

SPECTRUM **dialogue**

THE VOICE OF TECHNO-CLINICAL DENTISTRY

Vol. 24, No. 2 – March 2025



The Latest Advancements in Minimally Invasive Prosthodontics

An interview with Dr. Carlo P. Marinello

Basics of Functional Waxing Techniques The Occlusal Compass

Gunther Seubert

**Online
CE Test
Inside**



NEW! FRESCO CERAMICS

THE NEW ART OF LAYERING ZIRCONIA

- Ceramic pastes for veneering gingival and vestibular tooth regions
- For monolithic as well as slightly reduced zirconia structures
- Natural gingival reproduction with Fresco Gingiva; characterisation with stains is no longer necessary
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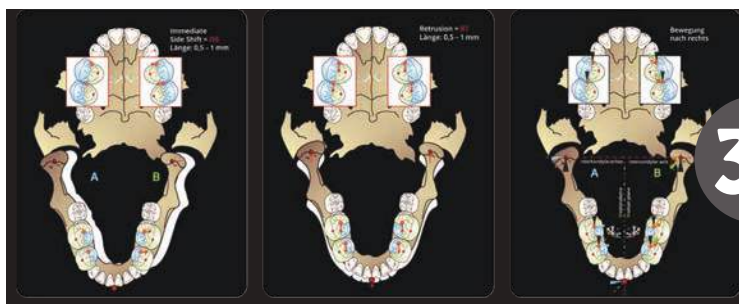
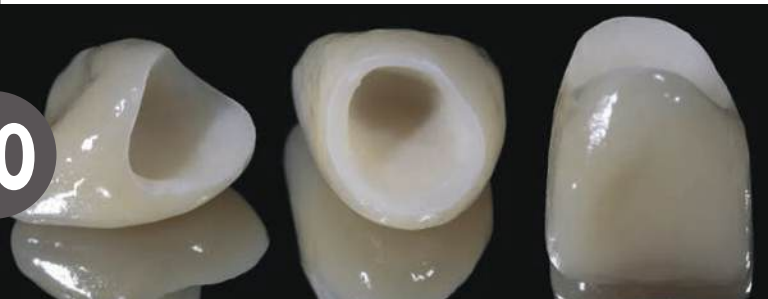
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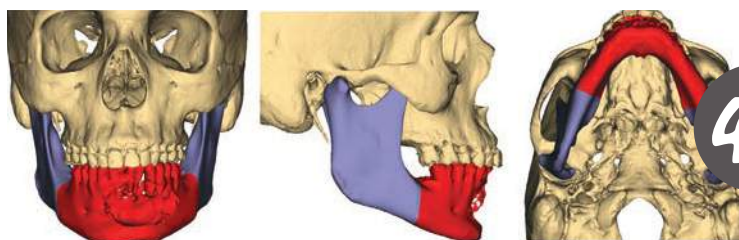
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Publisher
Ettore Palmeri,
MBA, AGD B.Ed., BA



Editor-in-Chief
Domenico Cascione,
CDT, B.Sc.



Executive Advisor
Lee Culp, CDT

Corporate Advisors



Philippe Aliabadi,
MBA, President of DenPlus



Sourena Ghandehari,
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ND & NHD



Daniele Rondoni, MDT



Odt. Paolo Smaniotto



Aldo Zilio, MDT



Publisher:

Ettore Palmeri, MBA, AGDM, B.Ed., BA
ettore@palmeripublishing.com

Editor-in-Chief: Domenico Cascione, CDT, B.Sc

Executive Advisor: Lee Culp, CDT

Design & Layout:

Yvonne Lo – yvonne@palmeripublishing.com

Office Administrators:

Elona Mulleti – accounting@palmeripublishing.com
Bahar Palmeri, B.Sc. – manager@palmeripublishing.com
Sylvia Liang – officeadmin@palmeripublishing.com

Event Coordinators:

Achini Dewage – events@palmeripublishing.com
Michelle Zhou – seminars@palmeripublishing.com

Canadian Office:

35-145 Royal Crest Court,
Markham, ON L3R 9Z4
Tel: 905-489-1970, Fax: 905-489-1971
Email: etторе@palmeripublishing.com
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Claudia Gabbert, Nordquadrat PR + Marketing

Dental Feels Good!

The dental lab is now pitching itself to job candidates! This is the new reality in today's lab environment. Why? Because companies are now competing for new employees, and the candidates' applications have almost become a secondary matter. This means that labs must present themselves as, for lack of a better word, as a sexy employer with a strong public image.

However, it's not just about portraying a positive company image; it's crucial that this image is genuinely reflected in the daily operations of the lab. Keywords like appreciation, involvement, and team spirit appear in every company's mission statement, but please make sure these values are actually practiced in your dental lab! Only then can your employees successfully recruit new team members. And that's a fundamental aspect of modern recruiting marketing: employees recruiting employees. They become your brand ambassadors, serving as testimonials for prospective candidates. What used to be called word-of-mouth is now amplified. Through social media and online platforms, these testimonials go "viral" and reach a global audience instantly.


Therefore, preparing your recruiting marketing strategy professionally is essential. Of course, this takes time and commitment. "I need to fully engage with my company and my team." But the results are significant. Successful employer branding, supported by clear recruitment and onboarding

processes, not only boosts the dental lab's external image but also strengthens internal cohesion. The result is a win-win situation, where your lab is seen as an attractive, sexy employer, and employees take pride in being part of a successful team.

Interviews, videos, podcasts, feed posts – this is a new form of company representation that, as we can all agree, brings a completely fresh aspect to the lab's daily routine. Simply posting a job ad on social media and hoping it brings in a flood of applications won't be very effective. Job candidates want to be familiar with your company before they even step foot into the lab.

Once a new employee is hired, the first days and weeks are crucial for their success and satisfaction. A structured onboarding program, integrating both informative and social elements, ensures a smooth start and promotes keep them – long-term employee retention.

By the way, an added benefit is that showcasing your employer brand through content also builds trust and transparency with your customers, or those who might become customers in the future. In this way, recruiting marketing doubles as lead generation.

"Dental Feels Good!" – Show this to your employees and customers, because our industry is and will continue to be exciting. 

*"Dental Feels Good!" –
Show this to job candidates,
your employees, and your
customers.*



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- ▶ Modified CTE value ensures very good ceramic bonding for crowns and bridges
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- ▶ Lowest tensions with specific guidelines for the recommended heat treatment
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Simple and efficient heat treatment.

Dental restorations made with remanium® star powder can now be annealed free of tension in approx. 1 hour without shielding gas or special furnaces. This combines the proven product quality with high efficiency and flexibility.

The Triple Threat: Strength, Beauty, And Speed!

Picture Source: Kuraray Noritake Dental Inc.

If you like KATANA™ Zirconia, just wait until you try KATANA™ Zirconia ONE. It's the solution for strength, natural beauty, and workflow efficiency all in ONE block. We improved upon Zirconia perfection!

The benefits of KATANA™ Zirconia ONE include:

- 1) According to ISO 6872:2015, Three-point flexural strength test Sample size 1.2x4x14mm, Span length 12mm Source: Kuraray Noritake Dental Inc.
- 2) Compared to conventional product, according to the verification of the CAD/CAM equipment's manufacturer.

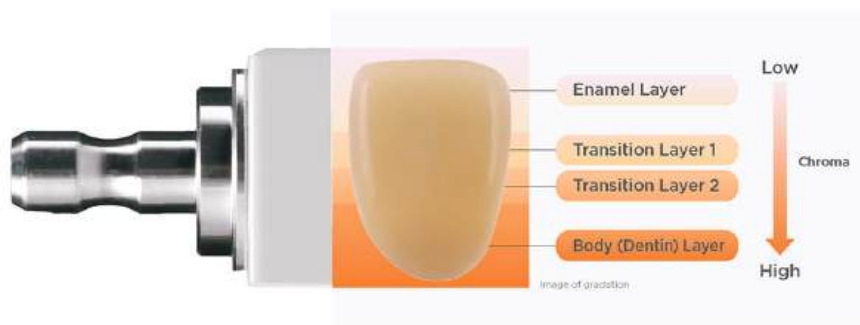


Natural Beauty: Gradation of Color

The multi-layered KATANA Zirconia block consists of four layers of zirconia in graduated shades. This product allows the chair side fabrication of natural tooth-coloured restorations, eliminating additional sintering time. Use the CEREC® Move Tool to position the restoration within the layers (show block with multi-layers.)

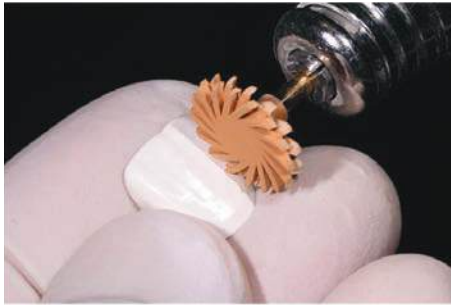
Super Fast Milling & 18 Minutes Sintering for CEREC®

The collaboration of Kuraray Noritake Dental's superior materials technology and Dentsply Sirona's CEREC Primemill with the Speedfire oven makes it possible to mill in under 5 minutes and sinter a full zirconia restoration in 18 minutes. You can choose your preferred finishing technique.



Choose your preferred Finishing Technique

You can choose your preferred finishing technique:



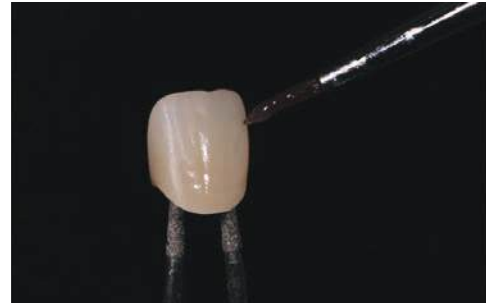
1. Pre-sinter Polish*

Polishing before the sintering



2. Post-sinter Polish

Polishing after the sintering



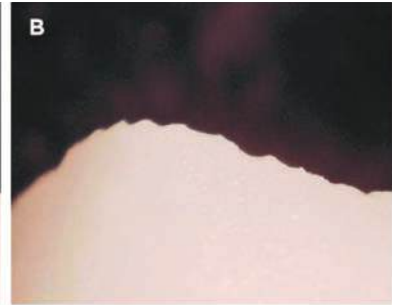
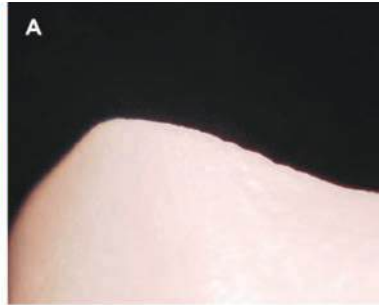
3. Glaze

Finishing with CERABIEN™ ZR FC Paste Stain

* In the case of pre-sinter polishing, if the prosthesis is not sufficiently dried after milling, aesthetic outcome may not be optimal.

Excellent Marginal Fit

KATANA™ Zirconia ONE offers excellent marginal fit. Accurate marginal fit is essential to achieve long-term success with restorations from both the mechanical and biological points of view.



KATANA™
Cleaner

Here are some recommended products to add to your restorative workflow:

KATANA™ Cleaner is a universal cleaner with unique MDP salt technology that can be used to clean zirconia after intra-oral try-in. It has a pH of 4.5 that can be used intra-orally as well, to clean preps. These features truly make it a universal cleaner.

CERABIEN™ ZR Paste Stain is a paste-type stain (surface stain) which allows for easy characterization of full zirconia, as well as both layered and pressed zirconia. It is recommended for dental technicians and dentists that want to further characterize sintered zirconia.

PANAVIA™ SA Cement Universal contains MDP in the paste and can be used to cement zirconia crowns without a separate primer/silane. This special long chain silane coupling agent in the paste eliminates the need for a separate silane bottle.

A light-cure formulation for cementation of ceramic veneers, inlays and onlays. PANAVIA™ Veneer LC offers excellent colour stability, high wear resistance, provides ample working time, and offers fast and easy clean up.



CERABIEN™ ZR Paste



PANAVIA™ SA Cement Universal



PANAVIA™ Veneer LC

- i. According to ISO 6872:2015, Three-point flexural strength test Sample size 1.2x4x14mm, Span length 12mm Source: Kuraray Noritake Dental Inc.
- ii. Compared to conventional product, according to the verification of the CAD/CAM equipment's manufacturer. [8]



Dr. Lawrence (Larry) Gaum, DDS, FADSA, FICD, FADI, Diplomate: National Dental Board of Anesthesiology

My Grandfather Came Through The Front Door

The other day, I began to think of my paternal grandfather, Sam Gaum, and his journey from a small village in Belarus to an even smaller one in Cape Breton, Nova Scotia. His dream was to become a Canadian citizen.

The year was 1910—two years before the tragic voyage of the S.S. Titanic, which sank several miles off the coast of Newfoundland. He traveled from a village called Kozhan Horodok by train to Liverpool, England, where he boarded a steamship bound for the Port of Halifax, Canada.

He could only afford to travel in steerage, alongside hundreds of other poor passengers in the lower decks. He had a total of fifty dollars to his name, and according to the purser's list, he was recorded as a shoemaker.

Most importantly, he entered Canada through the front door—legally. He completed all the necessary forms and documents and answered every question truthfully. He worked odd jobs, performing all types of labor to support himself, living with minimal food and lodging.

Finally, after a lengthy period, he was honored and proud to become a Canadian citizen.

I admire him for his strength, determination, and honesty. It was difficult, but he succeeded and accomplished what he set out to do. He was never tempted to sneak through the back door or cross the border illegally.

I'm proud to know that my surname represents honor and respect because of my grandfather's actions.

As for immigration, how do I feel about what's happening today in Canada?

I fully support legal immigration as it operates in Canada today. We need and welcome people from all over the world—professionals such as medical practitioners and dentists—who are well-trained and certified by institutions recognized by Canadian boards. We want individuals who will contribute their skills to all Canadians and help improve the existing health care system.

We need more medical GPs and dentists who are willing to practice in remote and rural areas, providing care to patients who currently have none.

We need immigrants capable of working in farming, construction, retail, schools, hospitals, law firms, the military, and other well-paid, full-time positions.

I wholeheartedly agree with and encourage all of the above, as long as they come through the front door—just as my grandfather did many years ago.

I shout a resounding “NO” to illegal immigration!

This country of ours abides by the “Rule of Law.” It is what makes Canada great. And it must remain great. **SD**



Dr. Gaum's grandfather,
Sam Gaum

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Sean Han, Dental Technologist

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Q&A About Rodin Flexisplint

As a general question, how long does a unpolished and unprotected printed pink resin for denture base remain impervious to water absorption and discolouration in the mouth? Would you know how polishing the surface by hand (with pumice & polishing compounds) extends the integrity of the denture?

Are your denture printing resins nano filled? How do the Pac-dent Rodin denture resins compare performance wise with Rodin Titan or Rodin Sculpture? So many questions, but the more you learn about the products, the better placed you are to provide better results!

1. How long does an unpolished and unprotected printed pink resin for denture base remain impervious to water absorption and discolouration in the mouth?

a. It is difficult to predict clinically how colour stable a denture material will be due to all the different conditions it is exposed to. However, we have conducted lab-based tests subjecting materials to water, dye, and denture cleansers. This roughly estimated use for 1 year. There was no clinically significant colour change (change in colour less than Delta E of 3) after treatment.

b. Rodin denture materials meet ISO standards for water absorption.

2. Does polishing the surface by hand (with pumice & polishing compounds) extends the integrity of the denture?

a. We are strong advocates of polishing all restorative materials and prosthetic devices. Polishing creates a smooth surface that helps prevent plaque accumulation,




SCAN ME



discolouration, improves wear resistance, and strength. With respect to polymer-based materials, polishing helps remove any layers that might not be completely cured due to oxygen inhibition.

3. Are Rodin denture printing resins nano filled? How do the Pacdent Rodin denture resins compare performance wise with say Rodin Titan or Rodin Sculpture?

a. Our lab has tested a number of printed, machined, and conventional denture resins. With respect to overall mechanical properties Rodin materials are higher than other printed and machined materials including Lucitone Digital Print. We do not compare these materials to those for printed permanent restorations as they require different design features. Denture materials are designed more for impact resistance with increased flexibility while permanent materials need to be stiffer particularly if being bonded to natural tooth structure. 



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The Latest Advancements in Minimally Invasive Prosthodontics

An interview with Dr. Carlo P. Marinello, Professor Emeritus since 2015, Dental School, University of Basel

Minimally invasive dentistry expresses an attitude, a general respect for the original healthy tooth substance and the soft tissues. These procedures have become a real option for many patients due to several factors, such as the extremely subtle and precise restoration fabrication processes, modern enamel and dentine bonding techniques, innovative biomaterials and technological developments. In this article, we interview Dr. Carlo P. Marinello*, who sheds light on the importance of minimally invasive prosthodontic procedures focusing on the latest innovations in this field, and we report a clinical case of a patient treated with the new Prettau® Skin® technique.

* **Dr. Carlo P. Marinello** graduated from the University of Zurich, where he was an Associate professor in the Department of Fixed and Removable Prosthodontics and Dental Material Sciences and later also Head of Periodontology. He was a Chairman of the Department of Reconstructive Dentistry and Temporomandibular Disorders at the Dental School of the University of Basel, where he is a Professor Emeritus since 2015. In his nearly 50 years of clinical experience in the field, he has been a member of many of most prestigious prosthodontic organisations.



Why do we need minimally invasive prosthodontics?

A: The healthy tooth, free of caries and restorations, represents the best starting situation for lifelong function regarding structural, biological and aesthetic aspects, as long as natural tooth substance is not lost via physiological or pathological processes. It is the dentists primary goal to prevent or slow down such physiological or pathological processes prophylactically or, in an advanced stage, to restore the tooth, as far as possible, to its original state utilising an additive procedure. Furthermore, we have to consider that the oral cavity is a 'hostile environment': humidity, stress, temperature- and pH-changes, etc., might lead to degradation, corrosion and to a subsequent failure of restorations. By utilising least invasive techniques through diagnostically guided therapy, by the use of lenses or a microscope and by minimising the number of teeth involved, we can make a decisive contribution to an increased survival of the natural tooth.

What examples of minimally invasive restorations do we have?

A: Minimally invasive dentistry includes different kinds of restorations. Veneer chips, incisal veneers, partial veneers, full veneers and 360-degree veneers are used, for example, in the anterior region before conventional crowns. The so-called table-tops, partial veneers and onlays are used instead in the posterior region. The replacement of single teeth is also subject to similar requirements. Adhesive bridges, for example, belong to the easy, successful and minimally invasive gap restoration in young and older patients. Simple removable partial dentures also represent a minimally invasive tooth replacement, as they efficiently replace several missing teeth without extensive preparation of the abutment teeth.



Figs. 1 - 5: Before/after case treated with Prettau® Skin® veneers, with a minimal thickness of 0.2 mm

Which are the latest innovations in terms of minimally invasive dentistry?

A: Among minimally invasive prosthodontics, veneers have great potential in terms of conventional use, and unlimited use for innovative ideas. A perfect example of this is given by the new Prettau® Skin® concept, a recent minimally invasive solution consisting of particularly thin veneers, reaching a thickness of 0.2 mm. These veneers represent an extremely subtle, sophisticated and at the same time stable restoration, showing high fitting accuracy.

Digital data collection and the resulting workflow with the fabrication and the try-in of a mock-up facilitate a maximum involvement of the patient in the decision-making process and make these veneers a predictable treatment for the patient, the dental technician and the clinician.

When treating patients with minimally invasive solutions, it is important to consider that facial enamel thickness decreases with age through erosion and wear, and that an

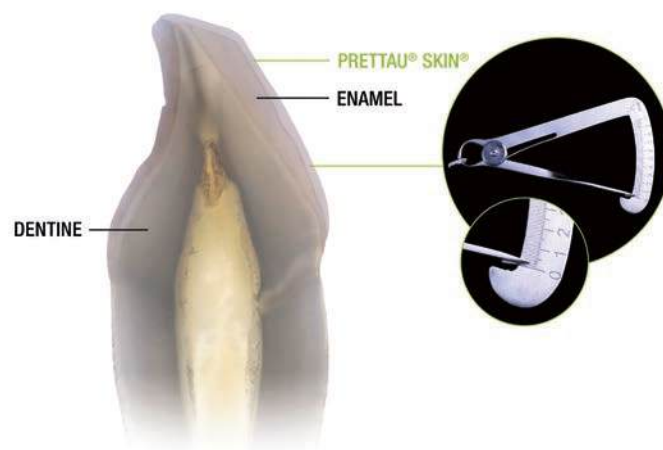
average enamel thickness of only 0.3-0.7 mm from studies is assumed. 'Old rules' claim that enamel reduction to 0.5 mm for a porcelain laminate veneer restoration is likely to expose dentine at the cervical area. In this context, Prettau® Skin® with its minimal thickness of 0.2 mm represents a prosthodontic solution that can be applied without or with just a minimal tooth preparation. In this way, the ultra-thin zirconia veneer fulfills three functions, replacing lost tissue – mainly enamel, protecting against further tissue loss and creating a sort of 'lifetime enamel'. The latter has still to be proven by long-term studies.

Which are the prerequisites for zirconia bonding?

A: Crucially, 10-MDP-monomer, a Phosphoric methacrylate is used to create a chemical bond to zirconia. The prerequisite is that a clean and micromechanically anchoring surface is created on the tooth surface and on the intaglio of the restoration. Also, the use of a specific Zirconia Cleaner for decontamination of saliva- and blood-contaminated surfaces is recommended. Today, with the modern materials and methods available, it is possible to guarantee a predictable and stable bond at least for the so far foreseeable time. However, the bonding of zirconia veneers is still a demanding clinical activity, requiring basic knowledge of adhesion and dedicated practical training.

How do the advancements in restorative materials and digital processes affect minimally invasive dentistry?

A: The latest zirconia innovations include materials showing very high translucency properties. In combination with built-in colour gradient, these materials can be used to produce particularly natural-looking restorations keeping a monolithic design. Concerning digitalisation processes, they permit to store permanent digital files for future reproduction as well as for possible fabrication of prototypes, try-in mock-ups or temporary restorations – an important treatment step to create restorations that meet patients' and dentists' requirements. In general, thanks to CAD/CAM technologies, it is now possible to produce zirconia restorations with a high level of precision. I can take the new Prettau® Skin® veneers as example also in this case. Concerning restorative materials, the producer has conceived a special zirconia characterised by gradients of natural colour, translucency and flexural strength (Prettau® 3 Dispersive® zirconia) which lend the veneers a very natural look without the need of further characterisation with ceramics, preventing the risk of chipping. Considering the digital working process, the collection of digital data is a remarkable factor for the production of these veneers. It permits diagnostic evaluation for determining the adequate insertion path of the veneer, a targeted preparation of the abutment tooth if indicated, and in particular, the fabrication of a mock-up that guides the further course of treatment in a targeted manner.



Prettau® Skin® - The latest innovation in minimally invasive dentistry

A healthy smile without preparation of the natural tooth structure

Prettau® Skin® (Zirkonzahn) is an innovative technique for the creation of ultra-thin Prettau® zirconia veneers with a thickness of only 0.2 mm. In this way, patients can be provided with an aesthetic and healthy smile with zero to minimal impairment of tooth structure. The veneers are suitable for the aesthetic correction of tooth discolourations, tooth gaps, crooked teeth, cone teeth and abraded teeth.

Zirkonzahn has developed a clinical and technical protocol which includes the fabrication of a resin mock-up to check functional, phonetic and aesthetic aspects. Based on the mock-up, the dental technician can produce a preparation guide marking the tooth areas that the dentist has to prepare for the minimally invasive application of the veneers – a useful tool to optimise planning and communication between dental technician and dentist, for the final benefit of the patient. Veneers preparation and cementation is then performed based on a proven protocol that includes both technical and clinical working steps:

- cleaning and isolation of the working area
- tooth preparation
- veneers preparation
- bonding preparation and application, curing

Prettau® Skin® is meant to be fabricated with the entire Prettau® line zirconia. However, Prettau® Dispersive® typologies are the most suitable, as they are already provided with a natural colour gradient from dentine to enamel during the manufacturing process. Zirkonzahn zirconia types generally have a good opacity effect. This property makes it relatively easy for the dental technician to achieve the desired colour effect already on the model. However, for even more patient-individual results, veneers can be further individually characterised with ICE Stains 3D by Enrico Steger and minimally veneered with Fresco Ceramics.

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Translucency
57%-43%

Strength
700-1050 MPa

Natural Gradient Effect

CE 0197



100% TOSOH
Zirconia Powder

Aidite



Veneer



Inlay



Anterior crown



Posterior crown



Full arch crown bridge



Full crown bridge



Full contour screw retained bridge



Implant

NO-PREP PRETTAU® SKIN® VENEERS IN PRETTAU® 4 ANTERIOR® DISPERSIVE®

— A case report

A young male patient presented to the clinical team expressing dissatisfaction regarding the appearance of his anterior teeth and requested an aesthetic and functional restoration of his anterior region (teeth 13–23) by adopting a minimally invasive treatment approach.



Fig. 7: Initial patient situation

The restorative team opted for ultra-thin no-prep Prettau® Skin® zirconia veneers, an ideal solution when wanting to preserve natural teeth yet enhancing the overall aesthetic outcome. Initially, the oral situation was digitally captured using intraoral scans, while facial physiognomy was recorded with the 3D Face Hunter facial scanner, enabling the creation of a virtual 3D model and the articulation of patient's dental and facial structures.

For optimal tooth shade selection, the Zirkonzahn Shade Guide Prettau® Line was employed, consisting of monolithic Prettau® Dispersive® zirconia tooth samples, which facilitated the preview of the final aesthetic outcome. Prettau® 4 Anterior® Dispersive® zirconia, characterised by its high translucency and specifically developed for anterior applications, was the material of choice selected for this restoration.

The tooth set-up was performed using the Zirkonzahn.Modifier software, where the most suitable morphology was selected and customised from the Heroes Collection virtual library.



Fig. 8: Design of the virtual tooth set-up in the Zirkonzahn.Modifier software

The optimal insertion direction for the block-out model was determined to ensure precise restoration placement.



Fig. 9: Determination of the optimal insertion direction for realising a block-out model

Subsequently, a mock-up was designed and milled out of a Temp Premium Flexible resin blank to assess functional, phonetic, and aesthetic properties, providing an initial preview of the possible final result. After a positive evaluation of the try-in by the dentist and the patient, six Prettau® Skin® veneers were designed and milled out of a Prettau® 4 Anterior® Dispersive® zirconia blank. The veneers were then sintered in the Zirkonofen Turbo and characterised with ICE Stains 3D by Enrico Steger, applying only minimal layering using Fresco Ceramics for enhanced aesthetic qualities.



Fig. 10: The 6 Prettau® Skin® veneers made of Prettau® 4 Anterior® Dispersive® zirconia

Finally, the restorations were cemented into the patient's mouth, and a bite splint was produced from Therapon Transpa resin to protect the veneers and ensure their longevity.


Upon completion of the treatment, the patient expressed full satisfaction with the final restoration's functionality and appearance. 



Fig. 11: Final restoration in situ

Case realised by:

Dr. med. dent. José Carlos Alva Manríquez – León, Mexico

DT Alexander Lichtmannegger – Zirkonzahn Education Center Brunico, South Tyrol, Italy



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Precision and Adhesion: Fundamental Requirements for Long-Term Success *Aesthetic Replacement After 20 Years*



Dr. Andrea Savi



Odt. Vincenzo Castellano



Fig. 1: Bruxist patient with full rehabilitation performed 20 years ago by Dr. Samuele Valerio.

Technologies, materials, and procedures have evolved significantly over the years. However, the principle of preserving natural tooth structure remains fundamental for ensuring long-term durability.

The case presented involves an extensive rehabilitative treatment for a bruxist patient performed by Dr. Samuele Valerio in 2004 (Fig. 1).

The patient regularly underwent oral hygiene sessions and occlusal checks with no significant complications over the years. However, recently, microfractures appeared in the ceramics of central incisors 1.1 and 2.1, necessitating their replacement (Figs. 2 and 3).

The initial restorative treatment used monolithic lithium disilicate ceramics for all anterior and posterior teeth (Fig. 4). However, 1.1 and 2.1 were fabricated with layered ceramics on beveled shoulder preparations (Figs. 5 and 6).



Figs. 2 & 3: Microfractures in central incisors 1.1 and 2.1.



Fig. 4: Posterior sector preparations by Dr. Valerio for lithium disilicate onlays.

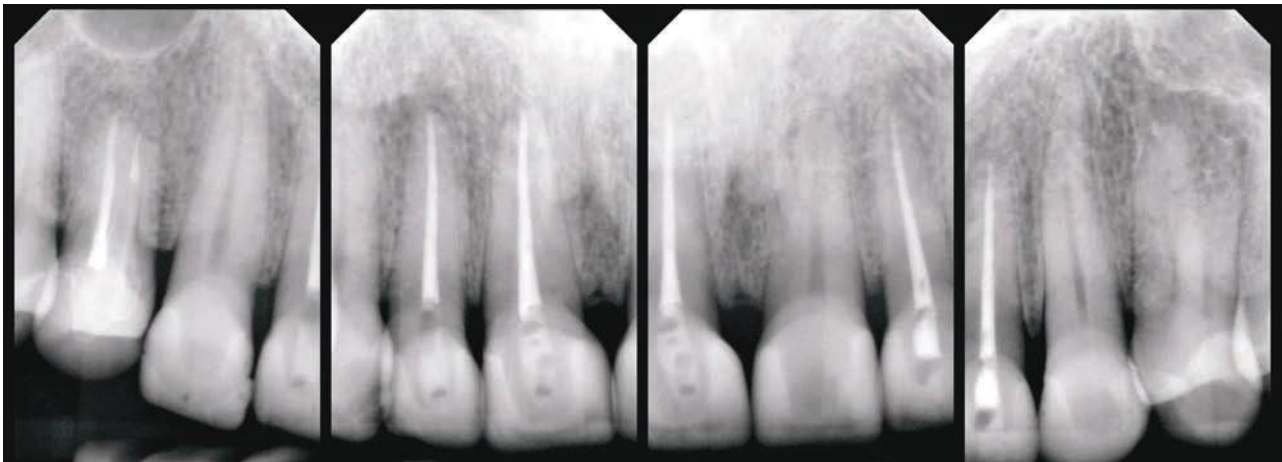


Fig. 5: Radiographic status of the 20-year anterior rehabilitation.



Fig. 6: Anterior preparations by Dr. Valerio.



Fig. 7: Feldspathic ceramic removal for 1.1 and 2.1.



Fig. 8: Fracture line in the ceramic.



Fig. 9: Complete ceramic removal while preserving the original preparation.



Fig. 10: Placement of the first retraction cord in the gingival sulcus.

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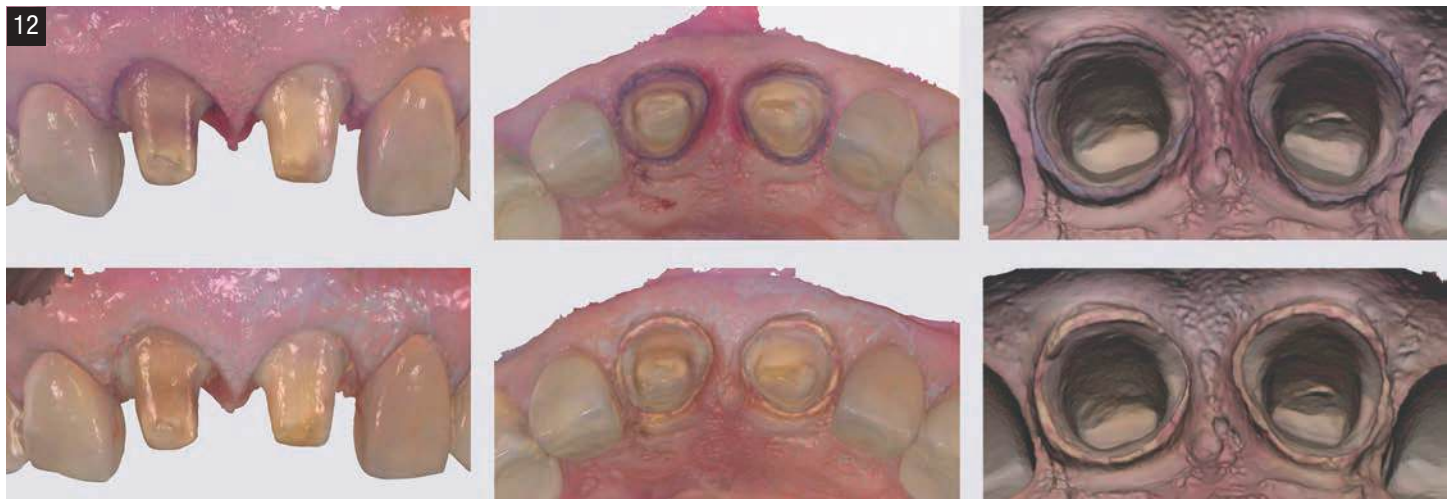
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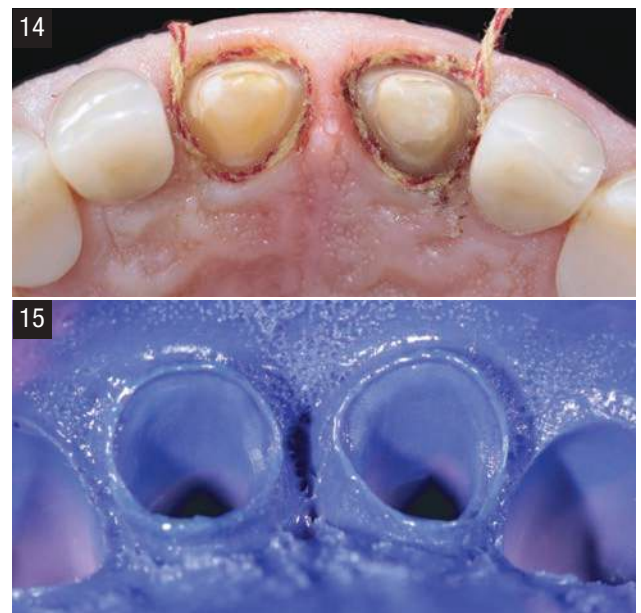
Fig. 11: Placement of the second retraction cord.

The required retreatment was limited to the feldspathic ceramic crowns on the two central incisors (Fig. 7), which exhibited evident fracture lines within the crown thickness (Fig. 8).

During ceramic removal, special care was taken to preserve the original tooth structure and maintain the initial preparation, using magnified vision and ultrasonic tools (Fig. 9). The final preparation involved only refining the closure margins without altering the original shape (Fig. 10).



Figs. 12 & 13: Dual digital scans with single and double retraction cord setups.



Figs. 14 & 15: Polyether impressions using the double-cord technique.

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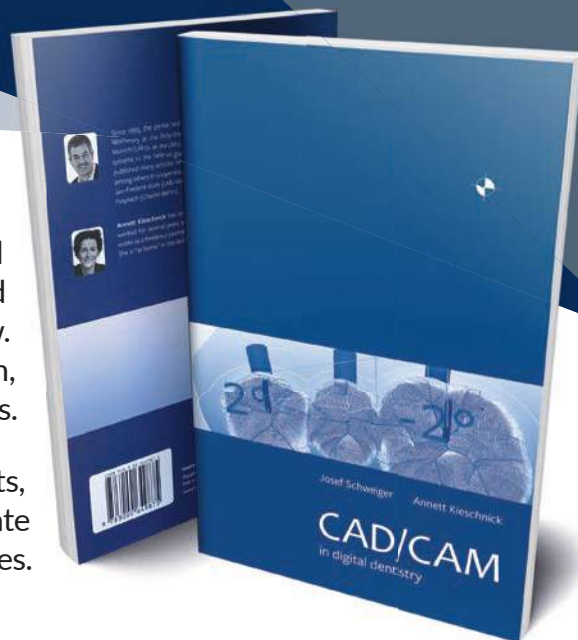
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Figs. 16a - b: Adapted preliminary relined provisionals.



Figs. 17a - 18: Gypsum model with detachable dies and digitally scanned gingiva.

In the same session, using the double-cord technique (Figs. 10 and 11), both digital impressions (Figs. 12 and 13) and analog impressions in polyether (Figs. 14 and 15) were taken. Preliminary relined provisionals were adapted, and the patient was dismissed (Fig. 16).

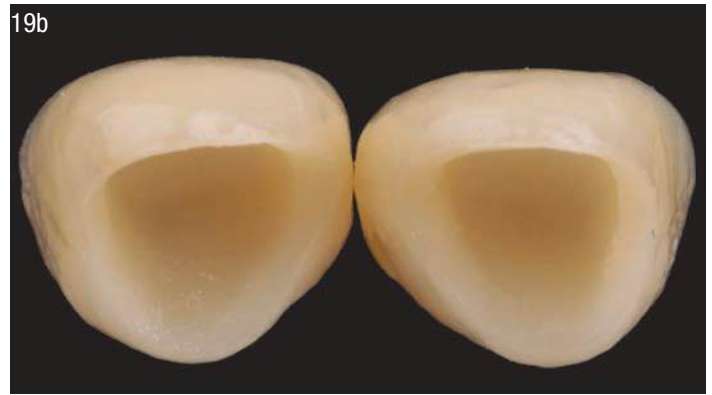
Although a fully digital workflow was possible, the clinical choice to use pressed lithium disilicate while maintaining the original preparation favored an analog approach (Figs. 17–21). Digital contributions were used only to replicate the transmucosal trajectory (Figs. 22 and 23).

While technology is rapidly replacing analog techniques, for pressed lithium disilicate crowns, the analog pathway still provides the highest precision.

Two critical and indispensable factors for long-term success are the precision of marginal closure and the accuracy of the cementation procedure. These were the conditions that Dr.

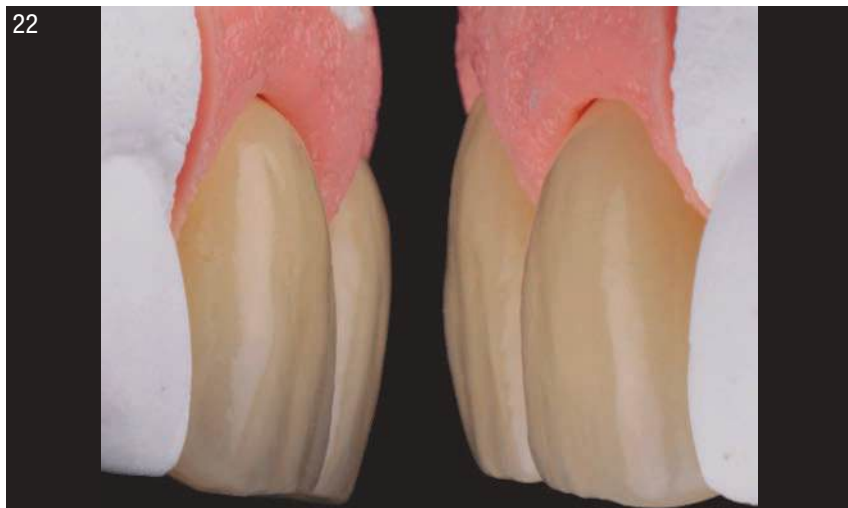
Samuele Valerio meticulously sought and achieved in the initial treatment.

The restorative approach chosen is a hybrid: the analog path follows what was done 20 years earlier, with only the ceramic type being replaced, but with digital support for the faithful reproduction of the transmucosal pathway transferred to the analog model. The crowns made for the refurbishment are in monolithic lithium disilicate, obtained with the pressed technique, with the margin rebased onto the gypsum stump and the vestibular portion ceramized. The digital scan allows for exact recording of the soft tissue morphology before the modification created by the gingival conditioning with retraction cords, which is then transferred to the analog model. The silicone gingiva is created based on the morphology of the crowns without gingival conditioning, which, in this case, are the original crowns to be replaced, whose shape is to be reproduced without variation. The digital approach offers advantages in simplifying the procedure of replicating the shape of the original crowns.



Figs. 19a - 20: Completed monolithic lithium disilicate crowns.

Fig. 21: Marginal adaptation of crowns on the gypsum die.



Figs. 22 & 23: Detachable dies with silicone gingiva and crown adaptation on the gypsum model.



Figs. 24 & 25: Unetched internal crown surface and accidentally etched external areas.



Fig. 26: Corrected crowns ready for adhesive cementation.



Figs. 27 & 28: Cemented crowns.





Figs. 29 - 30: Protrusive and lateral occlusal checks.

The feldspathic ceramic crowns showed stress fractures in a patient with bruxism and clenching, but the precision of the marginal closure, accurate adhesive cementation, combined with constant home and professional oral hygiene, protected the stumps for 20 years, ensuring that no infiltration or marginal seal failure was present when they were removed.

The adhesive cementation protocol for lithium disilicate involves etching the internal surface of the crown with 10% hydrofluoric acid for 20 seconds, followed by cleaning with ultrasound in an alcoholic solution.

It is important to carefully check for areas that were not perfectly etched or accidentally etched outside the margin (Figs. 24 and 25).

It is crucial to clean and re-treat unetched areas or polish portions that were mistakenly etched to ensure optimal adhesion



Figs. 31a - b: Radiographic check.

and avoid the presence of cement residues in uncontrollable areas (Fig. 26).

Cementation was performed using a dual-cure cement, after placing a retraction cord in the sulcus (Fig. 27).

Once cementation was complete, occlusal checks were performed (Figs. 28 to 30) as well as radiographic controls (Fig. 31). [8]

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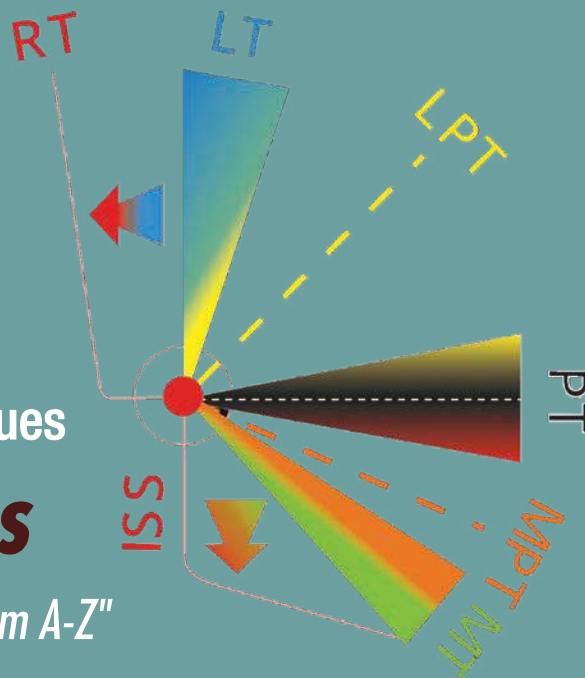
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Basics of Functional Waxing Techniques

The Occlusal Compass

An excerpt from the book "Posterior Teeth from A-Z"
by Gunther Seubert

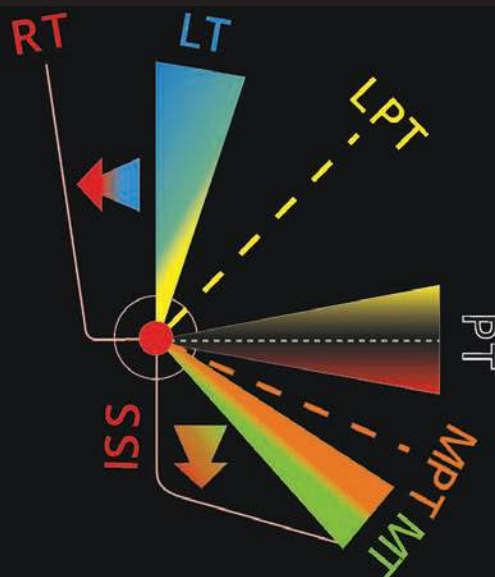


The Occlusal Compass symbolically represents the various chewing movements; it also indicates the spaces our tooth cusps occupy during excursive movements. With its help, a dentist or dental technician, like a sailor on the high seas, can navigate through the cusps, ridges, and fissures at any time. The movements and spaces are marked according to an international colour code, which we also encounter in other waxing or occlusion theories.

The areas hatched in the respective colours of the movement directions (Fig. 1) are meant to symbolize the possible spread of movement. The boundary areas of ISS (Immediate Side Shift), which follows the mediotrusion, and RT (Retrusion), which follows the laterotrusion, are shaded in red. This compass is well-known to us from biomechanics, as described by Michael Heinz Polz. The natural waxing technique according to Dieter Schulz, which goes beyond the point contact situation and also deals with contact surfaces, includes an extended occlusal compass that considers the medio-protrusion movement. Here, the medio-protrusion movement is marked in orange. In addition to the Occlusal Compass, the natural waxing technique offers another orientation aid for beginners:

It divides the occlusal surface into different segments. If you proceed systematically when waxing—considering the Occlusal

Fig. 1: Apex of the cone = red dot, central fossa = red circle, protrusion = black line (PT), laterotrusion = blue line (LT), lateroprotrusion = yellow line (LPT), mediotrusion = green line (MT).



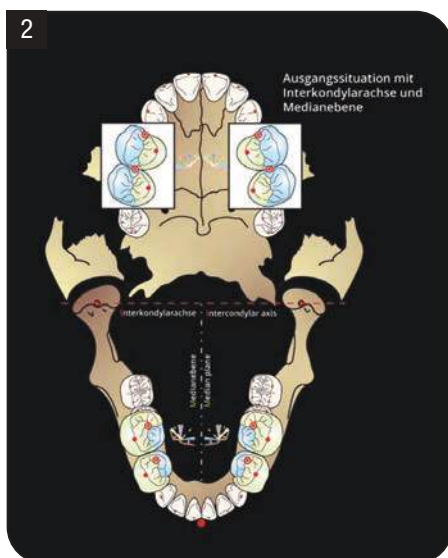


Fig. 2: The two first molars (upper and lower jaw) in the starting position.

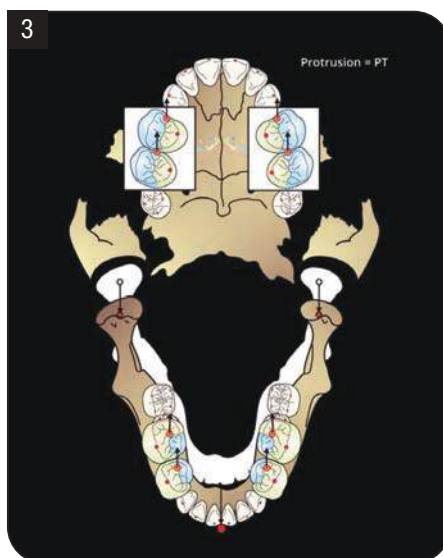


Fig. 3: The first molars in protrusion, marked with a black line.

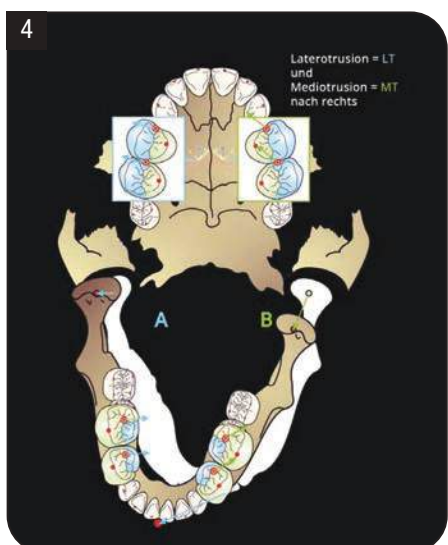


Fig. 4: The molars during laterotrusion (blue line) and mediotrusion (green line) to the right.

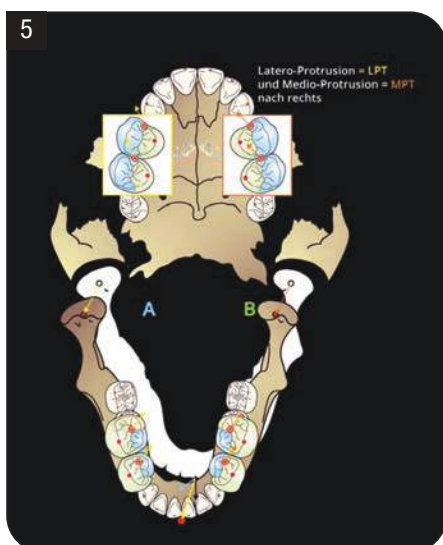


Fig. 5: The molars during latero-protrusion (yellow line) and medio-protrusion (orange line) to the right.

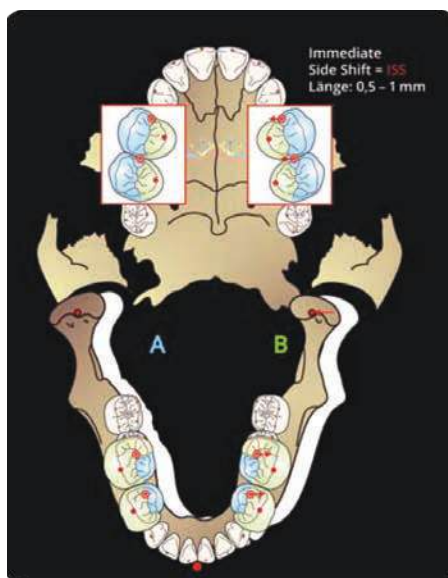


Fig. 6: The molars during the so-called Immediate Side Shift (ISS).

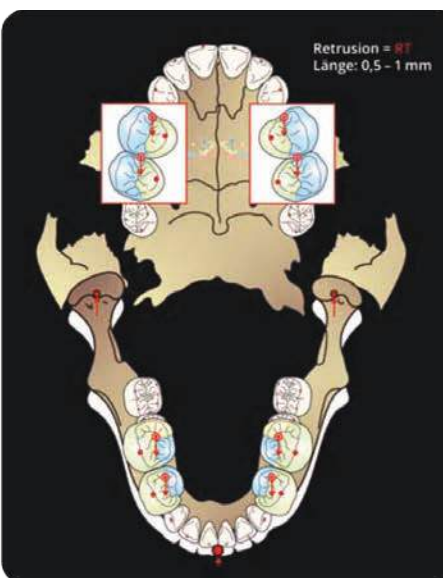


Fig. 7: The molars during retrusion (RT) over a distance of about 0.7mm.

Compass and the arrangement of the individual segments—it's truly no magic to reconstruct a natural and functional occlusal surface. In this context, "functional" means an occlusal surface that does not interfere with any movement. By the way, I find the term "Occlusal Compass" somewhat misleading.

A compass, as we know, has fixed directions that do not change. North is north, and south is south. However, with an "Occlusal Compass," there is only one fixed movement direction, which is protrusion (black). All other movements vary in their angle (they become sharper), especially as we move away from the jaw joint towards the anterior teeth. But what does that mean? Let's assume there is a 90° angle between protrusion and laterotrusion in the condyle area, then we find a much smaller angle between these two movements in the area of the first molars. For premolars, the angle is even smaller, and as we approach the anterior teeth, this angle becomes increasingly acute (Fig. 2 to 8). This also applies to mediotrusion and latero-protrusion.

Although the term "Compass" is illustrative, "occlusal movement coordinates" is closer to reality. In his book, Gunther Seubert shows, with insightful graphics, that nature determines these movement coordinates, providing the framework for every restoration. ^[5]

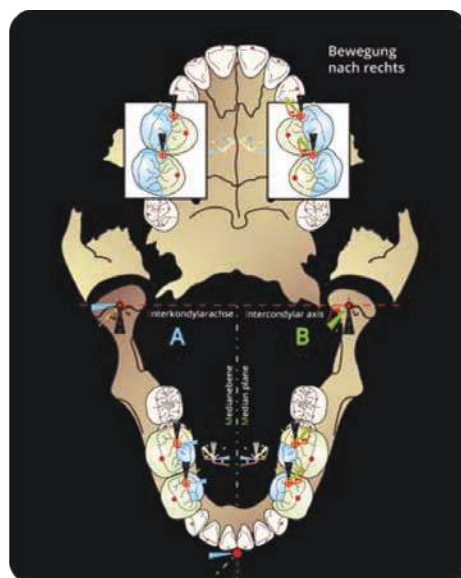


Fig. 8: The molars with all occlusal coordinates during a movement to the right.



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Harmony:

Multilayer Zirconia in Daily Use in the Laboratory Selection Criteria

Odt. Master Carsten Fischer

Abstract

Carsten Fischer is considered one of the best-known ceramic specialists in Germany. He has been working without metal for more than 25 years and focuses on all-ceramic restorations. He has always been involved in aesthetic all-ceramic restorations and has collaborated intensively in the development processes of these materials. As a solution-oriented pioneer, he has been providing advice to renowned manufacturers in the development of their ceramics. In this way, he always acts from different perspectives and manages to integrate the practical challenges of daily laboratory work with a scientific approach. The goal is always to make solutions and concepts simple, safe, and predictable. His impulses for development include essential aspects of aesthetics and functionality, as well as applicability.

He masters the entire platform of combining complex scientific concepts with (seemingly) simple aspects of everyday life. From his perspective, every development must meet the need to simplify dental procedures for dental technicians without compromising quality or increasing the risk of errors through complicated applications. Currently he is working on several questions related to microstratification. In this article he focuses on the hottest question: Which zirconium oxide is the best base? Once again, his many years of experience is a sure guide.

Carsten Fischer now prefers multilayer zirconia and has come across a pressing question: which multilayer zirconia to use? This question currently occupies the minds of many dental technicians. The choice is wide, and one thing is certain: zirconia oxide \neq zirconium oxide. Are you spoiled for choice? Not Carsten Fischer.



Odt. Master Carsten Fischer has been practicing as a self-employed dental technician since 1996 in Frankfurt on the Main. Since 1994 he has been active as a speaker internationally and supplements this activity with publications in many countries. Carsten Fischer is a member of several scientific committees and a long-time consultant to the dental industry. He is a lecturer at Steinbeil University in Berlin, liaison to several organizations (DGI), vice president of EADT and member active member of FZT e.V. (Association of Dental Technology).

The modern daily life of the laboratory is characterized by a wide variety of materials and products. Especially in the case of relatively new materials (e.g., zirconium oxide), however, the choice can become difficult. This article discusses the zirconium multilayer and shows the essential factors to consider when choosing. The focus is on the production of beams for microstratification, where the term "truss" is imprecise in the context of microstratification. Eighty to 90 percent of a multilayer restoration is zirconium oxide. This is a base for shaping and staining. Therefore, the choice and the exact colour are of great importance. In the laboratory we still work according to a conventional colour scale (classical Vita colour scale). But does a zirconium oxide A3 really corresponds to the A3 of the colour scale?

The History of Zirconium Oxide

The history of zirconium oxide is marked by important milestones. In the beginning, zirconium oxide was an opaque material. Later on, efforts were made to give the material a basic colour similar to that of teeth (beige, cream, white, etc.).

Then translucencies came into play, which gave the material more naturalness. Today the focus is on multilayered zirconium oxides. With these multilayered zirconium oxides, the dental laboratory has at its disposal an instrument that, ideally, integrates calibration well. This scale offers the potential to mimic the diversity of optical-luminous properties and the interplay between opacity and translucency that we know from the natural tooth. But not all manufacturers know how to achieve a harmonious result.

Zirconium Oxide



Zirconium Oxide

As a table of alloys that integrates different gold alloys, the zirconium oxides vary in detail and have significant differences. It seems absurd to think that the dental laboratory must adapt to the respective manufacturer's zirconium oxide. Rather, zirconium oxide should be at the pace with the times.

Current Situation

The modern dental laboratory makes all-ceramic restorations routinely and economically. While highly trained specialists are able to use the various shades of all-ceramic completely freely and create beautiful restorations, the standard laboratory requires restorations to be made with relative ease. This requires zirconium oxides that work in a reliable manner. The ceramics departments are staffed by smart people who want to use their experience to produce esthetic restorations reproducibly and efficiently. Their work is largely based on the classic Vita shade guide (Vita Classic). Although an increasing number of patients are going to the laboratory, the Vita colour scale will continue to be the main basis for colour communication. And it is precisely at this point that a great disharmony arises between the classical colour scale and the indication of zirconia colour.

Seemingly Equal

Apparently equal things do not function in the same way. At first glance, zirconium oxides do not stand out hardly at all. A white disk. But what does it contain? This is where we need our "table (of alloys) of oxide zirconium." Zirconium oxides differ mainly in their mechanical and optical properties.

First of all, it is necessary to differentiate the various "eras," and for this it is necessary to consider the formula of production. The base is usually tetragonal zirconium oxide (TZP, tetragonal zirconia polycrystal), to which the manufacturer adds additives as stabilizers (e.g., yttrium oxide). By changing the yttrium oxide content, the manufacturer controls the properties of the oxide of zirconium. The material is adapted to the respective indication (e.g., high translucency, high strength). Types of zirconium oxide are commonly classified according to the generations. The most obvious differences are found in the strength to bending (between 750 MPa and 1,500 MPa) and in the degree of translucency (from highly translucent to opaque).

- 1st/2nd generation: zirconia 3YTZP
- 3rd generation: zirconia 5Y-TZP
- 4th generation: zirconia 4Y-TZP
- Multi-generation zirconia

Experience shows that it is advantageous to work with an oxide of zirconium of the current generation. In our daily laboratory work, we use an oxide of zirconium multilayer oxide of the type 4Y-TZP (ArgenZ HT+ Multilayer, Argen Dental).

The Veneer

For a long time, layering was considered the "bottleneck" of all-ceramic restorations. Soon a desire was expressed to make zirconium oxide accessible for the monolithic fabrication. Later, with the first multilayer zirconium oxides in 2013, monolithic restorations could avoid the sensitive "bottleneck" (chipping).

Aesthetic finalization is based on the original multicolour structure of the zirconium oxide and, if necessary, colour enhancement with surface staining or a partial layering similar to a veneer. Further development has led to the optimization of the materials including new working concepts, followed by the next milestone: microstratification.

Microstratification as Rebirth of Partial Cladding?

Microstratification is not a rebirth of partial cladding, but an independent technique. Although the application of a thin layer of veneer is not new, microstratification cannot be compared with the traditional partial veneer. The micro layering is performed with specially designed ceramic materials designed. Both zirconium oxide and veneering ceramics are suitable for this purpose.



Fig. 1 — Visualization of microstratification with the example of an anterior crown. Base made of zirconium oxide which imparts shape and colour aesthetically finalized with a thin layer of ceramic from veneer. Image published for the first time in Quintessenz Zahntechnik (edition 09/2022)

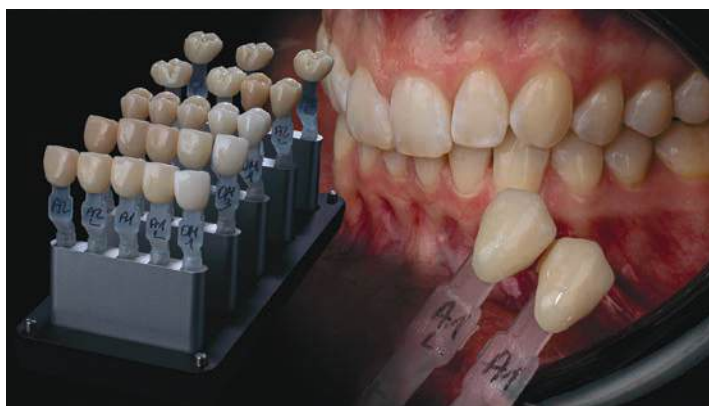


Fig. 2— Individually produced shade samples (Colour Index) for anterior teeth made of zirconia original (here ArgenZ HT+ Multilayer). Note: Due to volume variation, we recommend separate colour samples for premolars and molars

Microstratification Definition:

- Veneering only in the visible area
- Use of special characterization colours with 3D effect
- Internal colouring technique + Build Up
- Layer thickness from 0.1 to 0.6mm
- Special Microstratification challenges
- Beam or base material (multilayer zirconium oxide) has decisive influence. 80-90% of the esthetic result is determined by the base
- Careful selection of zirconium oxide (determination of the colour)
- It must be possible to imitate the optical effects of light even with the thinnest layers
- Use multilayer zirconia to ensure a good colour match
- Use ceramic concepts with feldspar-base especially microstratification
- Secure bonding between truss and veneering ceramics
- Internal characterization colours as a connector between zirconia and veneering ceramic

Requirements for Zirconium Oxide Multilayer

The choice of a particular zirconium oxide therefore requires a thorough examination of the subject. Basically, zirconium oxide must meet certain criteria as a base material, including:

- Excellent balance between opacity and translucency (colour harmony)
- Reliable processing properties (milling and sintering)
- Consistently good results (reproducibility)
- Stable material properties (durability)

Figure 1 clarifies the significance of microstratification. The initial situation is always the abutment, sometimes more or less discoloured. The general rule is that the space for a ceramic restoration is limited. This is followed by the base (multilayered zirconium oxide), which is encased in a thin layer of veneer. To be successful with this technique, a "colour-safe" foundation is

essential. Working with a zirconium oxide that does not possess this capacity creates problems. With a coating layer so thin, it is difficult to compensate for colour inconsistencies (e.g., gray shades, incorrect colour distribution) (Fig.1). This leads to a problem that we were not aware of before. We are working in the middle of nowhere when the components of the multilayer zirconium oxide do not conform, and the colour does not match the classical reference. The great advantage of microstratification is that 80-90% of the parts that shape zirconium oxide are defined. The aesthetic success of the entire restoration relies on the zirconium as the basis of shape and colour.

The Communication of Colour

The choice of colour for zirconia multilayer represents a challenge for all of us. Whether we like it or not, we usually work on the basis of the Vita colour scale. This has been used for decades. It is an old reference for innovative materials: it is clear what its shortcomings are.

There are good alternatives for a proper communication of colour. Nevertheless, it is to be expected that the majority of communication about colours will continue to take place through the classical colour scale. This also means that zirconia oxides should theoretically match the colour scale. In practice, this is a problem in the daily life of many laboratories. Analysis of several polished crowns made of zirconium oxide shows that in many cases the result has nothing in common with the reference colour of the conventional colour scale. Manufacturers do not seem to have uniformity in the development of zirconium oxides. This demonstrates once again that a high level of expertise is needed to produce a "colour-safe" zirconia.

As a laboratory, we want to be able to trust the manufacturer, as an A2 blank will result in an A2 restoration and we will not have to work "in the middle of nowhere" during finishing (e.g., with microstratification). A zirconium oxide that is truly suitable for daily use should be able to best reproduce every colour on the colour scale.

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Case One: Six Anterior Teeth on Nearly Uniform Stumps with Plenty of Space Available



Fig. 3 — Colour choice for anterior restoration design



Fig. 4 — Abutments prepared for crown application



Fig. 5 — Provisional in PMMA, milled by CAD/CAM



Fig. 6 — Final view of the natural crowns



Fig. 7 — Possible equipment for the photographic documentation of colour determination as a basis for colour matching



Fig. 8 — Determination of tooth colour in the mouth of the patient with the conventional Vita colour scale



Fig. 9 — In a direct colour comparison, the differences between the colour scale sample and the individual are easily recognized. Only the colour sample individual is of great help due to colour matching. This makes it possible to get very close to the colour of the tooth in the reconstruction



Fig. 10 — Colour determination in detail with the individual colour sample (Colour-Index in oxide of zirconium original)

Individuality in the choice of uniqueness:

The variety of natural tooth colours and the demand for naturalness are the basis of our work. We would like to work according to standardized procedures, but the results must not be standard. In our laboratory, a method of chromatic communication or colour matching has been established. It is the basis upon which we select zirconium oxide, and the corresponding colour is a perfect match.

The Colour Index in Zirconium Oxide

We work with an individual colour model, the chromatic index, based on the original colours of zirconium oxide. This is our tuning tool. At first it may seem expensive, but the result is

still worth this "investment." The production of the chromatic index is a great advantage for processing zirconia. The process of production is simple and rigorous. A crown is milled from the original material, sintered and coated with glaze without the need for major machining. Please note: since each tooth has different volume ratios which affect the base colour, it is necessary to create a colour index for each anterior tooth, premolar and molar. The result is the index of colour for all cases. Experience shows that the initial outlay is amortized over a short time. Colour matching without patients in the dental laboratory "A3 please, but a little clearer!" Probably every ceramist knows this statement about the dentist's directions. It creates in the mind, an idea of the colour desired. To select the corresponding zirconium oxide, the reference (Vita A3 colour scale) is kept next to the sample of individual colour (our index of colours, Figure 2) in zirconium

Case Two: A Classic for Microstratification



Figs. 11 and 12 — Zirconium oxide base (ArgenZ HT+ Multilayer) prepared for microstratification. Approximately 80-90% of the restoration is defined by the zirconium oxide



Fig. 13 — After microstratification (Initial One Squin, GC) we focused on layering completely during the aesthetic finish



Fig. 14 — Finished restoration after cementation

oxide and a comparison (colour matching) is found. Interesting and at the same time worrisome, is the observation that many oxides of multilayered zirconium have almost nothing in common with the colour reference (Vita colour scale). The deviations of some multilayer zirconium oxides are sometimes important. The problems are, for example, too high a translucency, a pronounced gray, an unnatural colour, visible transitions, colour layers placed in incorrectly, etc. But there are also positive examples. We have had good experiences with ArgenZ HT+ Multilayer, which enables good colour indexing (Figs. 3 - 6). In this way, it is possible to correctly realize "A3, but a little lighter." The result is an excellent base for microstratification. The zirconium oxide base matches the desired base colour with a high degree of certainty. It is possible to focus completely on the finish, aesthetics and individual characteristics of the restoration.

Choosing Colours on the Patient

If the patient is referred to the dental laboratory for the choice of colours, the well-known guidelines are applied guidelines (neutral colour environment, absence of clothing with high colour intensity, absence of lipstick, correct lighting conditions, etc.). Incidentally, a black hairdressing cape has been shown to be effective in neutralizing the surrounding colours. We also use black lip and cheek protectors to avoid reflections, etc.

Photographic documentation is essential for determining colour in the patient's mouth. With a digital SLR camera and the appropriate equipment (displays, reflectors/bouncers, etc.), it is possible to obtain a photographic result of great effect with

high added value. However, the procedure requires a lot of time and technique. Alternative: it is possible to take good photos even with the sophisticated cameras of modern smartphones. The important thing is to take a picture. The work should always be performed under a calibrated light source (e.g. Smile Lite, Figure 7). To create the photo, a conventional colour key (Vita colour scale, Figure 8) and an individual colour sample (colour index, figure 9). On this basis, colour matching is carried out (Fig. 10). If one takes into account the volume of a premolar, a molar and an anterior, the success rate is high.



Perfect Match or None at All?

When colour matching is performed using the Colour-Index, it is possible to select the base colour quickly, provided that the range of oxides of zirconia offers a selection of colours that is sufficiently complete. For example, ArgenZ HT+ Multilayer integrates 25 different shades, enabling dental technicians to achieve the perfect match without any effort. Zirconium oxides, which are only offered in a small assortment according to colour groups, end up in the "no match" in many situations. Dissonances make the work more difficult.

The idea of reducing the range of materials in the dental

Third Case: Complicated Case with Different Abutment Colours and Little Available Space



Fig. 15 — Work order: four all-ceramic anterior crowns for a young patient who comes to the laboratory for colour selection due to high esthetic demand. Colour matching by Colour Index (Bleach shade OM3, with seven-layer colour gradient layers, ArgenZ HT+ Multilayer)



Fig. 17 — Impression of the restoration the day after cementation. The condition of the gingiva will improve significantly in the following weeks



Figs. 16a and 16b— Finished crowns (zirconium oxide base and microstratification) on the model. Monolithic palatal restoration, finished with vestibular microstratification



Fig. 18 — Significant improvement in red-white aesthetics is visible already after one month. The crowns are made of almost 90% zirconium oxide (ArgenZ HT+OM 3 Multilayer)



Fig. 19 — Happy patient: the final in situ result

laboratory and offer only a few multilayer ingots for "all cases" is ambitious and grandiose, but unfortunately it does not work in daily life. Some manufacturers now recommend using a slightly lighter shade light in the range; for example, instead of an A3, one should tend to use an A2, and the restoration should be adapted by means of tinting. This seems to be the wrong way to go at a time when we need reproducibility. "If I need an A3, I use an A3," is our statement. ArgenZ HT+ Multilayer integrates so-called L-Shades, which have a brightness value slightly higher in order to do justice to additional finishes. This provides security and offers reproducible paths.

Comfortable and Safe

Comfortable and safe is what a contemporary multilayer zirconium oxide should inspire today (Figs. 11 to 14). The respective zirconium oxide should allow for a predictable result without having to consider factors that are difficult to control during processing.

Because, let's be honest, only in a few cases do we really

have all the factors of influence in our hands in the dental laboratory. We need materials that provide flexible application and simple procedures with uniform process chains. The specific properties of the manufacturer that complicate the daily work in the laboratory are contraindicated. Simplification is much more in demand in dental restoration that is already complex. Another important expectation of an oxide of multilayer zirconium is that no transition lines are visible between the individual layers. In addition, the process of uniform sintering is important for the daily work of the laboratory. Not all dental technicians can work with different sintering furnaces, and the adjustment of furnace parameters for each sintering process is time-consuming. In addition, this is associated with new sources of error. Even a deviation of 50° from the sintering temperature can massively affect the strength properties. This danger can be reduced significantly with a uniform sintering temperature.

Conscious Question

Just because something is possible, does that mean it makes

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sense? The messages of marketing related to the development of new materials should be questioned consciously and critically. Currently multigenerational zirconium oxide is being loudly advertised. In this case, in a single blank, several generations of zirconium oxide are present; different combined values of flexural strength and translucency. From my point of view, this is not the first time that an idea has been born on the drawing board with the noble claim of wanting to trigger a paradigm shift. However, we often lose sight of the reality of daily work in the laboratory.

Currently, there are many sources of error when working with multigenerational zirconium oxide; this is not proportional to the assumed potential of the material. Constellation is a source of error during nesting or complicates the process of work, including when placing extensive work. Small errors can cause the portion of zirconium oxide with low flexural strength in the restoration subject to load. This puts the desired high stability of the restoration at risk. In a small laboratory team, the risk can be counteracted, if necessary, with constant monitoring of all the phases of work. But especially in medium or large size labs, a reproducible procedure seems hardly achievable. Another weakness in the laboratory is the confidence of our customers in new materials is limited.

If ceramic fractures or the like occur, it is difficult to rebuild confidence. Although scientific data on zirconium oxide confirms good success rates and excellent long-term stability, these negative experiences are decisive. From the point of view today, it does not seem progressive to accept a weakening of the overall restoration just in the name of a possible increased translucency. We need to be cautious and conscious with these new materials.

The Success of Microstratification

The success of microstratification relies mainly on the quality of the base material made of zirconium oxide (Figs. 15 to 19). The requirements of the material are:

- Uniformly high strength
- Smooth colour gradient with no visible transition lines
- Natural aesthetics and improved optical properties
- Consistently good material quality
- High accuracy of fit
- Uniform closing margins
- Smooth and uniform surfaces

A zirconia with these characteristics requires sophisticated manufacturing, excellent raw material quality and solid experience. Argen is a family-owned company that produces in-house its zirconium oxides using its own technology. This allows experts, with a solid understanding of the requirements of dental technology, to specifically control the properties and characteristics of the material. In the United States, for example, ArgenZ products are the dominant multilayer zirconia, and for good reason, because the quality of the product is compelling. Once you have worked with this material, one does not want to do without it anymore. In recent years, Argen has created a completely new product line that has been very successful in other markets (for example, in the United States). The bar is high, and we need to take advantage of it.

Tips and Tricks for Microstratification

Microstratification tips and tricks are a good enrichment for the daily laboratory routine.

Summary of the Most Important Aspects

- The zirconium oxide base determines the result of microstratification. The choice of material then becomes a criterion of success
- A multilayered zirconium oxide with a smooth colour gradient and no transition lines visible has proven itself.
- In our opinion, multilayer zirconia should have uniform flexural strength. Multigenerations zirconia should be used with caution.
- Zirconium oxide should have a medium translucency (about 40%). With this type of zirconium oxide, it is possible to make a large number of patient cases. Note: Too high a translucency is disadvantageous in some situations and can quickly lead to a dead-end in the polishing process.
- To select the appropriate colour of zirconium oxide, we recommend Colour-Matching. The conventional colour scale (Vita colour scale) is matched to the colour sample made individually (colour index) of the zirconia. For incisors, premolars and molars, because of the different volume ratios, it is necessary to create a separate colour scale (Figs. 20 to 22).
- The zirconia must have sufficient brightness. Sometimes, however, the appropriate brightness value presents a challenge for colour matching. In this case, a sample chromaticity in the bleaching area of the zirconia may be the best choice, because in this case the power comes effectively from the depth. But beware: this case itself represents a high challenge.
- Even the colour of the abutment can influence the result. Although a zirconia such as ArgenZ HT+ Multilayer covers many discolouration, it does not cover all of them and it is necessary to inform the clinician. We need information about the discoloured abutment (e.g. IPS Natural Die Material, Ivoclar) to make a colour match and select the appropriate zirconia.
- The zirconia must have uniform processing strategies (e.g., sintering parameters) and offer reproducible results.

Regardless of the manufacturer, multilayer zirconia is not a plug-and-play solution; it requires a well-considered dental procedure, where you know what you are doing so that you do not have to work "haphazardly." With the right material and attention to the fundamentals, one can create an excellent base for subsequent finishing (microstratification). With this in mind, ArgenZ HT+ Multilayer is not an alternative for us, but the solution.

Facts and Figures

ArgenZ HT+ multilayer (Fig. 23)

- Uniform flexural strength of 1250 MPa
- Seven evenly distributed colour layers with no lines transition lines

Fourth Case: Restoration of Misaligned Rear Ends



Fig. 20 — Gold alloy crowns should be replaced with all-ceramic crowns



Fig. 22 — The successful posterior restoration in the lower. Zirconium oxide (ArgenZ HT+ Multilayer, Argen Dental) is the basis for the shape and colour. Zirconium oxide's uniform flexural strength of 1250 MPa provides high safety



Fig. 21 — The first attempt: zirconium oxide crowns are undoubtedly beautiful to look at, but they have evidently too much translucency. This results in a gray hue. This drawback can be avoided by colour selection with an individual colour index. In this case, it is necessary to take into account the massive volume of a molar

Machining

During milling, the following stable and consistent results are obtained. It is possible to mill without chipping, even thin cervical closure edges. Sintering is based on process uniformity. With other zirconium oxides, thermal stresses often occur, especially with large restorations with a high volume (e.g., monolithic frameworks), which can lead to chipping and fractures. Here, too, ArgenZ HT+ Multilayer hits the mark. The defined sintering process ensures high precision - free of thermal stresses.




Fig. 23— ArgenZ HT+ Multilayer as a zirconium oxide base material for microstratification. Distribution researched and smooth colour gradient without transitions (cervical to incisal), as well as resistance to uniform bending

- 25 different colours
- Discs of different heights
- Optimal colour matching

Profile – A True Hybrid Material

A true hybrid material combines all the requirements we have in the laboratory dental technician. For us, the leader in the category among multilayer zirconium oxides is ArgenZ HT+ Multilayer. This zirconium oxide multilayer specially "refined" has significant differences from many other products.

Aesthetics (Translucency Up to 45%)

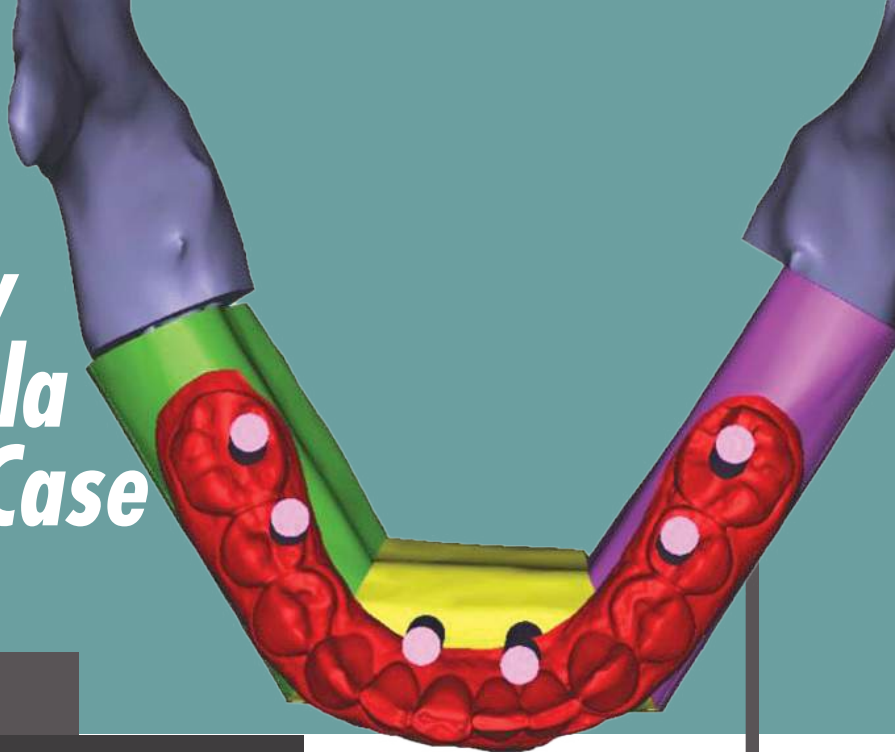
ArgenZ HT+ Multilayer combines seven layers with a colour gradient that is smooth and without transitions from the cervical to incisal area. Unlike other multilayer materials, no transition lines are visible between the layers. The opacity is sufficient to hide structures that are dark. 

Acknowledgements

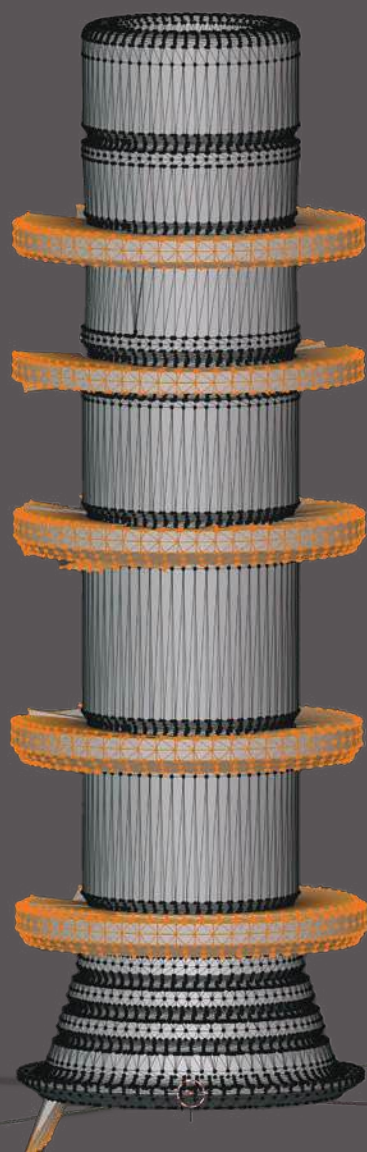
Special thanks go to my colleagues, especially Naomi Sulzmann, and to the dental office YourSmile of Dr. Rafaela Jenatschke in Frankfurt Niederrad. With the right material and attention to the fundamentals, it is possible to create an excellent base for subsequent finishing (microstratification).

Multidisciplinary Mandibular Fibula Reconstruction Case

by Dimitri Tschilis

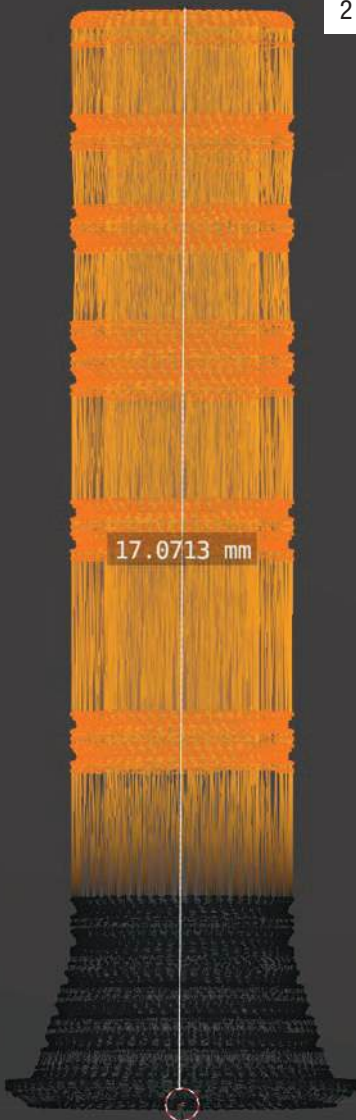


1



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17.0713 mm



I want to share with you one of the most life changing and rewarding cases I have done in my career. This patient required a mandibular fibula reconstruction with a full arch, immediate load temporary prosthesis. My team and I had to figure out many things prosthetically but clinically nothing would have been possible without the amazing multi disciplinary team involved. Surgery took place in a local Advent health facility. Dr Fawaz Makki performed the surgery and Dr Jennifer Somoray is the prosthodontist who performed all clinical dental procedures.

The patient's entire mandible was reconstructed using parts of his fibula, special guides were provided that indicated the precise length needed for each section. The idea here is to remove the patient's mandible containing a tumor, reconstruct it using parts of his fibula, precisely placing dental implants and performing an immediate load prosthetic procedure. All of this in one appointment!

The process began with detailed planning, starting with intraoral and bite scans of the maxilla and mandible, followed by a CBCT scan of the patient's head and fibula. These scans were merged to assess the tumor's impact and plan the reconstruction, ensuring that bone, tissue, and teeth aligned properly.

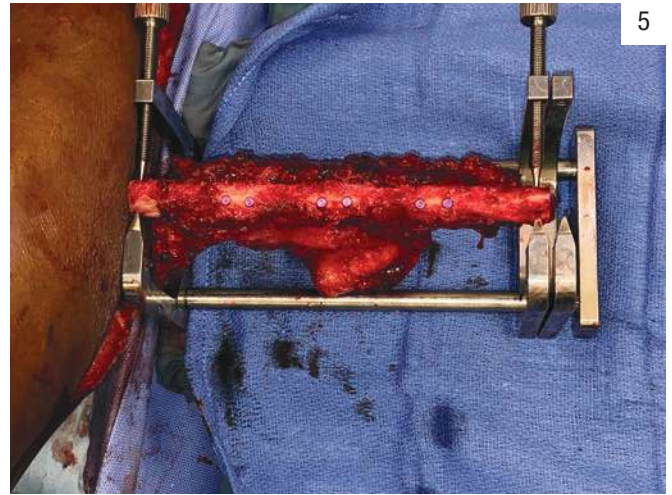


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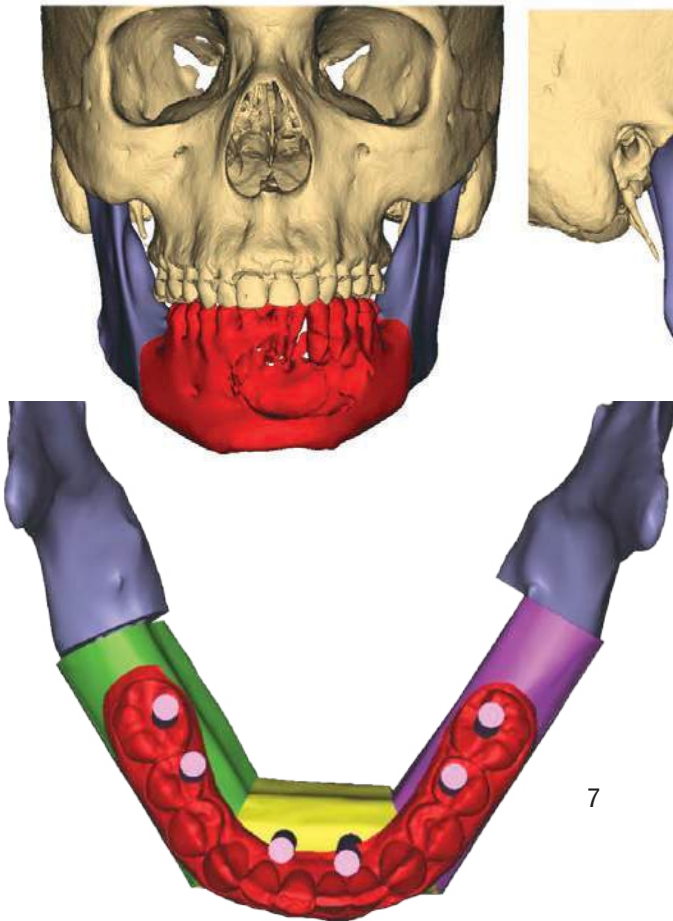


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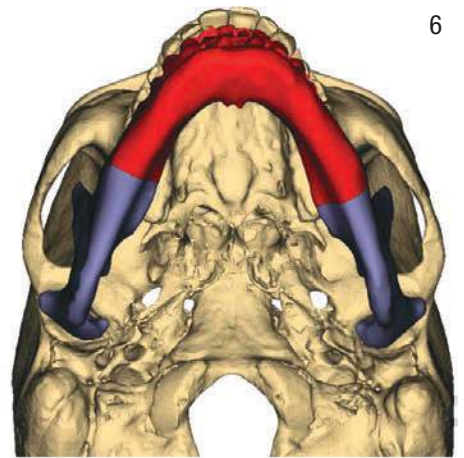
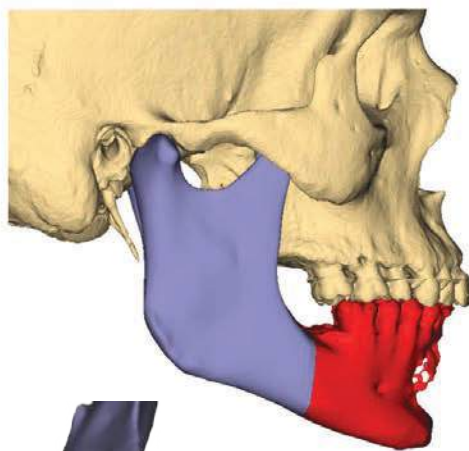
We utilized multiple CAD software to digitally simulate the final outcome of the reconstructed mandible and to design a functional, esthetic interim full-arch prosthesis. The simulated fibula reconstruction was provided to us as an STL file. We had to precisely align CBCT, the simulated fibula, the final implant placement, preop scans, opposing and design an immediate load. Due to the prosthetic's required height, 3D printing and ceramic-infused PMMA materials were used instead of milling. The prosthetic was cured using a nitrogen flash unit, resulting in a stronger final product and eliminating the risk of long-term monomer leakage. Esthetics were enhanced by layering multiple composite colors to mimic the patient's existing gum, with guidance from detailed photos provided by the clinician. I used a mix of colors and viscosities. Regular flow was used at the base



5



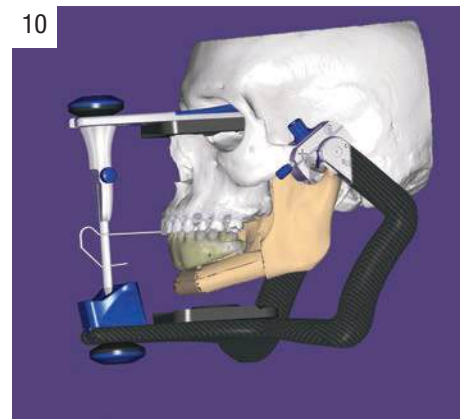
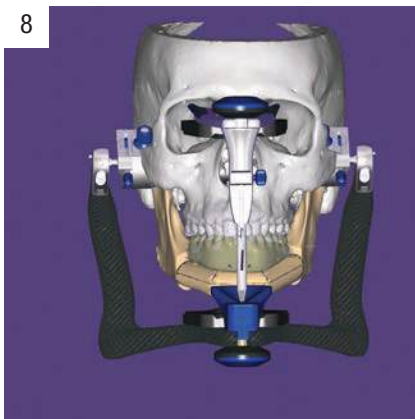
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and high flow was used for final layers. A very small layer of light curing glaze was used at the very end.

The extreme height of the prosthetic posed an additional challenge, as existing implant parts were inadequate. Our team re-engineered custom parts using non-dental CAD software. They made cylinders longer and with much more aggressive retentive elements. Once design was finalized we then proceeded to produce them in-house.



This case stands out as my favorite of the year due to its complexity and the life-changing impact it had on the patient. It exemplifies the meticulous planning, collaboration, and innovative thinking required to make a difference in someone's life. Once again, technology was used as a tool but artistry, common sense and experience were needed to hand create the final prosthetic.

I want to thank Dr. Jennifer Somoray and Dr Fawaz Makki for the opportunity and education in this case. Thank God the patient is doing great almost one year in and his temporary is holding up. We will soon be working on a long term final prosthetic. I foresee a huge challenge for the permanent restoration, given the extreme height. We will definitely think outside the box and share the next steps! 

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Questions for:

The Latest Advancements in Minimally Invasive Prosthodontics

An interview with Dr. Carlo P. Marinello

1. What is the primary goal of minimally invasive prosthodontics?
 - a. To remove as much natural tooth structure as possible
 - b. To restore teeth with as little damage to the natural tooth as possible
 - c. To use only metal restorations for durability
 - d. To replace all teeth with implants
2. Which of the following innovations in minimally invasive dentistry involves the use of ultra-thin veneers that are only 0.2 mm thick?
 - a. Prettau® Skin® veneers
 - b. Prettau® 3 Dispersive® veneers
 - c. Zirconia crowns
 - d. Porcelain laminates
3. The Prettau® Skin® technique requires extensive preparation of the tooth structure.
 - a. True
 - b. False
4. What is the function of the resin mock-up used in the Prettau® Skin® procedure?
 - a. To check the functional, phonetic, and aesthetic aspects of the veneers
 - b. To prepare the tooth for full crowns
 - c. To test the enamel thickness of the tooth
 - d. To replace the need for digital scanning
5. Which bonding agent is essential for bonding zirconia veneers in minimally invasive prosthodontics?
 - a. Phosphoric acid
 - b. 10-MDP monomer
 - c. Epoxy resin
 - d. Silane coupling agent

Questions for:

Precision and Adhesion: Fundamental Requirements for Long-Term Success

Aesthetic Replacement After 20 Years

Dr. Andrea Savi & Odt. Vincenzo Castellano

1. What was the primary reason for replacing the feldspathic ceramic crowns on teeth 1.1 and 2.1?
 - a. The patient wanted a cosmetic enhancement
 - b. The crowns showed signs of microfractures within their thickness
 - c. The patient developed an allergic reaction to the materials
 - d. The original cementation had failed, causing leakage
2. What material was used to replace the original feldspathic ceramic crowns?
 - a. Monolithic zirconia
 - b. Layered feldspathic ceramic
 - c. Pressed lithium disilicate with a ceramized vestibular portion
 - d. Composite resin
3. Why was an analog approach chosen for the final restoration, despite digital technology being available?
 - a. The clinician preferred traditional techniques over digital workflows
 - b. Pressed lithium disilicate restorations require precise marginal closure, best achieved through analog methods
 - c. The patient requested an analog workflow
 - d. The digital workflow was too expensive
4. What was a critical step in the adhesive cementation protocol for lithium disilicate crowns?
 - a. Etching the internal crown surface with 10% hydrofluoric acid for 20 seconds
 - b. Using a glass ionomer cement to ensure longevity
 - c. Applying fluoride treatment before cementation
 - d. Relying only on mechanical retention instead of adhesive bonding
5. True or False: The original tooth preparations were modified significantly to accommodate the new crowns.
 - a. True
 - b. False

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Questions for:

Harmony: multilayer zirconia in daily use in the laboratory Selection criteria

Odt. Master Carsten Fischer

1. What percentage of a multilayer restoration is zirconium oxide?
 - a. 50%
 - b. 80-90%
 - c. 70%
 - d. 40%
2. Many oxides of multilayered zirconium have almost nothing in common with the colour reference (Vita colour scale).
 - a. True
 - b. False
3. By changing the yttrium oxide content of zirconia oxide, the manufacturer can control the properties of oxide in zirconium.
 - a. True
 - b. False
4. Microstratification can be defined to include:
 - a. Layer thickness from 0.1 to 0.6 mm
 - b. Veneering only in the visible area
 - c. Imitate the optical effects of light even with the thinnest layers
 - d. All of the above
5. When choosing a tooth shade on a patient, the author uses:
 - a. A black hair dressing cape, black lip and cheek cover
 - b. A white hair dressing cape, white lip and facial cover
 - c. Whatever hair and clothing the patient presents with
 - d. None of the above

Questions for:

Multidisciplinary Mandibular Fibula Reconstruction Case

Dimitri Tschillis

1. What imaging techniques were used to plan the mandibular reconstruction?
 - a. Panoramic X-rays and cephalometric radiographs
 - b. Intraoral and bite scans, CBCT scans, and digital simulations using CAD software
 - c. MRI and PET scans
 - d. Traditional plaster models and hand measurements
2. Why was ceramic-infused PMMA used instead of milling for the prosthesis?
 - a. It was more cost-effective than traditional materials
 - b. The patient had an allergy to milled materials
 - c. The prosthetic's height required a stronger, more durable material that could be 3D printed
 - d. Milled materials were unavailable at the time of the procedure
3. How did the team address the issue of implant component inadequacy due to the prosthetic's height?
 - a. They shortened the prosthetic to fit standard implant parts
 - b. They used stock components and modified them manually
 - c. They re-engineered custom implant parts using non-dental CAD software, making cylinders longer with aggressive retentive elements
 - d. They postponed the procedure until proper implant parts were available
4. What was the primary benefit of using a nitrogen flash unit in curing the prosthetic?
 - a. It made the prosthetic more flexible for future adjustments
 - b. It strengthened the final product and eliminated the risk of long-term monomer leakage
 - c. It accelerated the curing time but had no impact on durability
 - d. It changed the color of the prosthetic to match the patient's natural gums
5. The entire mandibular reconstruction, including tumor removal, fibula grafting, implant placement, and prosthetic loading, was completed in a single surgical appointment.
 - a. True
 - b. False

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ANNOUNCEMENTS & PRODUCTS

EXOCAD ANNOUNCES PARTICIPATION AT THE UPCOMING INTERNATIONAL DENTAL SHOW

exocad, an Align Technology, Inc. company and a leading dental CAD/CAM software provider, today announced its planned participation at the International Dental Show (IDS) 2025, March 25-29, at the exhibition center's Hall 1, booths A040 and C041. With more than 250 square meters of highly interactive exhibit space, exocad's team of experts will demonstrate the company's latest software releases to take minimally invasive dentistry to new levels. For the first time, visitors will be able to try the latest software releases at exocad's arcade "test-and-try" stations.

Additional information is available at exocad.com/ids



At IDS, exocad's team of experts will demonstrate the company's latest software releases and products, including TruSmile Video, TruSmile Photo, and AI Design.

Save the Date!

Circle April 4-5, 2025, on your calendar for the upcoming Technorama event at the Delta Toronto Hotel and Conference Center. Unlock valuable insights through outstanding educational sessions, seize networking opportunities, and indulge in entertaining experiences. Discover more at www.diac.ca/technorama



Spectrum Days Canada

Palmeri Media Group is pleased to announce the dates for the 2025 Spectrum Day schedule across Canada;



Calgary: June 14th | Vancouver: October 4th | Montreal: October 25th | Toronto: November 7th

All events will now be techno-clinical in nature, inviting Dentists, Dental Technicians, Denturists, and Hygienists to participate.

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bridge



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bridge



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