

The Mini-Max principle: When profitability is combined with aesthetics

GC Initial™ IQ ONE SQIN painting and micro-layering system: A new level in the field of all-ceramics

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The goal of all-ceramic restorations is to produce a natural imitation of beautiful teeth. At the same time, dental technicians must meet the economic challenges facing the dental laboratory. A balancing act that can be mastered nowadays with modern ceramics and dental finesse. The author describes his work with the GC Initial™ IQ ONE SQIN painting and micro-layering ceramic system. As a result, the mini-max principle can be implemented in the laboratory day and achieves maximum aesthetics with reduced effort.

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Observe, create, set up, try out... the path to skill is long for dental technicians and it is characterized by patience and perseverance. Especially in the production of ceramic restorations, countless small subtleties determine the result. The shape, colour and texture of the restoration, functional parameters, framework materials, shrinkage properties of the ceramics – all this must be mastered. The aim is to deliver a restoration with a natural and aesthetic overall look. Impressive here is the fact how intensively dental technology has been dealing with the imitation of natural teeth for decades. Ceramic veneering techniques that have matured almost to perfection enable maximum aesthetics. Nevertheless, costs and efforts are high up to the maximum achievable outcome. In order to meet the economic requirements of the day-to-day laboratory routine, concepts and materials (i.e. lithium disilicate and zirconium oxide) have been developed with which monolithic restorations can be produced. However, the benchmark for the aesthetic result – especially in the anterior region – is the traditional layered crown. A modern, alternative production route for all-ceramic restorations is micro-layering.

The Mini-Max principle in all-ceramics

With as little use of resources as possible, the defined goal should be achieved – this is how the “Mini-Max principle” can be explained in one sentence. Translated to dental technology, this means accomplishing the maximum

achievable result with the most manageable effort. While, for example, for posterior crowns, the path with minimal effort is the full monolithics implementation, this system often reaches its aesthetic limits in the anterior tooth area. The alternative is micro-layering. In this process method, the fully anatomical ceramic framework (pressed, ground or milled) is slightly reduced at the vestibular side and at the end, the light-optical properties of the natural teeth are imitated by means of a thin layer of veneering ceramics. The process can be wonderfully combined with the painting technique to achieve the last bit of naturalness. The GC Initial™ IQ ONE SQIN painting and micro-layering concept stands for a well thought-out system with coordinated products. The complexity of the light-optical properties of natural teeth can be achieved with comparatively little effort. The procedure is efficient. At the same time, many uncertain variables of all-ceramics (e.g. the influence of the framework colour, shrinkage upon sintering, the layering concept, etc.) are easy to control.

Prime example: GC Initial™ IQ ONE SQIN painting and micro-layering concept

But is the maximum result (benchmark is the conventionally layered crown) achievable with this efficient system for vestibularly reduced monolithics? Finding an answer to this question is the aim of this prime example. In order to obtain an evaluation standard, six crowns (teeth 13 to 23) would first be converted in conventional sintering technology on refractory dies



Fig. 1: Crowns layered on refractory dies (sintering technology) (GC Initial MC) as a high benchmark and basis for evaluation.

(Cosmotech Vest, GC) with layered ceramics (Initial MC, GC) (Fig. 1). This is the aesthetic benchmark for the implementation of the same crowns with the GC Initial™ IQ ONE SQIN painting and micro-layering concept.

The complete GC Initial™ IQ ONE SQIN painting and micro-layering system consists of three coordinated ceramic materials:

GC Initial IQ Lustre Pastes ONE

These 3D ceramic paints are used for the internal and external characterization of frameworks as well as the connection firing (necessary for SQIN). In-depth light dynamics (3D effect) are achieved. Lustre Pastes ONE – a further development of the popular Lustre Pastes NF – are ready-to-use, feldspar-based ceramic masses. The mixture of fine ceramic particles brings about the three-dimensional paints' colour intensity and lifelike translucency and fluorescence (Fig. 2), e.g. for monolithic restorations.

GC Initial IQ SQIN

These micro-layering ceramics are used to design morphology and surface texture. A three-dimensional surface texture with natural gloss (self-glazing) is achieved. With the



Fig. 2: Representation of the fluorescence of GC Initial IQ Lustre Pastes ONE.

SQIN ceramics, lifelike aesthetics can be achieved within a layer that is merely 0.2 – 0.6 mm thick. The balanced mixture made of feldspar-based ceramics creates a three-dimensional effect – colour, depth and natural translucency. In addition, the special Form & Texture liquid offers special processing and modelling properties to create an individualized surface texture.

GC Initial Spectrum Stains

With these universal 2D paints, individual internal and external characteristic peculiarities are realized. With their unrestricted variety of colour nuances, every situation is really taken into account.

In our comparative case, six anterior crowns were implemented with the GC Initial™ IQ ONE SQIN painting and micro-layering system and two finishing paths were chosen:

- 1st quadrant: Minimally reduced framework, painted with Lustre Pastes ONE / Spectrum Stains and then veneered with SQIN
- 2nd quadrant: Monolithics, painted with Lustre Pastes ONE / Spectrum Stains



Fig. 3: a) Fully anatomical wax-up.



Fig. 3: b) The fully anatomical wax-up was slightly buccally reduced in the 1st quadrant.



Fig. 3: c) Pressed crowns (GC Initial LiSi Press MT) on the model.

Creating the basis

The choice of framework material is an essential aspect for the result. The decision depends on various factors; for example, if the restoration is to be cemented conventionally in the mouth, zirconium oxide may be the right material. In this case, the crowns were made of lithium disilicate ceramic (Initial LiSi Press, GC) using the press technique. Initial LiSi Press offers a wide range of ingots with natural translucency. For this sample case, our

“favourite” ingot with medium translucency level (MT) was used.

In the 1st quadrant, the fully anatomical wax-up was buccally reduced by about 0.5 mm in order to create space for the veneering. In the 2nd quadrant, the wax-up was pressed fully anatomically (Fig. 3). The wax-up was embedded to press all-ceramic (GC Initial LiSi Press MT ingot, shade A2) crowns. The precise fit accustomed to press ceramics ensures a smooth workflow. After grinding the sprues, the crowns were ready for completion.

Finalization with the painting technique (monolithics)

The monolithic crowns in the 2nd quadrant were completed using the painting technique. The Lustre Pastes ONE enable – in combination with the Spectrum Stains or alone – to adjust the colour, brightness, grey value and surface texture. The ceramic surfaces can be characterized sensorially easily with the 3D paints. The aesthetics of the natural-looking glaze masses are noteworthy. Without any layering, the crowns are monolithically finalized (Fig. 4).



Fig. 4: The crowns in the 2nd quadrant were finished with the painting technique. The slightly reduced crowns in the 1st quadrant were prepared for micro-layering.

Finalization with the micro-layering technique (micro-buccally reduced monolithics)

The Lustre Pastes ONE were also used for the buccally reduced crowns in the 1st quadrant. Here, they play out their strength as an internal paint. The crowns are characterized more intensively with the Lustre Pastes ONE in preparation for the veneering and then fired. This connection firing gives the structure a complex depth and turns it into the optimal basis for the micro-layering principle. The SQIN ceramics enable a colour effect full of dynamics at a low layer thickness. Thanks to the low thickness of the ceramic layer, among other things, the sinter shrinkage is extremely low to non-existent. This makes the system manageable and reproducible. Also worth mentioning is the special mixing liquid (Form & Texture liquid) with an ingenious property: when mixed with the ceramic, the latter can literally be modelled. Almost like a supple soft wax, a natural surface texture can be created. We breathe life into the restoration with a brush, so to speak. Delicate and at the same time pithy-intense – this is how the SQIN masses can be applied and processed. Experience has shown that if textures are incorporated into the surfaces during layering, more beautiful results are produced than when rotating tools are used. When the textures are “fired in”, the masses blend, resulting in a natural structure. After firing, the gloss level was only adjusted by manual polishing. By gently “overdrawing” the crowns with the rubber polisher, the raised areas get a slightly smoother surface. The interplay of convex and concave surfaces, which is hardly visible

to the naked eye, ensures the high naturalness. Finally, the polishing brush with diamond polishing paste was used. A few minutes later, the result was achieved.

Evaluation of the result

This sample case was made with the intention to answer the question of whether a maximum result can be achieved with minimal effort via the GC Initial™ IQ ONE SQIN painting and micro-layering system. The answer is provided by the pictures or the juxtaposition of the layered crowns

(see Fig. 1) with the monolithic or micro-buccally reduced restorations. The results of the painting and micro-layering system stand up to the high bar set by “crowns layered on



Fig. 5: a) Finished restorations after manual polishing.



Fig. 5: b) The crowns in the 1st quadrant were finished with the micro-layering technique and the crowns in the 2nd quadrant with the painting technique.



Fig. 6: In comparison: The conventionally layered restorations on refractory dies.

refractory dies" (Figs. 5 and 6). With dental experience, the necessary sense of aesthetics and the required spatial thinking, excellent results can be achieved. The many parameters that determine the final result in the conventional layering technique are reduced to a minimum. And the time required for implementation is significantly lower than with layering.

Patient case: Complexity and simplicity – "The double lottery"

In day-to-day laboratory routine, the "Mini-Max principle" is a welcome solution to meet rigorous aesthetic demands and economic challenges at the same time. In the presented patient case (dentist: Dr. Dana Adyani-Fard), teeth 11 and 21 had to be supplied with all-ceramic crowns (Figs. 7 and 8). Designing two crowns standing next to each other in a nearly symmetrical manner can be a challenge with a conventional layering technique – depending on the initial situation. In this case, the crowns were made in a reproducible, simple way, using the micro-layering technique.

Clinical pre-treatment

The complexity of this case lies with the position of the teeth in the anterior region. The patient consulted the practice after anterior trauma with severe dislocation of tooth 11 and enamel-dentine fractures on both upper centrals. Tooth 11 in particular was massively misaligned. In the clinical pre-treatment, tooth 11 was repositioned and endodontically treated. Teeth 21 and 11 were initially restored with composite (G-aenial



Fig. 7: Situation after anterior trauma. The patient desired an aesthetic improvement of the anterior teeth.



Fig. 8: Situation after clinical pre-treatment and preparation of teeth 11 and 21.

A'CHORD, Shade A2, GC). The next step was the preparation of the teeth for the all-ceramic crowns. Digital impressions were made and the data was transmitted to the laboratory for the creation of the restorations.

Micro-layering technique for all-ceramic restorations

In order to be able to produce crowns 11 and 21 as symmetrically and efficiently as possible, we decided on micro-layering following the aforementioned system. In the first step, the bases of the Initial LiSi Press crowns were manufactured and buccally reduced (about 0.4 mm) (Fig. 9). This low layer thickness is sufficient to achieve vividly dynamic restorations with the GC Initial™ IQ ONE SQIN painting and micro-layering system.

As described above, the buccally reduced crowns were painted and



Fig. 9: Monolithic ceramic crowns, slightly reduced in the labial area.

fired with the Lustre Pastes ONE and received colour and basic fluorescence through this connection firing (Fig. 10). Now the SQIN masses were applied in a minimal layer and the crowns were supplemented in their shape. While the framework with the Lustre Pastes ONE depicts the basic colour, all other masses serve to accentuate and play with translucency, opalescence, etc. At the same time, the brush was used to create a surface texture (using the Form & Texture Liquid). After firing, the desired result was revealed (Fig. 11).



Fig. 10: Crown bases painted with Lustre Pastes ONE.



Fig. 11: Veneered with a micro-layer of SQIN ceramic.

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Fig. 12: a) and b) The finished restorations on the model – all-ceramic crowns manufactured with comparatively little effort. Clearly visible is the vivid surface texture, which could be achieved by modelling in the wet stage (Form & Texture Liquid).

This was followed by manual polishing. The crowns were then sent to the dental practice and tried in the patient's mouth (Fig. 12). The intaglio surfaces of the restorations were etched with HF for 20 seconds, followed by application of G-Multi PRIMER. G-Premio BOND was applied onto the teeth in accordance with the instructions for use after a selective etch protocol. Next, the crowns were adhesively luted with a dual-cure adhesive luting composite (G-CEM LinkForce™, GC), shade A2 (Figs. 13 and 14).

Result

The patient's desire for an improvement of the anterior teeth's aesthetics was fulfilled. Without having to compromise on aesthetics and safety, we were able to produce natural-looking restorations in the laboratory with a reduced effort.



Fig. 14: a) and b) The result a few days after final cementation. The crowns fit naturally into the dental environment. The position of the teeth is in harmony with the lips and profile.



Fig. 13: Try-in of the crowns in the mouth.

Summary

The aim of an aesthetically indicated restoration is a natural-looking result in harmony with the facial and oral environment, similar to a bouquet that only manifests in its entirety. Achieving this requires many aspects – subtleties and nuances determine the image. And it is precisely this complexity of details that makes an all-ceramic restoration in the anterior tooth area so difficult. With GC Initial IQ ONE SQIN, we enter a new level of all-ceramics. The painting and micro-layering technique makes the complexity manageable. Minimal principle of all-ceramics – with minimized use, we achieve maximum aesthetics. Nevertheless, the mini-max principle does not mean that only minimal know-how is required. Because what remains is the realization that good dental

technology is always based on the interaction between high-quality products, well thought-out concepts and dental finesse.

"Producing ceramic restorations also means incentive and motivation to me. Each day, we try to get a little closer to nature and face this challenge again with every patient case. Modern materials – e.g. GC Initial IQ ONE SQIN – offer us the opportunity to continue to hone our skills with in-depth knowledge, a sense of aesthetics and artistry, without losing sight of economic efficiency." MDT Andreas Pilch

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