Improving interocclusal records for crowns and fixed prostheses

Fixed prosthodontics is one of the major components of clinical activity for U.S. dentists. It has been estimated that in 2010, about 36 million units of fixed prostheses were placed in the United States (R. Braswell, coexecutive director, National Association of Dental Laboratories, oral communication, Jan. 7, 2011). Assuming that there are about 140,000 active general dentists and prosthodontists in the United States,¹ that means that the average general dentist or prosthodontist placed about 257 units during the year, or about 21 units per month. Multiplying this number by the average revenue produced for a crown in the United States (about $900)² indicates that gross revenue from crowns was about $231,000 per dentist for the year. That number is about 30 percent of the average overall annual gross revenue of the approximately $780,000 reported for a general dentist by the American Dental Association (ADA).³

In other words, it obviously is important that dental students, and subsequently dentists, are competent in fixed prosthodontics. However, there are questions about whether this has been achieved. I routinely hear reports from dental laboratory technicians about challenges with the tooth preparations, impressions and interocclusal records they receive from their dentist clients. In my opinion, all three of those topics need immediate and in-depth attention from instructors in dental schools and dental continuing education settings.

In this article, I will discuss one of those topics: methods by which dentists can make more adequate interocclusal records that are based on scientific evidence, on my observations of crowns and fixed prostheses that have been accomplished in laboratories in this country, and on opinions held by me and by the laboratory technicians at CR Foundation in the course of nearly 50 years.

The Challenge with Interocclusal Records

It has been my observation in hands-on courses and in clinical study clubs that many fixed prostheses, as they come to dentists from laboratories, require occlusal adjustment before cementation. In other words, they are “too high.” The negative clinical results of roughening the occlusal surfaces of ceramic restorations are well known to dentists. The surfaces become rough and dull visually unless finished and polished to a substantial degree. It is my observation that typical practitioners do not re-fire restorations they have altered before cementation and that few finish and polish them thoroughly. This usually is due to a lack of laboratory facilities in their private offices, as well as to the time and cost involved in refiring or finishing and polishing the ceramic.

Another challenge arises when multiple units are cemented at one time. Occlusal adjustment almost always is necessary in the mouth after cementation, or at a later time after occlusion has...
matured. Clinical dentists know well that most of the various ceramics used today cause wear on opposing teeth or restorations’ occlusal surfaces, and the result of long-term ceramic degeneration caused by removing the superficial ceramic from a restoration’s occlusal surface varies across brand names and types of ceramics.

It is clear to clinicians that it would be well to receive fully fired and glazed ceramic restorations from their laboratories and cement them without needing to adjust the ceramic surfaces. How can dentists and technicians make more adequate interocclusal records to reduce or eliminate these problems?

HOW TO MAKE BETTER INTEROCCLUSAL RECORDS

The majority of the nearly 1 million units of crowns and fixed prostheses Glidewell Laboratories produces per year are single units (J. Shuck, vice president of sales and marketing, Glidewell Laboratories, Newport Beach, Calif., oral communication, Jan. 5, 2011). Techniques for such relatively simple situations need to be made even simpler and more predictable.

Double-arch impressions. Most dental schools teach students to take full-arch impressions of both maxillary and mandibular arches for single crowns. However, in my polling of thousands of dentists in continuing education courses, I have found that almost all dentists abandon the full-arch concept immediately on graduation. This is due to the full-arch impression’s lack of financial feasibility, increased time involvement and frank reduction in accuracy when compared with simple double-arch impressions made of the side of the mouth being treated.

I strongly suggest that dental students should be taught not only the procedures for making full-arch impressions and mounted casts for single crowns, but also the optimal procedures for making double-arch impressions. There is no doubt that double-arch impressions not only are as good as but may be better than full-arch casts for single units.4-11 I apologize for inciting the wrath of many of the idealists reading this column; however, when we can’t stop a flood, let’s at least control it and make it better. Almost all restorative dentists make double-arch impressions—and they can be excellent, as shown in research.4-11

Procedure. The procedure for making an optimum double-arch impression is as follows:

- Carefully analyze the occlusion for prematurities.
- Eliminate any obvious prematurities that cause deviation in the slide from centric relation to maximum intercuspalation, leaving the slide from centric relation to maximum intercuspalation smooth, straightforward and intact.
- Make the double-arch impression in mandibular position. The double-arch impression is made in maximum intercuspalation, which is one reason why the interocclusal relationship usually is quite accurate. On mandibular closure, saliva and debris are forced from the occlusal surfaces, which is not the case in a full-arch impression. Such interdigitation of the arches during the impression leaves the occlusal table relatively clear of inaccuracies potentially caused by debris, air bubbles or saliva remaining on the tooth surfaces.
- Use a double-arch tray. Double-arch trays should have very thin, non-water-absorbing interocclusal wafers, as well as a wide facial-lingual dimension between the supporting sides. The teeth, palate or bony tori can cause narrow supporting sides to deviate. The tray should extend from the most distal tooth to include at least the canine on the side of the arch being treated. The tray should have minimal and non-intrusive supporting sides, with an extremely thin connector on the most distal end of the tray to allow for accurate closure into maximum intercuspalation.
- Observe for proper mandibular closure. The clinician should observe the closure pattern of the jaw before making the impression, ensuring that he or she knows the patient’s exact closure pattern and visually recording the contact of the canines on the opposite side of the arch.
- Choose the appropriate type and viscosity of impression material. I prefer medium-viscosity material syringed around the tooth preparation(s) and heavy-bodied material in the tray to ensure the stability of the set impression.
- Ensure proper mandibular closure. Guide the patient into maximum intercuspalation position and observe the contact of the teeth on the opposite side of the arch for accuracy. I prefer, after warning the patient, to deliver a gentle tap on the external inferior aspect of the mandible to ensure that the patient has closed completely into the desired position.
- Pour casts. As a former laboratory technician and a long-time prosthodontist, I prefer to pour the prepared side of the impression first, allow it to set, lubricate the die areas and then pour the opposing side and mount the casts to a small-hinged articulator.

Accuracy. A single unit or as many as two units fabricated properly with this technique seldom need any adjustment at the seating appointment.

Full-arch impressions.
There are situations in which double-arch impressions are not indicated, in my opinion. Among them are the following:

- Patients who have worn away the canine rise and incisal guidance of their teeth by means of bruxing often have no stable maximum intercuspal position. In such cases, full-arch impressions are indicated, and full-arch casts should be mounted in centric relation for optimum predictability. In my experience, some occlusal adjustment almost always is needed on seating such restorations.

- With a few exceptions, when more than two teeth are prepared or missing, occlusal stability in maximum interdigitation is difficult to obtain. (When almost all of the teeth are present, it is relatively easy to retain occlusal stability, even if one or two teeth are prepared.) In such cases, full-arch impressions and casts are more stable and preferable.

- A patient with many missing teeth, or an unstable occlusion caused by mobile teeth or any other apparently unpredictable occlusal situation, is better treated with full-arch impressions and full-arch casts.

**Intercuspal records for full-arch casts.** Most dentists have been taught to use various material between the two arches to register the proper interdigitation of the arches in centric relation. Most often, clinicians use heavy-bodied vinyl polysiloxane or some form of wax to accomplish this. Subsequently, the clinician places this full-arch intercuspal record between the maxillary and mandibular casts and mounts the casts on an articulator. When many teeth have been prepared or are missing, this is one of the only ways in which to mount the casts. However, the use of this technique in cases in which only a few teeth (three or four) have been prepared or are missing has aroused controversy. Many schools teach the use of an intercuspal wafer that fits all around the arch, whereas others have supported a piecemeal intercuspal record that is placed only where the teeth have been prepared or are missing. 12,22

I prefer piecemeal intercuspal records for full-arch casts when only three or four teeth are involved. My preferred technique for a three-unit fixed prosthesis is as follows:

- Observe the occlusion carefully for prematurities.
- Eliminate any obvious prematurities that cause the slide from centric relation to maximum incuspatation to deviate. When making a three-unit fixed prosthesis for a person who has a normal, stable occlusion without any visible pathosis, I prefer to leave the centric relation-maximum intercuspatation slide present and construct the prosthesis to fit into the long-established healthy occlusion with the slight shift remaining.
- Decide on the mounting position. Do you prefer to mount the casts in centric relation or in maximum interdigitation? For simple three-unit situations, I prefer to mount the casts in maximum interdigitation because it is a stable, easily identified, reproducible and comfortable position. When the fixed prosthesis is returned from the laboratory and before cementation, adjust any retrusive prematurities from centric relation to maximum interdigitation.
- After tooth preparation is complete and impressions are taken, ask the patient to close the mouth into maximum interdigitation and observe tooth contacts all around the mouth.
- Make the piecemeal intercuspal record. Place the medium of your choice on only the areas that have been prepared and have the patient close into maximum interdigitation. I prefer rigid vinyl polysiloxane, which is made especially for intercuspal records. Let the material set, trim it and send it to the laboratory to be used for mounting the casts. In cases in which it is needed (such as a long-centric or wide-centric occlusion), right and left lateral check bites can allow semiajustable setting of condylar inclination and Bennett movements.

**Accuracy of the piecemeal intercuspal record technique for three or four units.** Accomplished correctly, in my experience, this procedure will produce optimum occlusion with minimal or no adjustment of the fixed prosthesis. However, there are potential challenges with this technique. Among them are the following:

- If the patient exerts too much occlusal force on the intercuspal record material and the tooth preparations for the prosthesis have removed posterior stops for the occlusion on that side of the arch, there is a possibility, albeit small, that the mandible will overclose. The resultant prosthesis will be “too low.”
- Positive stone bubbles on the casts may not allow the casts to come together properly. A too-high prosthesis will result.
- Using high-expansion mounting plaster or stone may open the occlusion and cause discrepancies in mounting the casts, thus making the prosthesis too high.
- The clinician should trim the intercuspal record so that it touches only the occlusal surfaces of the involved prepared teeth. Any record material extending onto soft-tissue areas will not allow optimum accuracy, usually relating to a prosthesis that is too high.
Clinical Courses, and a cofounder and senior consultant almost every time. Any lack of stone-to-stone contact between the maxillary and mandibular casts of the unprepared teeth will result in a prosthesis that is too high.

**SUMMARY**

There is no question that most dentists often must deal with crowns or simple three- or four-unit fixed prostheses that require occlusal adjustment on the seating appointment. Proper impressions and mounting of casts can reduce or eliminate that challenge. Optimum use of properly designed double-arch trays and well-made double-arch impressions can result in highly accurate interocclusal relationships for simple one- or two-unit cases. Casts for three, four or more units can be mounted in many ways. I have described a piecemeal interocclusal record technique for these simple cases that, when accomplished properly, allows optimum occlusion almost every time.

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The views expressed are those of the author and do not necessarily reflect the opinions or official policies of the American Dental Association.