# Natural-looking imitation of pink esthetics

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## Introduction

Even in the case of complex prosthetic reconstructions, patients want their dentures to look natural in addition to having the basic functions (speaking, chewing, tasting) returned to their stomatognathic system. Dentures should by no means have an adverse effect on the patient's esthetic appearance. Esthetic soft tissue design reflects this philosophy.

The IvoBase® denture base system offers an efficient method to create custom-made esthetic soft tissue reconstructions. The patients' expectations can be ideally met with a flair for esthetic design and a combination of three materials – IvoBase denture base material, SR Nexco® light-curing lab composite (customization) and ideally designed denture teeth.

## IvoBase System

The IvoBase System is based on a fully automated injection and polymerization process All the components (flasks, capsules, injector, etc.) are coordinated with each other. Chemical shrinkage of the resin is compensated during the polymerization process due to thermal management in the flask. As a result, volumetric shrinkage is prevented by the continued supply of additional material during the polymerization process to provide a denture base that demonstrates a high accuracy of fit and an excellent surface finish. Chemically, the IvoBase denture base materials fall into the category of self-curing polymers but offer the qualitative advantages of heat-curing polymers. As the self-cure process of IvoBase commences at a starting temperature of 40°C, thermal shrinkage is reduced compared with that of conventional heat-curing polymers. Monomer and polymer are supplied in predosed capsules to ensure an optimal mixing ratio and to eliminate direct skin contact with the monomer. The IvoBase System results in denture bases that demonstrate lifelike pink esthetics and closely resemble the light-optical properties of the natural gingiva. Characterizations can be easily applied to the denture bases to accommodate the specific expectations of the patient.

## Case presentation

A partially edentulous upper jaw was to be restored with a palate-free denture retained with telescopic crowns. The inner (primary) zirconia copings for teeth no. 13, 14, 15 and 23, 24, 25 were sheathed with electroformed copings (secondary parts) attached to a tertiary structure made of base alloy. The electroformed copings were cemented to the base alloy structure in the oral cavity to ensure a tension-free fit. Tooth setup was performed according to conventional prosthetic principles while the static and functional requirements as well as the patient's individual expectations were taken into account. Tooth position, smile line, lip volume, phonetics and other criteria were checked in the

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*Figure 1: Esthetic try-in of the wax-up.*

*Figure 2 and 3: Wax-up after successive contouring of the soft tissue parts in wax.*

course of an esthetic try-in (Fig. 1) before fabricating the final denture. Natural-looking artificial gingiva parts were already achieved in the wax-up and the soft tissue areas were individualized with subtle but effective touches (Figs 2 and 3).

### Lab procedure

After both the dentist and patient had approved the wax-up, the denture was ready to be processed into acrylic. To perform this task, I used the IvoBase denture base system, which allowed me to transfer the wax-up to the final restoration without loss of detail.

## The injection-based system provides a clean, accurate, safe and straightforward working method.

### Investing and boiling out

Both flask halves were identical. Prior to investing the model, I placed the flask lid, access former half and filter wax component in one of the flask halves. After applying a thin coating of petroleum jelly to the inner surfaces of the prepared flasks, I soaked the model with the mounted waxed-up denture with water and isolated it with stone-to-stone separating fluid. The model was now ready for being invested in plaster; a Class III dental stone is recommended for this purpose. I took care to place the model at the centre of the flask and to ensure a space between the anterior margin of the model and flask of approx. 10 mm. To create a flush surface between the edge of the model and the flask housing, I removed all surplus plaster whilst it was still soft. The stone surface should be flush with the access former to prevent the plaster from spalling during the subsequent working procedure.

After the stone had hardened, I replaced the access former half with the access former full and positioned the prefabricated injection wax component. As a palate-free denture base was fabricated in the present case, the sprues were pressed onto the maxillary tuberosity. I made sure that the sprue was contiguous in all areas of the denture base. Then, I attached what are known as aeriation channels at

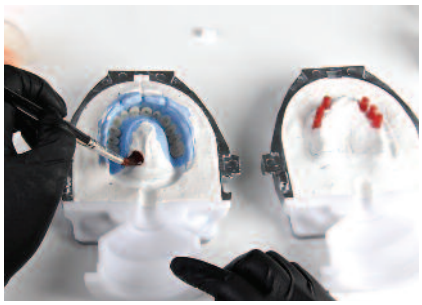

*Figure 4: The teeth are conditioned and the stone parts isolated.*

*Figure 5: The inhibited opaquer layer is removed and the framework repositioned on the framework.*

*Figure 6: The flask and IvoBase mixture are placed in the injector and the program is started.*

*Figure 7: Careful divesting after the fully automated polymerization process.*

*Figure 8: Finishing requires only a few steps as the wax-up is processed into the acrylic without loss of accuracy.*

the anterior region to vent the flask cavity during the injection process. These components were also prefabricated and were easy to connect to the denture base. Important: the aeriation channels must not come into contact with the flask housing. Next, I coated the teeth and gingival areas with a medium-body addition curing silicone (A-silicone of a shore hardness of 65) and then applied some stippling to the silicone before it had set to create a retentive pattern and secure the silicone in the stone. No silicone was applied to the occlusal surfaces and access former. After isolating the stone surface, I positioned the upper flask half and locked the flask halves using the locking clasp. Then, I filled the flask with dental stone (Class III) with the help of a vibration device to avoid air bubbles. Excess stone was skimmed off so that a flush surface resulted between the stone and flask lid. Once the stone had set, the flask was heated in a water bath at 90°C and then the two flask halves were separated. The wax was now soft and could be easily removed in large pieces. After the full access former had been taken out, the model and teeth were boiled out with clean boiling water to thoroughly remove all wax residue.

## Transfer to acrylic

The basal surfaces of the cleaned teeth were roughened with jet medium and mechanical retentions applied with a small round bur. After that, I returned the teeth to the silicone key. Next, I applied a thin coating of Separating Fluid to the stone surfaces of the cooled flask halves (Fig. 4). Prior to joining the flask halves, I masked the base metal alloy framework with opaquer. For this purpose, I used a pink opaquer for the gingival areas and a tooth-coloured shade for the areas under the telescope teeth. These materials were first applied as a foundation layer and then in a covering layer. Once the framework had been thus prepared, it was placed on the model and secured with wax (Fig. 5). The aeriation filter, centring insert and funnel were inserted and the flask halves assembled.

The denture base materials are available in seven shades. For the case presented here, I selected IvoBase High Impact in shade 34-V. I removed the monomer container from the predosed capsule, joined the fluid and powder and mixed the two components to a homogenous mixture. With a few easy manipulations I attached the centring insert and flask to the capsule and then placed them into the injector according to the manufacturer's instructions. Next, I selected the relevant injection program and then started the injection process (Fig. 6). The process was fully automated and, with the RMR function added, took approx. 65 minutes to complete. The RMR function further reduces the already very low content of residual monomer to below one per cent. As the injection and polymerization process were exactly matched to the material, chemical shrinkage was completely compensated. Once the program had been complete, I removed the flask and cooled with water. Divesting was performed under a dental press.

The IvoBase System includes a divesting aid to facilitate this process. Having detached the flask halves, I carefully removed the denture from the stone core and separated the capsule using a separating disc (Fig. 7). All waxed-up areas were faithfully reproduced in the acrylic.

## Completing the denture

Now, I directed my full attention to finishing the denture. The advantage of using this system became most apparent at this stage, as hardly any reworking was necessary. The finely modelled surface structures and textures of the wax pattern

*Figure 9: Light-curing SR Nexco composite can be optimally combined with the IvoBase System to characterize the denture base.*

*Figure 10: A thin coating of bonding agent is applied to the gingiva-coloured parts,...*


*Figure 11: ... allowed to react and then cured with light.*

were replicated in the acrylic without loss of detail. In a few quick steps the denture base was ready for final customization (Fig. 8). With SR Nexco, the artificial gingiva can be given an individual touch and natural-looking characterizations to suit the patient's expectations. SR Nexco ideally complements the IvoBase denture base material (shade 34 V) (Fig. 9).

I applied a light-curing conditioner (SR Connect) to the acrylic surface to create an adhesive interface that would allow the application of individual shade characterizations (Figs 10 and 11). After that, I focused on creating subtle details to reproduce a natural depth effect. I customized the vestibular areas and applied fine capillaries on the facial side using variety of different shades. Key anatomical features should be borne in mind when characterizing soft tissue parts to achieve a lifelike reproduction. For instance, keratinized gingiva has a light pink colour because less blood normally flows through it. By contrast, the mucogingival areas receive a far larger supply of blood and are interspersed with fine blood vessels. These details were easy to reproduce with the SR Nexco range of materials. Aspects of three dimensionality including alveoli and festooning were already created in detail in the wax-up and transferred to the acrylic without loss of detail using the IvoBase System. The SR Nexco gingiva materials and my technical skills enabled me to individualize the prosthetic gingiva by applying materials in different shades in a targeted fashion to attain a natural-looking final result (Figs 12 and 13).

Prior to final light-curing, I covered the entire surface with an oxygen-tight glycerine-based gel (SR Gel) to prevent the formation of an inhibition layer. After completing the final polymerization process, I polished the surface. The use of goat's hair brushes, a high-gloss buff and Universal Polishing Paste effectively resulted in a superbly smooth and glossy surface, without loss of surface texture or shade characteristics.

*Figure 12: Characterization: subtle stippling and fine red blood vessels enhance the natural appearance of the prosthetic gingiva parts.*

*Figure 13: The individual SR Nexco materials can be adapted using a disposable sponge.*

*Figure 14: The tooth replacement harmoniously integrates into the patient's face and satisfies his esthetic expectations.*

*Figure 15: Successful interplay between light, shadow and shade. The surface texture modelled in wax has been processed into acrylic without loss of detail using the IvoBase System. The resulting light dynamic properties convey a natural appearance to the artificial gingiva.*

## Result

Pink esthetics that very closely resembles healthy soft tissue is the result of this approach. Fine details of texture – such as subtle stippling, slightly accentuated alveoli or free gingiva margins – give artificial gingiva a natural appearance. The IvoBase denture base material beautifully harmonizes with the SR Nexco composite and together, these two materials create natural light reflections and a dynamic interplay of colours. The compact and smooth surface is not only esthetically pleasing but also provides optimum conditions for denture hygiene (Figs 14 and 15).

## Conclusion

The IvoBase injection process provides a straightforward method to process waxed up denture bases into high-quality PMMA. Waxed-up setups can be transferred 1:1. Polymerization shrinkage is mostly compensated, thus minimizing the effort required by the dental technician. The soft tissue parts can be customized to meet the individual expectations of the patient and to provide dentures with natural-looking pink esthetics.

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