Maximal aesthetics within a micro-layer!

A new, efficient concept for monolithic workpieces

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Patric Freudenthal *graduated as a dental technician in 1989 at the University of Malmö, Sweden. Before that he worked as a dental assistant between 1984-1986. After graduating, he worked as a technician for 10 years before starting his own lab with Björn Stoltz. IQDENT has worked with implants, CAD-CAM and aesthetics during all this time, with focus on bioinert materials. Since 2004, Patric has been lecturing on different topics, such as: implants, CAD-CAM, aesthetics, full ceramic etc. Function & aesthetics with technology is the key-instrument in his everyday work.*
He is a member (and board member) of The Dental Technicians Guild.

The start of all-ceramic restorations with zirconium dioxide (ZrO_2, often referred to as zirconia) was only a small change from PFM, in the sense that the coping was only in a different material. However, the digital way of working made its entry in the dental lab with CAD (computer-aided design) and that saved us some money in the production (Fig. 1). This has been important for the technique to succeed because the coping was expensive and not always the best. More detailed information can be found in my previous article about zirconia as a predicable material (Zirconia: Aesthetic, strong and predictable – first published in GC Get Connected 14, 2019).

Moment	PFM Time	Zirconia Time
Model	20	20
Spacer	3	6
Applying casting channels	2	0
Invest	2	0
Prepare alloy	5	0
Cut casting channels	3	0
Adjustments	5	0
Polishing	4	3
Margins	5	5
Wax-up	15	0
Investment material	3	0
Burn-out	4	0
Devest, sandblasting etc.	6	0
Try-in	3	1
Porcelain	40	40
Total time	**120**	**75**

Fig. 1: Production time comparison charts between the traditional PFM-crown and the first generation of zirconia

Maximal aesthetics within a micro-layer!

After CAD/CAM was established in the labs, a new era of ceramic materials arose to make the restorations look aesthetic and natural. In the early days before zirconia, titanium-ceramics were used, with a poor result but it was the only available option at that time. The dental industry became aware of the big market for new ceramics to layer on these full ceramic solutions (zirconia – alumina). This was the second stage of better results and better economy for the dental labs with full ceramic restorations.

When we got to full in-house production of all-ceramic work (zirconia), designing as well as milling, a door was opened to a new product portfolio.

It didn't take a long time before semi-monolithic and full monolithic crowns were implemented and designed in our lab. This product type demanded a new approach making use of ceramic staining and layering techniques.

Fast forward a couple of years and lots of experimenting. . ...

As users of GC's ceramic products, we immediately found a possibility with the Initial ceramic line and the combination of Initial Lustre Pastes NF and Initial Zr-FS (Fig. 2). This provided us two predictable products: monolithic crowns using a ceramic painting technique and semi-monolithic (designed for micro-layering ceramics) crowns.

Along the way, we learned a few things:

- We saved time leading, to increased profit
- The shape and size were already in place (CAD design)
- The amount of different materials used decreased
- We didn't lose our goal of delivering esthetic results

This procedure and material selection became our standard protocol for all-ceramic solutions, both for zirconia and Initial LiSi Press (lithium disilicate pressable ceramic). With this standardised workflow, everything became more efficient and controlled. This set-up could be perceived by our customers in terms of positive feedback, in our turnover and profit and in the amount of time spent in the lab – everything became better.

As business owners, we always look at our costs, production time and the effect on our profit, while maintaining the quality requirements.

Still we were not satisfied with this set-up. In my entire career, I've always searched for ways to improve whatever I'm doing and my business partner and I have made some good choices over the years (but also a few bad ones).

This has led us to our current situation. Our dental lab - IQDENT - is today a 98% digital lab. Our products are 90% all-ceramic and our standard products are monolithic and micro-layered crowns, bridges and implant work. We recently also engaged into digital dentures, partial dentures and splints. If we get requests for traditional PFM, we take care of the design but outsource the production (milling or metal sintering).

This way of thinking and running our business also lead us to experimenting with the available solutions. So we combined Initial Lustre Pastes NF with a little bit of Initial Spectrum Stains and Initial Zr-FS to get a more effective way for micro-layering without compromising on the aesthetics.

At the same time, GC was looking into novel ceramic solutions that lead to a new concept that fitted into their Initial IQ philosophy – "Intelligent Quintessence - with less you do more ...." and was launched as "the Initial IQ ONE SQIN concept".

Fig. 2: Case with a foundation of Initial Lustre Pastes NF, sprinkled with Initial Zr-FS "CL-F", then individualised with Initial Spectrum Stains and finalised with Initial Zr-FS (Enamel and CT).

It is all about material improvements based upon new Lustre Pastes with increased fluorescent character (Initial Lustre Pastes ONE – LP ONE) and new powder technology for micro-layering techniques (Initial SQIN), both compatible with the Initial Spectrum Stains (SPS). During the field tests performed in our lab, we could already notice the possibilities and potential of this concept. Now, after a few months into the evaluation phase, we have a solid system at our disposal for all-ceramic works:

- Even more time saving
- Predictable results
- High quality output

When our "old way" using a protocol Initial Lustre Paste NF and Initial Zr-FS is compared to this new Initial IQ ONE SQIN concept, it can be seen that the protocol remains more or less the same, but a few steps and firing cycles could be removed (Fig. 3).

Moment	Initial Lustre Pastes + Initial Zr-FS	Initial Lustre Pastes ONE + SQIN
	Time	Time
Processing	10	10
Printed model	0	0
Prepare margins	15	15
CAD/CAM	1	1
Cut out of blanks	10	10
Prepare coping	5	5
Coloring Liquids (unsintered)	5	5
Initial Lustre Pastes (sintered)	25	15
Ceramic layering	0	0
Finishing & polishing	10	10
Total time	**71**	**61**

Fig. 3: The left chart shows the "old" way and the right chart is with GC Initial IQ- ONE SQIN concept. Ten minutes are saved on every single unit.

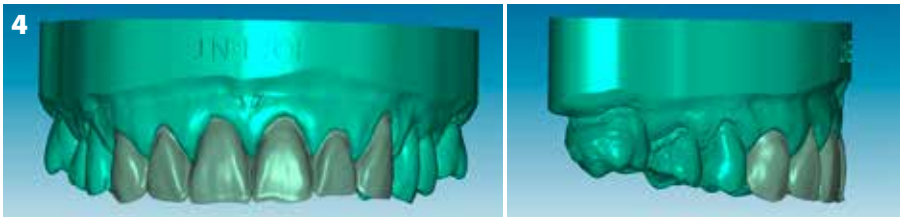

Fig. 4: Digital design of the framework with a 0.2-0.4 mm buccal cut back

The GC Initial IQ ONE SQIN concept in our lab

ONE SQIN

Step-by-step preparations:

- Digital design is with a buccal cut-back between 0.2-0.4 (Fig. 4)
- Mill wax (or print) in case LiSi Press is used or mill the zirconia
- Press or sinter in the desired base color
- Prepare the framework for ceramic layering as usual
- Sandblast the framework slightly with 2.0 bar pressure (pure Al_2O_3)

Step-by-step ceramics application:

- Application of the ready-to-use new LP ONE to cover the complete framework/coping. SPS are used for details (when required).
- Firing is done with vacuum following the instructions. The new LP ONE offer colour as well as fluorescence and serve as connection layer (Fig. 5).

Fig. 5: The lithium disilicate framework (Initial LiSi Press LT), individualised with Initial Lustre Pastes ONE.

- When the colour and characterization are adequate, the new Initial SQIN ceramics are applied. It is important to use the dedicated "Form & Texture" liquid and the correct drying time. If the ceramic layer is thicker, the drying time needs to be longer.
As a glaze fire we use the dentin program but take it down to 710°C (can be different in different ovens). Even though we could significantly reduce our working time, the finished restorations look beautiful and lifelike (Fig. 6).

Fig. 6: Finished full ceramic restoration with SQIN. Vestibular and lateral views.

Some clinical cases with zirconia: step by step

Besides its use onto lithium disilicate frameworks, Initial SQIN can also be used to microlayer zirconia frameworks as can be seen in the next cases. LP ONE are again ideal to characterise the framework and to serve as a connection layer for the SQIN ceramics.

Before the digital buccal reduction (Fig. 7), a digital wax-up was made and the dentist had a try-in. If there are any adjustments needed, the dentist rescans and sends the file to the lab before the final design is milled.

Fig. 7: The digital cut back is only 0.3mm

After the milled workpieces are fitted on the model, they are slightly sandblasted (2 bar). After a first characterisation firing with LP ONE and SPS, the micro-layering is done using Initial IQ SQIN (Fig. 8). To fix the zirconia restoration onto the trays in the furnace, we use Initial Firing Foam.

Fig. 8: The zirconia restorations are characterised with LP ONE and SPS and layered with Initial SQIN.

After fitting, surface and texture shaping of the restoration, we glaze at approx. 720°C or polish (Fig. 9).

Another major advantage of this concept is its repeatability and predictability for any kind of all-ceramic case (Fig. 10) as can be seen in the next case with gums.

Even restorations with gingival reproduction follow the same easy approach: design, mill, sintering, LP ONE characterisation and SQIN micro-layering and texture.

Usually we don't use any infiltration liquids to colour the gingival part of the zirconia. We start from a tooth-colored framework (Fig. 11) and then layer gingiva ceramics over it (Fig. 12). This approach follows the same procedure as previously explained: slighty sandblasting the framework, a first layer of Initial Lustre Pastes NF GUM shades (with Initial Spectrum Stains). Detailed gingival morphology is given with the Initial SQIN Gum shades (Fig. 13).

At IQDENT, this is just one of our tools when it comes to ceramic restorations, because we use the complete GC Initial system. For particular, complex cases where more details, depth and incisal translucency are needed, Initial Zr-FS or Initial LiSi are used. For all our standard cases (some of which are also more complex), we go for the Initial IQ ONE SQIN concept, whether it is a single crown, implant work or bridge, zirconia or Initial LiSi Press. In other words: it is a very versatile system.

Fig. 9 a-b: Final restorations after glazing. a) on the model; b) in the mouth

Fig.10: Green state zirconia, before sintering. Thanks to the digitalization, any case is now reproduceable.

Fig. 11: An 8-unit restoration with gingival reproduction

Fig. 12: Gingival layering on top of the zirconia framework.

Fig. 13: Final restoration after firing. The auto-glaze effect of the SQIN ceramic is clearly visible.