inlays, onlays, bridges, PFM crowns, posts, and CAD/CAM restorations) cemented with Relyx Unicem were available for evaluation at 8 years.17 Postoperative sensitivity was 1.1% of the seated restorations. The retention rate was more than 97%.

Another self-adhesive resin cement (PANAVIA SA CEMENT, formerly CLEARFIL SA CEMENT) was evaluated in 570 restorations at placement.18 There were no reports of postoperative sensitivity. This cement was recalled with 196 lithium disilicate and zirconia restorations at one year. The ceramic restorations were primed with a ceramic primer
Crown and Bridge Cements: Clinical Applications

Clinical Tips\(^{3,4,5}\)

**Glass Ionomers and Resin-Modified Glass Ionomers**
- Clean tooth with pumice or glycerin-free polishing paste and isolate.
- Use a polyacrylic acid dentin conditioner—it will improve the bond strength.

**Aesthetic Resin Cements**
- Try-in pastes can be removed with water, alcohol, or pumice without affecting bond strength of cement to veneer.
- Bonding requires strict isolation to avoid contamination.
- Thin the bonding agent with a stream of air to remove the solvent and to minimize pooling. Solvent left in the bonding agent can inhibit setting and affect the bond strength of the resin cement.

**Adhesive Resin Cements**
- Some cements require a gel barrier for complete setting.
- Automixed capsules and automixed syringes save operator time.
- Use light activation whenever possible—dual-cured cements typically have increased flexural strength and bond strength when activated with a light.

**Self-adhesive Resin Cements**
- To minimize staining at enamel-ceramic margin, etch the enamel with phosphoric acid for 10 seconds before cementation.

**Additional Tips**
- Do not over-dry tooth. Moisten surface with wet cotton pellet, if needed.
- Excess cement is easiest to remove after brief exposure to a curing light, but hard to clean up if you light-cure too long. Cure for 2 to 4 seconds, clean up the gross excess and the contacts, and then post cure the restoration.
- Never use light-cure only cements with zirconia-based restorations or highly opaque silica-based restorations.
- Glutaraldehyde and HEMA-containing desensitizers (Gluma Plus [MicroPrime G]) can be used on dentin before cementation to assist in decreasing postoperative sensitivity.
- Excess cement in interproximal areas can be difficult to clean up if the resin cement is not cleaned up before it sets. Diamond finishing strips (NTI Serrated Diamond Finishing Strips [AXIS Dental]) and CeriSaw (DenMat) can be used to remove set excess cement from interproximal contacts. Use a dead-soft Tofflemire to wrap around certain crown, inlay, and onlay preparations while cementing a restoration to keep the cement from getting into the interproximal areas.
- Dual- and self-cured adhesive resin cements are usually not compatible with sixth- and seventh-generation bonding agents, because these self-etching bonding agents contain acidic primers that interact with the self-cured chemistry of the resin cement. Follow manufacturers' recommendations when bonding resin cements to tooth structure.

(CLEARFIL CERAMIC PRIMER). The debonding rate at one year was 2%. No marginal staining was observed.

**SUMMARY**
Cement selection can be confusing because factors such as substrate, the type of restoration, and patient needs must be considered. Some substrates require additional treatment before cementation. This article describes the most commonly used traditional crown and bridge cements (GI and RMGI) used for metal and metal-ceramic restorations, and resin cements used for all-ceramic restorations. Advantages, disadvantages, indications, and contraindications of cements have been reviewed. Recommended uses of cements for metal, ceramic, and laboratory composite restorations have been presented. General guidelines for surface treatment of silica- and zirconia-based restorations when using resin cements have been discussed.
REFERENCES

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POST EXAMINATION QUESTIONS

1. Which one of the following cements requires a separate primer for a zirconia-based restoration with less than adequate retention?
   a. Self-adhesive resin cement.
   b. Aesthetic resin cement.
   c. Glass ionomer (GI) cement.
   d. Resin-modified glass ionomer (RMGI) cement.

2. Which one of the following cements would be expected to provide the highest fluoride release and fluoride rechargeability?
   a. Self-adhesive resin cement.
   b. Aesthetic resin cement.
   c. GI cement.
   d. RMGI cement.

3. Which one of the following substrates requires chemical pretreatment with silane coupling agent?
   a. Lithium disilicate ceramic.
   b. Alumina ceramic.
   c. Zirconia ceramic.
   d. Metal alloy.

4. Which one of the following pretreatments would be the best choice for a zirconia-based ceramic restoration?
   a. Etching with hydrofluoric (HF) acid gel.
   b. Silane.
   c. Ceramic primer with acidic adhesive monomer.
   d. Etching with phosphoric acid.

5. Which one of the following cements requires the use of separate self-etch or total-etch bonding agent for bonding to enamel and dentin?
   a. Self-adhesive resin cement.
   b. Aesthetic resin cement.
   c. Temporary resin cement.
   d. RMGI cement.

6. Which one of the following cements is recommended for cementation of aesthetic fiber posts?
   a. Self-adhesive resin cement.
   b. Aesthetic resin cement.
   c. GI cement.
   d. RMGI cement.

7. Which one of the following cements is recommended for permanent cementation of an implant-supported crown?
   a. Self-adhesive resin cement.
   b. Aesthetic resin cement.
   c. GI cement.
   d. RMGI cement.
8. Which one of the following substrates does not require pretreatment with silane?
   a. Lithium disilicate ceramic.
   b. Leucite-reinforced ceramic.
   c. Zirconia ceramic.
   d. Feldspathic porcelain.

9. Which of the following is the best micromechanical pretreatment for the intaglio surface of a zirconia-based restoration?
   a. Etching with HF acid gel.
   b. Sandblasting with 50 µm alumina.
   c. Etching with phosphoric acid.
   d. Silane.

10. Which one of the following cements would be expected to provide the highest flexural strength?
    a. Self-adhesive resin cement.
    b. Aesthetic resin cement.
    c. GI cement.
    d. RMGI cement.

11. Use of a polyacrylic acid dentin conditioner with GI cement will:
    a. Increase the flexural strength of the cement.
    b. Reduce the early solubility of the cement.
    c. Increase the fluoride release of the cement.
    d. Improve the bond strength of the cement.

12. Which one of the following cements might require a gel barrier to minimize the air-inhibited layer and ensure adequate polymerization?
    a. Adhesive resin cement.
    b. Aesthetic resin cement.
    c. GI cement.
    d. RMGI cement.

13. Dual- and self-cured resin cements are usually not compatible with which one of the following types of bonding agents due to the high acidity of the bonding agent?
    a. Seventh-generation bonding agents.
    c. Fourth-generation bonding agents.
    d. Fifth-generation bonding agents.

14. Which one of the following types of restorations should probably not be bonded with light-cured only resin cement?
    a. Lithium disilicate ceramic veneer.
    b. Leucite-reinforced ceramic anterior veneer.
    c. Feldspathic porcelain anterior veneer.
    d. High-strength zirconia-based restoration.

15. The use of phosphoric acid etching with self-adhesive resin cement might be recommended to:
    a. Improve the bond strength of the cement to dentin.
    b. Reduce postoperative sensitivity.
    c. Increase the benefit of fluoride release of the cement.
    d. Minimize staining at enamel-restoration margin.

16. Try-in pastes should be removed from tooth structure before bonding with aesthetic resin cement by:
    a. Rinsing with phosphoric acid.
    b. Microetching with aluminum oxide powder.
    c. Rinsing with water or alcohol.
    d. Using medium-grit prophy paste.
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ANSWER FORM: COURSE #: 156
Please check the correct box for each question below.

1. ☐ a  ☐ b  ☐ c  ☐ d  9. ☐ a  ☐ b  ☐ c  ☐ d
2. ☐ a  ☐ b  ☐ c  ☐ d  10. ☐ a  ☐ b  ☐ c  ☐ d
3. ☐ a  ☐ b  ☐ c  ☐ d  11. ☐ a  ☐ b  ☐ c  ☐ d
4. ☐ a  ☐ b  ☐ c  ☐ d  12. ☐ a  ☐ b  ☐ c  ☐ d
5. ☐ a  ☐ b  ☐ c  ☐ d  13. ☐ a  ☐ b  ☐ c  ☐ d
6. ☐ a  ☐ b  ☐ c  ☐ d  14. ☐ a  ☐ b  ☐ c  ☐ d
7. ☐ a  ☐ b  ☐ c  ☐ d  15. ☐ a  ☐ b  ☐ c  ☐ d
8. ☐ a  ☐ b  ☐ c  ☐ d  16. ☐ a  ☐ b  ☐ c  ☐ d

PROGRAM EVALUATION FORM
Please complete the following activity evaluation questions.

Rating Scale: Excellent = 5 and Poor = 0

Course objectives were achieved.  __________
Content was useful and benefited your clinical practice.  __________
Review questions were clear and relevant to the editorial.  __________
Illustrations and photographs were clear and relevant.  __________
Written presentation was informative and concise.  __________
How much time did you spend reading the activity and completing the test?  __________
What aspect of this course was most helpful and why?  __________
What topics interest you for future Dentistry Today CE courses?  __________