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Provisional Materials: Key Components of Interim Fixed Restorations

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Abstract

Clinicians have many choices of provisional materials from which to choose when fabricating interim fixed restorations. While traditional materials are still in use today, temporary materials are continuously being updated and improved upon. In addition to the functional necessities required of the provisional material, it must also provide esthetic value for the patient. This article provides an overview of provisional materials, including newer bis-acryls that have helped eliminate some of the challenges associated with traditional acrylic materials. Composite resin preformed crowns for single-unit provisional applications are also discussed, along with CAD/CAM-fabricated materials. Regardless of the material selected, a provisional restoration must maintain and protect the underlying tooth structure from ill effects.

Provisional materials are key components in the fabrication of interim fixed restorations for the making of various veneers, crowns, bridges, and other cosmetic procedures.[1] Temporary materials have changed immensely since their early days in the 1930s[2] from acrylics and premade crown forms to newer bis-acryl materials and computer-aided design/computer-aided manufacturing (CAD/CAM)-generated restorations. The dental professional now has many choices of materials from which to choose and must determine which material fits best for the patient.

Regardless of the material selected, a provisional restoration still must maintain and protect the underlying tooth structure from ill effects. It must protect the pulp from invasive microorganisms as well as from hot/cold thermal changes in the mouth. Marginal adaptation is critical in maintaining a seal around the tooth structure and protecting the finish line for the final, permanent restoration.[1] Proper occlusion as well as the periodontal elements must be

maintained.[1,3] Food must be able to be easily swept away to prevent possible food impaction and maintain soft-tissue health. Interproximal contacts and emergence profiles must be properly established and maintained to prevent the shifting of teeth and allow the patient to sustain proper hygiene.[1]

In addition to all of the functional necessities required of the provisional material, it must also have some element of esthetic value for the patient. This is especially true for a tooth that is in the anterior aspect of the patient's mouth. Patients want a temporary restoration to look and feel good without the fear of it falling off prior to the insertion of the final restoration. While traditional materials are still being used in practice today, temporary materials are continuously being updated and improved upon.

Traditional Options

From a historical perspective, acrylic temporaries are the oldest materials still in use today.[2] They are divided into two main groups: PMMA (polymethylmethylacrylic) and PEMA (polyethylmethylacrylic). They typically come in a powder/liquid format that necessitates a manual mixing of the two components, which is usually done in a dappen dish and delivered into a matrix. The matrix for the acrylic is usually made from alginate or alginate substitute, silicone matrix, vacuuform matrix, polyvinyl siloxane material matrix, or polyether matrix.[1] Great care must be taken when using these acrylics on the tooth structure, especially if undercuts are present on the teeth. The provisional can easily lock into place and become difficult to remove, causing it to break or damage the existing tooth structure. Placing a small amount of petroleum jelly or glycerin on the teeth can help to alleviate this problem.

Both PMMA and PEMA materials can be used for single and multiple long-span provisionals. Both are low-cost materials that can be smoothed and polished relatively easily.[4] PMMA offers increased strength[1] and a stable color over the course of the couple of weeks that the final restoration is being fabricated. However, there is a greater exothermic temperature release as compared to PEMA material.[1,5] The heat must be dissipated from the tooth structure to avoid possible pulpal or tissue damage. This can usually be accomplished by carefully removing the material and using a cool water and air spray during the polymerization process. Both materials come in a multitude of shades, depending on the supplying manufacturer. These materials usually need to be relined prior to cementation to create a proper seal around the tooth. During the polymerization process a distortion of the materials will need to be adjusted in the patient's mouth. PMMA and PEMA materials both give off a distinct odor that patients and dental staff often notice. Yet, they both offer a cost-effective, adequate option for meeting the criteria of a proper provisional material.

Newer Materials

Newer bis-acryl materials have helped to eliminate some of the challenges associated with traditional acrylic materials. Bowen developed bisphenol A glycidyl methacrylate (Bis-GMA) in the 1960s,[6] a material that has been the backbone for most composite resins used today. This paved the way for bis-acryl materials, which are self-cured composites. Available in a wide

variety of shades, including the more popular bleach shades, bis-acryls come in a convenient syringe applicator and have a low exothermic reaction,[1,4] decreased shrinkage,[4] and a less odorous smell. A disadvantage of bis-acryls is that they can break relatively easily when placed in areas of increased stress[1] ; however, since they are a composite-based material they are fairly easy to repair with either the same material, traditional composite, or flowable materials.[7,8] Bis-acryls also typically cost more than traditional acrylic materials.[8]

The fabrication of bis-acryls typically is identical to their acrylic counterparts. A matrix is needed, into which the material is syringed and then placed on the tooth, removed, trimmed, and polished. There is less risk of pulpal damage with bis-acryls since these materials typically generate much less heat during the polymerization process.[9] Many of the problems associated with traditional acrylics have been eliminated with the bis-acryl materials, which are easy to use, flexible during insertion and removal, radiopaque, and color stable.[10] These materials are ideal for single-unit and some multiple-unit situations. The overall clinical situation of function and occlusion will dictate whether or not bis-acryl is the proper choice.

Preformed acrylic/metal crowns and self-cured bis-acryl materials have led to the evolution of light-cured composite resin preformed crowns for single-unit provisional applications, namely Protemp™ Crowns (3M ESPE, www.3Mespe.com). These crowns come in preformed molar, premolar, and canine shapes and can easily adapt to select clinical situations. They are convenient for cases of severely broken or missing tooth structure when fabrication of a matrix is difficult. Made of composite-based material, these moldable crowns allow the clinician to adapt a fit around a preparation on the buccal, lingual, and occlusal aspects prior to setting the material with a light. Enhancing the advantages of composite provisional and preformed crowns, these newer crowns combine good fit, wear, and strength with ease of fabrication and polishability while eliminating the need for a matrix.[11] There is also the added benefit of improved physical and chemical properties of the material itself.[12]

Digitized Fabrication

Esthetic demands have given rise to the digitization and CAD/CAM-aided fabrication of materials and restorations, taking dentistry to a new dimension. Precision-milled acrylate polymer-filled contoured single- and multiple-unit provisional restorations are now available that offer increased strength and fit along with a customizable solution for even the most demanding of patients. One drawback is that this is not a direct chairside procedure. A scan must be sent to a laboratory, and the provisional is fabricated prior to the procedure. An increased cost is associated with this service, which typically must be passed on to the consumer.

One product that integrates the dentist with the dental technician is Telio (Ivoclar Vivadent, www.ivoclarvivadent.com), a system of compatible materials for temporary restorations. Dental CAD/CAM users are able to combine a chairside product (Telio CS)—a self-curing provisional material—with Telio CAD acrylate polymer blocks and Telio Lab materials.[13] This combination of materials (chairside and laboratory) allows for easier fabrication of inlays, onlays, veneers,

and crowns, eliminating some of the challenges associated with other provisional techniques such as polymerization shrinkage, impression errors, mixing errors, and overall clean-up. The acrylate polymer blocks can be used for long-term provisionals up to a year in difficult crown and bridge cases. This system also combines improved physical properties of the material. The collaboration between dentists and dental technicians across all phases of treatment is the first step in achieving a flawless provisional and final restoration.

Conclusion

The provisional restoration is one of the most important steps in fabricating a fixed prosthodontic restoration, allowing both the dentist and patient to evaluate functional and esthetic concerns prior to the final insert. It is a test drive of sorts of the biological and physical characteristics.

There are many materials available for interim restorations, and it is vital that the clinician chooses the material that most closely matches the clinical needs of the patient. No one material fits all of the needs of the patient or dentist. Material selection should be based on each unique clinical case. A well-made provisional restoration can not only help avoid inconvenience and annoyance issues such as a patient returning for a broken or lost temporary but can save on chairside insertion of the final restoration. Healthy tissue and the overall health of the gingiva and teeth enable easier insertion and clean-up.

A thorough understanding of the materials available to clinicians and the clinical situation at hand will allow for a successful end-product.

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