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Simple, Predictable, and Versatile Premium Digital Denture Creation: A Fresh Look at Automation in Denture Making

By Gene Peterson, CDT

"Today's" Digital Denture

"Everything is going digital" seems to be the quote of the decade. Digital technologies in dentistry have come to be known for their streamlined workflows, accuracy, efficiencies, and their sense of automation in the overall process. The goal of technology is to continue improving to make things faster, easier, and cheaper, which results in natural automation. More important, the timeline of improvement is faster than most can keep up. Digital denture technology is no different and while there is not yet a magic wand amongst the various systems available to create a digital denture without human input, a certain level of automation in digital dentures can now be realized through a system's simplicity, versatility, and predictability. The advent and development of digital dentures over the last 10 years have revolutionized the way technicians, clinicians, and patients view and approach the subject of complete dentures. The fact is it is still evolving rapidly. What started out as teeth being bonded into precise positions in a milled base has evolved into more sophisticated attempts to create quality final prostheses; some being much better than others. The same holds true with the software used to design digital dentures. Design software has increasingly advanced via open source or proprietary digital design packages, each requiring varying levels of expertise to master. Even the equipment used to create a digital denture including scanners, milling machines, and 3D printers

and accompanying materials are improving faster than customers can realize a true ROI on their investment. Finally, the "digital denture workflow" is becoming codified as more and more systems are learning to take advantage of the common benefits of embracing digital. So, what's the next evolution? What separates all the players? It comes down to a straightforward question: What do technicians and clinicians want and expect in a digital denture system? The answers are clear. Whether laboratory technician or clinician, if you are going into the digital world fresh, you want a system that is simple, straightforward and user friendly as well as a system that is versatile and allows you to easily bridge the gap from conventional to digital. Equally important, you must have predictability and a quality digital prosthesis that adds value to your reputation and provides the best product and care for the patient and/or customer. Most important, you want a system that can help reach your digital goals in an affordable manner.

Keeping it Simple AND Complete

Digital systems and workflows in dentistry have become quite sophisticated, attempting to automate as much as possible in the process. The problem is that some of the systems have become quite difficult to master, especially for those who may not be accustomed to digital. The key is to keep it simple and logical, yet still complete. A digital denture system does not need to solve all the problems

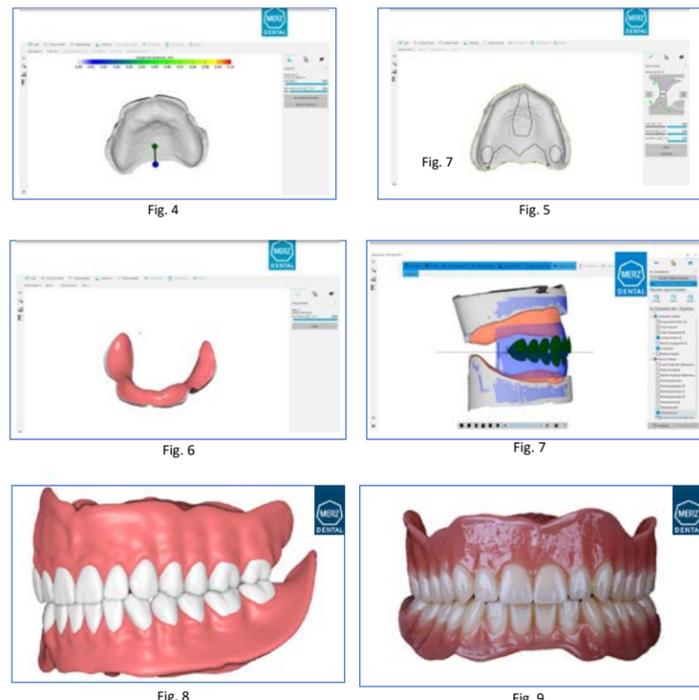
that a technician or clinician face with endless features. They do need, however, to provide enough options to provide a clinically appropriate outcome, hopefully with a short learning curve. As digital denture designers, we want to be able to assimilate what we already know and trust into the use of new digital tools. Digital denture systems available today offer proprietary software as well as open source or commonly used programs, and this is good if they meet the objective. An example of a proprietary and open digital denture design software is BDCreator® PLUS, part of the Baltic Denture System® (BDS) from Merz Dental. This example demonstrates certain key features you would want in a simple and complete digital denture design system. A user-friendly feature is the “Design Wizard,” where the designer is easily and logically guided through well laid out, concise work steps to ensure that each digital design results in a clinically correct proposal ready for manufacture. This type of intuitive prompting is also available in other digital denture design systems. Beginning with scanning (Fig. 1) and data import, .STL record files of the final impressions and interocclusal records are registered and prepared in the background by the software and readied for design. Some systems require these steps be done outside the software which may require further training (Fig. 2).



An esthetic reference is extremely useful and should be visible for key steps in the identification of clinical landmark and tooth setting. Model analysis is an excellent and useful feature that allows the designer to identify the force bearing areas of the ridges and establish stable alignment between of the arches (Fig. 3).



An automated way to identify the correct clinical path of insertion and block out undercut areas is even more critical in digital dentures due to the accurate fit of the intaglio surfaces of the based to the tissue (Fig. 4). Borders defined by the software and control needs to be given to the designer to define the denture’s peripheral borders as clinically required including the ability to reproduce the contours of a fully border molded impression if required (Fig. 5). Automated base creation ensures minimum thickness and anatomical coverage requirements (Fig. 6). There are a variety of



approaches to setting the teeth amongst the available digital denture design systems. Advanced systems can use model analysis data and previously placed landmarks and esthetics data to automatically create clinically acceptable proposals. It is common that a variety of digital tools are required to make changes to the setup if necessary. A most desirable feature is that the teeth be fully integrated, one with another, thus maximizing the efficiency of the overall setup process by avoiding single tooth changes; this could take forever (Fig. 7). More advanced systems automatically generate a fully contoured and esthetic base ready for export and milling and best of all, will require minimal finishing time (Figs. 8-9). When evaluating a digital denture design program, carefully consider the level of automation that comes in the software. Does it offer simplicity, ease of use, and a quick learning curve? You want a software that will “pull you through.” Such a system should allow you to complete the entire design process in about 10 minutes, which brings a new level of efficiency and productivity to your denture department.

Confident Predictability

Certainly, a common major factor in the hesitancy to adopt a new digital technology, especially digital dentures, is the concern of doing something new for fear it does not fit within our comfort zone. Denture technicians and clinicians are creatures of habit when it comes to dentures. We want things to be predictable; we know what works. Whatever system you eventually adopt, you want to make sure it provides a sense of automation through confidence that the final product will meet and exceed your and your customer’s expectations. Fundamentally, digital dentures are dependent on seven critical components to ensure success. First and foremost, accurate centric records and final impressions are required. Equally critical are six clinical (chairside) esthetic elements accurately identified by the clinician. These include the second through seventh components: midline, incisal edge,

lip support, tooth size, gingival height, and horizontal plane of occlusion. This can be provided in whichever choice of record you choose, so long as it is correct. Two-appointment digital dentures are entirely achievable if this information is correct, and successful delivery becomes predictable and most likely assured.

A mandatory requirement of predictability is the quality of the final prosthesis. With several milled and 3D printed options available to manufacture a digital denture, the material’s overall esthetics and material properties are paramount. Prices of finished dentures in general run the spectrum from less sophisticated methods to high-quality processing techniques, materials, and customization. This is also true with digital dentures. There is a wide array of materials and techniques being used and developed which are improving daily. Pricing for these digital systems varies greatly as does the overall quality and esthetics. Many who have the high standard of providing premium final dentures have made premium investments with the hope of providing the same level of satisfaction in a premium digital denture.

Unfortunately, due to the ongoing development and improvement of dental materials and their physical properties, several digital denture systems, although very promising, do not qualify for the status of premium digital denture. Factors including overall esthetics, porosity, strength, staining, wearability, longevity in the mouth, and bio-hygienic characteristics, among other things, must be taken into consideration when attempting to provide a premium final product. While most techniques will eventually achieve this status, as of today and arguably, the milled digital denture made from known high-quality materials without the bonding of teeth is the best option. Carefully compare the processes of each system. The desired characteristics of a premium digital denture include a final prosthesis from a highly cross-linked, high-impact, minimal porosity, minimal residual monomer, PMMA-base material and fully integrated, highly esthetic, lifelike, multi-layered, highly cross-linked and wear resistant teeth. Some manufacturers offer the advanced process of integrating the teeth into the base material which chemically results in a PMMA interface that constitutes a monolithic structure which does not entertain the idea of delamination, it is one continuous solid material; there is no risk of “pop-outs” (Figs. 10-11). The ability to deliver a quality product naturally creates confidence and predictability with your customer.



Fig. 10



Fig. 11



Fig. 13

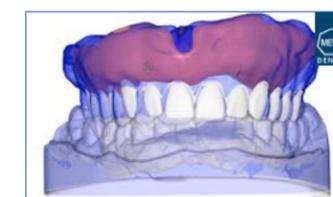


Fig. 14

It Must Be Versatile

Another key consideration when evaluating a digital denture system is the ability to easily integrate what

you offer and easily offer it digitally. Look for a system that allows you the ability to produce a variety of digital denture products and advanced features where you can feel comfortable adopting a system that covers your needs. A major convenience factor is the ability to “jump in” at any entry point of the design or manufacturing process. You also want to have the flexibility to choose your equipment options or be able to use compatible equipment you already use.

Regarding the ease of “jumping in” to the digital denture workflow, once you have decided to create a digital denture, the system must allow you the ability to accept any form of denture record set. To create a digital denture, the minimum required records include accurate final impressions (antagonist if creating a single arch) and an accurate centric relation record. This may be provided in many forms, as discussed with predictability. It may be an existing denture with a bite and wash impression, a duplicate denture with the same, a wax rim and final impressions or full wax-up (tried-in) with bite (Fig.12).



Fig. 12

Digital scan files created in the lab or clinic also can also easily be used. Remember, its communication of the correct information is vital to the success of any digital denture.

In today’s denture market, with about 15 percent of the population requiring at least one denture, we know there are a lot of possibilities in treatment planning for the average denture patient. It is imperative that the digital denture system you invest in has flexibility to create digital dentures for every individual’s situation. This includes full-over-full (Fig. 13), single arch (Fig. 14) and immediate

complete digital dentures (Fig. 15).

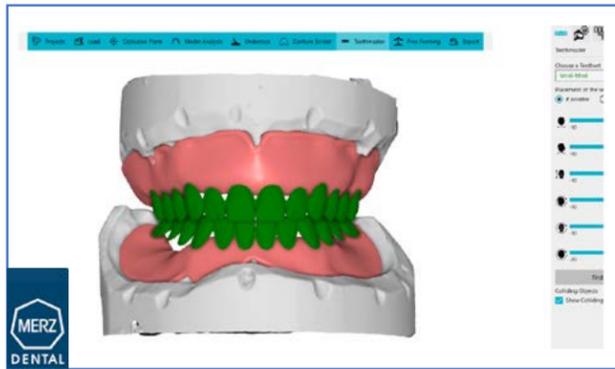


Fig. 15

Many systems have the advanced feature of setting the occlusion inside a fully integrated articulator (Fig. 16) and milling dynamic adjustments into the occlusion against the opposing arch (Fig. 17).



Fig. 16



Fig. 17

Another useful advanced feature is the ability to digitally extract teeth when creating immediate complete dentures with ability to perform digital alveoloplasty (Fig. 18) to the ridges where more room is needed.

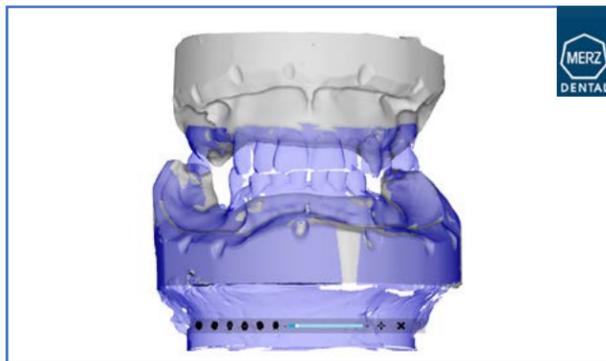


Fig. 18

Depending on the system, you could subsequently create a bone reduction guide which could be 3D printed or milled using the .STL file. Other great advanced options of select systems include the ability to create a try-in or create digital pockets for overdentures attachment housings (Fig. 19).

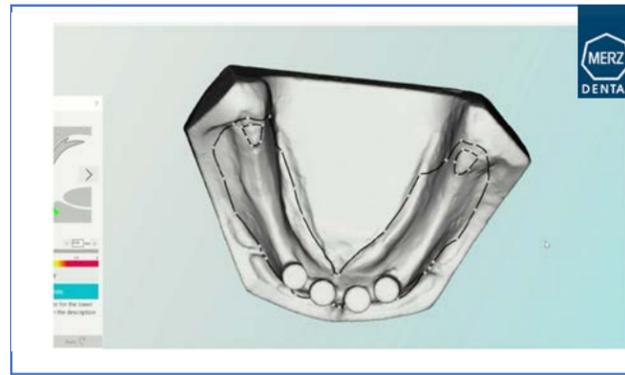


Fig. 19

A Fresh Look

It is an exciting time in the world of denture creation and the digital denture revolution is here and evolving fast. The digital denture workflow is proven. If the financial and professional decision is made to produce a digital denture, make sure the system will ensure a quick transition with ease and meets your needs. Digital denture automation has been redefined through its simplicity, predictability, and versatility. It will allow you to create greater efficiency and maximize your productivity and profitability.

About the author

Gene Peterson, CDT

Director of Technical Development and Learning Growing Sterngold Dental's Digital Solutions is Gene's self-proclaimed goal. Gene oversees all aspects of Sterngold's technical department, leading digital development efforts, product offering pipeline, and educational methods and content directives, working closely with sales, marketing, and customer service. With over 30 years of experience, Gene has an extensive and diverse background in the dental industry, covering R&D, clinical and dental laboratory workflows and protocols, production, and facility management. After owning and operating a dental laboratory for 18 years, he spent the last nine years with a major digital denture and technology company. As a subject matter expert, he has co-written research and white papers on digital dentures and other technical subjects. Gene is involved with several professional organizations, including the NADL, ACP, and the Academy for BioEsthetic Dentistry. He serves as Co-Chair of the Advisory Board and is a guest lecturer for the Dental Laboratory Technology program at Pima Community College in Tucson, Arizona. Fluent in English and Spanish, he is often called upon as a national and international guest lecturer. Apart from being a Certified Dental Technician (NBC) and a Certified BioEsthetic Dental Technician, Gene holds a BS degree in Biology from Brigham Young University. Originally from Southern California, Arizona has been home for 33 years with wife, Gretchen and their three children. They enjoy traveling and any activity done together as a family.

National Denturist Association Conference



The National Denturist Association Annual Conference is thrilled to be back for 2021. Everything being offered at the Conference will provide an exceptional learning experience. Since connecting and networking with your peers is the best learning environment, we are ready to meet together again in person and help you to redefine and renew your focus both personally and professionally.

Don't miss this excellent opportunity to be a part of one of the best meetings providing continuing education courses and an outstanding showcase of products and services.

The NDA is exploring the option of having some of the live courses recorded for later viewing on the NDA website for a virtual CE package. NDA will not be offering the entire catalog of live CE as a virtual option. If virtual CE is offered after the Las Vegas meeting, it will be no more than 6 hours of CE. More information will come on virtual options in August.

The Orleans Hotel, Las Vegas | October 13-16, 2021

Course Topics and Schedule Subject to Change - Schedule as of July 1, 2021

Tuesday - October 12, 2021

9:00 am -12:00 pm NDA Board Strategic Planning
1:00 pm -4:00 pm NDA Board Meeting

Wednesday- October 13, 2021

9:00 am -10:00 pm NDA Committee Meetings
10:15am - 11:15 am NDA Meeting with State Affiliates
11:00 am -5:00 pm Registration
1:00 pm - 5:00 pm Optional Hands-On Clinic (4 CE hrs) - Proposed Eugene Royzengurt
1:00 pm - 3:00 pm Opening Keynote Session (2 CE hrs.) - Ruben Arebalo - Servicing Overdentures: Restore Retention, Reline Review, and More (Sponsored by: PREAT)
3:00 pm - 3:15 pm BREAK
3:15 pm - 5:15 pm General Session (2 CE hrs.) - Marc Wagenseil - Amping Up Your Superhero Denture Skills! (Sponsored by VITA North America)

Thursday - October 14, 2021

7:00 am - 8:00 am Buffet Breakfast
8:00 am - 10:00 am Opening Keynote Session (2 CE hrs.) - Dr. Mark Murphy (Sponsored by: PREAT & NDA)
10:00 am - 10:15 am BREAK
10:15 am - 11:45 pm Track A (1.5 CE hrs.) - Marc Wagenseil - Model Analysis - Again? (Sponsored by VITA North America)
Track B (1.5 CE hrs) - Arian Deutsch - The Bridge... Analog Wisdom, Digital Efficiency (Sponsored by Candulor)