EDITORIAL

The Changing Faces of Laboratory Technology

It seems reasonable to say that anyone who has attended an implant dentistry meeting within the last few years has been exposed to a discussion of the changing face of dental laboratory technology. Presentations describe the use of new materials and techniques, and have introduced technologies that have fundamentally changed the way laboratory procedures are accomplished.

It has been an interesting time because there are rather contradictory approaches in play. One approach has been to embrace digital technology that allows the use of tooth libraries to establish the form of the dental prosthesis. Conversely, others have presented the traditional approach of a custom design for each prosthesis. The digital approach promises to use data regarding tooth form that will create consistently attractive restorations, while custom designs will continue to be used to provide artistic interpretations of beauty. The recognition that there are two distinctly different approaches to the creation of laboratory-fabricated prostheses further illustrates the differences within the industry.

Historically, dental laboratory procedures were performed by dentists during the course of treatment. Many dentists would pour casts, arrange denture teeth, process dentures, fabricate gold crowns, and perform other laboratory procedures required in their practices. As time passed and laboratory demands increased, there was an outsourcing of laboratory procedures to freestanding laboratory facilities. As the industry grew, there was a proportionate increase in the need for formal educational training. Training programs were created and with these educational programs came a growth in the number of certified laboratory technicians. Over time, however, the number of training programs for dental technology peaked and is now in decline. Today, the number of formal certified dental technology programs is no longer sufficient to replenish the number of retiring technicians. In essence, the laboratory industry, as it has developed, is no longer sustainable.

The simple fact that fewer technicians enter the workplace each year than the number of technicians who leave the industry has established a need for creation of technicians outside the realm of traditional training. Therefore, we are seeing the ongoing evolution of digital laboratory technology. Today a tooth preparation or an implant component may be digitized at the impression stage. The digital impression is used to create a virtual model of the dentition and/or arrangement of implants. This model may be manipulated in the virtual world to fabricate a restoration that mimics nature with little or no contact from human hands. In this situation, a small number of computer-savvy technicians may produce prostheses for a large number of clinicians.

The digital evolution should segue well into implant dental procedures. In contrast to traditional tooth preparation, for which no two preparations are exactly alike, implant components are as identical as machining technology will allow. Therefore, the original goal of digital impressions, the nearly exact duplication of a surface through a digital impression, has been replaced by techniques that mimic the orientation of components in space. Transfer components must fit precisely to the implants and allow orientation of the specific geometric configurations that are unique to a given implant. It is surprising that the earliest iterations of digital impressions took the misguided path towards duplication of tooth preparations rather than mimicry of implant components. One wonders how the field would have developed had the latter been developed first.

This question is no longer germane, as implant component impressions are now virtually ubiquitous. Impressions are now designed to record relative positions of components and teeth. By using this technology, the computer designer is able to "program" the proximity of interproximal and occlusal contacts. It is interesting to note that when the proposal was made that an implant crown be 100 µm out of occlusion, it was obvious that such a planned discrepancy was a poetic description of a need for implant-supported restorations to be "lighter" in occlusion than the natural dentition, rather than being made to establish the actual measurement. Today such a differential is indeed possible, as digital technology allows restorations to be fabricated with this level of precision. Perhaps this is one of the reasons that digital technology is making rapid inroads into the modern dental laboratory.

Simultaneously, the dental material industry has been involved in the introduction of new generations of ceramics that demonstrate vast improvements in material properties. The traditional compromise in strength that accompanied our most esthetic restorations appears to no longer be necessary. New materials are stronger and more beautiful than ever before. In the hands of the right technician, these new materials are helping to usher dentistry to previously unrecognizable levels of clinical success.

In most instances, these new advances are being developed with techniques that more closely mimic traditional techniques. Hence, the dichotomy persists, with digital computerized technology being used to create facsimiles to tooth forms described in textbooks, while the digits of human hands simulate the beauty found in nature through artistic rendering of natural tooth forms. Perhaps the most beautiful revelation will occur when digital meets digits, a future that stands just before us.

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