

# CAD/CAM dentistry and the laboratory technician: partners in success

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The concept of digital dentistry is one that started out small and has progressively increased in momentum until its boundaries appear to have become endless. New technologies in dentistry will only be successful if they are combined with a complete understanding of basic comprehensive dentistry. While new technology and computerization can make procedures more efficient, less labor intensive and more consistent, it will not replace education, practical experience and clinical/technical judgment.

The most exciting factor surrounding these technologies is not, however, only in the potential applications of the technology that are being hypothesized by dental professionals. The excitement truly lies in the fact that these “hypothetical” applications are currently being developed today, and some are even in the final stages.

In a relatively short time period, digital technology will revolutionize the quality of dental care that is being delivered in modern practice. Implants are now well documented for fulfilling the functional requirements in prosthetic tooth replacement. These new technologies, along with the evolution of surgical and prosthetic techniques, allow the dental team predictable, consistent results in implant rehabilitation. MicroDental is involved as a beta test area for many of these emerging technologies.

As dentistry evolves into the digital world, the successful incorporation of computerization and new technology will continue to provide more efficient methods of communication and fabrication, while at the same time retaining the individual creativity and artistry of the skilled dentist and dental technician. The utilization of new technology will be enhanced by a close cooperation and

working relationship of the dentist/technician team.

The evolution from hand waxing to “digital waxing” using the diagnostic wax-up and provisional restorations, as well as their digital replicas to guide us in the creation of CAD/CAM restorations, will be presented. The utilization of these new technologies, along with the evolution from “hand” design to “digital” design—with the addition of the latest developments in intra-oral laser scanning, materials and computer milling/printing technology—will only enhance the close cooperation and working relationship of the dentist/dental laboratory team (Fig. 1).

The dental laboratory’s primary role in restorative dentistry is to perfectly copy all of the functional and aesthetic parameters that have been defined by the dentist into a restorative solution. Throughout the entire restorative process, from the initial patient consultation, diagnosis and treatment planning to final restoration placement, the communication routes between the dentist and the laboratory technician



**Figure 1.**

*Photos courtesy of Lee Culp, CDT/CTO.*

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Figure 2.

require a complete transfer of information.

Functional components, occlusal parameters, phonetics and aesthetic requirements are just some of the essential types of information that are necessary for the technician to complete the fabrication of successful, functional and aesthetic restorations.

Today, as in the past, the communication tools between the dentist and the technician are photography, written documentation and impressions of the patient's existing dentition. The clinical models from these impressions are created and mounted on an articulator that simulates the jaw movements of the mandible (Fig. 2).

### The digital laboratory

As restorative dentistry evolves into the digital world of image capture, computer design and the creation of dental restorations through robotics, the dental laboratory must evolve as well. To fully understand this concept, a laboratory must be clearly defined.

At first thought, it may seem that a laboratory is the place where a dentist sends his or her patient's impressions to (Fig. 3) be processed into restorations, which are sent back to the dentist for adjustment and delivery. This definition fits well with the traditional concept of a laboratory/dentist workflow.

However, just as the Internet has forever changed the landscape of communication through related computer technology, the possibility to use CAD/CAM restoration files electronically has provided the catalyst for a significant change in the way we view and structure the dentist/laboratory relationship.

Imagine that the laboratory is not a physical place, but exists only in (Fig. 4) the talents of those performing the restorative process: the dentist and the technician. The

equipment used to create the restoration may be located centrally, remotely or both. The laboratory is essentially a workflow, which is as flexible as the abilities of the dentist, the technician and the equipment will allow.

The primary decision becomes where the hand-off from one partner to another should occur. The dentist, who has the ability to optically scan teeth for impression making and chooses CAD/CAM restorations as the best treatment option for his or her patients, has enhanced freedom as to where the hand-off to the technician should occur. As a result, the laboratory is no longer a place, it is rather to a great degree, virtual.

### Communication is key

The ability to facilitate communication between the dentist and the lab is of utmost importance and what makes the E4D system stand out. Tools such as the E4D Sky network enable E4D clinical operators to communicate and facilitate the transfer of data to technicians whenever laboratory involvement is required. With just a click, the entire case (whether scanned or completely designed) can be sent from chairside to the laboratory for fulfilment of the online prescription (Fig. 4).



Figure 3.



Figure 4.

### The digital process

The new millennium has brought with it a change in digital dentistry as more than 20 different CAD/CAM systems have now been introduced as solutions for restorative dentistry. The introduction of digital laboratory laser scanning technology along with its accompanying software allowed the dental laboratory to create a digital dental environment to accurately present a real 3-D virtual model that automatically takes into consideration the occlusal effect of the opposing and adjacent dentition.

As well as the ability to design 16 individual full contour, anatomically correct teeth at the same time (Fig. 5). It essentially takes a complex occlusal scheme and its parameters and condenses the information, displays it in an intuitive format that allows dental professionals with basic knowledge of dental anatomy and occlusion to make modifications to the design, and then sends it through to the automated milling unit.

For the dental lab profession, the introduction of digital technology effectively automated or even eliminated some of the more mechanical and labor-intensive procedures (waxing, investing, burnout, casting, and/or pressing) involved in the conventional fabrication of a dental restoration, allowing the dentist and technician the ability to create functional dental restorations with a consistent, precise method.

### Linear versus vertical manufacturing

The successful laboratory of the future will need to focus not just on the quality of the end product, but also more



Figure 5.

efficient production methods to reduce turnaround time within the laboratory process. Digital technology will allow the laboratory production to become vertical rather than linear.

The current laboratory fabrication process follows a very linear progression: model fabrication, day one; waxing, day two; finishing, day three; ceramics, day four, etc. Average production time for an all-ceramic or porcelain-fused-to-metal restoration is approximately five to seven working days based on this fabrication method.

In the digital laboratory, impressions will still be received from the client. Instead of taking days or weeks to go through several processes, we will be able to accomplish the same process in two to three days.

Once the impression is received at the laboratory, the impression can be scanned and data sent to several digital production stations at the same time. This will potentially allow the model, the restorations (both framework and waxup) and the final ceramic restoration to be completed at the same time.

### Digital diagnostic and treatment planning

The basis for all long-term success in restorative dentistry is a comprehensive diagnosis and treatment plan. The ability to preview a case from start to finish, communicate and co-diagnose with other specialists and specialties about dental patients via the virtual world is the true power and capability of digital dentistry

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