Precision impressions using polyethers

Dr Akit Patel outlines how different impression materials can suit different scenarios

Producing a precise impression is an important step in obtaining that perfect restoration. Exact fitting restorations facilitate efficient working time, periodontal prophylaxis, micro-occlusal control and harmonious aesthetic marginal fits. Therefore, it is the aim of the master impression to be highly accurate and a dimensionally stable ‘negative’ whether it is of a tooth preparation, implant platform or a soft tissue contour. These requirements remain important to both conventional or CAD/CAM production of laboratory restorations.

There isn’t a single impression material that fits every clinical situation because, the truth is, there isn’t an ideal material. The two most commonly used materials for final impressions are polyethers and polyvinyl siloxanes. There have been continued modifications to their chemistries, ie, rendered hydrophilic addition-reaction silicones and advanced next generation polyethers. They have been evaluated in vitro and their properties have been well documented. However, an in vivo study is difficult to accomplish because of different variables. Within these two groups, there are a myriad of excellent material options available today; however, optimal final impression is still a challenging task.

Some companies have introduced a new class of impression material referred to as vinyl-polyether hybrids. These two-paste systems contain a polymer with polyether and siloxane groups, which, in theory, should combine the dimensional stability and siloxane groups contribute to both the dimensional stability and accuracy of surface detail. Some of the clinical benefits include:

- Best initial hydrophilicity
- Excellent flow properties
- A snap-set behaviour
- Extremely low shrinkage
- Dimensionally stable
- Super stiff
- High tear strength and elastic recovery
- Single one-step technique (monophase)
- Extremely accurate detail reproduction that meets American Dental Association specifications for impression materials recording line detail below 25μm.

The impressive collection of data demonstrates the high performance of Impregum polyether impression materials.

Figure 1: The Impregum family time line from 3M ESPE

Accurate final impressions are the result of properly integrating multiple interrelated steps during the preparation and impression-taking process:

- Healthy soft tissue environment
- Create an impervious preparation
- Atraumatic tissue retraction
- Moisture control
- Correct tray selection
- Material choice and technique
- Inspection of the impression.

The following list helps to simplify the common types of polyethers used:

- Impregum Penta (medium-bodied) for Pentamax machine
- Permadyne Penta H (heavy-bodied) for Pentamax machine
- Permadyne Garant 2:1 (light-bodied) for hand dispenser
- Impregum Penta Soft (medium-bodied) for Pentamax machine
- Impregum Penta H Duosoft (heavy-bodied) for Pentaxim machine
- Impregum Garant L Duosoft (light-bodied) for hand dispenser
- Impregum Penta Soft Quick (medium-bodied) for Pentaxim machine
- Impregum Penta H Duosoft Quick (heavy-bodied) for Pentaxim machine
- Impregum L Duosoft Quick (light-bodied) for hand dispenser.

Figure 2: The Impregum family timeline from 3M ESPE

Concentrate on an isolated area

Impregum Penta is a medium-viscosity material that sits in the middle of low and high flow materials. By virtue of this, it is self-supportive and has the capability to flow and capture intricate details without exerting high pressure. Impregum Penta Soft has been shown to have significantly better flow properties than VPS materials. Impregum possesses a low contact angle (hydrophilic), which means that the material flows well when it hits the surface, even in smaller areas. Its hydrophilicity and precision flow behaviour allows for superb impressions in moist conditions, useful for capturing details in the sulcus area without the need for a wash material. Polyether is naturally hydrophilic; a property VPS material is still yet to match. Clinical tip: Impregum is moisture tolerant by nature (it will not displace visible water, blood, saliva or saccharic fluids), when it contacts tissue the field must be kept clean and dry. The use of tissue retraction should be compulsory when the field is close to the gingival tissues so that a minimum of 0.5mm beyond the margin is captured circumferentially around the tooth.

Given the identical chemical basis, all polyether consistencies can be freely combined with each other. A chemical bond after curing is guaranteed. Clinical tip: For intraoral direct post impressions, the use of Permadyne Garant (light-bodied) can be used with Impregum Penta (medium-bodied) to capture finer detail due to its lower viscosity. Alternatively, you can consider using Impregum Duosoft heavy and light materials (Penta range) are used in a single-step process. The advantage of using a monophase (Penta, Penta Soft, Penta Soft Quick) is that it is straightforward and easy to use, see Figure 2. There is no need to stock more than one material, there are no problems with coordination due to using two mixing guns and there is no issue with two different viscosities blending fully, which constantly omits the risk of developing creases and insufficient recording of fine details. Clinical tip: First load the tray using a Pentaxim machine for quick and accurate mix and then load a Penta elastomer or Impregum intraoral syringe to inject material around preparation margins. During this process keep tip buried in the material at all times to avoid air entrapment (see Figure 3).
Whether an impression of single or multiple implants, any play of the implant impression will lead to inaccuracy. Polyethers are the material of recommendation for implant impressions. Polyethers are more rigid and will help prevent a non-rigid tray from distorting, although the authors preferred technique utilises a rigid plastic, metal or custom tray. When excess undercuts are present, it is recommended that these be blocked out to prevent other restorations being pulled out or inadvertently locked.

### Challenging scenarios

Impregum Penta is a slow-setting time material and therefore adapts to the task at hand (single unit of a full arch). If a master impression of a single crown is being made, then faster-setting materials are possible. When the procedure is for multiple units or involves a patient who is particularly challenging, maximising the working time is prudent. Impregum’s snap-set material is more forgiving than traditional VPS impression material, enabling detailed reproduction without distortion. Its snap-set behaviour ensures that it will not start setting before the working time ends; when it does, though, it does so immediately. Hence, the indicated working time can actually be used to full capacity. Clinical tip: To prevent permanent deformation, the impression should be removed in line with the axis of the prepared tooth. The impression can be stored for up to two weeks if kept cool, dry and out of direct sunlight.

Impregum can be used to fabricate master casts for a wide range of restorative indications, see Figures 4 and 5: complete dentures, removable partial dentures, crowns and bridges (conventional and adhesive), inlays and onlays, posts and implant prostheses.

Extremely accurate impressions can be achieved when the monophase technique is used in conjunction with metal or custom trays and Impregum (author’s material of choice is Impregum Penta for fixed restorations). A one-step dualphase technique using Impregum Penta H Duosoft and Garant L Duosoft (author’s material of choice for conventional removable prostheses) combines the benefits of a polyether impression material, while using a heavy and light body to serve as a functional impression. Impregum has certain qualities that set it apart from VPS and therefore offers the ability to improve the predictability of creating optimum master impressions in difficult situations.

**The impression is most important**

The choice of impressioning is a matter of personal preference. However, it must be remembered that the success of an impression depends on characteristics of the impression material and the way it is manipulated, the skill of the clinician and the experience acquired with a given technique rather than on the choice of a given procedure or specific impression material. New and evolving digital impression technologies may someday minimise some of these challenges, but it may still be some time before traditional impressions are no longer necessary.

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