



# Fundamentals and New Concepts in Impression Taking

by Gary Alex, DMD

**D**espite the increasing use of digital scanning, conventional impression materials such as polyether and vinyl polysiloxane (VPS) are still the materials most often used by dentists when taking crown and bridge impressions. It makes sense for dentists using these materials to stay up to date on improvements and technique modifications so they can be efficient, minimize cost and capture impressions that are as accurate as possible. This article will examine some of the idiosyncrasies and nuances of both polyether and VPS impression materials, as well as touch on technique and mixing modifications.

## The basics of impression materials

While other alternatives exist, crown and bridge impression materials today are concentrated in two

major categories: polyether and VPS. Virtually every aspect of VPS and polyether materials has been improved in some way over the last several years. Physical and chemical properties such as tear strength, elastic memory, dimensional stability, hydrophilicity, viscos-

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Top left: Automatic mixing units allow for a more thorough, faster, easier, and cleaner mixing, and are one of the best investments you can make to improve the impression-taking experience. (Shown: 3M ESPE Pentamix 2 and 3M ESPE Pentamix 3)

Top right: Excellent detail displayed from use of VPS impression material. (Shown: 3M ESPE Imprint 4 VPS Impression Material)

Bottom right: Polyether impression materials have excellent flow characteristics and, once set, form a rigid polymer matrix. (Shown: 3M ESPE Impregum Impression Material)

ity, flow characteristics and working and set time have all been improved or tweaked. But perhaps the biggest change that has taken place is the way in which we mix VPS and polyethers—more on that later.

I personally suspect most dentists use one impression material and tend to stick with that material because they are used to it and it seems to be working for them. I like and use both VPS and polyether, as each has its advantages and disadvantages depending on the clinical situation. Both material categories are capable of producing excellent impressions.

While there are some studies that indicate polyethers may be slightly more accurate, VPS is more popular in the United States. However, it is clear that both types produce clinically acceptable impressions. Having said that, both materials do have their idiosyncrasies and there are differences that might favor one material over the other in certain clinical situations. A brief review of these materials may be a useful refresher.

### Polyethers

Polyethers were first introduced in 1965 and have been around longer than VPS materials. I started using polyether right after dental school because my father, a practicing dentist for almost 50 years, was using it. I found it to be extremely accurate and liked it, but did find it difficult to remove in some cases when taking

full-arch impressions. Taste was also an issue for some patients and it had a long set time. The introduction of products such as Impregum Penta Soft Quick Step Polyether Impression Material many years later addressed these issues with faster setting, improved taste and less rigidity.

Generally speaking, polyethers tend to exhibit a snap set behavior and once set, they form a more rigid polymer matrix than VPS materials. While this can make them more difficult to remove from the mouth, this same rigidity might make them a better choice for picking up metal and ceramic copings, frames and implant impression copings. Polyethers also have excellent flow characteristics and are intrinsically hydrophilic (prior to setting and once set).

### VPS

VPS materials, on the other hand, are chemically hydrophobic and require the use of surfactants to enhance their affinity for moisture. One thing that dentists need to keep in mind is that it is most important for these materials to be hydrophilic in the unset stage (i.e., while they are being injected around a preparation). It is less important that they are hydrophilic after they are set and as a result all those ads that show the hydrophilic nature of set VPS materials don't mean much.

Dr. Gerald Kugel's 2007 study<sup>1</sup> found that polyether impres-

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A retraction procedure including retraction paste and a compression cap can be very effective in controlling bleeding and providing tissue retraction.

sion materials were significantly more hydrophilic before, during and after setting compared to VPS impression materials. However, the hydrophilic nature of some of the latest VPS materials has been significantly improved.

Some of the positive attributes of VPS impression materials are that they are also extremely accurate, well tolerated by patients, usually less expensive than polyethers, dimensionally stable over long periods of time (many days, even weeks, can go by before they need to be poured), can be poured multiple times, and are easier to remove from the mouth than polyethers. This might make them a better choice when dealing with loose teeth, significant undercuts and edentulous impressions.

One recently introduced VPS material that I use regularly in my practice is Imprint 4 VPS impression material from 3M ESPE, which is very hydrophilic for a VPS.

To the best of my knowledge, the “Super Quick” variety has the fastest intra-oral set time of any current VPS impression material due to a unique chemistry that warms the material and speeds up setting, but only after it is placed in the mouth. This allows for a long working time but very quick setting time once placed.

### Tools and tips

Of course, the impression material itself is only one aspect of the impression-taking procedure. New products and tools have been developed to expedite and improve the impression-taking experience.

### Intra-oral syringes

Typically, dentists use auto-mixing syringes when injecting

preparations with a unique dispensing tip design.

To use, the intra-oral syringe is screwed onto the end of an impression material cartridge (VPS or polyether) and filled. It is then removed and the plunger is placed in the tip, after which the filled syringe is ready for use. The design of these tips can significantly reduce impression material waste and the product can be very useful for certain hard-to-reach preparation areas because of the way the injecting tip is designed.

### Proper retraction

Unfortunately, inadequate retraction and tissue management are still significant issues for many dentists. If you can't clearly see the margin of your preparation, don't expect to be able to capture it in an impression—digital or conventional. Furthermore, if you are not using magnification with a halogen light, you should be. I do not believe it's possible to do excellent dentistry without magnification. Looking at your preparations and restorations under high magnification can be a very humbling experience.

To achieve the ideal margins that are necessary, many dentists would benefit from re-examining their retraction procedures. One tool that may be helpful in this is retraction paste in a specially designed capsule. The Retraction Capsule (3M ESPE) was introduced a few years ago and employs a 15 percent aluminum chloride paste that is dispensed from a single-use compule. This is similar to a composite compule but with a much longer and thinner tip.

The use of aluminum chloride, especially in conjunction with ROEKO Comprecap compression caps, can be very effective in controlling bleeding and providing tissue retraction. The compression caps are available in a number of sizes to fit over the prep

and help force and hold the aluminum chloride paste in the sulcus. They also give patients something to gently bite down on while the retraction paste takes effect. Retraction paste also requires less technical skill to properly apply than retraction cord and can be taught and delegated easily to dental assistants.

On the downside, aluminum chloride interferes with the chemical setting process of both polyether and VPS impression materials. It's very important for dentists to thoroughly wash off residual retraction paste prior to placing impression materials.

### Automatic mixing

In my opinion, an automatic mixing unit is one of the best investments you can make to improve the impression-taking experience. Anyone who is still hand-mixing impression materials should strongly consider switching to machine mixing in conjunction with the use of auto-mixing syringes. The use of these devices allows for a mixing experience that is faster, easier, cleaner and more thorough. In my office the usual procedure is to have my assistant fill the impression tray with a machine-mixed heavy-body material while I am injecting a light-body material around the preparations with an auto-mixing syringe. Automatic mixers offer so many advantages over hand-mixing that it really makes sense to have an impression-mixing machine of some type, unless you are taking few impressions.

### Be fussy and set high standards

One study reported that more than 89 percent of impressions sent to dental labs had one or more visible defects.<sup>2</sup> Another JPD study reported that more than 50 percent of impressions sent to dental labs had defects in the marginal areas. That's scary! To get a

good impression you have to really want to get a good impression. This requires knowledge, good technique, good materials and a precise and methodical clinical protocol. If you pull the impression and it's not right, bite the bullet and re-take it until it is. If you're not fussy about taking and getting a good impression don't expect to get a well-fitting restoration back from the lab. Examine your impressions under magnification in good light and be critical.

Finally, in terms of digital scanning, I know really good dentists who have digital scanners and use them for 90 percent of their impressions. I also know really good dentists who have digital scanners yet still take 90 percent of their impressions with conventional impression materials. Some of the best clinical dentists I know don't have a scanner at all.

I do have and use a digital scanner (mostly for single units) but still take the majority of my impressions with conventional impression techniques. The point is, you don't need to use a digital scanner to deliver excellent dentistry. Having said that, it's also apparent to me that the future of dentistry is digital in nature and digital impressioning clearly has its advantages. Certainly, dentists who want to mill their own restorations in-house via CAD/CAM need to master digital scanning.

I do think it's important for dentists to learn

about digital scanning, try out some systems, take some courses and see if digital scanning is right for them and their practice. Some day digital scanning may replace all conventional impression materials, but that day is not here yet. ■

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#### References

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### Author's Bio



**Dr. Gary Alex** graduated from Tufts University Dental School in 1981 and completes numerous hours of continuing education with an emphasis on occlusion, adhesion, comprehensive dentistry, materials and aesthetics. An international researcher and lecturer, Dr. Alex is an accredited member of the American Academy of Cosmetic Dentistry, International Association of Dental Research, American Equilibration Society, and is co-director of the Long Island Center for Dental Esthetics and Occlusion. Dr. Alex maintains a practice in Huntington, New York, that is geared toward comprehensive prosthetic and cosmetic dentistry.