

Esthetics redefined

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Modern dentistry requires not only new technologies and treatment methods but also modern products that are geared towards the needs of today's market. Products that have been utilized to meet the same demands for many years have to be assessed according to new criteria. Pre-fabricated denture teeth, for example, are used for new fields of application, eg in implantology. Pre-fabricated composite teeth are basically divided into two categories: PMMA-based pre-fabricated denture teeth have been available for many years and mainly cover the market for removable dental prosthetics. With the arrival of Condyloform® II NFC from Candulor (Wangen, Switzerland) and SR Phonares NHC from Ivoclar Vivadent (Schaan, Liechtenstein), the second generation of compositebased teeth has been launched.

If a close look at the requirements of dental implant prosthetics is taken, the differences to conventional tooth replacements are clearly evident. The chewing forces measured in implant-borne dental prostheses are eight to ten times higher than those recorded in tooth-supported restorations. Consequently, denture teeth are exposed to considerably higher abrasive wear when used in implant-borne reconstructions (Figure 1). Another difference is found in relation to complete denture prosthetics. While the aim is to achieve a balanced occlusion in complete dentures, conventional canine guidance is recommended in conjunction with implant-supported prostheses.

Material of the future?

With SR Phonares NHC, Ivoclar Vivadent focused on developing a tooth line that meets the requirements of modern dentistry. This tooth line has been specifically designed for use in implant prosthetics. It consists of a nano-hybrid composite (NHC) and involves the use of advanced iso-filler technology. The inorganic nanofillers

which are part of this technology provide the material with a homogeneous material quality. Scientific studies show that the filler composition affects the wear behaviour of materials. Homogeneous materials which contain microfillers demonstrate lower abrasive wear values than materials containing macrofillers. In addition, the SR Phonares teeth are manufactured with a newly developed method of production; instead of pressing, an injection process is used. Consequently, the teeth are free of flash lines and can be rotated in all directions during the tooth set-up. As a result, any individualized esthetic set-up option can be accomplished.



Figure 1: Removable implant-borne bar-latch prosthesis with conventional PMMA denture teeth after a service life of two years. High chewing forces and poor wear properties resulted in the rapid damage of the occlusal surfaces.

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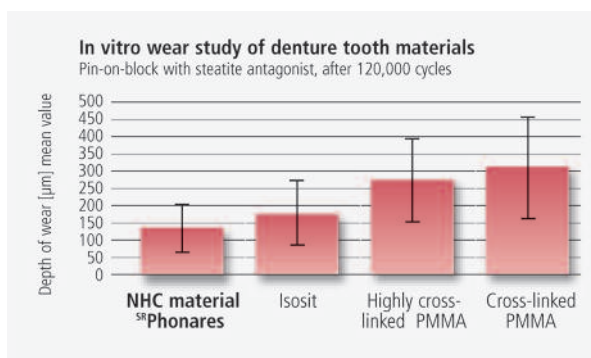


Figure 2 Source: Dr dipl Ing (FH) Martin Rosentritt, 08/2009, University of Regensburg, Germany.

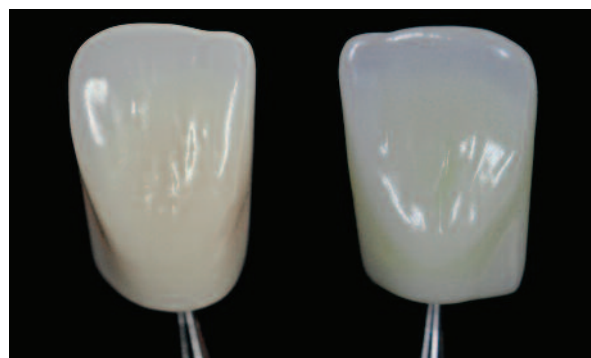


Figure 3: Lifelike moulds and clearly structured surfaces characterize the SR Phonares NHC teeth. The gingival proportions can be shaped to match the natural contours.



Figure 4: Tooth moulds are selected according to the patient-specific characteristics. Shape type chosen here: M – soft – universal.

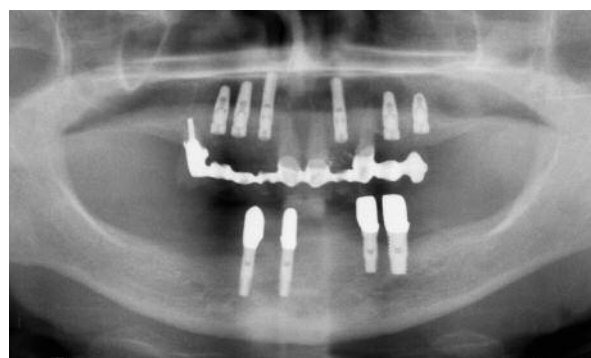


Figure 5: Situation after initial temporary stage. A removable implant-borne bar-retained prosthesis was planned for the lower jaw.

Properties

The wear values have been improved over those of conventional PMMA teeth, as was confirmed in a study by Dr Martin Rosentritt (University of Regensburg, Germany, 08/2009, Figure 2). Consequently, the SR Phonares NHC teeth are suitable for use in implant prosthetics. In addition, the innovative range of anterior tooth moulds meets the specific characteristics of the individual patient. With the help of a selection tool (FormSelector), the tooth size is first selected from sizes S, M and L. Next, the basic type is determined: soft (round) or bold (angular). Finally, the degree of wear is chosen: no wear (youthful), low wear (universal) or severe wear (mature). The teeth feature a silky mat surface and lifelike surface structure, which may be modified with rotating instruments if necessary. In my opinion, special attention was given to developing a tooth line that helps optimize the gingival architecture. Interdental closure can easily be accomplished, even if the teeth are rotated. In

addition, the cervical design allows for a harmonious contouring of the gingival papillae. The oval cervical shape creates a natural emergence profile (Figure 3).

Application in practice

The tooth moulds have been designed with the patient in mind and this really shows in practice. We first determine the shape type directly on the patient by means of an analysis of the esthetic appearance, taking all esthetic characteristics into account. On the basis of this analysis, a matching tooth mould is selected from the range of SR Phonares teeth. In the above example, the tooth mould of the maxillary tooth set-up (wax-up) harmoniously blends into the surroundings of the lips (Figure 4).

The patient case presents an edentulous patient who was treated with an upper denture on six implants and a lower denture on four implants (Figure 5). A fixeddetachable, veneered metal-ceramic prosthetic reconstruction was designed for the upper jaw. The lower

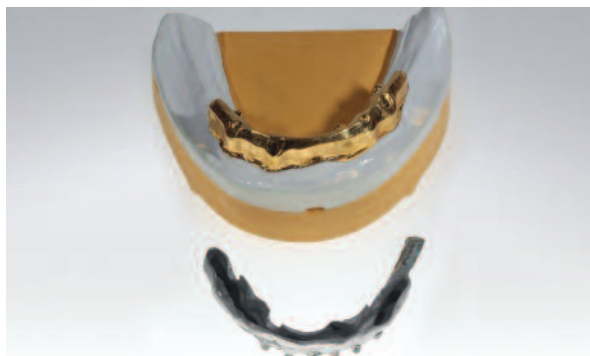


Figure 6: The substructure consists of a primary bar with an electroplated secondary structure, which is bonded to a base metal strengthening frame.



Figure 7: The teeth are mounted to the framework using toothcoloured resin before the reconstruction is completed with pink material.



Figure 8: Completed implant-borne lower prosthesis.



Figure 9: The shape and surface of the new SR Phonares NHC teeth harmonize well with the contours of artificial tissues.



Figure 10: The new NHC denture teeth in their oral surroundings.



Figure 11: Combined implant esthetics – removable composite prosthesis in the mandible and fixed ceramic veneered reconstruction in the maxilla.

jaw was reconstructed with a bar-retained prosthesis. The distal extensions of the bar enable the rotational axis to be shifted towards the posterior side, which increases the stability of the prosthesis. A wax-up of the anterior and

posterior teeth was created and tried in on the patient. After the esthetic dimensions had been established, a gold alloy primary bar and an electroplated secondary structure were fabricated with the help of silicone keys. A tertiary

framework was cast of base metal alloy and bonded to the electroplated structure to reinforce it (Figure 6). From our long-term experience in implant prosthetics, we have seen the importance of placing cast retention pins under each individual denture tooth. To mount the teeth, they are wetted with monomer and polymerized onto the framework using tooth-coloured resin. The tooth necks and cervical areas of the SR Phonares nano-hybrid composite teeth consist of a PMMA resin, which ensures a reliable bond to the denture base. Next, the metal basis is coated with a pink opaquer (Figure 7). The pink esthetics was created according to the specific characteristics of the patient. The restoration of the upper jaw will not be discussed here.

Before the prostheses were incorporated, anterior guidance was established. The composite denture teeth of the lower jaw should work in harmony with the ceramic veneers in the upper jaw. The light-optical characteristics of the NHC material should be similar to those of the ceramic (Figures 8 to 11). The topic of discussion will be the long-term wear behaviour of these different materials.

Conclusion

If these teeth fulfil their promise, they will be suited for several fields of application, particularly in implant prosthetics. The technical characteristics offer a great deal of potential. The nano-hybrid composite was optimized during several years of development. As a result, the teeth are distinguished by increased resistance to wear, low affinity for plaque accretion and high resistance to discoloration. Esthetically speaking, they allow a pragmatic, lifelike reconstruction of the oral situation in many patient cases. The anterior teeth in particular feature an accomplished shape and surface structure due to their haptic design. Dental prosthetists will be pleased with the possibilities to design the gingival contours. Individualized add-on materials are certainly a further possibility to be discussed in future. The long term results on the wear behaviour in particular will show if SR Phonares NHC deserves the accolade "implant tooth of the future".

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