Digital dental impression devices have been introduced to the profession, potentially eliminating the need for taking conventional impressions for crowns and fixed prostheses. I have discussed this concept in previous columns in this journal. However, additional changes to the concept are emerging, creating confusion among dentists and causing them to wonder whether there is a need to change their impression techniques. The many questions I hear about this topic from dentists attending continuing education courses can be distilled into the following four.

- “Should I continue to make impressions in the conventional manner using conventional materials?” Both scientific evidence and clinical observation have shown that currently available impression materials—vinyl polysiloxane, polyether, the newer material vinylsiloxanether and the older reversible hydrocolloid—provide excellent reproduction of tooth preparations.

- “Should I purchase a device that makes digital impressions?” With a digital impression device, the clinician creates the impression digitally and sends the data to a laboratory capable of working with this technology; the laboratory then creates the restorations and sends them to the dentist for placement. Two popular digital impression devices now competing on the market are the iTero (Cadent, Carlstadt, N.J.) and the Lava Chairside Oral Scanner C.O.S. (3M ESPE, St. Paul, Minn.). Both of these devices limit the dentist to the use of laboratories that have, and are trained to use, the laboratory devices associated with the respective impression devices. These devices and this technical concept are proving themselves to be viable alternatives to conventional impression making.

- “Should I purchase a device that makes digital impressions and also provides the ability to mill some types of restorations in the clinical office?” The two competing devices are CEREC (Sirona Dental Systems GmbH, Bensheim, Germany) and the E4D Dentist System (D4D Technologies, Richardson, Texas). The ability of computer-aided design/computer-aided manufacturing (CAD/CAM) devices to produce clinically acceptable restorations has been reported many times in the dental literature. Other companies soon

**Impressions are changing**

Deciding on conventional, digital or digital plus in-office milling

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will enter the market and be competitive with the CEREC and E4D milling devices.

“Should I purchase a device that enables me to make digital impressions now and upgrade to in-office milling later if I like?” At this point, only the entry-level CEREC and E4D devices offer the initial ability to make digital impressions only and an option to upgrade to in-office milling down the road. However, it is rumored that other companies will provide this option in the future.

Although research reports and clinical comparisons continue to come forth regarding the acceptability of the above concepts and devices, in my opinion and clinical experience, the accuracy of properly accomplished impressions—whether conventional or digital—is no longer a question with any of the concepts.

There are other questions dentists should ask about these four choices:

■ “Are there major advantages to making digital impressions instead of conventional impressions?”

■ “Should I purchase a digital impression device at this point in the concept’s development, and will digital impressions dominate impression making in the future?”

■ “Would a device that makes digital impressions and also mills restorations in the dental office fit into my practice?”

■ “Am I sure I want to invest this amount of money in a device that still is being developed and refined?”

I will discuss these questions on the basis of both scientific research and clinical observation, and I will make suggestions for clinicians who are considering changing to the use of digital impression techniques and to the in-office milling of restorations. The predictions included below are opinions based on my significant experience with all of the devices and concepts discussed and on my global contacts with practicing dentists in continuing education courses.

**USING CONVENTIONAL IMPRESSION TECHNIQUES**

Most dentists are comfortable with conventional impression materials and techniques as used for crowns and fixed prostheses. It is difficult for anyone to change from a successful and relatively moderate-cost technique to an unknown and expensive one. As I noted previously, current impression materials are excellent. I often have identified elastomer impression materials as among the most adequate of all dental materials in fulfilling their intended purpose. However, digital impressions have advantages, as described in the next section. Dentists must consider whether the advantages of the digital impression technique outweigh their familiarity with conventional impression procedures and their clinical success with conventional impression techniques. There appears to be no urgency to change from the use of conventional impressions unless practitioners are impressed with the positive characteristics of digital impressions outlined below. I predict that digital impression techniques will grow in use gradually and, eventually (many years from now), will dominate the impression procedures for inlays, onlays, crowns and fixed prostheses.

**PURCHASING A DEVICE THAT MAKES DIGITAL IMPRESSIONS ONLY**

In my opinion, many dentists do not enjoy or have interest in the laboratory aspects of dentistry. These dentists are satisfied to make tooth preparations and impressions, send the impressions to a competent laboratory technician and seat the restorations a few days later. If you are positive that you do not want to be involved with any of the steps in the milling procedure, and you have made the decision to make digital impressions, you may purchase any of the four devices described in this column at roughly similar prices to make digital impressions only. The approximate price of a digital impression device ranges from $25,000 to $30,000 (J. Denney, western regional sales manager, Cadent, oral communication, Aug. 27, 2009; E. Neuenfeldt, professional relations manager, 3M ESPE, written communication, Aug. 27, 2009).

**Why change from conventional impressions to digital impressions?** Digital impressions have several desirable characteristics:

■ The mess that occurs when making conventional impressions is eliminated. Dental assistants are pleased with the resultant elimination of mixing and cleanup.

■ Patients prefer the simplified digital impression concept, and they express relief at not having to endure the uncomfortable experience of having a conventional impression made in the mouth.

■ Shipping the impression to the laboratory is merely a digital transfer via one of many methods such as e-mail, disk or
Because there is no actual, tangible impression, there is no need for disinfection or threat of disease transfer from the patient to the technician. The tasks of pouring the impression, making the base and trimming the dies are eliminated.

Assuming that the digital impression and the digital interocclusal record have been obtained accurately, the need to articulate the casts also is eliminated.

Are these advantages important enough to convince you to make the change to digital impressions? Additionally, are you sure you want to send the digital impression to a laboratory and not mill the restoration in your own office?

Some dentists do not know whether they want the responsibility of in-office milling with the attendant potential need to modify restorations and to stain and glaze them before they are ready to be seated. If you are one of those dentists, perhaps you should enroll in a CEREC course, an E4D course or both to help you make the decision.

If you still are undecided after taking such a course, you may elect to purchase the entry-level CEREC or E4D device, with the potential to upgrade if you decide to add in-office milling in the future.

PURCHASING A DEVICE THAT MAKES DIGITAL IMPRESSIONS AND MILLS RESTORATIONS

There are now about 25,000 CEREC users worldwide (Michael Dunn, director of CAD/CAM Marketing, CEREC, oral communication, Aug. 13, 2009) and, although the E4D was released on the market only recently, there are a growing number of dentists using that device as well. There is minimal independent research comparing the two devices; however, a recent comparative project conducted by the staff of Clinicians Report showed that both devices were similarly capable of producing acceptable milled restorations.28

Advantages of in-office milling of restorations. Dentists can gain from milling restorations in their offices in several ways:

Restorations can be placed in one appointment, an aspect many patients regard as a significant advantage.

The patient receives fewer anesthetic injections because there is no second appointment.

Practitioners report that the in-office milling concept encourages the use of conservative tooth preparations such as onlays, three-quarter crowns and conservative full crowns.

In-office milling eliminates the need for provisional restorations, with their accompanying negative characteristics.

The clinician controls the entire procedure; the process involves no laboratory component.

Several steps in the procedure—including imaging, milling and initial fitting of the restoration—can be delegated to qualified staff members while the dentist treats other patients.

According to experienced users, the in-office milling concept can be financially acceptable and even can produce significant income.

Disadvantages of in-office milling of restorations. Not every aspect of in-office restoration milling is positive.

The equipment requires an initial investment of about $120,000. Various financial plans and potential add-ons (at additional cost) exist.

Learning to use the device and fit it into the office routine requires time and effort.

To become and remain proficient in using the software and hardware, the clinician and staff members must use the devices frequently.

After assisting many dentists in learning about and using in-office milling, I conclude that it is a viable concept for some, but not all, dentists. I advise interested dentists to enroll in courses on in-office milling of restorations before making a decision about purchase of either of the two devices.

SUMMARY

Some dentists face the dilemma of wanting to keep up with the technological advances in the profession while feeling unsure about embracing the digital impression technique and the related in-office milling of restorations. This column provides, on the basis of scientific evidence and clinical observation, a candid appraisal of the several impression options available to dentists: conventional impressions, digital impressions and digital impressions accompanied by the ability to mill restorations in-office.

After considering all options, dentists must make the decision themselves concerning whether or not these concepts fit well into their practices at this time. All of the devices and techniques I have described here, including conventional impressions, are producing clinically acceptable restorations, but the digital option also can provide signifi-
cant advantages for both dentists and patients.

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