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Dental Materials

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The use of dental amalgam has declined, but in most of the world, amalgam is the most widely used and widely taught direct restorative material for load-bearing posterior restorations. There are few national regulations on the use of amalgam; however, there are several nations where few amalgam restorations are placed. Long-term studies have shown that under optimum conditions, posterior restorations of amalgam and resin composite last longer than reported previously and that amalgam restorations outlast composite restorations. In general practice settings, posterior amalgam and composite restorations both have lower longevities.

Precious Metals in Dentistry  591
Daniel A. Givan

Precious alloys are an important material group in dentistry because of their ease of use, excellent compatibility, favorable mechanical and physical properties, and application in ceramic-metal bonding. Although new precious alloys have been introduced in the past decades, frequently because of economic pressure, gold-based alloys remain a popular choice. Researchers have suggested that alloys should be chosen based on an understanding of the alloy system, selection of proven alloys from quality manufacturers, and consideration of the requirements of a given clinical situation.
### Base Metal Alloys Used for Dental Restorations and Implants

Michael Roach

One of the primary reasons for the development of base metal alloys for dental applications has been the escalating cost of gold throughout the 20th century. In addition to providing lower cost alternatives, these nonprecious alloys were also found to provide better mechanical properties and aesthetics for some oral applications. Additionally, certain base metal alloy systems are preferred because of their superior mechanical properties, lower density, and in some cases, their capability to osseo-integrate. The base metal alloy systems most commonly used in dentistry today include stainless steels, nickel-chromium, cobalt-chromium, titanium, and nickel-titanium alloys. Combined, these alloy systems provide a wide range of available properties to choose the correct material for both temporary and long-term restoration and implant applications.

### Impression Materials: A Comparative Review of Impression Materials Most Commonly Used in Restorative Dentistry

Barry S. Rubel

Impression materials are used to record intraoral structures for the fabrication of definitive restorations. Accurate impressions are necessary for construction of any dental prosthesis. The relationship between static and mobile oral structures must be reproduced accurately for an optimum cast. The more common types of impressions are used for fabricating diagnostic and master casts. Accurate impressions depend on identifying the applications that do or do not fit each material’s characteristics. Materials used without adequate knowledge of their characteristics can impair a successful outcome. Often, the choice of impression materials depends on the subjective choice of the operator based on personal preferences and past experience with particular materials.

### Direct Composite Restorations

Aaron D. Puckett, James C. and Jefferson Gamblin

Composite dental restorations have replaced amalgam in many situations. Problems associated with stress, large difference (CTE) of composite-coal technique sensitivity; technology, and improving reduce these problems. Restorations, the use of composite materials must continue to how to use composite materials.

### Adhesion to Tooth Structure: Bonding Systems

Ivan Stangel, Thomas H. I

Given the enormity of commercial products in dentistry can be daunting. This article organizes around an understanding of the systems, and their application result is the better practice.

### Endodontic Materials

R. Scott Gatewood

This article presents a practice of endodontic those that have been the clinical usage, and time new knowledge in the are devoted to obturation smear layer removal, medicaments. Knowing aid the clinician in choosing a situation. Properties, costs of use are presented to aid the particular need.

### Dental Cements for Definitive Luting: A Review and Practical Clinical Considerations

Edward E. Hill

Dental cement used to attach an indirect restoration to a prepared tooth is called a luting agent. A clinically relevant discussion of conventional and contemporary definitive luting agents is presented in this article. Physical properties are listed in table form to assist in comparison and decision-making. Additional subtopics include luting agent requirements, classifications, retention and bonding, cement considerations for implant-supported teeth, and fatigue failure.
Composite dental restorative materials have advanced considerably over the past 10 years. Although composites have not totally replaced amalgam, they have become a viable substitute in many situations. Problems still exist with polymerization contraction stress, large differences in the coefficient of thermal expansion (CTE) of composites compared with tooth structure, and with some technique sensitivity; however, new expanding resins, nanofiller technology, and improved bonding systems have the potential to reduce these problems. With increased patient demands for esthetic restorations, the use of direct filling composite materials will continue to grow. The one major caveat to this prediction is that clinicians must continue to use sound judgment on when, where, and how to use composite restoratives in their practices.
Recent Advances in Materials for All-Ceramic Restorations
Jason A. Griggs

The past 3 years of research on materials for all-ceramic veneers, inlays, onlays, single-unit crowns, and multi-unit restorations are reviewed in this article. The primary changes in the field were the proliferation of zirconia-based frameworks and computer-aided fabrication of prostheses, and a trend toward more clinically relevant in vitro test methods. This article includes an overview of ceramic fabrication methods, suggestions for critical assessment of material property data, and a summary of clinical longevity for prostheses constructed of various materials.

Bone Graft Materials
Harry V. Precheur

This article examines each class of bone grafting material based on some of the studies in each of the following categories: safety, animal research, periodontal and maxillofacial applications, skeletal grafting, and attempts to qualify the efficacy of each class of material. The article also examines some of the research being done in “tissue engineering” to get a sense of the future of bone grafting.

Biocompatibility of Dental Materials
Kenneth R. St. John

With the long history of use of many materials in dental surgery, biocompatibility concerns are not as great a concern as other issues, such as long-term degradation, mechanical strength problems, and prevention of secondary caries. It is important, however, not to forget that the potential exists for adverse tissue responses to synthetic materials used in repair, augmentation, and repair of natural tissue structures. As new materials and repair techniques become available and the sophistication of cell-level and subcellular response evaluations increases, the concerns to be addressed and the methods to be used may change. The advent of tissue-engineered medical products may mean that new questions must be addressed.