

Good impressions

There's nothing funny about bad impressions. Understanding impression material properties helps troubleshoot problems before they occur.

By Steve Rogers and John Gladman



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The wide array of impression materi-

als on today's market requires lab technicians and dentists to have a thorough understanding of the basic properties, applications, strengths, and limitations of each material to ensure production of a superior impression. Accuracy of fit and marginal integrity have improved greatly with increased use of microscopes, CAD/CAM technologies, and precision investments and die stones. Therefore, the ability of the dentist to create an accurate impression is more important than ever before to provide patients with a superior restoration.

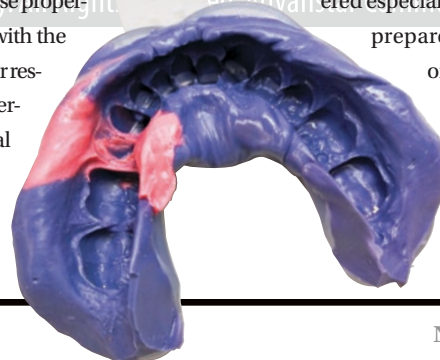
Very few courses presented at the numerous annual dental conventions address the importance of understanding the handling and behavior of impression materials, especially in a moist environment. As active consultants to dental clients, your understanding of these properties will help your clients provide you with the information you need to fabricate superior restorations. This article will present an overview for polyether impression material and general impression troubleshooting considerations for clinicians and laboratory technicians.

MOISTURE TOLERANCE IS KEY

Clinical success in obtaining an accurate impression is dependent on many factors, such as the handling of materials, type of tray used, and the presence of moisture. Of these, the predominant factor is moisture. In the presence of moisture, hydrophilicity is a critical property for dentists to consider when selecting an impression material. The hydrophilicity of unset impression material determines how well the material flows into moist areas, which is quite often the case in a general clinical setting.

Hydrophilic materials have a high affinity for moisture; hydrophobic materials do not. Polyether impression material, due to its natural hydrophilic nature, captures fine details better than other types of impression material in a wet environment. Use of polyether should be considered especially when impressing cases that are prepared subgingivally or when bleeding or salivation is an issue. Additionally, polyether is often considered for use with cases where accuracy of fit is important, such as an implant case or for bridgework.

Vinylpolysiloxane (VPS) mate-



PHOTO, TOP: JUPITERIMAGES; BOTTOM: NEXUS STUDIOS



Fig. 1 Communication between the lab technician and clinician should play an important role in troubleshooting.

IMAGE OF 3M ESPE IMPREGUM PENTA SOFT POLYETHER IMPRESSION, COURTESY NEXUS STUDIOS, LTD.

Fig. 2 An example of inhibited setting.

IMAGE FROM "ESPERTISE TROUBLESHOOTING GUIDE," COURTESY 3M ESPE

Fig. 3 This impression illustrates poor retraction and syringe technique.

IMAGE FROM "ESPERTISE TROUBLESHOOTING GUIDE," COURTESY 3M ESPE

Fig. 4 Example of an accurate and detailed impression laboratories would like to receive from dentists.

IMAGE OF 3M ESPE IMPREGUM PENTA SOFT IMPRESSION MATERIAL, COURTESY OF HOLMER MESIER, DDS, UNIVERSITY OF MINNESOTA

rials are hydrophobic and sensitive to contaminants found in the manufacture of latex gloves, which can lead to voids and inhibited setting, respectively. Although VPS materials are being reformulated with surfactants added to try to match the natural hydrophilicity of polyether, the hydrophilic properties only occur when the material is polymerized, or set. While this may aid the laboratory when pouring casts, it does not aid in accuracy during impressing.

SET RATES

The set rate of an impression material is the amount of time, specified by the manufacturer, that it takes for the material to transition from its working state to its set state. The term "snap set" is used to describe a material that changes to its set state quickly at the end of its specified working time. A "quick set" material has a shorter working time and is setting throughout the working time where patient/assistant movement may cause a distortion. In addition, a material that snap sets will exhibit good flow properties until the end of the working time and then quickly sets. A snap set material, such as polyether, is less likely to have distortions or other errors in the impression because its partial set time is much shorter.

POLYETHER: OLD-FASHIONED OR UNSURPASSED?

In the studies we reviewed, polyether rated best in moist environments in comparison to VPS, polysulfide, or zinc oxide eugenol materials. Because polyether has higher hydrophilicity than silicones with surfactants added, it displaces moisture from the start of the mix all the way through the set phase, reducing voids due to blood or saliva. VPS materials will exhibit hydrophilicity equal to polyether only when fully polymerized.

One study comparing the dimensional accuracy of four impression materials, published in the *American Journal of Prosthodontics*, found that the VPS impression materials tested demonstrated satisfactory surface detail reproduction only under dry conditions, whereas the polyether impression materials produced satisfactory surface detail reproduction under both dry and moist conditions.

Today, it is clear that polyether remains unsurpassed in the unset stage (when the material is injected into the oral cavity), and consistently shows a significantly superior flow behavior to capture more detail, as compared to VPS materials, during the working time. Polyether also offers the advantages of having a "snap set" versus a "quick set," which is more likely to allow distortion during setting.

"Improper handling can cause a variety of problems when the restoration is seated."

—Nexus Studios, Ltd.

CLINICAL CONSIDERATIONS

The importance of good communication between the clinician and the laboratory technician cannot be over-emphasized. When a clinician is experiencing problems, or has a desire to improve quality and reduce set times, working with the lab is essential for reducing variables and improving consistency. Common clinical considerations that may be overlooked include:

Leaving cord in the impression: The cord may dry the impression material, causing distortion in the margin area, the most critical area of the impression.

Inhibitory effects: With VPS materials, the presence of latex or hemostatic agents can inhibit the set time, potentially distorting the impression or causing areas not to set completely. Although gloves are available in non-latex nitrile, other products such as rubber dam or temporary material may still contain latex or other compounds that can affect the setting time. Thorough cleaning with diluted hydrogen peroxide after making the temporary will help eliminate the problem, but care must be taken not to cause the recurrence of bleeding. The use of hemostatic agents can cause similar inhibitory effects. Different agents affect different materials, so it is advised to consult the manufacturer's instructions for type of agent to use with the material. Polyether materials are affected by hemostatic agents containing epinephrine or ferric sulphate. Thorough rinsing with water is recommended.

Trays and adhesives: If the dentist is using a custom tray, wait 24 hours after fabrication before using the tray, because tray acrylic will continue to shrink. In the studies we reviewed, stiffer trays provided the best results for all materials. For optimal adhesion, the manufacturer's instructions should be followed for any tray adhesives used.

Packaging/transportation: While many labs provide transport bags that are designed for biohazard transport, polyether impressions should not be bagged for 30 minutes after setting. They should be kept dry and not packaged with anything that is moist, such as moist toweling or stone models (stone models exude moisture for many hours).

Rework costs: With the costs of business so high, unnecessary adjustments are expensive. At an

estimated \$400 per hour for chair time in the average practice, a difficult seat can cost more in chair time than the cost of the crown, not to mention the problems created in scheduling. It pays for the dentist to try a few materials to determine what works best.

LAB CONSIDERATIONS

The importance of understanding the handling requirements of materials in the laboratory is often overlooked as well. Improper handling can cause a variety of problems when the restoration is seated. Below are some of the problems that underscore the importance of proper handling in the lab.

Disinfection: Check with the manufacturer for any disinfection agents that are not advised. After rinsing, use a light stream of air to dry the impression. Wait at least one hour before pouring to allow the material to equalize to the environment. Watch for “double disinfection,” where both the clinic and the lab disinfect the impression. Overexposure to disinfection agents can affect many materials.

Storage: Store polyether impressions in a dry environment and out of direct sunlight. Excess humidity can adversely affect them. Optimal conditions are generally considered 73°F at 52% humidity. Most polyether impressions can be poured up to 14 days when stored under similar conditions.

Pouring models: The use of surfactants (debubblizers) is contraindicated for pouring stone into polyether impressions. Some polyether materials can be stiff, and model separation can be difficult, especially with full-arch impressions. Be sure to follow the manufacturer’s recommendations for best results. When pouring an epoxy model from a VPS impression, wait 24 hours before pouring because the material releases hydrogen that could affect the epoxy. When pouring epoxy into a polyether impression, a dry silicone separator must be used or the two materials will bond together.

Ongoing dialogue: It is especially important that the laboratory maintain good communication with its clinicians. If you find that the die stone is soft at the margin, you should communicate with the doctor to find out if a hemostatic agent was used. Or if presented with a full-arch bridge, discuss a frame trial or fabricating the framework in sections. More work and frustration can be caused by a lack of communication between the laboratory and the doctor than any other factor.

ATTRACTIVE RESULTS

Our experience and research continues to show that polyether has fewer inhibitory issues and creates the most precise impressions in the presence of moisture. When material properties are understood and used correctly, the combination results in good impressions that everyone can appreciate. **lab**

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