

DIGITALLY DRIVEN SYNERGY FROM SURGERY TO FINAL



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Zirconia must be considered as one of the most important evolutionary materials of the last two decades. This material single handedly rendered obsolete years of research and study into layering ceramics and brought legitimacy to design softwares like 3Shape and Exocad.

For many years, old school technicians huddled behind phrases like “layering will never die” and argued that monolithic zirconia would never be able to compete with the beauty and artistry of layering ceramics. Today, that group is not only shrinking rapidly, but in some cases has been replaced by new world technicians who have mastered this new medium.

Initially, the argument that artists would be replaced by a machine was heavily debated and this unfortunately led to many technicians seeing technology as a threat. Today, even early adopters from across the globe will attest that technology, no matter how advanced, proved to be nothing

The 2000’s will forever be remembered as an era of great dental evolution! Even though this transition from analog to digital technology driven applications lagged most other industries, the effects of this change has now started to exponentially influence almost every aspect of the industry.

Not unlike most other evolutionary journeys, this transition was initially also met with plenty of resistance and doubt! As time progressed, most dental professionals realized that innovative technologies and a drive for better products produced more efficiently would prove these critics wrong.



Fig. 1



Fig. 2

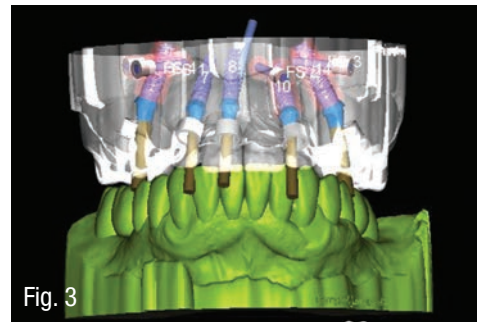


Fig. 3



Fig. 4



Fig. 5

THE INFLUENCE OF GUIDED BONE CONTOURING ON HYGIENE AND ESTHETICS

To start the planning and diagnostic phase a patient is scanned with a CBCT scanner, digital impressions of the pre-op dentition are captured and then sent to the lab via a secure web-based portal.

The data is evaluated and, if necessary, cleaned-up. The IO scan images and DICOM data are then aligned in the implant software. In a complex case, like in the example, a third diagnostic data set is matched with the IO scan images and DICOM. (Fig.3)

Bone reduction (or bone re-contouring) should always be considered in this diagnostic design phase. This pre-planned bone-to-prosthetic connection position and contour greatly influences the final esthetic outcome and plays an extremely important role in the hygiene of the final prosthesis. (Fig.4)

Hybrid-hygiene, especially in the maxilla, is a hot topic and many studies and articles have identified a direct correlation between an overlapped design and peri-implantitis.⁽⁶⁾ This problem, which is very avoidable with a well-planned guided approach, often leads to the loss of dental implants and therefore failure of the final prosthesis.

Ultimately, the intaglio contour of the hybrid is dictated by the contour of the post surgical bone. (Fig.5) Guided contouring of this crucial surgical aspect leads to a hygienic, functional, and highly esthetic final prosthesis.

more than a unique brush in modern-day dental technicians' hands!

Ultimately, the property that drove zirconia to becoming the most utilized material was the fact that it was one of the first materials able to support a complete digital workflow.^(a)

Eradicating unnecessary hand processing, like layering ceramics, means that data captured intraorally will not be corrupted by human interpretation and therefore is duplicated more accurately in the final prosthesis.

This digital workflow brought unprecedented predictability not only to tooth borne prosthetics but also simplified complex implant retained cases like hybrids.

The following case study demonstrates the advantages and accuracy of a full digital workflow from surgery to final delivery. (Fig.1) It furthermore shows the beautiful esthetics achievable by artists with today's monolithic zirconia materials. (Fig.2)^(b)

THE IMPORTANCE OF DIGITAL DIAGNOSTIC PLANNING

Even in today's technology driven

environment, there is still a lot of "discussion" surrounding guided surgery. With proponents and opponents making arguments for and against this technology.^(c)

Ultimately, the true value in a guided approach is found in the ability to accurately transfer the digital diagnostic plan to the analog surgery and beyond^(d) A well-balanced guided approach will not only simplify the surgery but more so play an integral part of the restorative process.

In complex implant supported cases, the entire case is pre-planned with a digital diagnostic, tooth-down, approach. This plan ultimately affects not only the position of the implants, but more importantly the predictability of the case from surgery to the final delivery.^(e)

This ability to pre-plan and transfer the data from digital to analog plays an integral part in the longevity of the hybrid prosthetic solution!

A predictable restorative outcome depends on a successful surgery. A successful surgery starts with a comprehensive diagnostic plan. Collaboration between the restorative, surgical and technical team members is the absolute key to achieve all the above.



Fig. 6

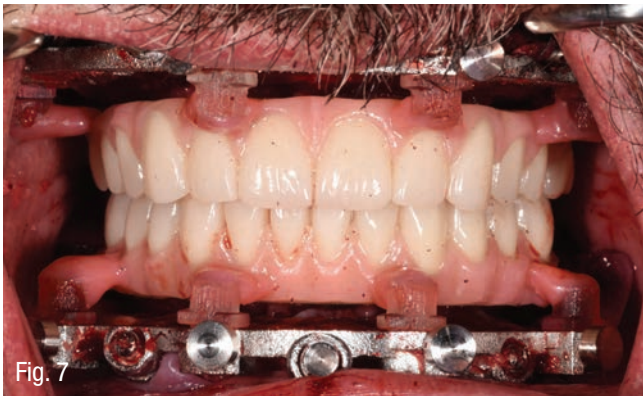


Fig. 7

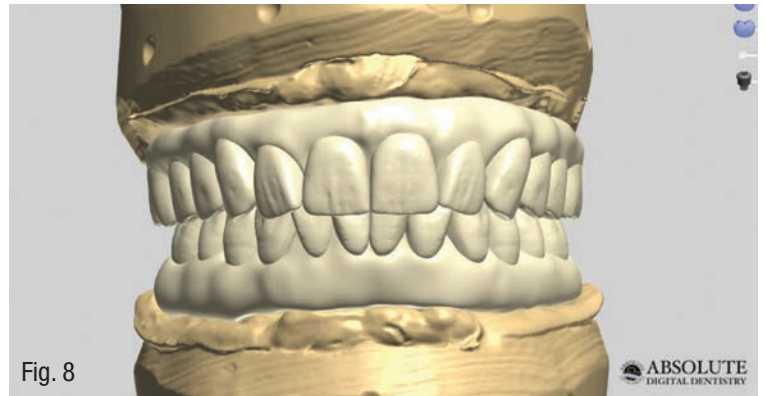


Fig. 8

DIAGNOSTIC PLANNING AND COMMUNICATION

To guide this design process, the Absolute Dental Lab & NavaGation Precision Guidance® teams work in harmony to create a comprehensive digital diagnostic plan.

This diagnostic design considers all the data sets gathered from the surgeon, restorative clinician and even the patient. The bone quality and position, high-low and retracted smile pictures, restorative requests and either a CO or CR bite all play an integral part in this design process.

Model matching of the diagnostic work-up, with super-imposing of the suggested final tooth positions, also allows for very effective communication between the restorative doctor and

laboratory technician. This input involving the entire team, ultimately responsible for the final prosthesis, greatly influences a flawless final delivery.

After input from all members are considered and finalized in a digital pre-plan, the surgeon, restorative doctor, lab technician and surgical planner meet via a remote technology like TeamViewer etc.

At this review the diagnostically driven implant placement pre-plan is reviewed, altered, and approved before guide and conversion hybrid fabrication takes place.

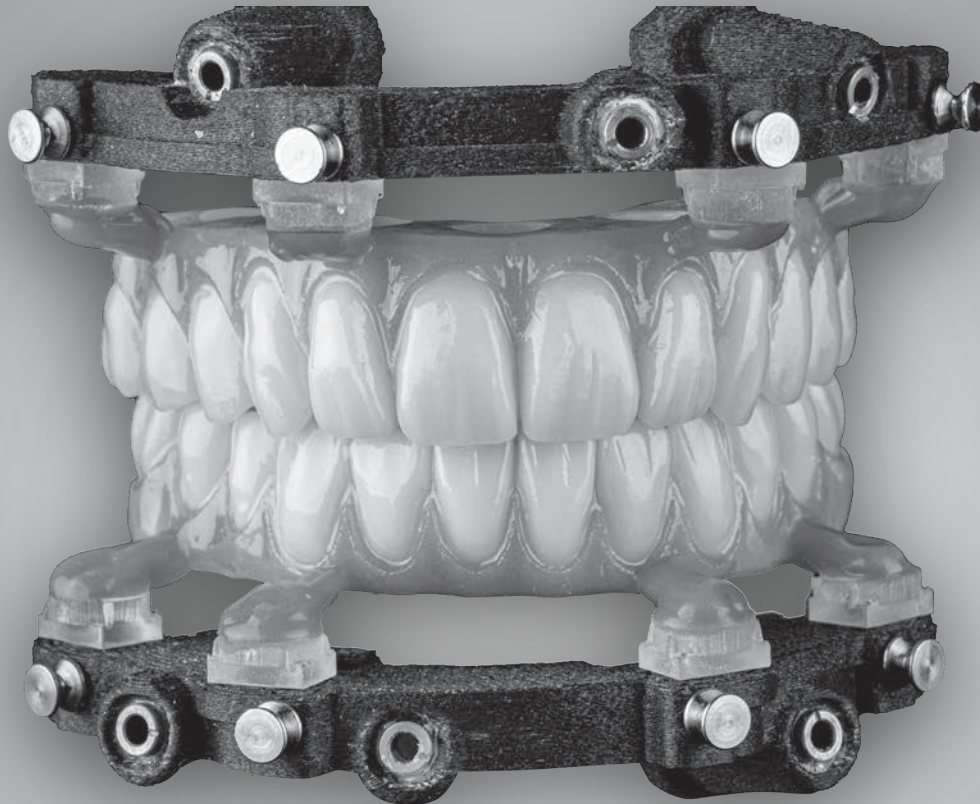
The importance and value of approaching a large case with a digitally driven, collaborative, team approach as described above simply cannot be overstated.

RESTORATIVE PROCESS GUIDED BY A CONVERTED INTERIM

The restorative value of a modern-day latched surgical solution, like NavaGation Synergy (navigacion.net), results in an accurate, digitally transferred pre-op bite to the chair-side converted healing prosthesis. (Fig.6)

This modern-day, latched conversion prosthesis is no longer an immediate denture cut and luted to a questionable nose-chin marked vertical position, but rather a reliable diagnostically driven pre-operatively set bite position.

The latched conversion (transitional/healing) prosthesis is simple to convert without the need for technical assistance during the surgical appointment. Because of the predictability of the bite



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Fig. 9



Fig. 9a

transfer, this device serves as the first data gathering step in the restorative process. (Fig.7)

In most cases, the patient heals for a three-to-four-month period with this interim prosthetic device in place. This allows the restorative clinician ample time to evaluate and adjust the bite while the patient is granted time to assess the esthetics and function of the interim prosthesis.

An accurately converted interim prosthesis, designed from the preoperative VDO (or manipulated centric relation), serves as a very effective first stage prototype. This device replaces the traditional first and second restorative appointments and eradicates the need for a bite-rim to establish the VDO and wax-based tooth try-in.

SYNERGY GUIDED WORKFLOW®

Three months after the successful surgery and conversion process by Dr. Christian Yaste, (Ballantyne Dentistry, Charlotte, North Carolina. Ballantynedentistry.com)

the adjusted and patient approved surgically converted healing prosthesis was digitized by utilizing an IO scanner.

A physical PVS impression was captured, and the model accuracy was validated by using an analog fabricated verification jig before submitting the data for fabrication to Jack Marrano, Absolute Dental's Director of Signature Prosthetics. (www.absolutedentalservices.com/signature-art-team)

Verifying the model accuracy is one of the most important clinical steps in the restorative process. This step guarantees a stress free, predictable, and accurate final prosthesis. More in-depth information on this Phase2™ digital data capture procedure can be found at www.absolutedentallab.com

PROTOTYPE MANUFACTURING OPTIONS

The Absolute ART team, a specialized division within Absolute Dental Services, is responsible to restore all

complex and larger esthetic cases. This team digitally designs the prototype try-in, based off the supplied digital file of the conversion prosthesis. (Fig.8) After design, the proposal is reviewed and approved by the restorative clinician. The prototype is then 3D printed, hand contoured and implant interfaces are luted in place.

Absolute Dental offers two transitional prototype options: a highly esthetic, functional long-term prototype or a short-term disposable version. In both cases, the preferred material for esthetics, strength and cost is Flexcera® Smile. This printable polymer tooth structure material is offered by Desktop Health™. (www.desktophealth.com)

A printable material is preferred over a millable PMMA because of the speed, accuracy and fine detail produced by additive manufacturing in comparison to reductive processes.⁽⁶⁾ Furthermore, the strength and wear resistance found in these new world polymers are comparable, if not superior, to millable PMMA pucks making this polymer solution a favorite amongst Absolute technicians.^(h)

Both prototypes can act as medium-term functional devices, but the esthetic version is hand finished and additional pink structure is added. (Fig.9)

This emergency/prototype device is fully interchangeable with the final prosthesis and therefore delivered as an emergency (back-up) hybrid with the final zirconia hybrid. (Fig.10)



Fig. 10

FABRICATION W/ DATA PRESERVATION

This prototype is an exact analog representation of the digital proposal. This prototype version of the final hybrid offers the clinicians and patient another opportunity to make small changes to the bite and esthetics before proceeding to the final hybrid. In a case where larger changes are required, it is crucial to fabricate another transitional prototype for analog approval. This is done to allow the additional changes to be approved by the patient intra-orally. More importantly, this allows these changes to be registered/archived in the digital data-set before fabricating the final prosthesis using a true copy-mill design.

The negative impact of adjusting on post sintered zirconia has been well documented. To protect the material integrity, the goal at Absolute is to complete all adjustments on the prototype and through this ensure a final delivery requiring zero adjustments. (Fig.11) The once daunting final delivery appointment is now greatly simplified because of design copy-mill technology.

The above can only be achieved if the prototype try-in and patient approval process is understood as technically more significant than the final delivery appointment. (Fig.12)

Digital technology, combined with these modern-day materials, are now allowing a 100% accurate copy-mill use of the gathered and approved data for fabrication of the final. (Fig.13)

SUMMARY

Ultimately, when these new-world digital technologies and material benefits are understood the impact on the final prosthesis is immense. (Fig.14)


When cases are digitally well-planned in a collaborative team environment and guided clinical workflows are carefully followed, complex cases can be restored with exceptionally precise long-term outcomes! 



Fig. 11



Fig. 12



Fig. 13



Fig. 14

Acknowledgements:

The authors would like to acknowledge the exceptional surgical abilities, restorative skills, and clinical photography by Dr. Christian Yaste from Ballantyne Dentistry in Charlotte NC. Conrad would also like to recognize the incredible artistic talents of Jack Marrano and his Absolute ART team. Under his guidance the ART team processes these complex cases not only in new world digital workflows but always maintains world-class artistry as their foremost goal.

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Conrad J Rensburg is owner of Absolute Dental Laboratory and leads the implant and NavaGation Precision Guidance® surgical divisions. Jack Marrano is Director of the Signature Prosthetics team and leads the Absolute Dental ART Team (Advanced Restorative Team). Together with their teams they offer comprehensive, high quality, prosthetic, and surgical solutions to clinicians from across the United States. Conrad and Jack can be reached at www.absolutedentallab.com

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Marrano is director of Absolute Dental Services Signature Prosthetics Division. A former Marine who started his ceramics career in 2002, he has managed several divisions of MicroDental DTI, served as director of technical artistry for Lee Culp at Sculpture Studios, and completed courses on advanced implant restorative dentistry with Carl Misch, DDS. He received fellowships from the Misch Institute and the International Congress of Oral Implantologists, and is a member of the Academy of Osseointegration, the American College of Prosthodontists, and the PEERS prosthodontic association, as well as being integral in the R&D of many restorative dental materials.