Provisional Fixed Restorations

A Peer-Reviewed Publication
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This course has been made possible through an unrestricted educational grant. The cost of this CE course is $59.00 for 4 CE credits.

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**Educational Objectives**
Upon completion of this course, the clinician will be able to do the following:

1. Understand the importance of provisional restorations from a mechanical, a biological and an aesthetic perspective.
2. List the different types of provisional materials available.
3. Understand the benefits and problems when selecting a provisional material.
4. Describe techniques for fabricating provisional restorations.
5. Describe methods to strengthen provisional restorations.

**Abstract**
With the increase in cosmetic dental procedures being performed clinically, provisional restorations have become more of a diagnostic tool than simply a space maintainer. Properly contoured provisional restorations assist in maintaining the gingival health, protecting the pulpal tissue, and serving as a blueprint for the laboratory when fabricating the final restorations. This article discusses why provisionals are as important as the final restorations, how to fabricate provisionals, and techniques to simplify those procedures chairside.

Provisional restorations have often been considered space maintainers, allowing the patient to function until the final prosthetics were ready to be inserted. The old adage “Do not make the temporary too nice or the patient may not come back” relies on this philosophy. Modern restorative treatment abandons this concept and focuses on the provisional as the final restorations, how to fabricate provisionals, and techniques to simplify those procedures chairside.

The requirements of the provisional restoration include (but are not limited to):
- Acting as a diagnostic tool to determine occlusion, occlusal/incisal plane, incisal length, and lip and tooth position
- Maintaining tooth position and preventing occlusal changes
- Establishing function, aesthetics, and phonetics
- Allowing the development of the gingival contours before final rehabilitation

Fulfilling these objectives prior to finalizing the definitive restorations can help eliminate potential challenges as well as evaluate the capacity for success functionally and aesthetically.

**Requirements of the Provisional Restoration**
At its most basic level, the provisional restoration requires good marginal adaptation, physiologic contours and embrasures, a polished plaque-resistant surface, and strength and durability, and it must be amenable to routine daily home care. Provisional restorations must also satisfy mechanical, biological, and aesthetic criteria, many of which are interrelated.

**Mechanical Criteria**
The greatest amount of stress is placed upon provisional crowns and bridges during chewing. Patients are unable to avoid contact with the provisional during meals, and the strength of the material selected will influence how durable the provisional will be. This is less of a concern when single units are temporized than when multiple units with pontics in the edentulous spaces are utilized.

Fixed provisional bridges function as a beam, and the greater the length of the edentulous area being spanned with pontics, the greater the flexure of the restoration. This creates high stress at the connectors and can lead to failure of the material at this juncture. The strength of resins used to fabricate provisionals, be they methacrylate, BIS-Acryl, or BIS-GMA, is lower than that of metal to ceramic alloys. Thus, the cross-sectional diameter of the connector needs to be larger than the final restoration to reduce the potential for failure. Aesthetic considerations may hamper this in the anterior. To avoid issues with the periodontal health of the abutment teeth, connectors should allow access for plaque control and not be overcontoured.

Another technique, used either as an alternative or in conjunction with the above, is to stiffen the pontic area so that flexure is minimized. This can be done by reinforcing the resin with fiber reinforcement (e.g., Splint-It® [Pentron Clinical Technologies], Ribbond® [Ribbond], or Connect™ [Kerr]) or metal wire. The advantage of fiber reinforcement is that the resin is able to penetrate it to form a more homogenous structure. When overload occurs, the resulting crack will propagate to the embedded fiber reinforcement and stop. This can prevent catastrophic failure of the provisional. Conversely, when a metal wire is used as a reinforcer, the crack propagates to the wire and the metal delaminates the resin. Catastrophic failure often results when a metal-reinforced provisional is subjected to overloading forces. Reinforcement should be considered when pontic span exceeds more than one unit, when prolonged time using the provisional will be required, and when oral habits such as clenching or bruxing are present. The methacrylate provisional materials offer higher strength than the often brittle BIS-Acryl-based materials, but at a compromise in aesthetics. The newer BIS-GMA-based temporary materials introduced in the past two years appear to offer the increased strength of the methacrylates, but with the improved aesthetics of the BIS-Acryl materials.

Provisionals often need to be removed and reused as the final prosthetics are being fabricated. This requires materials that can withstand the forces used to remove them. The strength of the provisional cement used can have no effect on this. If the cement is sufficiently weak and the provisional is strong enough, the provisional will not break upon removal.

Immediate load implant prosthetics may require placement of a provisional at the time of implant placement. These provisionals need to be functionally stable, resisting any movement to allow the implants to integrate without transfer of micromovement that may lead to the implant’s failure to
integrate. Because the patient may need to wear these provisional for six months or more, they need to be durable enough to provide long-term service.

**Biological Criteria**
A provisional restoration needs to seal and insulate the prepared tooth from the oral environment, thereby protecting the underlying pulp from insult and injury and the prepared dentin from recurrent decay. Because of the orientation of the dentinal tubules to the prepared tooth surface, a certain degree of pulpal trauma is inevitable during tooth preparation. In healthy teeth, each dentin tubule contains the cytoplasmic process, an extension of the odontoblast cell lining the pulp. Sealing the dentin surface with the provisional restoration will decrease osmotic activity between the tubule and the oral cavity. This will decrease irritation and subsequent sensitivity typically seen following fixed temporization.

Saliva leakage is another contributing factor to sensitivity following placement of a provisional restoration. The better the fit of the provisional restoration and the lower the solubility of the provisional cement, the less the patient will feel during the interim period before the permanent restoration is delivered. In severe situations, leakage may lead to irreversible pulpitis and the necessity for endodontic intervention.

Exothermic setting temperature also may have a detrimental effect on the underlying pulp. The higher the setting temperature, the greater the pulpal insult and the higher the chance that endodontic treatment may be needed in the future. This may influence selection of the provisional material if it is to be used intraorally.

To facilitate oral hygiene, the provisional must have good marginal adaptation, proper contour, and a smooth surface. This is particularly important when crown margins will be placed apical to the free gingival margin. If the restoration’s margins are inadequate or rough, or if plaque control is impaired, then gingival health will be compromised. The longer the provisional restoration must be worn, the more significantly any deficiencies in its fit and contour will affect the health of the gingival tissue. In addition, rough margins can affect the aesthetics of the final restorations and jeopardize gingival health by causing inflammation from plaque accumulation.

The provisional also needs to be able to maintain the teeth in a stable position from a periodontal standpoint. A stable provisional restoration is less likely to cause teeth to shift or extrude during the interim period before the final restoration is seated. Any such movement will require adjustments or a remake of the final restoration, and any inflammation created marginally has the potential to affect the periodontal health of the abutment teeth. Resulting inflammation may cause gingival proliferation; recession; or, at the least, hemorrhage, any of which can affect impressions or final cementation results.

**Aesthetic Criteria**
The appearance of a provisional restoration is important especially in the anterior. The degree to which the provisional material matches the color of the adjacent teeth is an essential requirement. Selection of which provisional material to use may be based on the ability to accent and modify the material for improved interim aesthetics. Of the different types of provisional materials available, methacrylate-based materials (e.g., TempSpan® C&B [Pentron Clinical Technologies]) offer the least in terms of color accenting and modification for improved aesthetics. Use of a BIS-GMA-based provisional material will permit modification with flowable composites or composite stains that bond due to the materials’ similar chemistries. Although these same modifiers may be used with BIS-Acryl materials, they may lack durability over the short term and peel from the underlying surface due to chemical disparities.

Color stability can influence selection of provisional materials. Some resins may absorb stains (porous) or trap stains on the surface (rough surface) that may make long-term use of the temporary an aesthetic issue. Surfaces that have been highly polished on a microscopic level are less likely to trap stain particles. Sealants can also prevent stain accumulation by providing a smoother surface. These sealants decrease water absorption and decrease staining due to coffee, tea, or other stain-producing beverages. Some resins may yellow over time due to the amines within the catalyst used to set them. This yellowing appears to be time-dependent and may not be an issue with provisionals used only for very short periods.

Provisionals may often be used to determine the aesthetics of the final restorations, acting as a guide for the laboratory. Modification of the shape and contour of the provisional can be simplified depending on the material with which the provisional is fabricated. As previously indicated, the BIS-GMA materials are chemically similar to flowable composite resins. This allows the dentist to contour or shape the provisional intraorally to meet the aesthetic demands of the patient. Larger changes in contour may be accomplished with application of a dentin adhesive to the provisionals surface, followed by light curing and the application of a hybrid composite. Once the shape and contour of the provisionals meet with the patient’s approval, an impression of the provisional taken intraorally can help communicate the desired aesthetic demands to the lab. Composite surface stains may be used to duplicate accents (white hypocalcifications, striations, and cervical coloration) to provide a better blend with the adjacent teeth.

**Selection of Provisional Material**
The material used to fabricate the provisional needs to fulfill the mechanical, biological, and aesthetic criteria outlined above. Available materials fall into two basic types based on their basic chemistry. Each type has its advantages and disadvantages. Methacrylates, which have been available for provisional fabrication the longest, can be further divided into three subgroups: methyl-methacrylates, ethyl-methacrylates,
and vinyl-methacrylates. These typically offer good fracture resistance and are easily polished but have a higher capacity for shrinkage and have less aesthetic appeal than other materials. The other categories of provisional materials are the composites BIS-Acryl and BIS-GMA resins. BIS-Acryl resins have an aesthetic advantage over the methacrylates but are more brittle and may not be suitable for multiple units when the pontic width exceeds one unit. BIS-GMA resins have the methacrylates’ fracture resistance and BIS-Acryl’s improved aesthetics, allowing their use in anterior applications where aesthetics are critical and there are longer-span pontic spaces without brittleness concerns. (Table 1)

**Provisional Fabrication**

The use of a stent to provide a preliminary shape to the provisional can simplify its chairside fabrication. Various materials may be used to fabricate these stents either prior to presenta-

### Table 1. Characteristics of Resins Used for Provisional Restorations

<table>
<thead>
<tr>
<th>Type</th>
<th>Brand</th>
<th>Manufacturer</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methyl-methacrylate</td>
<td>Alike™Jet</td>
<td>GC America Lang Dental</td>
<td>Good marginal fit</td>
<td>High exothermic reaction</td>
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<td></td>
<td></td>
<td></td>
<td>Good transverse strength</td>
<td>Low abrasion resistance</td>
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<td></td>
<td></td>
<td></td>
<td>Good polishability</td>
<td>Free monomer toxic to pulp</td>
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<td></td>
<td></td>
<td></td>
<td>Durable</td>
<td>High volumetric shrinkage</td>
</tr>
<tr>
<td>Ethyl-methacrylate</td>
<td>Snap®</td>
<td>Parkell</td>
<td>Good polishability</td>
<td>Surface hardness</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Minimal exothermic reaction</td>
<td>Transverse strength</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Good stain resistance</td>
<td>Durability</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Low shrinkage</td>
<td>Fracture toughness</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Self cure</td>
</tr>
<tr>
<td>Vinylenethymethacrylate</td>
<td>Trim II</td>
<td>Bosworth</td>
<td>Good polishability</td>
<td>Surface hardness</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Minimal exothermic reaction</td>
<td>Transverse strength</td>
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<td></td>
<td></td>
<td></td>
<td>Good abrasion resistance</td>
<td>Aesthetics</td>
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<td></td>
<td></td>
<td></td>
<td>Good stain resistance</td>
<td>Fracture toughness</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Flexibility</td>
<td>Self cure</td>
</tr>
<tr>
<td>Methylethylmethacrylate</td>
<td>UniFast-LC™</td>
<td>GC America</td>
<td>Good marginal fit</td>
<td>Surface hardness</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Good transverse strength</td>
<td>Less stain resistance</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Good polishability</td>
<td>Brittle</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Durable</td>
<td>More expensive than methacrylates</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Not easy to repair</td>
</tr>
<tr>
<td>BIS-Acryl composite</td>
<td>Luxatemp® Turbo Temp 2™</td>
<td>Zenith/DMG Danville</td>
<td>Good marginal fit</td>
<td>Surface hardness</td>
</tr>
<tr>
<td></td>
<td>Protemp™ II</td>
<td>Engineering 3M/Espe</td>
<td>Low exothermic reaction</td>
<td>Less stain resistance</td>
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<td></td>
<td></td>
<td>Good abrasion resistance</td>
<td>Brittle</td>
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<td>Good transverse strength</td>
<td>More expensive than methacrylates</td>
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<td></td>
<td></td>
<td>Low shrinkage</td>
<td>Not easy to repair</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Dual curable</td>
<td>Limited shade selection</td>
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<tr>
<td></td>
<td>Tempphase™ Gorgeous Temp™</td>
<td>Kerr DenMat</td>
<td>Good marginal fit</td>
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<td></td>
<td></td>
<td></td>
<td>Good polishability</td>
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<td></td>
<td>Very low exothermic reaction</td>
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<td>Good abrasion resistance</td>
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<td>Good transverse strength</td>
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<td></td>
<td>Very low shrinkage</td>
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<td></td>
<td>Thin oxygen-inhibited layer on setting</td>
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<td></td>
<td></td>
<td></td>
<td>Good color selection and stability</td>
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<td></td>
<td></td>
<td></td>
<td>Repairable with flowable or hybrid composite</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dual curable</td>
<td></td>
</tr>
<tr>
<td>BIS-GMA composite</td>
<td>TempSpan®</td>
<td>Pentron Clinical Tech.</td>
<td>Good marginal fit</td>
<td></td>
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<td></td>
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<td>Good polishability</td>
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<td>Excellent polishability</td>
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**Vacuform Stents**

A vacuform polypropylene thermoplastic that has a thickness of 0.020 in (0.5 mm) can be used as a stent in the chairside fabrication of provisional. The sheet material needs to be rigid enough to retain the adjacent teeth during fabrication but also to allow easy removal intraorally and permit the provisional’s removal from the stent. Use of thicker sheet material may lead to fracture of the provisional as it is removed from the stent.

This technique involves a preliminary model, the placement of denture teeth (where pontics will be placed), a vacuform machine, and sheet material designed for these stents. The advantage of this technique is that the diagnostic model may be modified to permit changes to the tooth contour to aesthetically alter the final provisional. Unfortunately, this...
technique requires an additional appointment to take preliminary impressions or additional chairside time if utilized at the appointment when teeth will be prepared. Another negative aspect of this technique is that fine detail may not be captured with the vacuform’s sheet material, resulting in longer chair time to shape the provisional. (Figures 1 and 2)

Figure 1. Light curing through a vacuform stent fabricated prior to the prosthetic preparation appointment.

Chairside-fabricated stents can be quick and allow greater detail in the stent so that finishing time can be reduced, providing a more aesthetic result. Various materials can be used in this process, ranging from alginate to polyvinylsiloxane (PVS) impressions taken at the prosthetic preparation appointment. Alginate impressions are easily distorted when reinserted. For single units this may not pose an issue, but when used for fabrication of a multunit fixed prosthesis (bridge), the distortion may lead to occlusal discrepancies that will increase chair time to correct. Alginate also requires the impression to be held in a moist environment to prevent dehydration, as a dehydrated alginate impression cannot be stored for future use should the provisional break.

PVS materials are a better material for chairside stents as they can easily be stored for future use and capture fine detail of the teeth occlusally and interproximally, resulting in less chairside time to finish the provisional. A medium-body material is suggested for fabrication of the stent, as stiffer materials may make removal of the provisional difficult and fracture it. Should the practitioner wish to use that preliminary stent as a “custom” tray after fabricating the provisional, a light-body PVS may be placed in the stent and reinserted to fabricate the final impression. If a BIS-Acryl or BIS-GMA provisional material is used to fabricate the provisional in the PVS stent, the oxygen-inhibited layer of the provisional material may leave a “greasy” coating on the surface of the PVS stent. This coating may prevent the light-body PVS from setting or chemically adhering to the stent’s PVS should the practitioner wish to reline the stent and use it as a final impression.17 (Figure 3) Cotton gauze wetted with alcohol is recommended to remove any surface coating. This is not necessary if a methacrylate provisional material is utilized, as methacrylate does not inhibit adhesion between PVS materials.

Figure 3. Unpolymerized PVS shown on the surface of the set impression material due to contamination of the tray material from provisional fabrication.

With the development of dual-cure provisional materials, most notably BIS-Acryl and BIS-GMA, the use of a transparent stent allows the practitioner to shorten chair time by accelerating the setting of the provisional material intraorally. It is also necessary to use a clear prefabricated tray to take the preliminary impression to achieve maximum light transmission. Opaque trays block light, and upon removal, some minor distortion of the provisional material occurs at the most superior aspects of the coronal surface. This requires additional time to either fit the provisional fully upon the preparations or occlusally adjust. When the stent and the light-cured material within it are removed, to decrease the incidence of provisional fracture, the internal surface of the provisional should be light cured again when removing it from within the stent.

Fabrication of a Light-Transmitting Provisional Stent

Light-curable provisional materials may be used in a stent intraorally to decrease the amount of chairside time required to fabricate the provisional. This approach can be applied to provisionalization of veneers as well as crowns and bridges. A vacuum stent may be fabricated on an extraoral study model, which requires impressions to be taken at a prior appointment or during a longer single appointment, to allow fabrication of a study model and use of a vacuform machine. A simpler approach, which can be done at the appointment and requires minimal chairside time, is use of a clear polyvinylsiloxane (PVS) impression material (e.g., TempSpan™ Clear Matrix Material [Pentron Clinical Technologies], Clearly Affinity™ [Clinician’s Choice], or Memosil® 2 [Heraeus Kulzer]) in a transparent impression tray. The transparent material and tray allow maximum curing light penetration, which rapidly sets the provisional. Light curing through the stent can minimize or eliminate the oxygen-inhibited layer on the surface of the provisional. A PVS will also flow interproximally, capturing more detail than a vacuform stent, creating more detail in the provisional, and decreasing the time required to finish the restoration.

Should areas of tooth structure be missing or need to be reshaped on the tooth to be provisionalized, composite
can be molded on the tooth and cured. After the taking of the clear stent impression, this material can be removed with an instrument prior to preparation. Edentulous spaces that will accommodate a pontic may be treated by shaping a denture tooth to fit the space and temporarily fixing it with wax or other means intraorally. This will shorten the time required to shape a pontic in the provisional.

A transparent impression tray is filled with the clear PVS material and is inserted intraorally. (Figures 4 and 5) Upon setting, it is removed and inspected for any voids. (Figure 6) Interproximal material should be trimmed with scissors or a scalpel to allow reinsertion of the impression. (Figure 7) It is suggested that the tray be tried in after preparation of the teeth, to ensure it can be seated fully.

After preparation of the teeth, they should be lubricated with a water-soluble material to facilitate removal of the cured provisional restoration as it is being fabricated. A topical anesthetic gel may be used and will not affect the setting of the provisional material. A dual-cure provisional material (e.g., TempSpan™ [Pentron Clinical Technologies] or UniFast-LC™ [GC America]) is injected into the tissue side of the clear PVS impression and the tray is inserted intraorally. (Figure 8) A handheld light is utilized to cure the provisional material intraorally. (Figure 9) To achieve maximum light transmission to the provisional material, the tip of the curing light should physically contact the clear stent. The light is first applied to the facial/buccal aspect of the stent and activated, then repeated on the lingual aspect. (Figures 10 and 11) The stent is removed intraorally and cured by setting for two minutes or light cured from the internal aspect. (Figure 12) The provisional is tried intraorally to check for fit and adjusted as necessary to seat fully. (Figure 13)

**Finishing and Polishing the Provisional Restoration**

Gross shaping may be performed by use of an acrylic bur or stone to remove flash of provisional material. This is followed by application of finishing disks in a slow-speed handpiece (e.g., Finitm Polishing System [Pentron Clinical Technologies], OneGloss™ [Shofu], or PDQtm [Axis]). A coarse disk is used to smooth the margins and shape the embrasure spaces. (Figure 14) This is followed by a medium-grit disk (Figure 15), then a fine-grit disk. (Figure 16)

A surface sealant for temporaries may be applied to give a high-luster and stain-resistant surface. The surface of the provisional is wiped with an alcohol-saturated piece of cotton gauze to remove any debris left from the finishing process. This will also remove any remaining oxygen-inhibited layers and ensure bonding of the glaze to the provisional’s surface. A thin layer of provisional glaze (e.g., TempSpan™ Glaze [Pentron Clinical Technologies], LuxaGlaze® [Zenith/DMG], or DuraFinish™ [Parkell]) is applied to all exterior surfaces of the provisional with a brush tip (Figure 17) and cured with a handheld light. (Figure 18) The glaze should be air thinned prior to light curing to avoid additional occlusal adjustments before dismissal of the patient.

**Repair of Provisional Restorations**

Should it become necessary to add material to the provisional to either change the contour of the restoration or repair a chip or defect marginally (Figure 19), the area should be roughened with a diamond in a high-speed handpiece. (Figure 20) This will provide fresh material to which the repair can bond and create some mechanical retention to which the repair resin can adhere.

An adhesive resin (e.g., Bond 1® [Pentron Clinical Technologies], Prodigy® [Kerr], or Variolink II [Ivoclar Vivadent]) is applied to the area to be repaired with a brush tip and light cured. (Figure 21) If the margin of the provisional needs to be repaired,
Figure 10. Curing is first performed on the buccal aspect of the stent.

Figure 11. Curing is performed in the lingual aspect of the stent.

Figure 12. Views of the provisional restoration after removal from the stent prior to finishing.

Figure 13. After removal of any flash at the margins, the provisional is tried in to check for fit.

Figure 14. Margins and interproximal material are shaped with a coarse disk.

Figure 15. A medium disk is utilized to blend marks left by the coarse disk.

Figure 16. A fine disk is utilized to achieve a smooth surface.

Figure 17. Glaze is applied to the provisional's surface with a brush.

Figure 18. A curing light is applied to set the provisional glaze.

Figure 19. A deficient margin is shown on the provisional restoration.

Figure 20. A diamond is used to roughen the area to be repaired.

The restoration is inserted intraorally. A flowable composite (e.g., Artiste™ [Pentron Clinical Technologies], UniFil® Flow [GC America], Revolution™ [Kerr], Gradia® Direct Flow [GC America], or EsthetX® Flow [DENTSPLY Caulk]) is injected into the defect and light cured. (Figure 22) To decrease the chance of the provisional locking on to the preparations, apply the flowable incrementally, cure each increment, and ensure that the provisional may be removed before completing the marginal repair. The authors suggest when repairing the margin of the provisional that the repair be made bulkier than the final contour to allow finishing of that area and to minimize the potential for breakage. Following finishing and polishing of the repair, the provisional is ready for cementation. (Figure 23)

**Temporary Cementation of Provisionals**

Temporary cements should provide good retention of the provisional but allow removal of the provisional without damaging it. Retention of the provisional appears to be more of a function of the film thickness of the temporary cement than the type of temporary cement used. Too thin a viscosity and the provisional may dislodge between appointments; too thick and it may be difficult to fully seat the provisional, possibly resulting in its fracture due to excess force applied in the process. These problems may be avoided by painting the temporary cement on the lateral walls of the interior of the provisional. Seating the provisional restoration slowly will disperse the temporary cement and not allow hydraulic force to limit full seating.

Zinc oxide-eugenol (ZOE) cements are widely used as temporary filling materials. However, eugenol has been shown to have a detrimental effect on both resin composites and dentin-bonding systems. No differences were found in either wall-to-wall contraction or in bond strength in some studies. This showed that eugenol-containing temporary cements
have no adverse effect on shear bond strength of dual-curing composite luting cements to dentin.\(^20\) Some evidence has been published that indicates IRM may have an effect on the final bond strength of the resin luting cement, depending on the ratio of eugenol used in the temporary cement mix. Significant decreases in bond strength have been shown.\(^21\)

The use of temporary cements, either containing eugenol or not, does not alter the retentive strength of ceramic restorations luted to dentin using the tested adhesive systems, whether the temporary cements are removed by excavator or sandblasting.\(^22\) Sandblasting the dentin surface with alumina oxide is advisable to remove any microscopic particles of provisional cement and provide the best surface for adhesion of the permanent luting agent.\(^23\) To minimize the incidence of sensitivity during the provisional period, use a temporary cement that contains anti-sensitivity ingredients, such as fluoride, potassium nitrate, and calcium phosphate (TempSpan\(^\text{®}\) CMT Temporary Cement [Pentron Clinical Technologies] or Temp Advantage [GC America]).

Numerous temporary cements are available. (Table 2) The industry has moved toward auto-mix dispensing systems and away from hand-mixing. Auto-mixing permits ease of dispensing directly into the provisional. Although

<table>
<thead>
<tr>
<th>Brand Name</th>
<th>Company</th>
<th>Weight</th>
<th>Volume</th>
<th>Retail</th>
<th>Price/gm</th>
<th>Delivery</th>
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</thead>
<tbody>
<tr>
<td>TempSpan(^\text{®}) CMT</td>
<td>Pentron</td>
<td>6.9</td>
<td>4.5</td>
<td>$23.95</td>
<td>$3.47</td>
<td>Auto-mix</td>
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<tr>
<td>Embonte</td>
<td>Cadco</td>
<td>15.0</td>
<td></td>
<td>$33.49</td>
<td>$2.23</td>
<td>Auto-mix</td>
</tr>
<tr>
<td>Temp Advantage</td>
<td>GC America</td>
<td>7.5</td>
<td></td>
<td>$27.00</td>
<td>$3.60</td>
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<tr>
<td>Proviling</td>
<td>Invoclar Vivadent</td>
<td>18.0</td>
<td></td>
<td>$61.49</td>
<td>$3.42</td>
<td>Hand-mix</td>
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<tr>
<td>PreVision CEM</td>
<td>Heraeus Kulzer</td>
<td>37.0</td>
<td></td>
<td>$40.99</td>
<td>$1.11</td>
<td>No-mix</td>
</tr>
<tr>
<td>RelyX Temp</td>
<td>3M ESPE</td>
<td>43.0</td>
<td></td>
<td>$27.49</td>
<td>$0.64</td>
<td>Hand-mix</td>
</tr>
<tr>
<td>SensiTemp (Non-Eugenol)</td>
<td>Sultan Chemist</td>
<td>8.0</td>
<td>4.0</td>
<td>$37.00</td>
<td>$4.63</td>
<td>Auto-mix</td>
</tr>
<tr>
<td>SensiTemp Zinc Oxide</td>
<td>Sultan Chemist</td>
<td>8.0</td>
<td>4.0</td>
<td>$37.00</td>
<td>$4.63</td>
<td>Auto-mix</td>
</tr>
<tr>
<td>Temp-Bond NE</td>
<td>Kerr</td>
<td>65.0</td>
<td></td>
<td>$30.49</td>
<td>$0.47</td>
<td>Hand-mix</td>
</tr>
<tr>
<td>Temp-Bond NE Clear</td>
<td>Kerr</td>
<td>6.0</td>
<td></td>
<td>$43.49</td>
<td>$7.25</td>
<td>Hand-mix</td>
</tr>
<tr>
<td>TR-2(^\text{TM})</td>
<td>Parkell</td>
<td>10.0</td>
<td></td>
<td>$29.25</td>
<td>$3.00</td>
<td>Auto-mix</td>
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<tr>
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<td>Exacta Dental</td>
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<td></td>
<td>$24.95</td>
<td>$2.27</td>
<td>Auto-mix</td>
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<tr>
<td>EZ Cement Cartridge</td>
<td>Exacta Dental</td>
<td>120.0</td>
<td></td>
<td>$95.95</td>
<td>$0.80</td>
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<td>TempoCem NE Smart-mix</td>
<td>Zenith/DMG</td>
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<td></td>
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<td>TNE Non-Eugenol</td>
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<td></td>
<td>$22.49</td>
<td>$0.32</td>
<td>Hand-mix</td>
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<tr>
<td>Zone</td>
<td>Cadco</td>
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<td></td>
<td>$34.49</td>
<td>$2.32</td>
<td>Auto-mix</td>
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<tr>
<td>Ultratemp</td>
<td>Ultradent</td>
<td>10.0</td>
<td></td>
<td>$39.99</td>
<td>$4.00</td>
<td>Auto-mix</td>
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<tr>
<td>Provocil QM</td>
<td>Voco</td>
<td>6.9</td>
<td>5.0</td>
<td>$31.95</td>
<td>$4.63</td>
<td>Auto-mix</td>
</tr>
</tbody>
</table>
some material is wasted in the auto-mix tip, it is typically less than for hand-mix materials, as the practitioner only dispenses what is needed.

**Conclusion**

Although the specific topic of provisional restorations has been discussed in great detail, it is inherent that the dental professional integrate new procedures only after in-depth study and further research.

**References**


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Dr. Kurtzman is in private general practice in Silver Spring, Maryland. He has lectured both nationally and internationally on the topics of restorative dentistry, endodontics, and dental implant surgery and prosthodontics and has had numerous journal articles published in peer-reviewed publications. Dr. Kurtzman is on the editorial board of numerous publications. He is a consultant and clinical evaluator to multiple dental manufacturers. He has earned Fellowships in the Academy of General Dentistry, the International Congress of Oral Implantologists, the Pierre Fauchard Academy, and the American College of Dentists, as well as Masterships in the Academy of General Dentistry and the Implant Prosthetic Section of the International Congress of Oral Implantologists. He also holds Diplomat status in the International Congress of Oral Implantology. He may be reached at Dr_kurtzman@maryland-implants.com.

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Dr. Howard Strassler is Professor and Director of Operative Dentistry at the University of Maryland Dental School in the Department of Endodontics, Prosthodontics and Operative Dentistry. He has lectured nationally and internationally on techniques and selection of dental materials in clinical use and aesthetic restorative dentistry. He is a Fellow in the Academy of Dental Materials and the Academy of General Dentistry, as well as a Member of the American Dental Association, the Academy of Operative Dentistry, and the International Association of Dental Research. He is on the editorial board of numerous publications. He is a consultant and clinical evaluator to more than 15 dental manufacturers. Dr. Strassler has published more than 40 articles in the field of restorative dentistry and has authored seven chapters in texts. He has presented at more than 425 programs, including most of the major programs throughout the United States, Canada, and Europe. Dr. Strassler has a general practice in Baltimore, Maryland, that is limited to restorative dentistry and aesthetics.

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1. A good provisional restoration
   a. Acts as a diagnostic tool.
   b. Prevents occlusal changes.
   c. Has good marginal adaptation.
   d. Does all of these.

2. The greatest amount of stress is placed on provisional crowns and bridges when
   a. The patient is drinking.
   b. The patient is chewing.
   c. The patient is sleeping.
   d. The patient is flossing.

3. Regarding the fixed provisional bridge, the greater the length of the endentulous area being spanned, the
   a. Smaller the provisional restoration.
   b. More likely it is to delaminate the resin.
   c. Greater the flexure of the restoration.
   d. Greater the patient’s sensitivity to pain.

4. To reduce the potential for failure, the cross-sectional diameter of the connector should ideally be
   a. Larger than the final restoration.
   b. Smaller than the final restoration.
   c. The same size as the restoration.
   d. None of these.

5. Flexure of the restoration can be minimized by
   a. Making sure connectors aren’t overcontoured.
   b. Using a provisional cement of the proper strength.
   c. Using a connector that’s smaller than the final restoration.
   d. Stiffening the pontic area.

6. Which of these is a reason to use metal wire instead of fiber when reinforcing resin?
   a. Fiber reinforcement tends to demineralize the resin.
   b. Metal wire forms a more homogenous structure with the resin.
   c. It is more likely to avoid catastrophic failure of the provisional.
   d. None of these.

7. The most attractive feature of BIS-Acryl materials is their
   a. Aesthetic appeal.
   b. Strength.
   c. Cost-effectiveness.
   d. a and b.

8. The most attractive feature of BIS-GMA materials is their
   a. Aesthetic appeal.
   b. Strength.
   c. Cost-effectiveness.
   d. a and b.

9. The most attractive feature of methacrylate materials is their
   a. Aesthetic appeal.
   b. Strength.
   c. Cost-effectiveness.
   d. a and b.

10. Provisionals which need to be removed and reused require
    a. Weak cement and weak provisional materials.
    b. Strong cement and weak provisional materials.
    c. Strong cement and strong provisional materials.
    d. Weak cement and strong provisional materials.

11. Immediate load implant prosthetics may need to be worn by the patient for more than
    a. Three months.
    b. Four months.
    c. Five months.
    d. Six months.

12. A certain degree of pulpal trauma should be expected during tooth preparation.
    a. True
    b. False

13. Sealing the dentin surface with the provisional restoration is most likely to have what effect on the osmotic activity between the tubule and the oral cavity?
    a. Increase it
    b. Decrease it
    c. Prevent it
    d. Initiate it

14. Irreversible pulpitis is most likely to occur during or after the provisional restoration process as a result of
    a. A low solubility point of the provisional cement.
    b. The cytoplasmic process.
    c. Saliva leakage.
    d. A preexisting gingival condition.

15. To help prevent staining, it’s best if the surface of the provisional restoration is
    a. Rough.
    b. Porous.
    c. Smooth.
    d. Opaque.

16. The yellowing that occurs over time in some resins is a product of
    a. Amines.
    b. Chemical disparities.
    c. A poorly contoured restoration.
    d. Methacrylate.

17. Which of these is chemically similar to flowable composite resins?
    a. BIS-Acryl
    b. BIS-GMA
    c. Methacrylate
    d. Fibrous reinforcers

18. The two basic types of provisional materials are methacrylates and
    a. BIS.
    b. Compounds.
    c. Composites.
    d. Vinyls.

19. The three subgroups of the methacrylate category of provisional materials include methyl-methacrylates and
    a. Vinyl-methacrylates.
    b. Ethanol-methacrylates.
    c. Ethyl-methacrylates.
    d. a and c.

20. Taking into account both aesthetics and strength, which of these materials is preferable when the pontic width exceeds one unit?
    a. BIS-GMA
    b. BIS-Acryl
    c. Methacrylate
    d. a and b

21. When using a vacuum stent, which of these is a potential problem if the sheet material is thicker than 0.5 mm?
    a. It may be too rigid to retain the adjacent teeth during fabrication.
    b. It may lead to the fracture of the provisional.
    c. It may prevent the provisional’s removal.
    d. It may require longer chairside time to prepare.

22. Alginate impressions usually retain their shape when reinserted.
    a. True
    b. False

23. Which of these impression materials must be kept moist to avoid dehydration?
    a. Polyvinylsiloxane
    b. PVS
    c. Alginate
    d. All of these

24. For what reason might one want the tray and impression material to be transparent?
    a. It’s easier to see and work with the provisional stent.
    b. Transparency allows the provisional stent to be light cured.
    c. Transparency allows the provisional stent to set stronger.
    d. b and c.

25. After intraorally inserting a transparent impression tray filled with clear PVS, the next step is to
    a. Examine it for voids.
    b. Remove it.
    c. Trim interproximal material with scissors or a scalpel.
    d. Allow provisional to set.

26. To what does “flash” refer?
    a. Rapid thermoplasticization
    b. Excess provisional material
    c. Intense light curing
    d. None of these

27. When finishing and polishing the provisional restoration, which of these finishing disks is used last?
    a. Coarse
    b. Medium
    c. Fine
    d. Finishing disks are not used in this stage.

28. Which of these is recommended by the authors when removing debris left over from the finishing process?
    a. Warm water
    b. A dry piece of cotton gauze
    c. An alcohol soak
    d. A piece of alcohol-saturated cotton gauze

29. A high-speed diamond handpiece is used when
    a. Polishing the surface of the provisional restoration.
    b. Adding material to the provisional.
    c. Changing the contour of the provisional.
    d. b and c.

30. Which of these is likely to result from using a temporary cement that’s too thick?
    a. The provisional may dislodge between appointments.
    b. The bond strength will be compromised.
    c. The provisional may fracture.
    d. Hydraulic forces will limit the cement’s effectiveness.
Provisional Fixed Restorations

EDUCATIONAL OBJECTIVES

1. Understand the importance of provisional restorations from a mechanical, a biological and an aesthetic perspective.
2. List the different types of provisional materials available.
3. Understand the benefits and problems when selecting a provisional material.
4. Describe techniques for fabricating provisional restorations.
5. Describe methods to strengthen provisional restorations.

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Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 0.

1. Were the individual course objectives met?  
   Objective #1: Yes  No  Objective #4: Yes  No
   Objective #2: Yes  No  Objective #5: Yes  No

2. To what extent were the course objectives accomplished overall?  
   S  4  3  2  1  0

3. Please rate your personal mastery of the course objectives.  
   S  4  3  2  1  0

4. How would you rate the author’s grasp of the topic?   
   S  4  3  2  1  0

5. How do you rate the objectives and educational methods?  
   S  4  3  2  1  0

6. Please rate the instructor’s effectiveness.    
   S  4  3  2  1  0

7. Was the overall administration of the course effective?  
   5  4  3  2  1  0

8. Do you feel that the references were adequate?    
   Yes  No

9. Would you participate in a similar program on a different topic?  
   Yes  No

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11. Was there any subject matter you found confusing? Please describe.  

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