



labline™

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EXCLUSIVE INTERVIEW

Many different traits can lead to success!

JÜRIG STUCK

LABLINE PHOTOGRAPHY - PART 2.

Dental Product Photography - A good photo is worth a thousand words

GIULIANO MOUSTAKIS

LABLINE ACADEMY

A Paradigm Shift in Alveolar Model Fabrication with 3D Printing

INGE MAGNE MDT

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JUAN MESQUIDA DDS

„4.4.1 System“

an innovative liquid micro-layering technique

Daniele Rondoni & Enrico Ferrarelli



Introduction

Since the late 80s, Noritake ceramics have used the Internal Live Stain technique, which, thanks to Master H. Aoshima, has been known throughout the world. In the beginning, the system was created for metal-ceramic, subsequently expanded with the system for zirconia called CERABIEN™ ZR CZR, a highly reliable ceramic system for zirconia, now enriched by the new generation Kuraray Noritake liquid ceramics that blend perfectly with the latest generation multi-layered zirconia.

The two authors, both through their clinical cases and in their educational activities, were able to develop a selection of new materials called 4.4.1 System. The 4.4.1 System technique is an effective liquid micro-layering system that reinvents the concept of layering on

zirconia in line with today's needs of the modern dental laboratory, even closer to new technologies but always attentive to the accuracy of procedures and analogue finishes maintaining the essence of quality.

Nowadays, the digital workflow represents a simplification of the analogue working phases guaranteeing an immediately higher standard with more predictable results, giving us more and more the possibility to use materials such as multilayer zirconia, improving their performance and versatility in order to offer high quality and increasingly conservative solutions for the patient. The key to a new aesthetic approach is the innovative multi-layer KATANA™ Zirconia, available with a full set of Vita 3 shades with different degrees of strength for an accurate translucency balance HTML 1200 MPa- STML 750 MPa- UTML 550 MPa.



[Fig. 1]



[Fig. 2]



[Fig. 3]



[Figs. 1 to 3] Optical effects of freshly sintered KATANA™ Multi-layered zirconia without any infiltration colour. A diffuse translucency is visible but also a gradual cervical chromatic increase and an increase in the incisal value, emulating the behaviour of the natural tooth.

This innovative 4.4.1 System is based on a new interpretation of the ILS technique, which involves the use of Internal Live Stain ceramic pigments mixed with their colourless Bright Dilution mass, transforming the way how the apparent internal paint colours are used into dense masses, gels that will be applied as a real internal three-dimensional micro-layering, individualizing the zirconia sub-layer having the opportunity to immediately see the result after firing.



[Fig. 4] By mixing ILS powder colours with Bright Dilution and the ILS special liquid, we obtain an emulsion which, applied directly on the zirconia, diffuses the colour by emulating the nature of the tooth.

With the addition of FC Paste Stain coloured high fluorescence liquid ceramics, it is a winning alternative in aesthetic functional restorations in a context of increasing demand for "full contour" restorations, waiting for the next generation of zirconium oxide that exceeds the inverse of the ratio of translucency and mechanical strength values.



[Fig. 5] Kit 4.4.1.



[Fig. 6]

The components of the 4.4.1 System

- [Fig. 6] Composition kit
 - 4 Internal Stain Powders with Bright Dilution and special ILS visualizer liquid
 - 4 Liquid ceramic CZR FC Paste stain1 ceramic mass in translucent powder CZR LT1
- [Fig. 7] Noritake palette for the correct mixing and conservation of the colours of ILS powders, which after mixing will have an ideal fluidity and maintenance ready for use.



[Fig. 7]

The essential combinations for liquid micro-layering

4.4.0 for zero cut-back

It is possible to emulate the optical properties of conventional ceramic layering in "full contour" restorations. This enhances the possibility of maintaining the anatomical characteristics unaltered thanks to the minimum contribution of ceramic material between 30 and 60 microns, also thinking of a totally digital workflow.



4.4.1 for micro cut-back

This technique is dedicated to those restorations that require the application of a layer of traditional translucent ceramic in the anterior sectors in order to further improve the refractive index of zirconia, which, although of the latest generation, still has limits in this sense.

In fact, the micro-layering 4.4.1 improves the optical performance of all the zirconium oxide formulations, creating, with a few firings, individual internal effects of surprising realism, also acting on the hue, chroma and brightness parameters with surprising control and simplicity, being able to evaluate the colours even before cooking.

A design of the vestibular internal anatomy is fundamental, leaving minimal space for the ceramic layer of 0.1-0.3 mm.

This technique involves two stages:

Phase 1:

internal micro-layering with Internal Stain emulsions to give the tooth the basic hue-value-chroma characteristics.

Phase 2:

external micro-layering to complete with FC Paste Stains



It consists of three stages:

Phase 1:

layering with Internal Stain emulsions to give the tooth the basic tint-value-chroma characteristics

Phase 2:

layering with "CZR Luster Porcelain" powdered ceramic about 0.1 / 0.3 mm thick, with which we will completely cover the "Internal Live Stains" restoring the original anatomy

Phase 3:

gloss completion with possible glaze ratio and characterizations with FC Paste Stain



The authors will indicate and illustrate the main steps of use of the technique 4.4.0 and 4.4.1 through two clinical solutions.

1st clinical case: 4.4 and 4.1

A clinical case of total upper and lower rehabilitation with the restoration of the DVO entirely made with single elements in KATANATM Zirconia. This case highlights the perfect integration between the two techniques 4.4. and 4.1.



[Figs. from 1a to 2b] The initial case presents problems of occlusal nature as well as aesthetic problems with loss of vertical dimension.

The protocol for this case envisaged the finalization in two phases: in the first phase, the posterior quadrants were constructed with crowns in Full Contour micro-layered

zirconia with the 4.4 technique to give stability to the occlusion, in the second phase the completion of the upper and lower frontal groups.



[Figs. 3 and 4] the posterior quadrants finalized with the 4.4 technique 0 cut-back.



[Figs. 5 and 6] On the model and in the mouth in comparison.

- Courtesy of Dr. S. Gismondi



In the second phase, after the installation of the rear quadrants, the upper and lower front groups were made.

For the superior, given the presence of more marked discolourations, we used KATANATM Zirconia STML with the 4.4.1 cut-back micro-layering technique as this

zirconia has a greater opacity. As for the front group lower full contour, we adopted the 4.4 technique using KATANATM Zirconia STML as it did not present important discolorations, furthermore, this technique allows keeping the anatomy unchanged even with reduced thicknesses and more conservative preparations.



[Figs. 7.1 to 7.3] Evidence of discolouration especially in the upper frontal group.

The upper front group was made with a 4.4.1 technique which consists of three phases:

Phase 1:
layering with Internal Live Stain with Bright mass emulsion directly on the sandblasted zirconia.

Phase 1:
layering and firing of a translucent CZRLT1 0.6 mm approx.

Phase 1:
completion and polishing with FC Paste Stain.



[Fig. 8] upper cut-back structures and lower full-contour structures.

Step 2 - Layering with a single ceramic powder:



[Fig. 11] 2nd layering phase - CZR Luster LT1 0,6 mm

[Fig. 12] 3rd glazing phase with FC Paste Stain

Step 1:



[Fig. 9] the first phase of layering in gel on the cut-back with Internal Live Stain



[Fig. 10] Internal Stain after firing



FC Paste Stain Glaze and Stain



[Fig. 12]



[Fig. 13] layering with Internal Live Stain gel to configure basic colour characters



[Fig. 14] layering with Internal Live Stain gel to configure basic colour characters

The lower front group was made with the 4.4 technique which consists of two phases:

Phase 1:
layering with Internal Live Stain with Bright mass emulsion directly on the sandblasted zirconia

Phase 1:
completion and finishing glaze and staining with FC Paste Stain



[Figs. 15] completion and finishing glaze and staining with FC Paste Stain

[Fig. 15]



[Figs. 16 and 17] perfect integration between the two techniques 4.4.1 upper and 4.4 lower



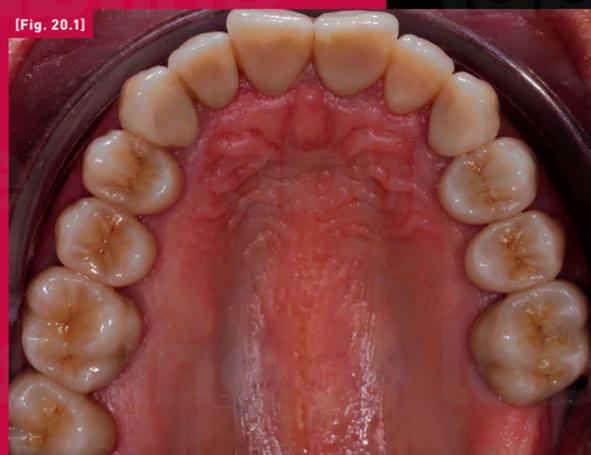
[Figs. 18 and 19] side view compared before and after restoration



[Fig. 20] occlusal view



[Fig. 20.1]



[Fig. 20.2]



[Fig. 21] final smile



[Fig. 1]

2nd Technical clinical 4.4.1 case



[Fig. 2]

[Fig. 1] Initial case situation where the aesthetic request is above all a morphological rebalancing that is studied digitally through a pre-visualization and mock-up. The work plan provides for a total crown treatment for the anterior quadrant.



[Fig. 3]

[Fig. 2] It will be created with a full digital workflow, so after the vertical preparations, data and information are collected through a digital, intraoral scan, which is sent to the laboratory.

[Fig. 3] The digital design for a minimal cutback of 0.1-0.3 is a very important phase of the work and must consider both the internal anatomical shape of the vestibular dentine, and the external morphology of the coronal contour and the palatal section, which will be totally in zirconia.

[Fig. 4] KATANATM Zirconia STML crowns before sintering. An important phase is the mechanical finishing for the care of anatomical details in the state of green zircon.

[Fig. 4]



[Fig. 5]



[Fig. 5] The crowns after sintering - no infiltration



[Fig. 6] We can see the morphological integrity of the palatal sections totally in zirconia.



[Fig. 7] Chromatic map of phase "4" of the interior colouring project

[Fig. 10]



[Fig. 11]



[Fig. 10] Control of the optical behaviour



[Fig. 11] Chromatic map of the microstratification of the single LT1 coating mass



[Fig. 12] Minimal microstratification for the vestibular morphological construction



[Fig. 13] After a single firing of the ceramic microlayer, we proceed with the finishing mechanics of the vestibular portion.

[Fig. 6]



[Fig. 7]



[Fig. 8] Key phase of internal colouring with ILS and B.D.



[Fig. 9] The vestibular substrate of the zirconia coloured after firing

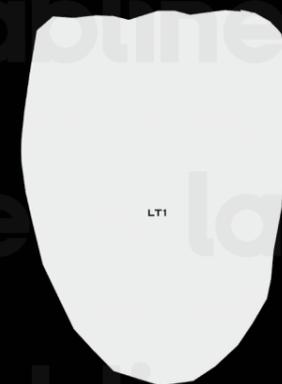
[Fig. 9]



[Fig. 8]



[Fig. 12]



Luster Colour Map

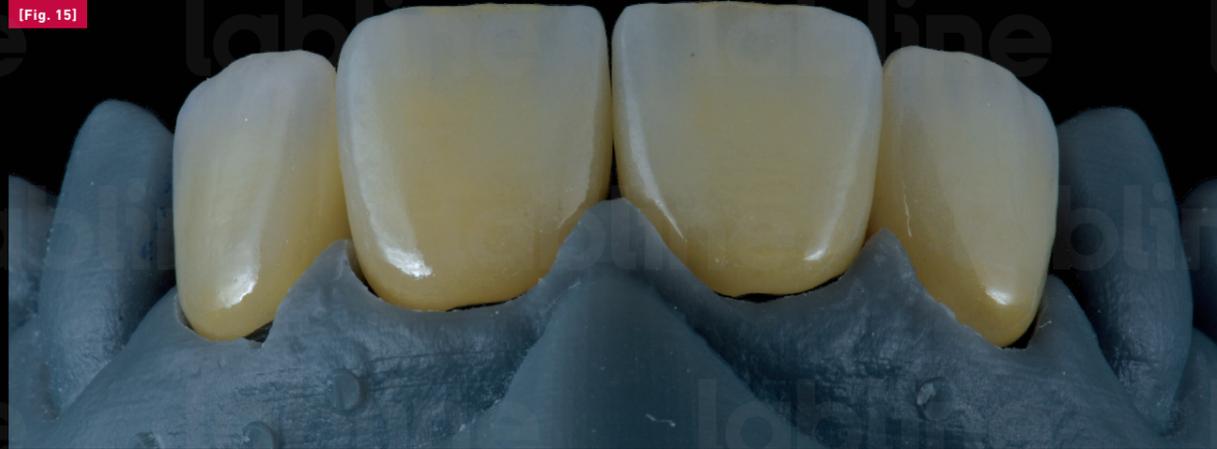
[Fig. 13]



[Fig. 14]



[Fig. 15]



[Fig. 14] Optical control of microstratification

[Fig. 15] The finished restoration after mechanical polishing in the absence of glaze

[Fig. 16] Polishing with diamond paste of the palatal portion in zirconia

[Fig. 16]



[Fig. 17]

[Fig. 18]



[Figs. 17 and 18] Last case of the 4 crowns in multilayered zirconia microstained with internal ILS emulsion and ceramic in the vestibular portion

Conclusions

Liquid layering brings a technique to our laboratories that thrills with results and new sustainability. The 4.4.1 technique is based on the use of only 9 colours applicable even with zero cut-back.

The technique 4.4.1. allows the individual colour control of multi-layer zirconium oxide through liquid micro-layering (4.4). The aesthetic integration of the restoration - with three-dimensional effects - is achieved with thicknesses of less than 0.1 mm.



Daniele Rondoni

Born in 1961 in Savona, the city where he still lives and works. He graduated from the dental technician school IPSIA P. Gaslini in Genoa, and in 1981, at the request of Dr. Derchi, he contributed to the establishment of the Odontotecnico School in Savona.

At a very young age, in 1982, he opened his laboratory in Savona, where today with his team, he collaborates with dentists in Italy and abroad, combining traditional analogue-based processing with new digital technologies.

His great professional turning point took place in 1988, after his experience as a student of Maestro Oliviero Turillazzi in Brescia.

He also had the opportunity to broaden his professional experience in Switzerland, Germany and Japan, where, by attending master Hitoshi Aoshima, he deepened the techniques of ceramic layering.

Being particularly dedicated to the study of morphology and dental aesthetics, he constantly collaborates in the development of materials for restoration and deals with education on the subject by holding courses for dental technicians and dentists in his laboratory and at the SICED school in Brescia.

Through courses and conferences, he has been a representative of Made in Italy Dental Technician abroad for many years.

Thanks to his profound commitment to teaching, he is the creator of AAT - When Aesthetic meets Art and Technique - a Community College, education, training and meeting project.

In 1997 he was the author of "Technique of Ceramic Multilayer", illustrating work protocols for ceramization and treatments of dental alloys.

In 2002 he created a laboratory manual on the use of composite materials, determining work protocols for the indirect technique and for the technique of pressing the composite on alloy structures in complex solutions on implants, where he describes the reverse hardness stratification system "TENDER", which he designed.

His clinical cases are published in dental aesthetics books, including "The conservative restoration of anterior teeth" by Dr. Lorenzo Vanini, "Restorative dentistry: treatment procedures and future perspectives" by Dr. Walter Devoto and "Layers" by Dr. J. Manauta - A. Salat.

Since 2020 he has been working as a dental technician consultant for the MESA Dental Alloys company in Brescia.

- Active member of EAED, European Academy of Esthetic Dentistry
- Active member of IAED, Italian Academy of Esthetic Dentistry
- Honorary member of Styleltaliano
- Member and rapporteur for SICED
- International instructor for Kuraray Noritake Dental Materials, Japan

Laboratory owner since 1980

Student of prof. Mario Martignoni, with whom he collaborated in various research activities, also carrying out didactic activities on topics related to gnathology, ceramics and precision metallurgy.

He conducts several courses and participates in conferences specifically on the issues of aesthetics and function with particular attention to new digital technologies.

- Since 1989 he has collaborated with Noritake in the field of ceramics and aesthetics, holding courses and conferences in Italy and abroad.
- He has carried out reports for important professional organizations and forums such as AIOP, Amici di Brugg, Quintessenza, on behalf of which he participated as an Italian speaker at the "World Symposium of Ceramics" in Tokyo in 1993.
- Lecturer in the "Training laboratory prosthetic technologies" course at the University of Chieti from 2009 to 2013.
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