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Digital denture workflow for a fully edentulous patient



3Shape Solutions used:

3Shape E series dental lab scanner

3Shape Dental System® Denture Design software

Case Background

Male, fully edentulous patient in need of a new set of dentures. The patient's dentition became terminal due to a past drug addiction several years ago. He has been rehabilitated with numerous sets of conventional dentures in the past.

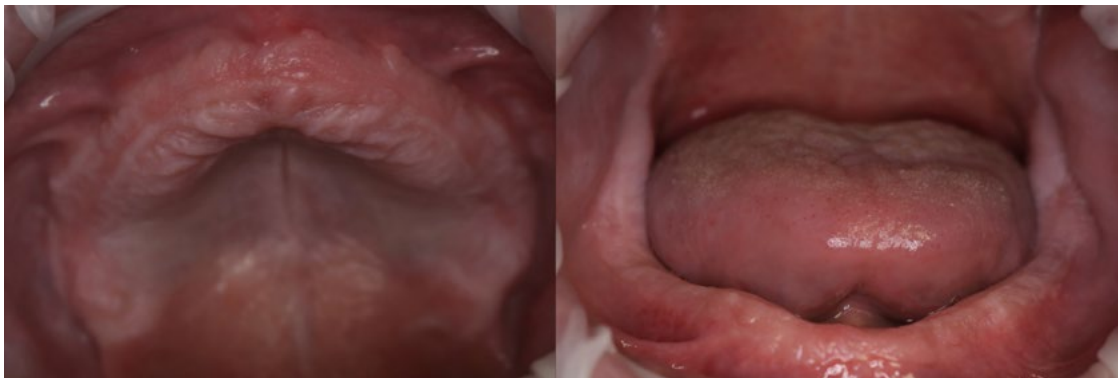


Figure 1. Initial situation of the patient demonstrating the edentulous ridges.

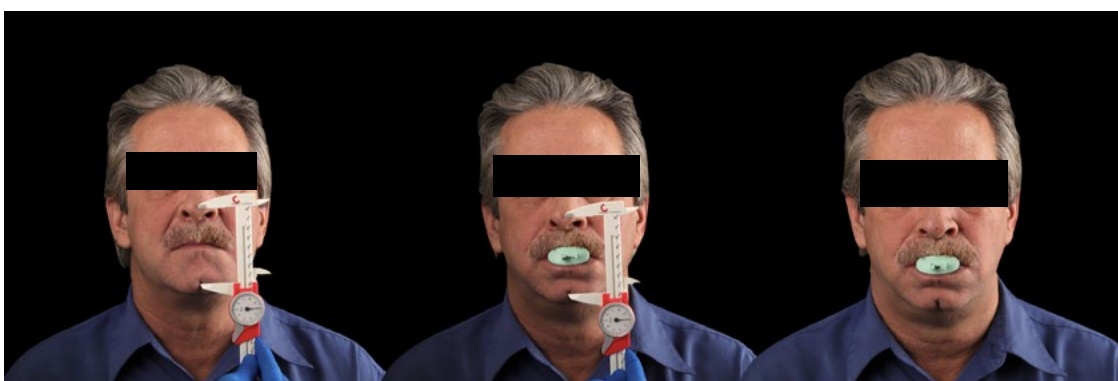


Figure 2. A centric tray (Ivoclar Vivadent) is utilized to establish a preliminary vertical dimension of occlusion and centric relation.

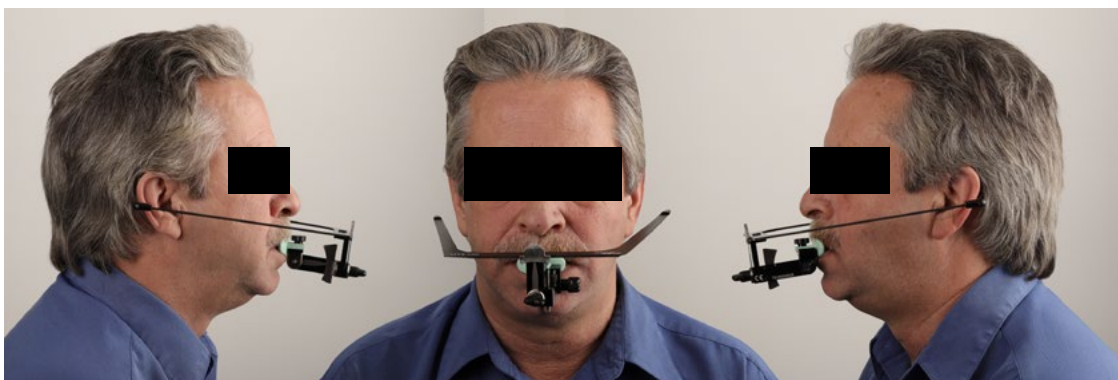


Figure 3. The UTS CAD (Ivoclar Vivadent) is utilized to establish the BiPupillary Line and Campers plane.

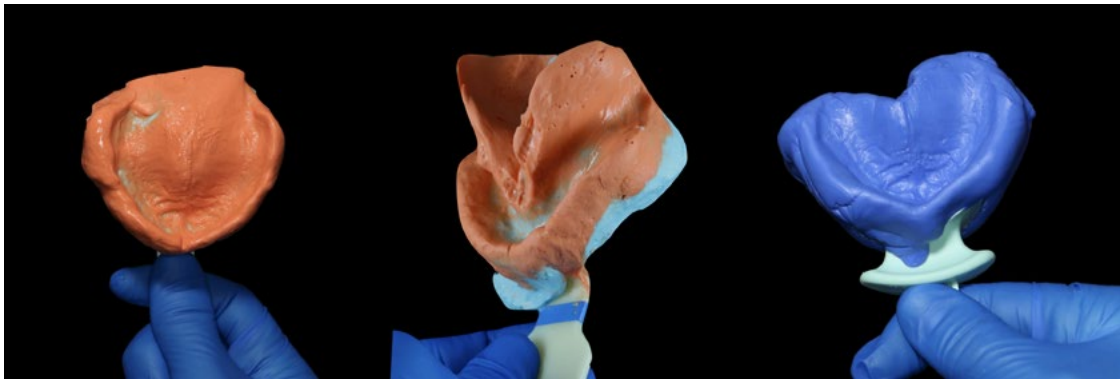


Figure 4. Preliminary impressions taken utilizing Accudent XD Material and the centric tray are shown in this figure. These constitute the initial records required for digital denture professionals.

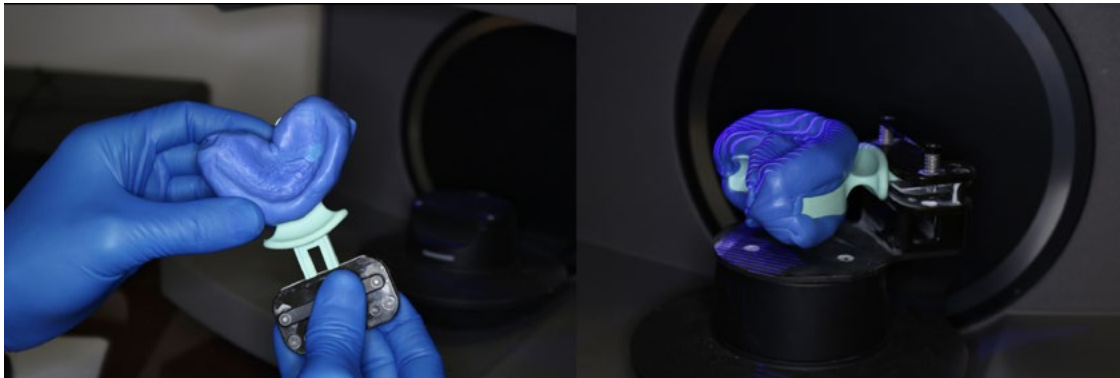


Figure 5. The centric tray is scanned utilizing the impression fixture (3Shape E Series lab scanner).

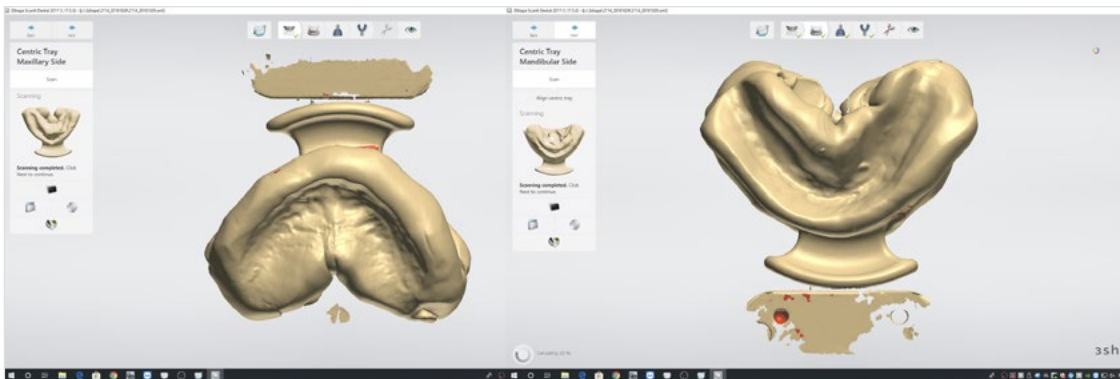


Figure 6. Maxillary and mandibular centric tray scanned in 3Shape software.



Figure 7. The maxillary and mandibular impressions are scanned utilizing the impression fixture in 3Shape (E Series) lab scanner.

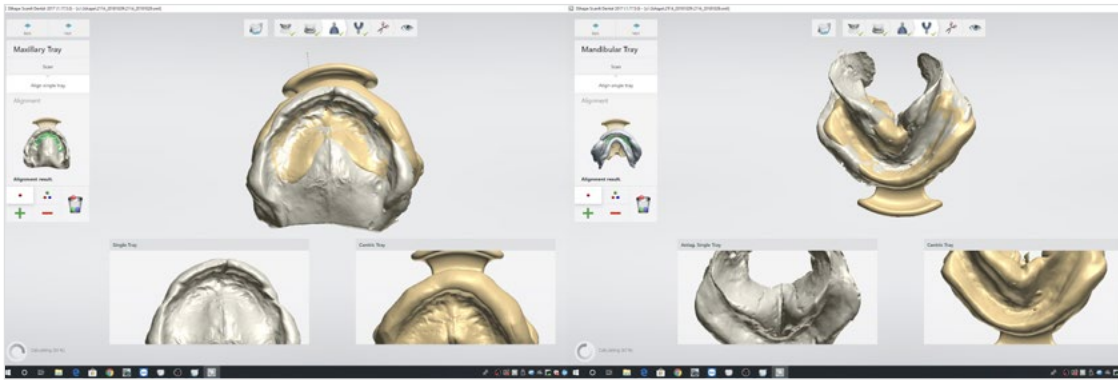


Figure 8. The maxillary and mandibular impressions are aligned into the centric tray intaglio surface.

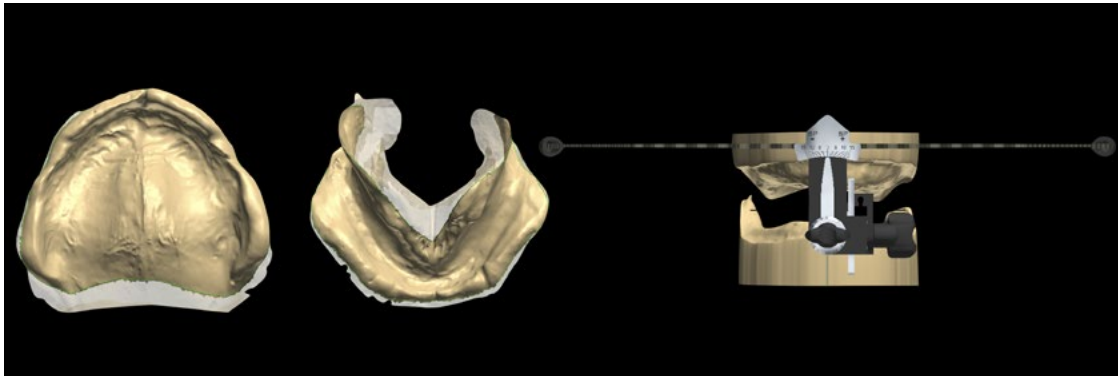


Figure 9. The maxillary and mandibular impressions are now trimmed to create preliminary casts. The 3rd image represents the maxillary and mandibular impressions articulated with the UTS CAD in place.



Figure 10. The design process of the 3D BITE PLATE / Gnathometer CAD (Gothic arch tracing device) is carried out and the manufacturing process utilizing the ProArt CAD try in.

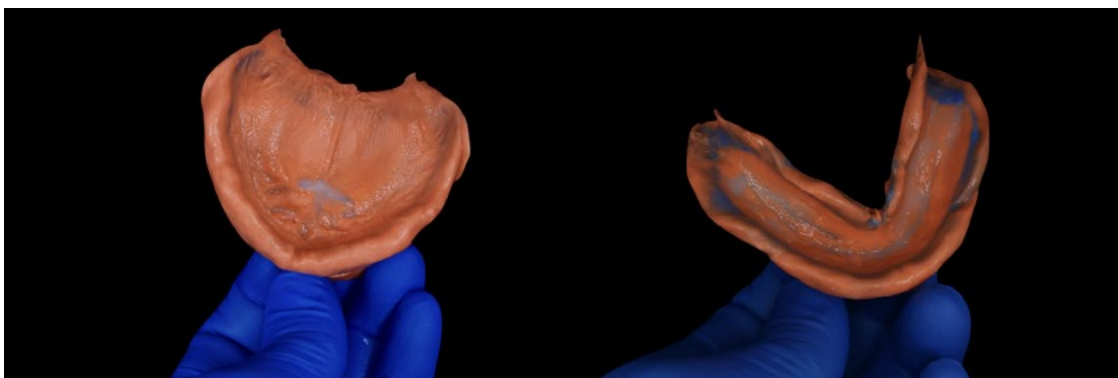


Figure 11. Closed mouth maxillary and mandibular functional final impressions are conducted utilizing SEMCD concept.



Figure 12. The UTS CAD (Ivoclar Vivadent) is utilized to re-establish the BiPupillary Line and Campers plane.



Figure 13. The Gnathometer CAD striking plate is placed and the patient performs centric and eccentric movements to create the arrow shown. The true physiological centric relation is recorded.

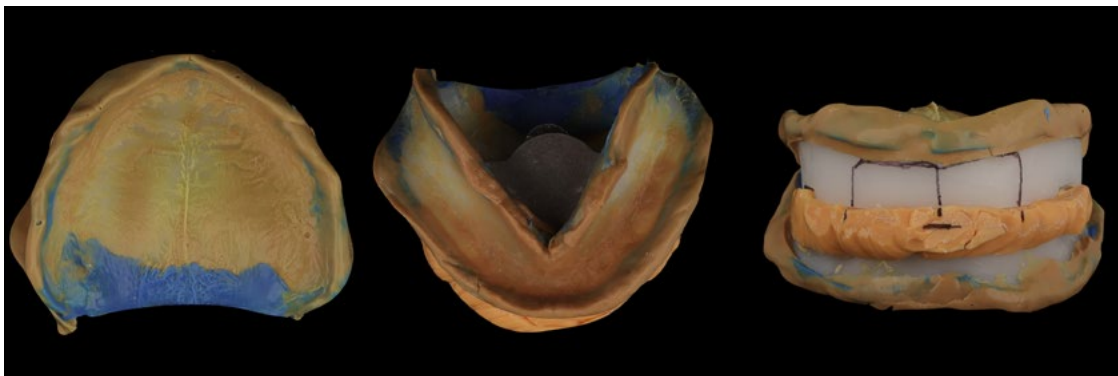


Figure 14 I. The maxillary final impressions with a monophasic post dam. The finalized registration of the 3D bite plate with the Gnathometer CAD utilizing Virtual Bite Registration material.

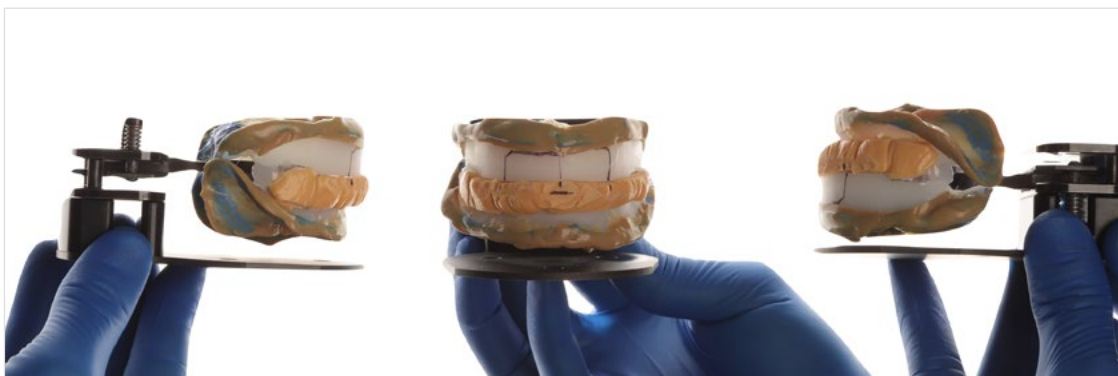


Figure 14 II. The maxillary and mandibular impressions & centric relation are scanned utilizing the impression fixture in the 3Shape scanner. This process allows an accurate scan in the X Y Z axis of the scanner.

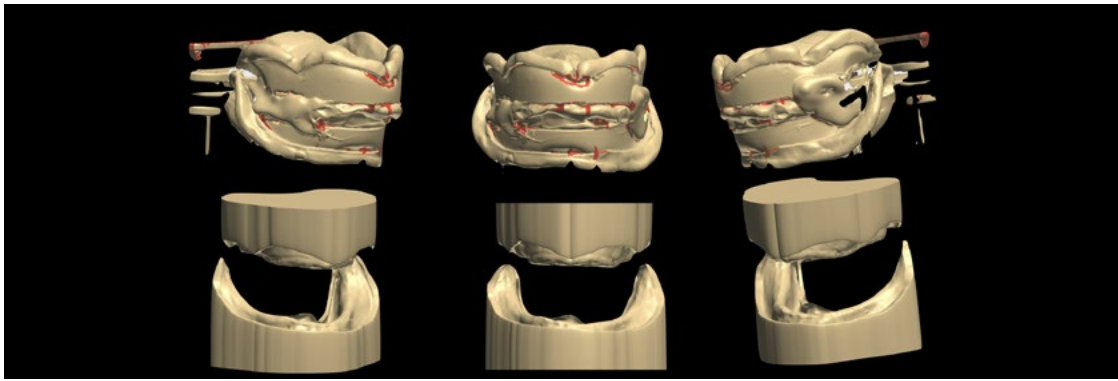


Figure 14 III. Demonstrating the virtual scans of the registrations. The master casts are now virtually created and articulated.

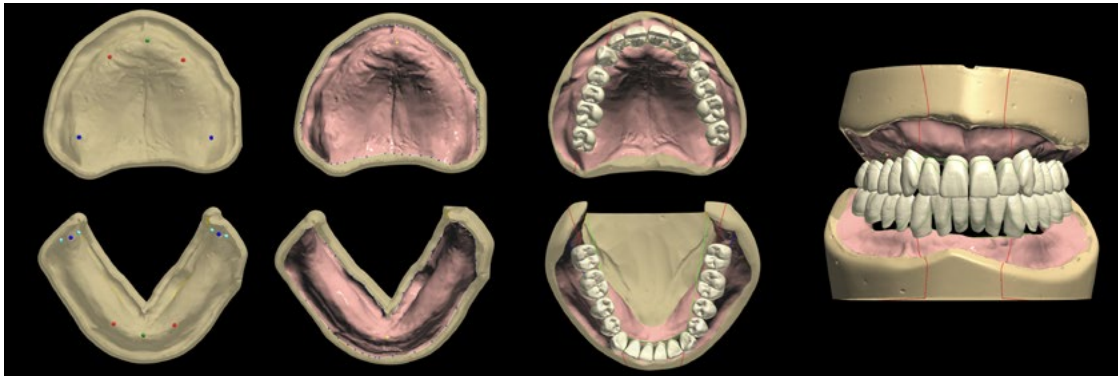


Figure 15. Model analysis is carried out utilizing anatomical landmarks for proper placement of the dental arch. The denture base outline is also performed. Tooth selection and placement is carried out. It is astounding the way in which we can evaluate our placement of the dental arch in relation to the ridge. This case utilized Phonares II B82-L51-NU5- NLS.

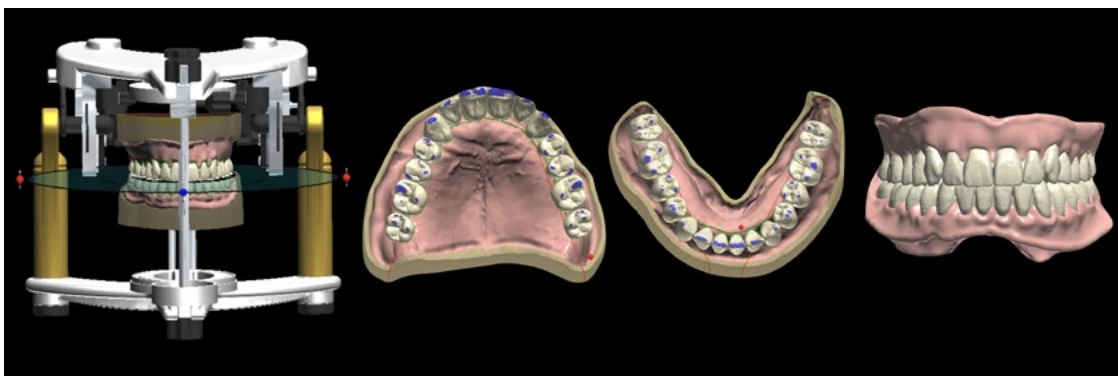


Figure 16. The Virticulator (Virtual Articulator) is utilized to evaluate the centric contact points during excursions. When utilizing a milled tooth arch these modifications can be modified during the manufacturing process reducing chair time during the insertion appointment. Artificial Gingiva is applied and contoured.

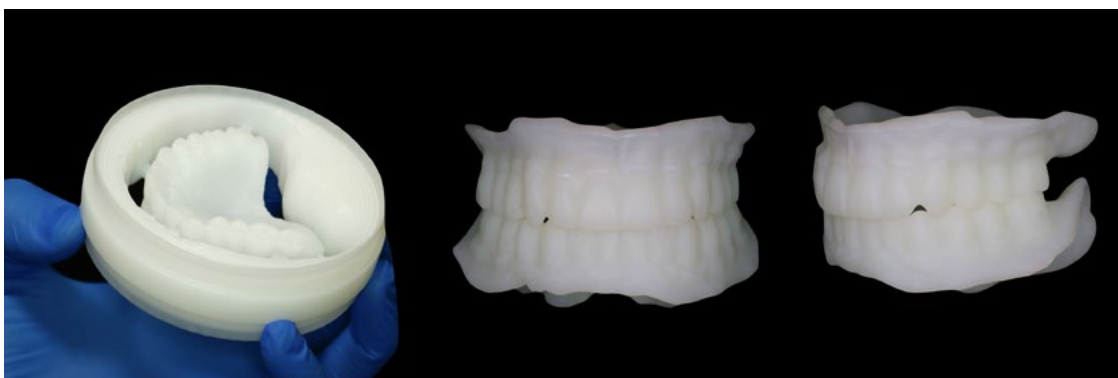


Figure 17. The manufacturing process of the Monoblock try-in utilizing the ProArt CAD try-in in conjunction with PM7 Wax can be applied to differentiate the dental arch and base.



Figure 18 I, II. The Monoblock try in is assessed clinically and any changes are indicated and modified in the software with ease.



Figure 19. The Careded manufacturers tooth workflow is indicated for the high aesthetic demands of manufactured teeth . Phonares II , Vivodent SPE, SDCL, Blueline are available in this workflow.

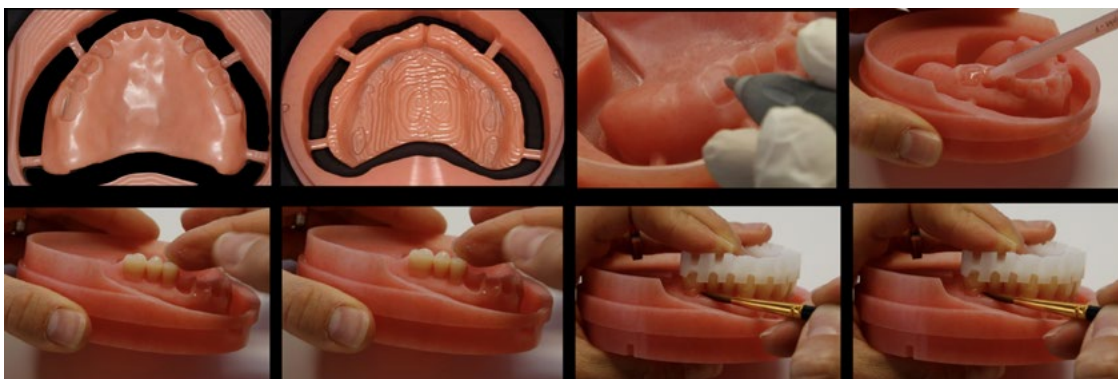


Figure 20. The entire denture base is milled except for the intaglio surface. Once the manufactures teeth are bonded into the denture base the disc will be placed back into the mill for finalization of the intaglio surface.

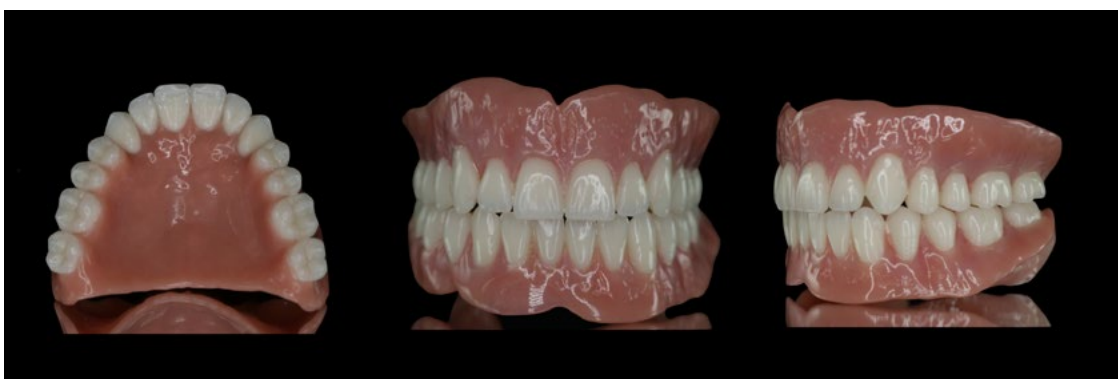


Figure 21. Finalized Careded tooth workflow denture utilizing Phonares II B82-L51-NU5- NL5.



Figure 22. Patients new oral situation.



Figure 23. The oversized milling process has changed digital denture manufacturing process efficiencies, as well as the accuracy, predictability and overall strength of the restorations. The Ivoclar Digital Denture System has a milling process that provides all of these aspects, the unique "Oversized Milling Process," which eliminates the need for manual removal of excess bonding material. The tooth arch and denture base are milled to approximately 80%, with the base sockets and tooth necks milled to precision. The arches are then bonded together, and the prosthesis is put back in the mill for a final milling.

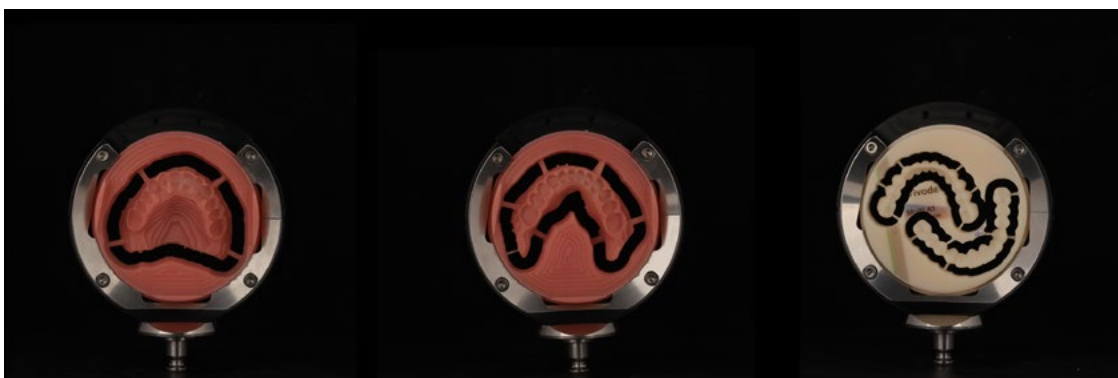


Figure 24. The Denture Base is rough milled (Oversized) utilizing Sr.IvoBase CAD (industrially produced high impact PMMA). The Dental Arch is rough milled utilizing Vivodent CAD Multi (industrially produced DCL PMMA).



Figure 25. The oversized milled denture base and dental arch are passively seated.

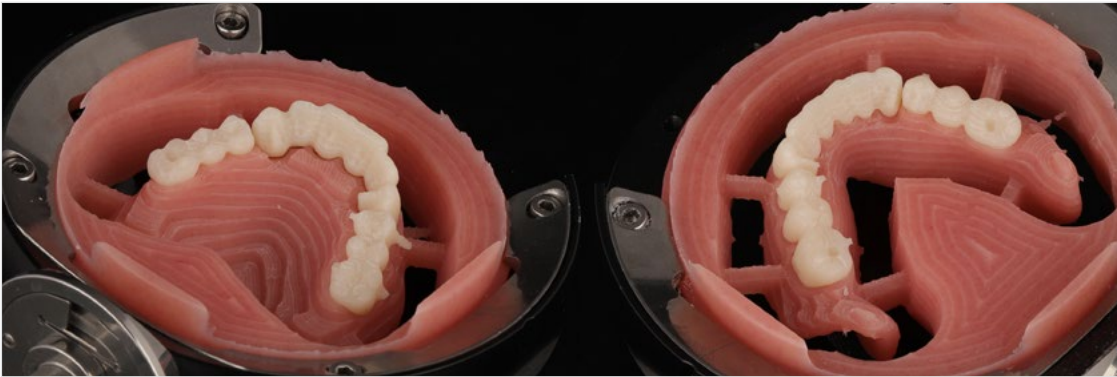
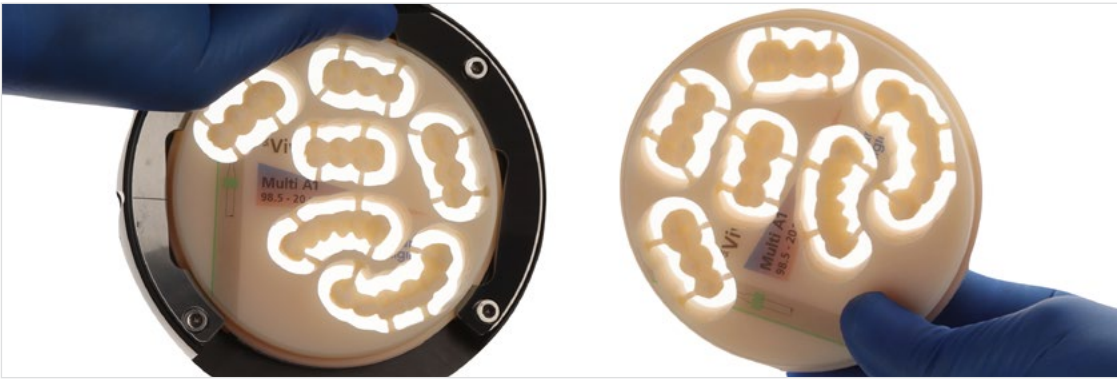


Figure 26 I, II. The new Vivodent CAD Multi, a polychromatic (industrially produced DCL PMMA) provides the highest aesthetics by creating unparalleled incisal translucency. New in 3Shape Dental System 2019, you have the capability to section the dental arch.

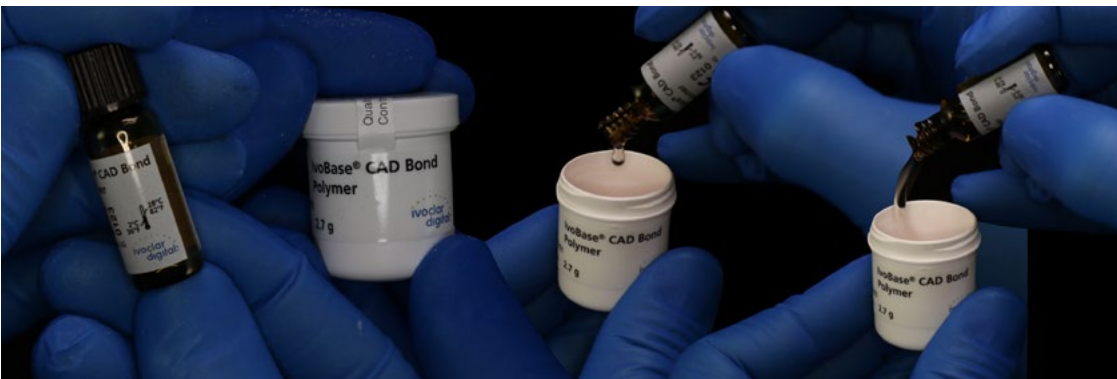


Figure 27. The Ivobase CAD Bond: This material is unique due to its extended polymerization process providing the technician increased working time (10 minutes).



Figure 28 I. Placement of the dental arch into the base utilizing Ivobase CAD bond material.

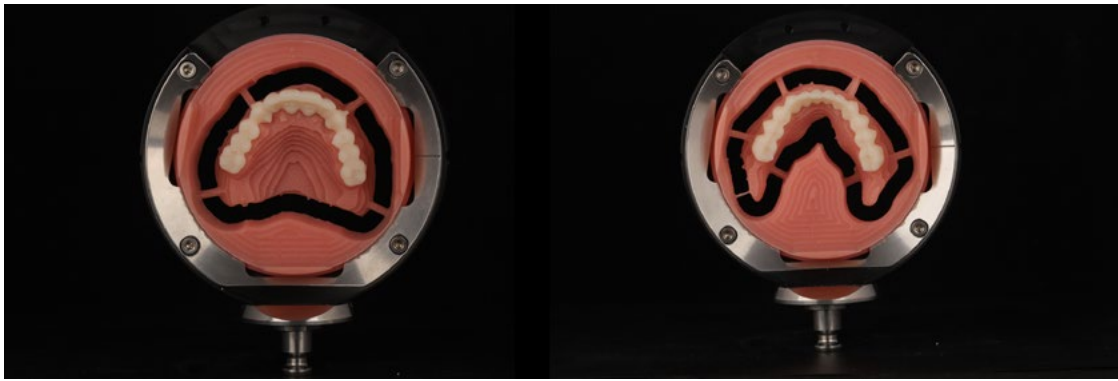


Figure 28 II. The oversized base and teeth polymerized and placed back into the PM7 for finalization.



Figure 29. Results of the milling process directly after milling in the PM7. Note the incisal translucency achieved with the Vivodent CAD Multi.



Figure 30. This figure demonstrates the incisal translucency achieved with the Vivodent CAD Multi.



Figure 31. Final prosthesis characterized and polished.



Figure 32. Demonstration of the uniform thickness provided by Digital Denture fabrication and the incisal translucency achieved with Vivodent CAD Multi.

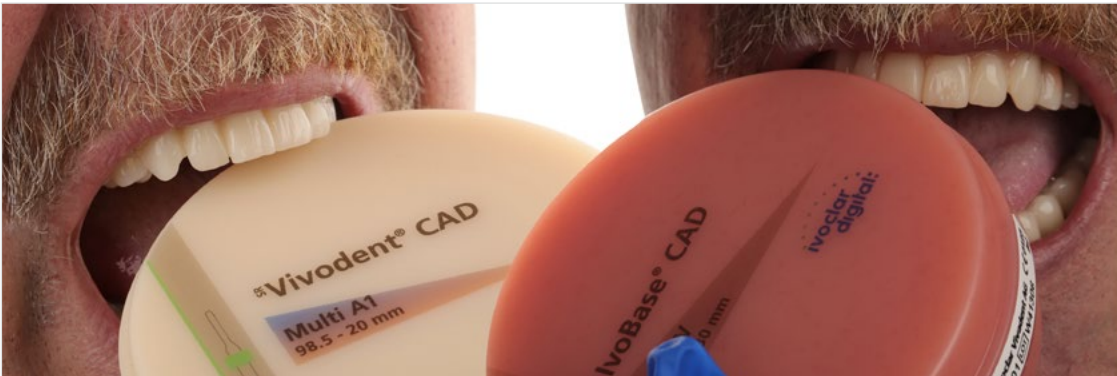


Figure 33. The patient having some fun demonstrating "biting on the discs."



Figure 34. Final prosthesis intraorally. The patient is very pleased with the aesthetic results.



Figure 35. Final prosthesis intraorally. The patient is very pleased with the aesthetic results.

Benefits of the digital workflow according to Eric Kukucka

One of the main challenges with the analog denture workflow is the laborious time it takes with resets, due to inaccuracies in occlusion, vertical dimension, and/or aesthetics. If, for example, our patient's midlines are skewed, we will have to remove all teeth (as many as 28), remove all wax, re-wax, re-set each tooth individually, redo the wax confinement then invest, process trim and polish. It's a very burdensome type of procedure. With a digital workflow, these types of corrections take ten to fifteen minutes.

In addition, in the case of a digital removable prosthesis, the uniformity of the design is very beneficial. Being able to replicate a patient's arch form of their palate, at a 2.5 – 2.75 mm of thickness is nothing short of remarkable. We can now have the desired thickness we, as dental professionals, have always dreamed of. This improves patients' comfort and adaptability significantly.

I firmly believe that embracing digital technology for today's dental professionals is imperative. There's a paradigm shift that is happening globally, with the movement into digital removable fabrication. It's essential that as dental professionals we make this investment, not only into the technology but into ourselves as individuals. We're only going to grow with making the investment and our patients will ultimately benefit the most in the end.

About Eric Kukucka DD

Eric graduated from George Brown with Honors and was named Valedictorian of all health sciences in 2010. Eric lectures globally as a key opinion leader for Ivoclar Vivadent and in North America for Nobel Biocare. His practices are in Windsor, Ontario, Canada, where he owns and operates three denture clinics "The Denture Center." Eric is dedicated to building great relationships within the dental community while always striving to create the highest standard of care for edentulous patients.

About 3Shape

3Shape is changing dentistry together with dental professionals across the world by developing innovations that provide superior dental care for patients. Our portfolio of 3D scanners and CAD/CAM software solutions for the dental industry includes the multiple award-winning 3Shape TRIOS intraoral scanner, the upcoming 3Shape X1® CBCT scanner, as well as market-leading scanning and design software solutions for both dental practices and labs.

Two graduate students founded 3Shape in Denmark's capital in the year 2000. Today, 3Shape has over 1,500 employees serving customers in over 100 countries from 3Shape offices around the world. 3Shape's products and innovations continue to challenge traditional methods, enabling dental professionals to treat more patients more effectively.