

A minimalistic veneering technique as prosthetic success concept

Microlayering with the GC Initial IQ ONE SQIN ceramic concept

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ZT Carsten Fischer graduated as a dental technician in 1992, following his father's footsteps. In 2007, he founded Sirius ceramics, a specialised laboratory for all-ceramic restorations and implantology, in Frankfurt/Main (Germany). He is considered one of Germany's all-ceramic specialists. He is the founder of the Panther machining protocol, the Finevo cleaning protocol and is a consultant for the development of zirconia materials. Passionate about his job, he focuses on CAD/CAM technologies and all ceramic restorations on teeth and implants and has a strong connection with industry and educational partners. Since 1994, he is a consultant for various companies in the dental industry and involved in product development and from 2012 to 2014, he was employed at the department for postgraduate education department at the University of Frankfurt. Carsten Fischer is a lecturer at Steinbeis University, Berlin, a lecturer at DIU/ Dresden International University and speaker for various organizations (DGI) and on the board of EADT.



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“What you see is what you get” – this small sentence describes the great advantage of micro-layering. While the conventional layering technique requires a great deal of experience in order to replicate a natural tooth in terms of shape, function and colour, the framework determines the basic parameters with micro-layering. About 80 to 90 percent of the restoration shape is already defined with this technique, so one can fully concentrate on the fine layer of veneering ceramics. This way of working enables a high-quality result and at the same time has a positive influence on the everyday work in the dental laboratory. After all, while dental technology is changing, one thing remains the same: the need for qualitative products and work.

The discussion as to whether the same good aesthetics can be achieved in this way as with classic layering technology is useless. Micro-layering (Figs. 1-5) is an alternative approach that offers great potential for many dental laboratories thanks to new processing technologies and modern materials science. Classical ceramic layering is an artistry

that works excellently and can lead to great results. But it requires well-founded know-how, a lot of experience and usually a high expenditure of time. And since hardly anyone is a natural talent, the dental technician has to work hard and disciplined for years to fully master it. New ways such as micro-layering are a welcome alternative.

Turnaround in all-ceramics

Micro-layering was born out of the need to improve the aesthetics of monolithic restorations. Modern zirconium oxide restorations have been produced for more than 10 years and are considered state of the art. Clinical experience and scientific studies confirm their long-term stability. Especially with the advent of multi-layered zirconium oxides, many dental laboratories have integrated monolithic restorations into their everyday laboratory life in order to avoid chipping of the significantly less strong veneering ceramics. The aesthetic finalization is based on the multichromatic zirconium oxide and, if necessary, a colour refinement with ceramic paint or micro-veneering takes place.

This all-ceramic course change led to safe and efficient restoration concepts. Rapid improvements in the field of hardware and software have opened up new possibilities for realizing even complex patient situations with the help of a full-fledged, virtual simulation (virtual articulation, face scan, complete chewing and joint data acquisition, etc.).

Basically, the application of a thin veneering layer is not new. What is new, however, are the especially designed ceramic materials (such as the ONE SQIN colour-and-form ceramic concept) and the microlayering 'principles':

- Veneering only in the visible area
- Use of specialized characterization with 3D-effect
- Internal staining + micro-thin ceramic layer (0.1-0.6 mm)

In order to meet the optical challenges of aesthetic veneering in such thin layers, special ceramic products are required, whose colouring is based on the classic layer masses in terms of colour value, fluorescence and



Fig. 1 and 2: Three crowns in the molar area, implemented with micro-layering technology. The functional surfaces of the crowns are monolithically designed.

opalescence. Certainly, it is theoretically possible to try the new concept with old products. In practice, however, it seems necessary to rely on modern materials, especially designed to enable minimalist ways to refine a restoration.

The company GC (Tokyo, Japan) was already focusing on veneering reduction more than ten years ago. At that time, the basic recipe was laid for what is now offered by many manufacturers as micro-layering. The focus of years of research was how the

laborious ceramic veneering could be reduced without aesthetic compromises. In the beginning, for example, there were the IQ-Concepts "Press Over Metal" and "Press Over Zirconia" as well as the "One Body Concept". The first 3D glaze paints, the Initial Lustre Pastes (GC), were launched in 2007, followed by Lustre Pastes NF in 2010. These developments formed the basis for the all-ceramic colour-and-form concept GC Initial IQ ONE SQIN (Figs. 6-10), a result of experience and modern materials technology.



Fig. 3-5: Partial veneering resembling classic veneering with the colour-and-form concept GC Initial IQ ONE SQIN; here using the example of a single anterior crown.



Fig. 6: Working example of an all-ceramic crown for the lateral anterior tooth 12 (GC Initial IQ ONE SQIN): zirconium oxide scaffold (ArgenZ HT+ ML).

Modern materials science as a basis

Materials science has laid the foundation for contemporary prosthetic work. Accordingly, basic knowledge is imperative. New developments should be observed with interest and critically questioned using a high professional standard. Often, the feedback from everyday laboratory life makes successful materials and products what they are today. The author of this article has always been actively involved in development processes and contributes a lot to new concepts and procedures with his experience and expertise. The ONE SQIN concept is an example hereof.

The ONE SQIN concept at a glance

The ONE SQIN system is based on past experience and focuses on the challenges of today. The set consists of coordinated ceramic masses, all of which can be combined with each other. It can be used on the one hand for purely monolithic, superficial applications and on the other hand for high-end aesthetics with internal characterization. Aesthetic refinement is then done with a paper thin (0.1-0.6 mm) veneering layer with specialized feldspar ceramics. The 3D-ceramic paints Initial IQ Lustre Pastes ONE are used to characterise the framework, providing natural



Fig. 7: Framework preparation (Lustre Pastes).



Fig. 9 and 10: Finished crown: buccal and lateral view.

light-optical properties (fluorescence, opalescence) and also take over the connection function for the ceramic micro-layer (Fig 11). With the feldspar-based microlayering ceramic Initial IQ SQIN, the morphology and surface texture are in turn determined (Fig. 12). Initial Spectrum Stains are universal "2D-paints" for individual characteristics (Fig. 13).

Depending on the need, the optimal workflow is selected. Very helpful are the versatility and the compatibility with which the individual components can be used and mixed with each other. The multitude of possibilities is therefore almost unlimited in order to do justice to a high-quality, sophisticated aesthetic result.



Fig. 11: The GC Initial IQ ONE SQIN system includes Lustre Pastes (paintable ceramic masses) for internal colouring (e.g. fluorescence), which omit the connection firing for the connection between the framework and ceramic.



Fig. 8: Thin veneering layer.



Fig. 12: A special Form-and-Texture liquid gives the ceramic an almost plastic consistency, the high stability enables targeted shaping.



Fig. 13: External colouring for individual surface characterization.

The benefits

Micro-layering is considered an alternative to conventional layering. From the point of view of the laboratory owner as well as the dental technician, it has many interesting advantages. The process is efficient without having to accept compromises in quality. In addition, it ensures a satisfying, reproducible workflow, which leads

to a good result with comparatively high certainty. Functional contact surfaces as well as approximate contacts are defined by the framework and this simplifies the aesthetic finalization many times over (Fig. 14). Especially less experienced dental technicians get the opportunity to deliver high-quality work and can thus be categorised in a good salary structure. This increases the attractiveness of dental work and is at the same time motivating for career starters. They can actively participate in the all-ceramic day-to-day business, for example by producing all-ceramic posterior tooth restorations almost independently. In addition, in the case of considerable aesthetic challenges (anterior tooth area), the framework can be prepared by less experienced ceramists; the ceramic specialist only has to devote himself to characterization and finalization.



Fig. 14: The design created in the software could be converted 1:1 into ceramic. The vestibular surfaces are veneered with a paper thin ceramic layer.

Zirconium oxide as a basis

Basically, the success of micro-layering is inextricably linked to the quality of the colour-bearing base – the framework material.

A multi-layered (ML) zirconium oxide framework replaces the dentine layering. Hence, the colour selection is of great importance (Fig. 15). It should be noted that most ML zirconium oxides are strongly saturated or intense in their colour saturation and often look a touch too dark. Therefore, it is advisable to always choose a slightly lighter shade. A topic

of debate is the shade selection method for ML zirconium oxide. In the field of shade selection, a turning point has been observed for some time. The classic monochrome Vita shade guide has only limited significance. It has served well in dental technology for decades and for a long time offered a good communicative basis – partially error-prone, but nevertheless it was very helpful. Now the system has reached its well-deserved retirement and can respectfully retreat. Although an A3 will always remain an A3, the reproduction of the shade based on the shade-providing framework is only possible if the shade communication is fully mastered. It is far from easy and the learning curve is steep, yet it forms the basis of a timeless all-ceramic.

It is also the task of the dental industry to strive for uniformity with regard to colour determination and nomenclature. Until then, the dental laboratory can help itself with e.g. a custom shade guide from the laboratory's own ML zirconium oxide.

Practical implementation of a restoration with ONE SQIN micro-layering

A validated workflow is required for the correct implementation of micro-layering. A framework milled in



Fig. 15: The framework replaces the dentine layering. Therefore, in micro-layering, the choice of framework material becomes a success criterion. Multi-layered zirconium oxides offer an ideal basis (zirconium oxide: ArgenZ HT+ ML, Argen Dental, Düsseldorf).

wax or PMMA, which can be precisely adapted in form and function to the circumstances, defines the basis. After shade selection, the framework is milled from ML zirconium oxide. (Tip: choose a lighter shade)

Framework preparation

Zirconium oxide still is a sensitive material that must be treated with care. Blasting of the framework is not recommended. The author relies on a pre-polished zirconium oxide surface. Special rotating tools (Fig. 16) are used for all-ceramics (Panther Edition, Sirius Ceramics, Frankfurt). The Panther kit includes a standardized processing protocol. The ceramic surface is prepared at 7,000 to a maximum of 12,000 rpm. Panther tools have very good cooling, which accommodates the ceramic's properties. Due to their good removal performance, only a low contact pressure is required. The framework surface is gently processed without damaging the ceramic structure. No residues remain on the framework surface. The polishing is followed by cleaning the framework in an ultrasonic bath (80% ethanol). The zirconium oxide surface can also be conditioned with special plasma devices. This leads to surface activation and consequently to better surface wetting.



Fig. 16: Careful preparation is already a central process step in the unsintered green state (Panther, Sirius ceramics). Novel instruments work in a material-friendly, efficient manner and leave no unwanted residues on the material's surface.

Internal Staining with Lustre Pastes ONE

The described concept integrates the Lustre Pastes ONE. These fine-grained paintable ceramics are used for the colour design of monolithic restorations as well as the internal characterization of veneering frameworks. At the same time, they have excellent wetting properties and serve as a strong connector between the framework and veneering ceramics.

The Lustre Pastes ONE are suitable for the internal and external characterization of

- Zirconium oxide and lithium disilicate frameworks
- Layered ceramics with a CTE between 6.9 and 13.3.

The ready-to-use Lustre Pastes ONE are based on a blend of refined glass ceramic particles that ensure lifelike deep light dynamics for a natural 3D-effect. In addition, all Lustre Pastes ONE are fluorescent (different levels) (Fig. 11). Thanks to their paste-like, thixotropic consistency, they are easier and more precise to apply compared to conventional stains.

Veneering with SQIN

The basic colour and shape are now already defined, so full attention can be paid to the light-optical subtleties and micro-texture. SQIN can be applied in layers of 0.1 to 0.6 mm. Thanks to the mixture of feldspar-based glasses, a lifelike three-dimensional effect is created that brings colour, depth and natural translucency to the restorations. The special Form-and-Texture Liquid offers good processing and modelling properties for an individual surface texture. The liquid gives the ceramic a sort of 'plastic' consistency: it can almost be modelled like wax. Due to its excellent shape retention, even morphological subtleties of the texture can be incorporated prior to firing

(Fig. 12). Caution: the application of the Form-and-Texture Liquid should be extremely economical (one drop is enough); otherwise the mass will become too plastic and a long pre-drying will be necessary. Since the mixture of liquid and SQIN powder results in a highly compact, dense mass providing high gloss, the final glaze firing can be omitted. This self-glazing effect is unique for specialized ceramic systems and provides efficiency in the process flow.

External Staining with Spectrum Stains

The Spectrum Stains are universal paints, used for individual characterization and are compatible with almost any type of dental ceramic due to their large TEC range. In particular, they have been adapted to the aesthetic colour concept of GC Initial. The powder paints are available in 20 shades and can be adapted to your own needs in their consistency with glaze liquid or glaze pastes. Regardless of the application method, a detailed result is achieved, which preserves the surface texture and at the same time allows an optimal gloss.

Firing

The thermally correct handling of zirconium oxide must be taken into account. Especially in the case of wide-span restorations, the firing curve is one of the most important parameters for a successful, long-term stable result. Only a sufficiently long drying time ensures a completed drying process. Long-term cooling must also be adhered to in order to avoid stresses within the ceramic. The bridge link with the largest volume determines the temperature rise and the cooling curve.

Other practical examples

Figures 17 to 21 show the exemplary application of Initial IQ ONE SQIN for the complete restoration of an upper jaw. In addition, an anterior single crown is shown, which was finalised with the micro-layering technique and components of the ONE SQIN concept (Fig. 22 to 25).



Figs. 17-21: Challenging full-arch treatment from initial situation to end result with monolithic restorations in the posterior area and micro-layered crowns in the aesthetic anterior area. Both approaches complement each other perfectly and complete the concept idea.

Conclusion

Micro-layering is an attractive alternative to classic ceramic layering. Thanks to modern materials, a high level of aesthetics can be achieved in a reproducible, efficient way, and with predictable, high precision. In combination with modern software and hardware, functional aspects can also be exactly implemented.

The ONE SQIN concept is the perfect complement to this technique. The most important points are:

- Minimal sinter shrinkage and wide CTE window
- Optimal fluorescence with firing stability
- Creation of structures and textures

in the wet stage, with excellent shape retention

- Self-glazing properties for time optimization
- Light-optical effects are convincingly imitated, even in the thinnest of layers
- Predictable results within few firings



Fig. 22: Tooth 11 is to be supplied with a new crown.



Fig. 23: The situation after removal of the old crown and light reparation.



Fig. 24: All-ceramic crown for which a zirconium oxide framework was veneered using micro-layering (ONE SQIN).



Fig. 25: Perfect lip image.

With all these possibilities, it must not be forgotten that a really high-quality prosthetic restoration can only be created in skilled hands and with sound knowledge of materials science. Safe, valid dental procedures are always at the basis.

Acknowledgements

The author thanks his team for their commitment and trust as well as the practice of YourSmile, Dr. Rafaela Jenatschke, for their daily willingness to support Sirius ceramics.

References

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