Accurate Impression Technique: A Key to Successful Prosthetics

Sergio Rubinstein, DDS

Consistent, predictable, and reproducible procedures in restorative dentistry are expected from our impression materials and techniques. When taking an impression, clinicians must consider the true costs of retakes. Their true cost is calculated not only in the materials used, but also in the extra time involved. Retakes due to inadequate impressions are not simply inconveniences; they are also drains on the practice, requiring both materials and time, and affecting the patient's perception of the dentist and his/her practice. Clearly, instead of being forced to adjust one's schedule and make time for retakes, *getting an impression right the first time* is worth using quality materials and paying close attention to the techniques employed. In my experience, choosing an appropriate technique, along with a material that has the right qualities for the case, help to ensure clinical success in one take.

IMPRESSION MATERIALS AND TOOLS FOR SUCCESS WITH IMPLANT PROSTHETICS

When I completed my specialty program in periodontal prostheses in the early 1980s, we were instructed to take single-tooth to full-arch impressions with rubber base using custom trays. One advantage of using rubber base was the time factor—the material allowed ample time for taking an impression of the entire arch. In addition, it was also accurate, if poured-up only once.

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After working with rubber base for many years, a drawback became apparent. When I began restoring implants in my practice, I soon found out that rubber base impressions were not accurate for the procedure, due to the greater rigidity of implants versus a natural tooth. When taking an impression on implants, the biggest test of a material is when the implants are connected restoratively as a multiple unit. It is critical to obtain a passive fit with the framework, so that undesirable forces are not transferred onto the implant. Rubber base did not provide enough accuracy for the reproduction of the implant position, so the search for a new, more stable and rigid material began.

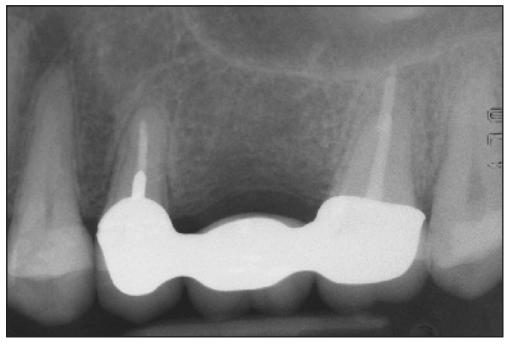

Figure 1. Initial radiograph showing a short root on the second premolar root and a molar with a vertical fracture.

I utilized polyvinylsiloxane materials for several years in putty form, as well as all types of viscosities in the syringeable material. I found that in using these materials, I had inconsistent results; sometimes the fit of the prosthetic framework was excellent, but other times the framework had to be sectioned and soldered. With the increase in the number of dental implant cases in my office, I began utilizing a polyether impression material (Impregum [3M ESPE]). I immediately recognized that it proved to be an accurate impression material in my hands; therefore, it has become my material of choice for any procedure requiring dental laboratory work. Having performed my own laboratory work for several years, I am able to evaluate the fit of restorations from both a laboratory and clinical point of view. In my experience, I have found polyether to be extremely reliable for both the dentist and the dental laboratory technician.

Figure 2. Occlusal view after the bridge was removed, showing the abscess from the fractured root.

THE IMPORTANCE OF CONSISTENT MIXES

Prior to the introduction of impression materials that could be dispensed from a gun or cartridge system, all impression materials were mixed with a spatula. While generally effective, in some instances, this method can produce inconsistent mixes and results. Once I found the dependability and consistency of polyether and its mixing characteristics, it became essential to have an automatic dispensing and mixing unit (Pentamix Automatic Mixing Unit [3M ESPE]). I acquired a mixing unit for each operatory, because I wanted to be productive and use each treatment room to its full capacity. Automatic mixing units offer several advantages that make them particularly helpful: they ensure completely consistent and homogeneous mix, allowing for void-free impressions; they help save material by dispensing only the required amount.

There are a number of advantages to using a polyether impression material that I have found to be particularly relevant. Primarily, its excellent dimensional stability and tear strength make it an excellent choice for traditional crown and bridge but especially useful for implant cases. Compared to vinyl polysiloxane, the polyether material provides superior detail reproduction in the presence of moisture.[1] It is also the most precise with the direct impression technique.[2] Polyether can be poured up several times with the fit of a framework remaining the same on the first and subsequent model(s). Finally, there is no need to make a custom tray using the material since plastic stock trays work extremely well.

A critical and essential aspect of taking an impression with a polyether is its consistent rigidity, which is a significant benefit for its stability. Because of the rigidity, undercuts are always blocked with laboratory rope wax, thus facilitating the removal of the impression from the mouth without distortion. The material performs accurately and consistently, giving the lab technician the best possible reproduction of the teeth

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or implant position in the mouth.

ADDITIONAL TOOLS: ELECTRIC HANDPIECE AND MAGNIFICATION

In my experience, the use of an electric handpiece and visual magnification are also especially helpful in performing highly accurate direct and indirect procedures in dentistry. The use of an air-turbine handpiece has been the treatment norm for several decades, but the introduction of the electric handpiece represents a great leap forward in preparing teeth quickly, accurately and easily. I have used one (NSK Brasseler Electric Handpiece) for a little more than 8 years and have found it to be extremely reliable, durable, and precise. The advantages of an electric handpiece include: high torque, which easily cuts off old restorations and crowns (especially nonprecious alloys and zirconia restorations); the ability to accurately quantify the torque via a control box; and most importantly, the ability to finish margins at a high definition, leaving a smooth and polished surface.

Additionally, the use of visual magnification, either with loupes or with the use of a microscope, is a must if excellence is to be achieved. We clearly cannot treat what we do not see! I have used telescopic loupes (Designs for Vision) for more than 20 years and could not practice precise high-level dentistry without them. One major advantage of these particular loupes is that they are completely customized to the individual, not only from a health perspective of one's individual eye needs, but also from a working distance standpoint.

By maximizing the magnification that one desires to work with, the customized settings of the loupes allow work to be accomplished with the best possible posture and reduces/eliminates back problems. Protecting our eyes with lenses, while enabling us to see with higher magnification at the correct position the work to be performed in the mouth, is not an option today...from my perspective it is a must!

As outlined above, research and technological advances have helped make modern implant dentistry routine in treatment planning and clinical practice. The following case demonstrates the use of these tools in the restoration of implants with a fixed bridge.

CASE REPORT

Diagnosis and Treatment Planning

A 57-year-old female presented to the office with a 3-unit fixed bridge on her maxillary left quadrant. Both abutment teeth, Nos. 13 and 15, had been endodontically treated. The patient's anterior abutment (premolar) had a short root and the posterior abutment (molar) had a vertical fracture, rendering a hopeless prognosis for the molar and very poor long-term prognosis for the premolar (Figures 1 and 2). The patient's wish was to replace the missing teeth and prosthesis via a treatment that would provide the most stable long-term result.

It was determined that implants would provide the most stable treatment in this case, as opposed to placing a new, longer-span bridge. A new bridge would have required cutting down healthy adjacent teeth, and the patient understood that if anything happened to one abutment (eg, caries), the entire bridge would be compromised.

An interdisciplinary approach is essential to correct patients' existing problem(s) and to provide patients with the expected result. Therefore, from the diagnosis phase to the start of treatment, close communication with everyone involved on the treatment team is a must. In this case, several meetings took place among the oral surgeon, the dental laboratory technician, and me (the restorative dentist). There is very little leeway for laboratory technicians once the case is on their bench. If the dental technician is involved from the onset, extremely valuable recommendations can be incorporated in the treatment planning (such as the design of the prosthesis: cemented vs. screw retained, use of stock versus customized components, straight or angled abutments, titanium versus gold or zirconium oxide.)

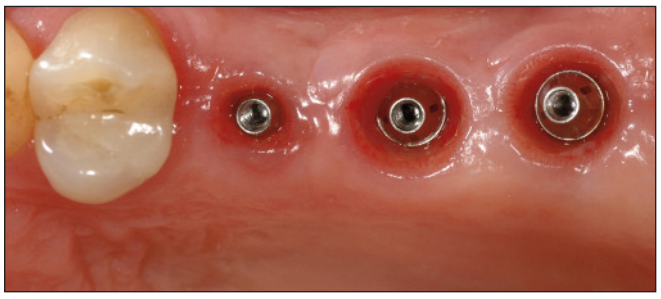

Figure 3. UniAbutments (Astra Tech Implants) in place on the implants.

Figure 4. Impression posts were placed for the open tray technique.

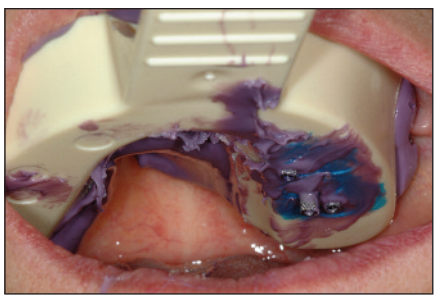

Figure 5. The tray was filled and inserted over the impression posts.

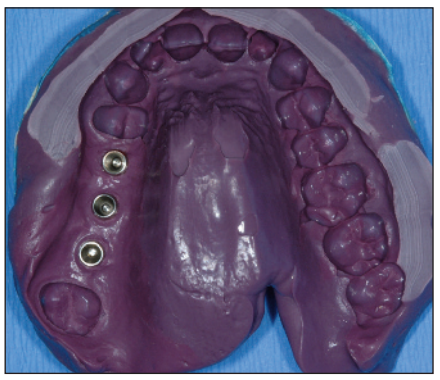

Figure 6. A full-arch impression (Impregum Penta Soft [3M ESPE]) helps the dental technician team create an accurate restoration that may reduce/eliminate the chance for occlusal adjustments.

Treatment Protocol

Teeth Nos. 13 and 15 were extracted, and the area was allowed to heal for 3 months. Then, Astra Tech implants were placed. These implants were selected due to their ability to consistently preserve bone and their excellent soft-tissue response, as well as their record of no clinically detectable micromovement between the implant and the abutments.

Following an additional 3-month healing phase, the patient returned to the office for impression-taking and evaluation of the implants. While the implants were properly integrated, it was determined to connect them for a bridge rather than restore the implants individually due to softer supporting bone around the implants. Different techniques are available to measure level of osseointegration of the implants, such as the use of a Periotest (Siemens) or the Osstell ISQ instrument, which provides a resonance frequency analysis to determine the clinical status of a dental implant. One of the major advantages of the Osstell ISQ Instrument is that the measuring results are not clinician dependent, which could, as with other systems, provide diverse results.

UniAbutments (Astra Tech Implants) were placed on the implants prior to taking the impression to eliminate the need to transfer abutments from the model to the mouth. This also eliminated any future need to disrupt the prosthetic connection at the implant level while helping preserve optimum soft tissue health (Figures 3 and 4). In cases like **(Author: this?)**, when the impression is taken on multiple implants, I use the open-tray technique for higher accuracy since there is no need to transfer the impression copings into the impression. To capture the impression, an automatic mixing unit (Pentamix 3 Automatic Mixing Unit) was used to mix the material. A medium body polyether impression material (Impregum Penta Soft [3M ESPE]) was syringed around the abutments and

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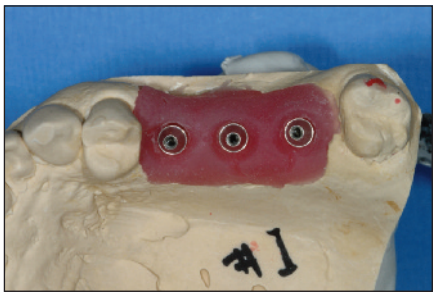

Figure 7. Occlusal view of stone model with soft-tissue reproduction.

Figure 8. Occlusal view of metal try-in procedure with only one screw on the middle implant to verify passive fit. (Notice that the metal has not been sectioned or soldered.)

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the tray was filled and inserted (Figure 5). The rigidity of the material makes it excellent for use in the tray, while its flowability also makes it good for use around the implant impression post. The tray was held in place for 8 minutes and then removed. To prevent distortion, the impression tray was removed by first loosening it on the opposite side from the implants (moved slowly with an up-and-down and side-to-side motion), with the area to be restored being removed last (Figure 6).

Figure 9. Buccal view of final prosthesis. (Laboratory work by Fujiki Toshi, RDT.)

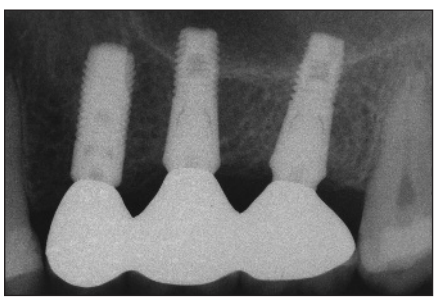

Figure 10. Radiograph showing excellent fit of the final prosthesis on 3 Astra implants. (Implants placed by Dr. Jeffrey Bressman.)

The dental laboratory team fabricated a metal framework for the try-in step (Figures 7 and 8). After verifying a passive fit during the try-in, the laboratory work proceeded with the creation of a fixed screw-retained bridge. The completed bridge was seated a month later, and the final result was a well-fitting and aesthetic restoration (Figures 9 and 10).

DISCUSSION AND CLOSING COMMENTS

A patient seeking treatment to replace a failing bridge expects long-term, stable results. Proper diagnosis and treatment planning as well as meticulous treatment and attention to detail enable us to provide patients with the expected results. While accuracy is important for any restoration, it is especially critical for implant procedures. It is also more difficult, given the osseointegration process. An accurate impression is vital in this procedure in order to ensure that the dental laboratory team has an accurate working model, thus enabling them to create a high quality final restoration or prosthesis and eliminating the possibility of a remake.

Many impression materials tout a fast set, but in implant cases this is not necessarily a virtue. Depending on the number of implant impression posts that must be captured, a faster setting material may not allow enough time to syringe material before the tray material begins to set. One technique that I have found useful to increase the working time for an impression is refrigerating (cooling) the impression material for a few minutes before taking the impression. This is effective at increasing the working time, but does not change the catalyst to base ratio of the material and does not compromise its accuracy.

The polyether impression material used in this case was stable and accurate enough to allow the dental technician to pour the model multiple times, enabling an accurate fit for restorative work; either for natural teeth, or for an implant-supported crown or prosthesis. This can significantly reduce adjustments at the delivery stage, saving time and ensuring a more satisfactory experience for the patient.

References

1. Walker MP, Petrie CS, Haj-Ali R, et al. Moisture effect on polyether and polyvinylsiloxane dimensional accuracy and detail reproduction. *J Prosthodont.* 2005;14:158-163.
2. Bambini F, Ginetti L, Memè L, et al: Comparative analysis of direct and indirect impression techniques. An in vitro study. *Minerva Stomatol.* 2005;54:395-402.

Dr. Rubinstein is a founder and partner at the Oral Rehabilitation Center in Skokie, Ill. He received his dental degree in 1980 from the Universidad Tecnológica de Mexico. From 1980 to 1982, he completed his specialty training in periodontal prosthesis at the University of Illinois at Chicago, where he was an assistant professor until 1992. He is past president of the Chicago Academy of Dental Research and the inventor of a custom abutment to prosthetically correct misaligned implants. He is a consultant to several companies regarding adhesive dentistry and implant prosthodontics and has lectured internationally, giving hands-on courses in adhesive dentistry. He has also published several articles in *Adhesive Dentistry and Implant-Prosthodontics*. He is a lecturer at DentalXP and is the author of 2 book chapters in *Implant Prosthodontics and Treatment Planning*. He can be reached via e-mail at the address oralrehab1@gmail.com.

Disclosure: Dr. Rubinstein is a speaker for Astra and has not received an honorarium for writing this article.

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