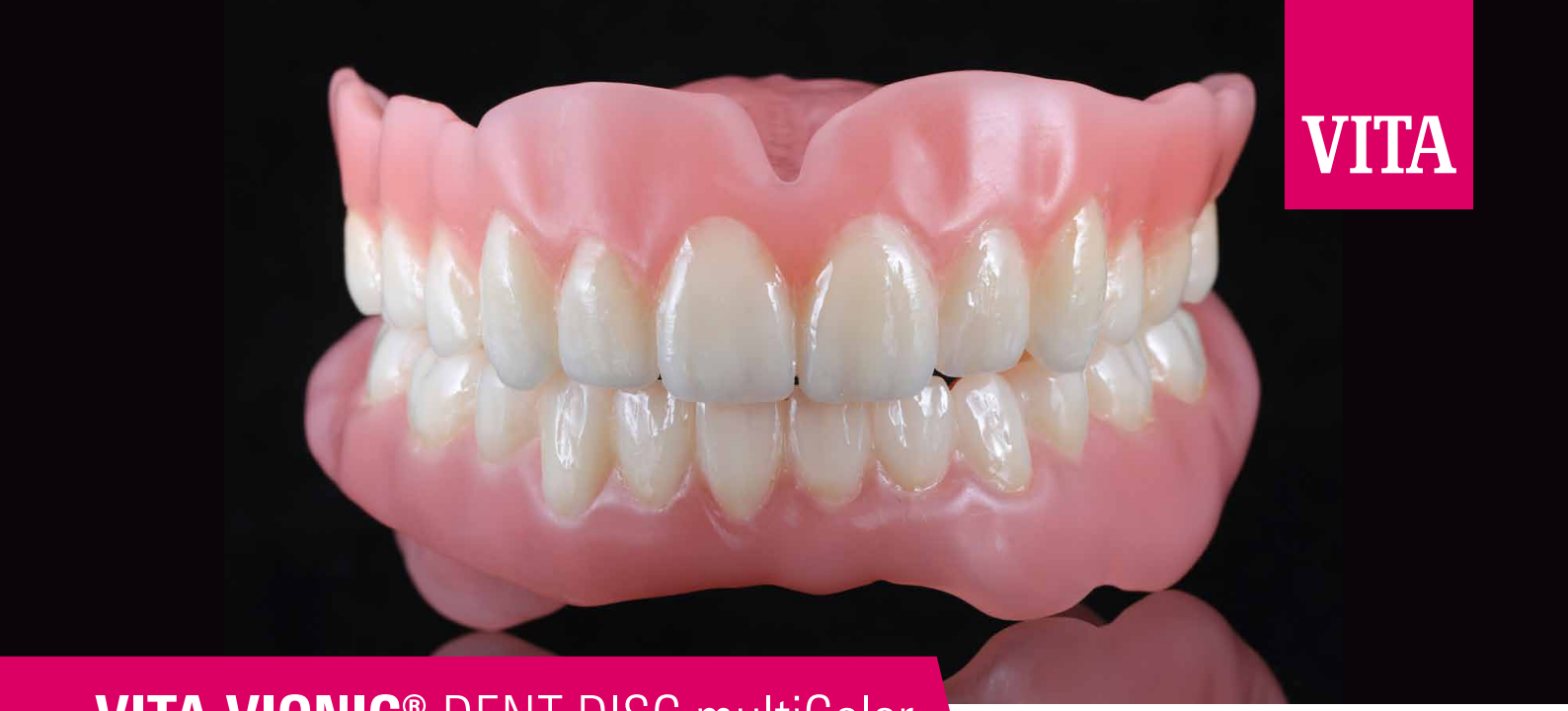

VITA

VITA VIONIC® DENT DISC multiColor

Patient-specific, digital full dentures using the subtractive workflow process

Prof. Dr. Pornpot Jiangkongkho, Dr. Wirun Khamwangsawad, Dr. Atittaya Chaowthawee, Dr. Pichamon Tharanatham

Developments in digital full dentures are advancing rapidly. There are now many different types of workflows available, and each user has to decide which workflow is right for them and for the individual needs of their patients. With the VITA VIONIC SOLUTIONS material system (VITA Zahnfabrik, Bad Säckingen, Germany), denture bases can now be printed or subtractively manufactured. The tooth material can be individually milled from a polychromatic blank. Alternatively, preconditioned, fully anatomically layered prefabricated teeth can also be used. Monochrome additive manufacturing of the dental arch is also now possible. In the following article, Dentist and Assistant Professor Dr. Pornpot Jiangkongkho, along with dentists and dental technicians Dr. Wirun Khamwangsawad, Dr. Atittaya Chaowthawee and Dr. Pichamon Tharanatham (all Faculty of Dentistry, Naresuan University, Tha Pho, Thailand), explain why and how they treated a case using VITA VIONIC BASE DISC HI and VITA VIONIC DENT DISC multiColor in a subtractive workflow.

Case study

The patient was seeking treatment due to fractures in his additively manufactured full dentures in the upper and lower jaw. He was not satisfied with the restorations in general, and was critical of their functional stability and esthetic appearance. The intraoral examination revealed no pathologies and only moderate resorption of the alveolar ridges. His current full dentures were manufactured using 3D printing technology, which did not provide the required robustness in terms of material, leading to fractures in the upper and lower jaw. The dentures did not adhere or hold properly. The dynamic and static occlusion were inadequate and the esthetics were not satisfactory.

Digital information and base material

The patient's existing digital information in the form of virtual models of the alveolar ridges and jaw relationship, as well as a bite registration prepared in advance in the digital workflow, were also to be used for the fabrication of the new restoration. The base was to be made as robust as possible to prevent new fracturing. For this reason, the decision was made to use subtractive manufacturing with the VITA VIONIC BASE DISC HI (Ø 98.4 x h 30 mm) using the patient-specific shade dark pink. The high impact (HI) disc has a particularly high level of PMMA cross-linking, resulting in increased durability due to its exceptionally high impact strength. The robust material can also be manufactured with a precise fit even in thin layers, automatically ensuring a high level of comfort.

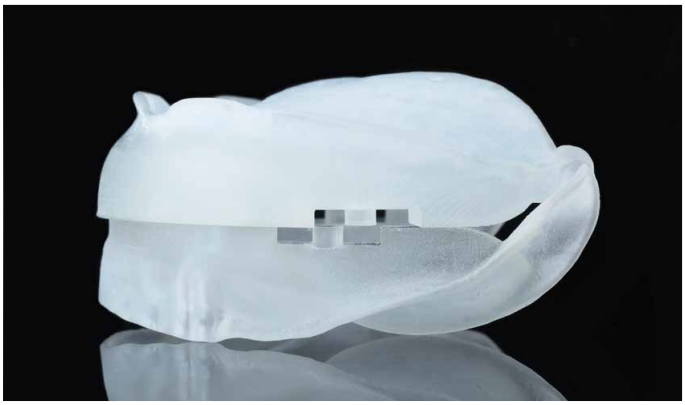

Fig. 1: A bite registration was prepared in advance based on the digital patient information already available.

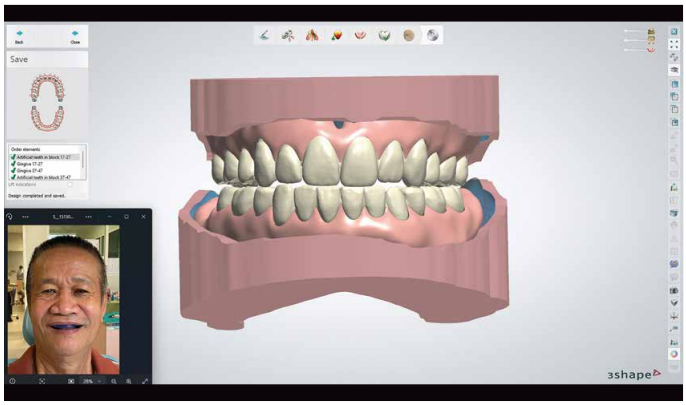

Fig. 2: The full denture restoration was designed using 3Shape CAD software.

Individualized premium dental material

The dental arch was also to be subtractively manufactured from the VITA VIONIC DENT DISC multiColor (Ø 98.4 x h 20 mm) to match the base. The milling blank was made from the highly cross-linked and abrasion-resistant VITA MRP composite formula, which is also used to manufacture all other VITA premium teeth with high abrasion resistance. The shade gradient integrated into the composite blank ensures a thoroughly natural esthetic appearance, while the additive tooth material had previously only been available in monochrome. The occlusion was also to be individually adapted to the functional needs of the patient during the virtual design process. Since the patient requested very light-colored teeth, a blank in the shade A1 was selected.

Fig. 3 to 5: The components of the full denture were subtractively manufactured using the milling blanks VITA VIONIC DENT DISC multiColor and VITA VIONIC BASE DISC HI.

Design and fabrication

The entire denture was designed and manufactured using CAD/CAM technology. The design was created using 3Shape CAD software (3Shape, Copenhagen, Denmark), and the subtractive processing of the blanks was carried out using the DGShape DWX-52D dry milling machine (Roland DG Corporation, Hamamatsu, Japan). The support structures were cut through with fine plastic milling cutters and then leveled, after which the prosthetic components were smoothed with sandpaper. The dental arches and denture bases were subsequently joined together using self-curing methyl methacrylate, and the composite was cured in a pressure pot. This achieved a seamless integration of the prosthetic components, which was expected to result in optimal functionality and esthetics during the clinical course.

Fig. 6: The two denture components of the maxillary denture aligned with each other precisely after subtractive manufacturing in the digital workflow.

Fig. 7: Using the lock and key principle, the dental arch could be inserted into the base of the full denture in the lower jaw.

Finishing and integration

A natural microstructure was then created on the vestibular surfaces of the anterior teeth using rotating grinding tools. This microtexture resulted in improved light diffusion and increased translucency. In addition, minor characterizations were applied to the anterior teeth using composite stains to emphasize the morphology and to achieve shade effects. Finally, the characterized areas were covered with a light-curing glaze. This was followed by a final polishing of both restorations, which ultimately provided excellent fit, functionality and esthetics once integrated. VITA VIONIC DENT DISC multiColor ensured a natural shade and translucency gradient, while VITA VIONIC BASE DISC HI in dark pink blended harmoniously with the patient's appearance. The patient and the dental team were completely satisfied with the results achieved using the digital workflow.

Fig. 8: Natural microstructures were created on the surface of the anterior teeth.

Fig. 9: Completed full denture after characterization of the anterior teeth with composite stains.

Fig. 10: The full denture restoration during clinical integration.

Technical tips

1 **Esthetic finishing:** Rotating grinding tools can be used to easily incorporate microtextures into the visible tooth surfaces in order to replicate the anatomy of natural teeth.
2. **Characterization:** Composite stains on the anterior teeth can be used to create natural shade effects and an individualized character.
3. **Digital workflow:** CAD/CAM technology makes it possible to precisely create full dentures that fit perfectly in a shorter amount of time.

Discussion and conclusion

The integration of VITA milling blanks into the digital workflow marks a significant advance in the fabrication of full dentures. VITA VIONIC DENT DISC multiColor ensures outstanding esthetics, thanks to its integrated natural shade gradient. During clinical use, the composite material offers the reliable abrasion stability that users of VITA Premium prefabricated teeth have come to expect. Especially in cases with limited vertical dimensions, it is possible to fabricate tooth material that is dimensionally accurate and does not require modifications at the basal or occlusal areas.

Especially when long-lasting restoration results are required, the highly cross-linked PMMA of the VITA VIONIC BASE DISC HI, with its increased impact resistance, excellent structural integrity, and biocompatibility, is currently the gold standard in the field of digital denture bases. The right blank can be selected for every patient type using the four different gingiva shades: classic pink, classic pink translucent, soft pink and dark pink. The denture base can also be individualized using composite stains, although this was not done in this case due to the depth of the smile line.

The precision of the dry milling process ensures a perfect fit, harmonious morphology and occlusion, and efficient finishing. Ultimately, the patient was very satisfied with the comfort, functionality and natural esthetics of the integrated full dentures. This case is an impressive demonstration of the potential and advantages of digital full denture fabrication as part of modern dental prosthetics. The fully digital workflow has proven to be both practical and reliable.

Depending on the equipment available, subtractive and additive materials or even prefabricated denture teeth can now be used. The clinical situation, the preferences of the patient and the budget determine which combination of materials is best suited to treat a particular case. Digital full dentures are becoming a valuable tool for improving treatment results and patient satisfaction.

Fig. 11: The patient was very satisfied with the comfortable fit of his bright and completely individualized smile.

Additional information and case reports at:
https://hs.vita-zahnfabrik.com/en/vita-vionic-dent-disc-multicolor

Spitalgasse 3
79713 Bad Säckingen
Germany

Phone: +49 7761 562-0
Hotline: +49 7761 562-222

info@vita-zahnfabrik.com
www.vita-zahnfabrik.com

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