

Micro Layering Technique

How to optimize multilayered zirconia through porcelain minimal layering



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Dental Technician



Work-flow management in dentistry has deeply changed over the last few years. Steady acquisition of a digital protocol, the introduction of new generation materials and most of all a better use of the “Workflow” as key-point of our work have allowed us to take advantage of new generation materials to their full potential.

Digital workflow is a simplification of the analogical work phases. Thus, we can achieve the best high quality solutions by the standardized use of multilayered zirconia, thus ensuring both performance and versatility at reduced costs for professionals and patients as well.

These options ensure more fluid and state-of-the-art lab-clinic synergy and deeper involvement of the technician especially during on-patient digital acquisition by intraoral scan, and most of all in the final project morphological and functional design. The ever-

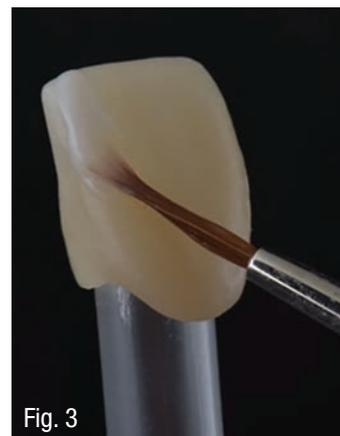
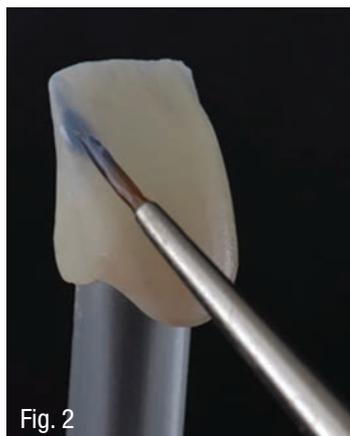
growing number of last generation zirconia CAD/CAM restorations is but a consequence of the newest clinical trends and latest technological discoveries.

Understanding the latest evolution of zirconia is paramount to follow the development of both restoration design and restoration techniques in order to achieve unparalleled aesthetic accuracy through CAD-CAM technology.

Hybrid solutions, with zirconia and porcelain areas, better meet functional needs in terms of lower abrasiveness and higher toughness.

A sophisticated aesthetic is then achieved through micro-layering with new opalescent effect, translucent porcelain and Luster powder.

Further technical evolution is now possible through new high fluorescence colored porcelain emulsions. Depending on the “level of need”, these can be a winning alternative to traditional porcelain multi-layer solutions.



The highest effectiveness is reached in conservative treatments when ultra-translucent cubic zirconia is used in combination with - liquid porcelain “FC Paste stains”.

Such combinations make it vital to perfectly know work protocols: these protocols, in fact, allow to fully take advantage of the technological potential available in lab, as well as the aesthetic versatility of such new generation materials.

Working protocols become fundamental to make the best out of both materials and technology, while confirming the well-established dental technician’s artistry.

According to the aesthetic request and case-complexity, today it is possible to adopt different “technical approaches”. Noritake porcelain, in combination with new generation Multilayered Katana Zirconia, allows the modern technician to easily and effectively solve cases according to their complexity.

Kuraray Noritake porcelain features top-level versatility, which is ideal when adopting traditional multilayering technique, for highest-quality and top-level aesthetic performance. Such cases require low density porcelain dentin, combined with opalescent effect Luster porcelain: Full Layer Solution. (Fig.1)

For multi-unit solutions and/or medium-complexity

aesthetic requests, it is interesting to take advantage of the best qualities of new Katana Zirconia, while considering the strength required. We will then opt for vestibular micro-layering technique with single layer Luster porcelain, and zirconia for the full palatal area. (Fig.2)

Lastly, when dealing with lower-difficulty aesthetic requests, we will finalize our project by opting for a zero cut-back solution featuring new Katana Zirconia and ultra-micro-layering technique with FC Paste Stain. (Fig. 3)

The key for a new aesthetic approach is the innovative multilayered Zirconia, now available in the complete VITA 3 Series shades, featuring 3 strength levels, to achieve the best translucence balance.

High Translucent ML 1200 Mpa- Super Translucent ML 750 Mpa- Ultra Translucent ML 550 Mpa. (Fig. 4)

Option 1 -Dentin frame structure

Zirconia is used as dentinal “core”, with a special internal design to reproduce the opalescence design according to age and color. The porcelain “Shell” microlayer is dedicated to the Luster porcelain (Fig.5).

Option 2 - Dentin structure with backing

A Zirconia “cut-back” is used with zirconia full palatal side and “vestibular shell” micro layered Luster to reproduce the aesthetic according to a special internal design for the mamelon (Fig. 6).



Fig. 8



Fig. 9

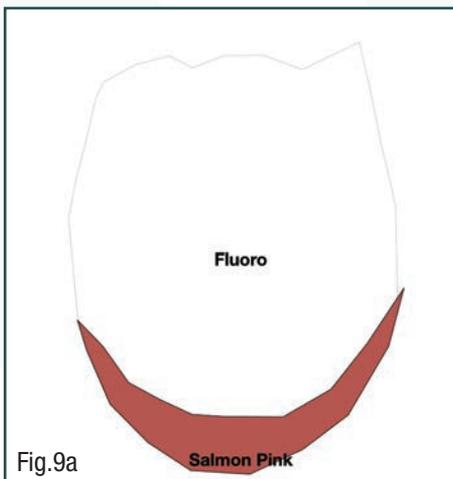


Fig.9a

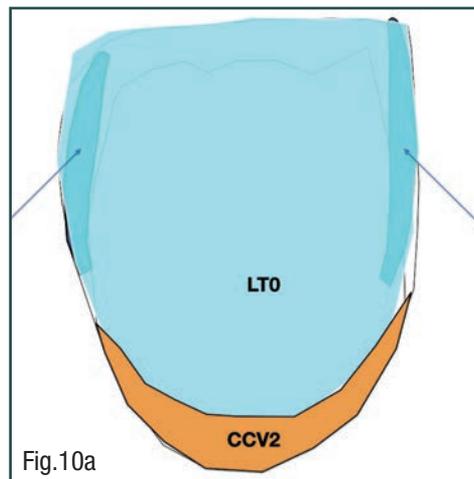


Fig.10a

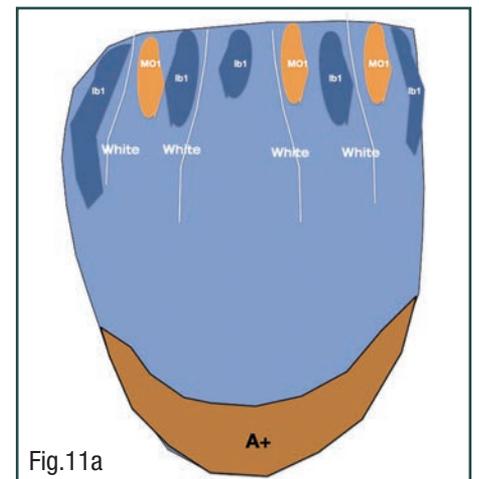


Fig.11a



Fig. 10



Fig. 11

Option 3 — Full Contour Shape

A “zero cut-back” technique is used to fully comply to the digital project and morphology. Aesthetic finalization is achieved through an innovative and minimal ultra-micro layering technique, using fluid porcelain FC Paste Stain (Fig. 7).

Clinical experience

Option 1 — Micro layering

One natural abutment and one abutment on implant for a high aesthetic request.

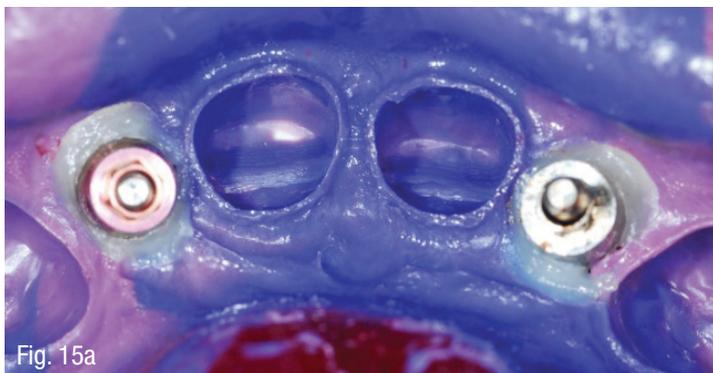
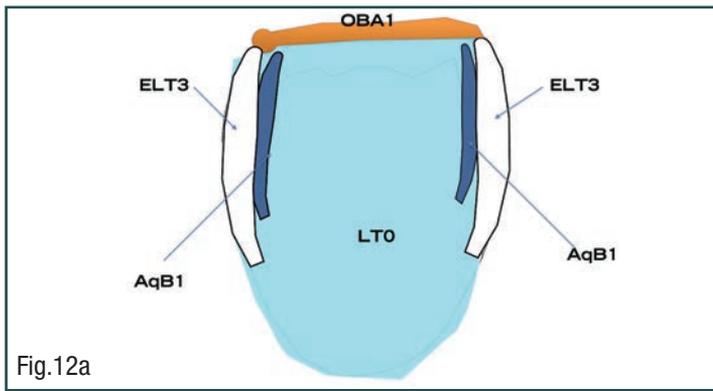
We will use multilayered zirconia Katana to reproduce the dentinal core, while calibrating the shade color (Fig. 8). As low strength is needed, we can proceed by using STML zirconia

Katana to carefully reproduce the dentinal side according to final color (Fig. 9).

Chromaticity and fluorescence can be controlled by two-step Internal Live stain technique. After a first bake of LTO-AqB1-CCV2 Luster layer, we will replicate some “HD” effects with a first ILS step for the crack line. We will use white, I.B.2 and M.O.1. (Fig. 10).

To complete the final morphology, we will use porcelain LTO-AqB1-ELT3 Luster (Fig 11). To finalize the crowns - after mechanical refinishing, including the Maister-cones step -, we will go through a Self-Glaze step in furnace without any added material (Fig. 12).

Final case of 2 micro layered porcelain crowns on STML zirconia used as dentine after cementation (Fig. 13).



Option 2 – Micro layering with Zirconia cut-back

After the removal of old metal porcelains, a case of 2 crowns on natural teeth and 2 screw-retained crowns on implant is solved.

Considering the medium aesthetic level needed, we pinpoint the high strength need and subsequently select HTML A2 zirconia

for full palatal design and vestibular cutback in order to replicate the internal opalescent design (Fig. 17-18).

To improve the 3D depth effect, we will use ILS technique on zirconia, ILS Incisal Blue 1 around the mamelon and ILS Fluoro, ILS Salmon Pink on the cervical side. For a better



Fig. 18

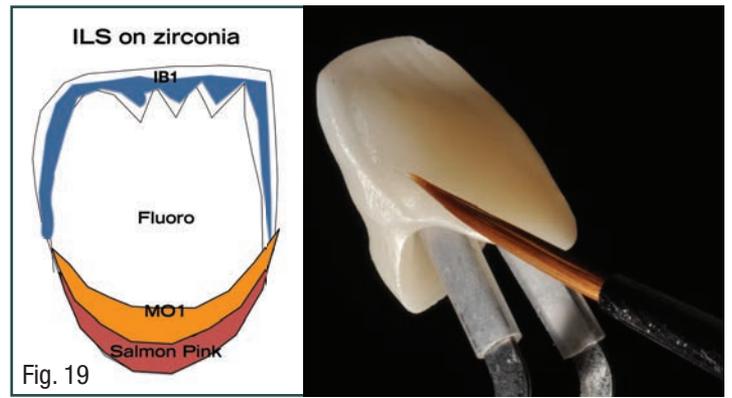


Fig. 19



Fig. 20

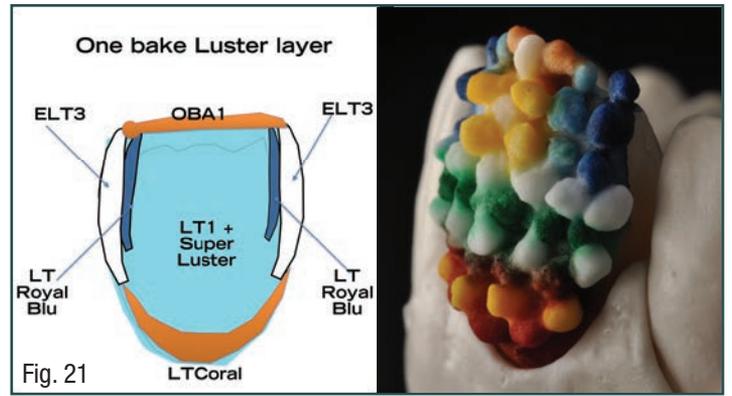


Fig. 21



Fig. 22



Fig. 23

calibrated chromaticity, we will choose A+ on the cervical side and onto the body (Fig. 19-20).

We will finally complete the vestibular morphology with fast porcelain micro layering using Luster porcelain powders only: AqB1 for the opalescence effect, LTO for body and incisal areas, CCV2 for cervical side and ELT3 for the transition area (Fig. 21)

After baking, we will proceed with vestibular refinishing (Fig. 22).

For a more natural surface we will carry out a self-glazing step (Fig. 23).

Palatally, mechanical polishing only will be carried out with Z-Pearl surface diamond paste (Fig. 23)



Fig. 23

Finalized case:

2 cut-back porcelain micro layered crowns and 2 micro layered screw-retained crowns on implant (Fig. 25 to 27)
Follow-up 4 years after intervention (Fig. 28).

NORITAKE KATANA™ ZIRCONIA



“Kuraray Noritake porcelain features top-level versatility, which is ideal when adopting traditional multilayering technique, for highest-quality and top-level aesthetic performance...”

Daniele Rondoni, MDT

from Rondoni's article **Micro Layering Technique** - How to optimize multilayered zirconia through porcelain minimal layering.

KATANA™ proprietary raw zirconia powder from Japan expands 90-minute sintering to 3-unit bridge restorations!



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- LT** (1,125 MPa / Translucency 27%) 3 Shades

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Fig. 25



Fig. 26



Fig. 27



Fig. 28



Fig. 29



Fig. 30



Fig. 31



Fig. 32

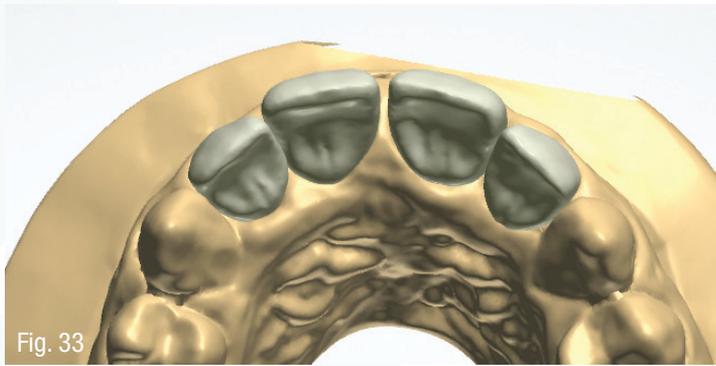


Fig. 33



Fig. 34

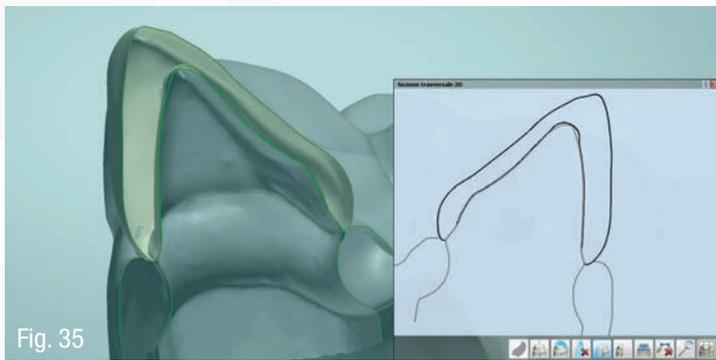


Fig. 35

Option 3—Ultra-micro layering on Zirconia zero-cutback

After removing the old metal porcelains, the case had to be treated again by rebuilding the natural abutments (Fig. 29 to 31). The new clinical situation features composite abutments and fiber post: the vertical bio-preparation is evident (Fig.32).

For this case it is fundamental to replicate the approved prototype/temporary and the digital project will be the best option (Fig. 33-34).

Our DP shows us the available thickness and subsequent mechanical strength needed. Color analysis will also show the easily attainable aesthetic result. Based on these observations, we will then realize a specular project, featuring a Zero cut-back solution, thus taking full advantage of the unique optical features of Katana ML Cubic Zirconia. The best advantage with a full contour zirconia is the support given to the gum tissue, both palatally and most of all cervically (Fig. 35).

According to the final color, the natural abutment color and thickness available, we selected an Ultra Translucent Zirconia ML for the full contour zirconia. It will be fundamental to be careful of the macro and micro shape, already in the zirconia pre-sintering phase (green state) (Fig. 36-37).

To obtain the best translucence balance, and correct chromaticity – which are the pillars of Zirconia-based aesthetic, it is paramount to respect a proper and efficient sintering program (Fig. 39).



Fig. 36



Fig. 37

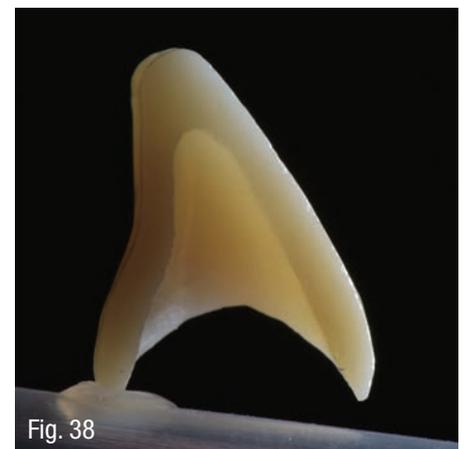


Fig. 38

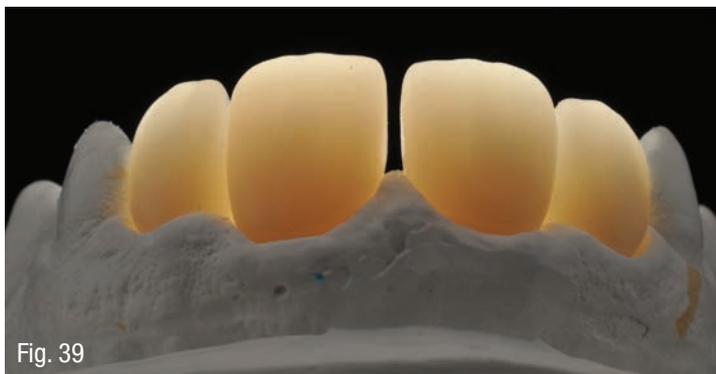
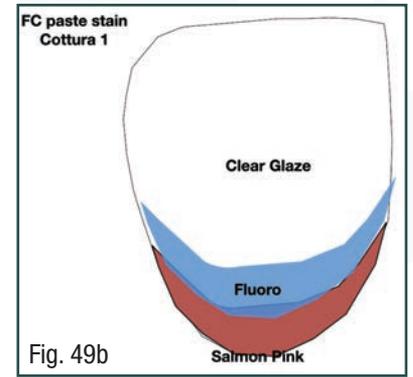
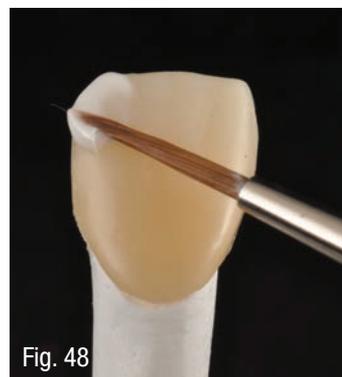
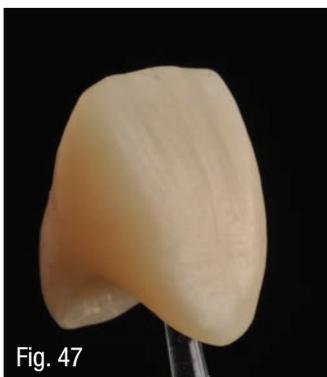
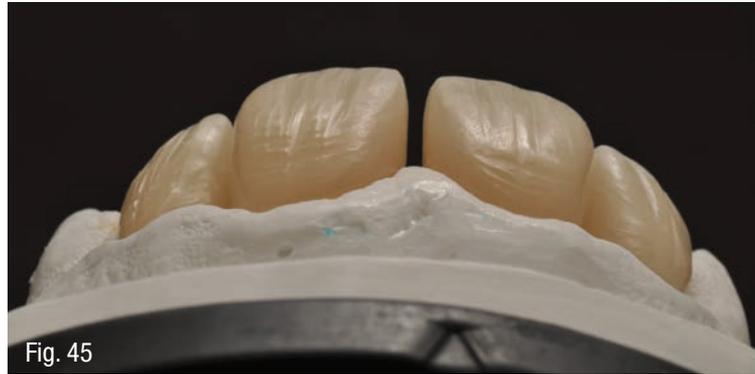
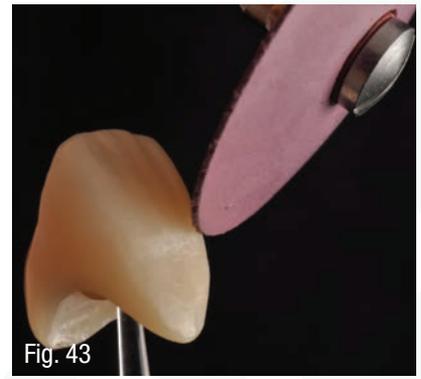
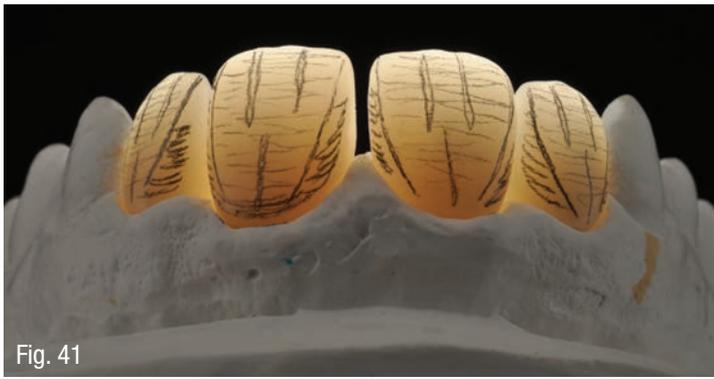


Fig. 39



Fig. 40

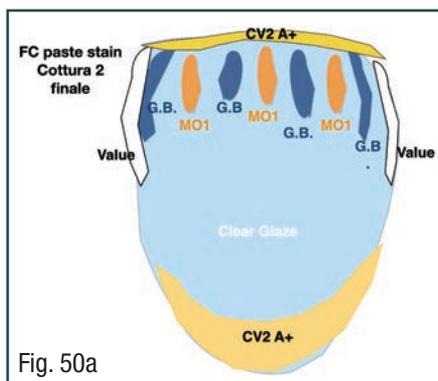


To achieve a final A2 shade it is advisable to select a lesser shade to easily balance the final chromaticity.

In the reported case it was selected Ultra Translucent Katana Zirconia A1 (Fig. 40)

Before finalizing and correcting the color, we will refinish the zirconia surface and texture (Fig. 41 to 45)

To refinish the zirconia restoration, we will prepare the surface by sandblasting (Fig. 46-47)



As we are working on super thin layers, an extremely thin layer will be available to finalize the aesthetic result.

We will use new generation FC Paste Stain liquid ceramic to adjust the color shade and replicate 3D natural effects, such as opalescence, HD characterization and improve translucency illusion (Fig. 48).

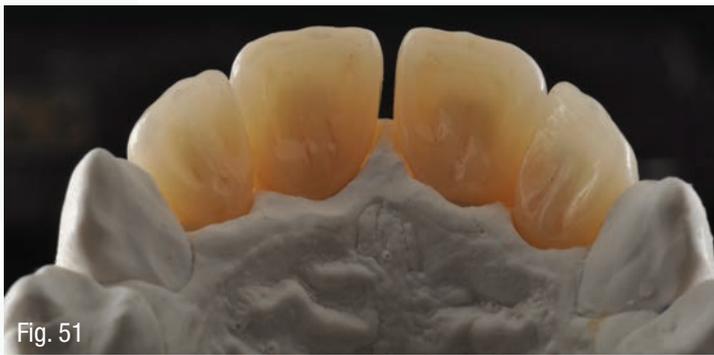


Fig. 51



Fig. 52



Fig. 53



Fig. 54



Fig. 55

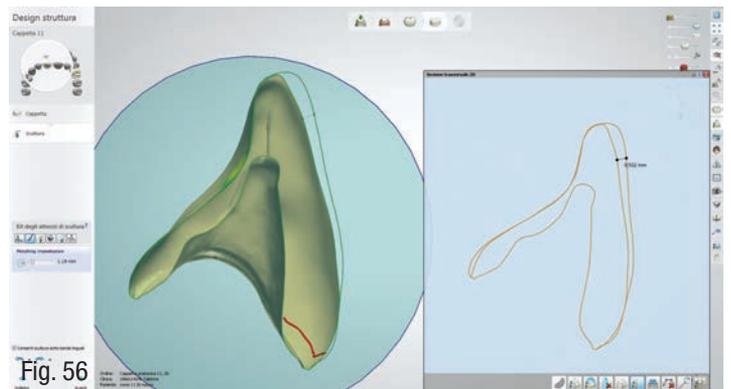


Fig. 56

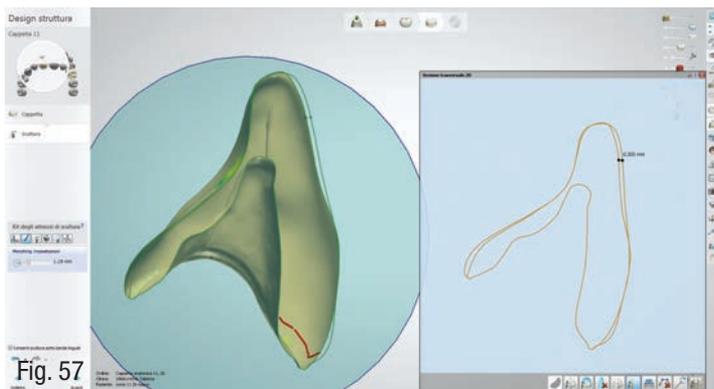


Fig. 57

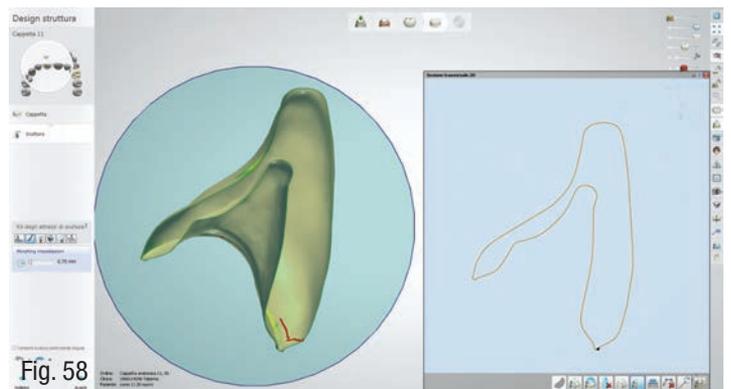


Fig. 58



Fig. 59

We will apply a first layer of FC Paste Stain Clear Glaze and Fluoro, we will proceed to vacuum-free baking at 750° C for 1 min. and 45° C temp. increase speed rate (Fig. 49 - 49b color scheme)

Temperature will be lowered to 730 °C for the second baking (Fig. 50a color-scheme and 50b)



Palatal zirconia only is mechanically polished with Kuraray Noritake Z Pearl Surface Diamond Paste (Fig. 51).

Polarized filter picture for effect and color check (Fig. 52)
4 full contour UTML

Zero cut-back Katana zirconia crowns after cementation (Fig. 53).

Follow-up (Fig. 54-55)

Conclusion

New Digital Bio-design

Multilayered Zirconia combined with new generation porcelain.

New requests and new needs inspire the new digital bio-design on the basis of technical complexities, clinical and aesthetic needs.



Fig. 68



Fig. 69



Fig. 70



Fig. 71



Fig. 72

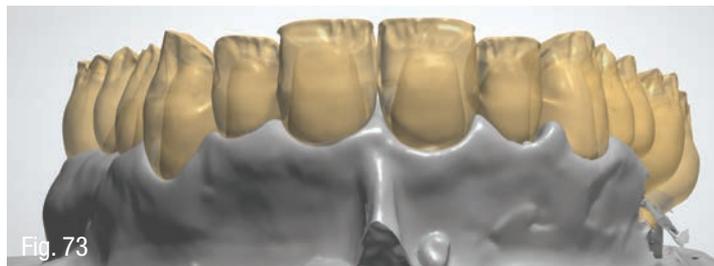


Fig. 73



Fig. 74



Fig. 75



Fig. 76



Fig. 77



Fig. 78



Fig. 79



Fig. 80

High complexity: 0.8-0.3 cut back for micro-layering (Fig.56)
 Medium complexity: 0.3-0.0 cut-back for 3D Ultra-micro-layering (Fig. 57)
 Low complexity: Zero Cut-back for ultra-micro-layering (Fig. 58)

Clinical Evidence

Case 1

Digital Prototype – Temporary copy (Fig. 59)
 Digital Bio design Cut-back (Fig. 60-61)
 1 Cut back design (Fig. 62)
 2 Single bake porcelain (Fig. 63)
 3 Furnace self-glazing (Fig. 64)
 4 Full palatal zirconia mechanical polishing (Fig. 65)
 From 66 to 70 final steps and final result

Case 2

Initial situation (Fig. 71)
 Digital prototype (Fig. 72)
 Digital Bio design cut back (Fig. 73)
 Enamel space thickness check (Fig. 74)
 Step 1 ILS (Fig. 75)
 Step 2 vestibular Luster layering (Fig. 76)
 Palatal mechanical polishing (Fig. 77)
 From 78 to 80 final steps, details and final result. 

About the Author

Daniele Rondoni is born in Savona in 1961, he lives and works in his hometown where he has been the manager and director of his own laboratory since 1982. He got his Dental Technician Degree at "P. Gaslini" Professional Institute in Genoa in 1979 and in 1981 was one of the professionals who started the Dental Technician School in Savona as a teacher and a member of the founding Council. His career features numerous international professional experiences in Switzerland, Germany and Japan and since 2007 he has been accepted as an active member of the EAED. In 1994 he started an international lecturing career in many of the most prestigious dental symposiums around the world. Particularly devoted to the study of morphology and dental aesthetics, he actively collaborates to the development of materials used for aesthetic dental restoration. He authored the text "Tecnica della Multistratificazione in ceramica" (Ceramic Multilayering Technique) and a lab manual about the use of composite materials, aimed at establishing working protocols for both indirect technique and composite pressing on metal structures and implants and thus introducing his own method, named "Sistema di stratificazione a durezza inversa" TENDER (Inverted Hardness Layering System).

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