Minimally Invasive & Digital Protocols for Maximized Esthetics.
A Team Approach

14th Annual Conference
of the Society for Color and Appearance in Dentistry (SCAD)

scientific evidence
for clinicians, clinical
relevance for researchers

SCAD

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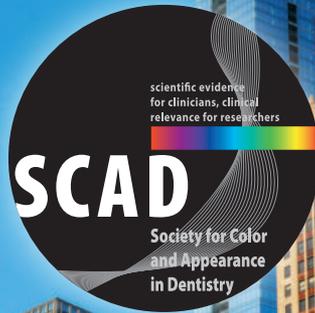
November 10-11, 2023
Chicago Marriott Downtown Magnificent Mile
PROGRAM BOOK
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SCAD

scientific evidence for clinicians, clinical relevance for researchers

Society for Color and Appearance in Dentistry
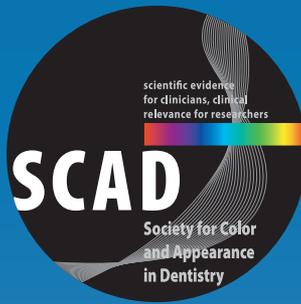
14th Annual Conference
Chicago Marriott Downtown Magnificent Mile • November 10-11, 2023

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Recommended Attire

Welcoming reception and educational sessions: Business casual
President's Dinner: Roaring 20s

Event Venues

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Breakfast and Lunch - *Salon 1*
General Session - *Salon 2*
Poster display - *Salon 1*
3M L&L Friday - *Salon 2*
President's Dinner Friday night - *Salon 3*

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A Message from the President

Dear Colleagues,

The Executive Board of the Society for Color and Appearance in Dentistry (SCAD) cordially welcomes you to our 14th Annual Conference.

The meeting features high-quality, evidence-based information on color and esthetic dentistry, presented by many of the leaders in this field (up to 13.5 CE hours).

We look forward to sharing the information and passion with you!

Federico G. Ferraris, DDS
President, SCAD

Program

Thursday, November 9, 2023

18:00-19:30 *SCAD Executive Board Meeting*

19:30-21:00 Welcoming Reception

Friday, November 10, 2023

7:00-8:00 *Breakfast with new members*

8:00-8:10 Opening Ceremony

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*Esthetics in function: Integrating
the Occlusal Principles Into the Smile Design*

8:50-9:30 Javier Vasquez, DDS, MS, PhD
*Multidisciplinary Approach for Minimal Invasive
Rehabilitations with 4D Planning.
The Digital Dynamic Patient*

9:30-10:00 *Break*

10:00-10:40 Julian Conejo, DDS
*The Digital Revolution: Predictable Clinical
Implementation to Achieve High Esthetic Results*

10:40-11:20 Amelie Mainjot, DDS, MS, PhD
*The One Step-No Prep Technique:
A Straightforward and Minimally-Invasive
Approach for Tooth Wear Treatment*

11:20-12:00 Marcio Breda, CDT
*Low Fusion Ceramic –
Techniques that Improve Esthetic Results*

12:00-13:10 *Lunch, Lunch & Learn, Poster Viewing*

13:10-13:50 Adam Mieleszko, CDT
*Color and Appearance in New Era
of Prosthodontics – a Saga Continues*

13:50-14:30 Patrycja Mialkowska, CDT
*Natural Bleached Color in Three Variations
Using VITABLOCS Material*

14:30-15:10 Marcos Vargas, DDS, MS
*An Update on Direct Anterior Esthetic
Restorations: Success is in Sight*

15:10-15:40 *Break*

Friday, November 10, 2023, Cont'd

15:40-16:20 Giovanni Sammarco, DDS
*Treatment Choice in White Discolorations
Management of Esthetic Area*

16:20-17:00 Ronaldo Hirata, DDS, MS, PhD
*What Matters about the Color
of Composite Restorations?*

19:00-22:00 *President's Dinner*

Saturday, November 11, 2023

7:00-8:00 *Breakfast*

8:00-9:20 Miles Cone, DMD, CDT, FACP &
Peter Pizzi, CDT, MDT, F.N.G.S.
Artistry, Technology and our Evolution

9:20-10:00 Prof. Dubravka Knezović Zlatarić, DDS, PhD
*To Change a Color or Not - Different Approach,
Materials and Protocols in Aesthetic Dentistry*

10:00-10:40 Miguel Ortiz, DDS
*Mastering In-House Restoration Finishing:
Practical Protocols for Polishing, Staining,
and Glazing*

10:40-11:10 *Break*

11:10-11:50 Francesco Mintrone, DDS
*Monolithic vs. Layered Restoration: Advantages
and Limits of the Materials in the Digital Era*

11:50-12:30 Eliseo Sammarco, DDS, MS
Digital Workflow in Esthetic Dentistry

12:30-13:10 Markus B. Blatz, DMD, PhD
*CAD/CAM Ceramics
in Esthetic Adhesive Dentistry*

13:20-13:30 *Closing Ceremony*

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Oral Presentations

Friday, November 10
8:10-8:50

Esthetics in Function: Integrating the Occlusal Principles into the Smile Design

Marcelo Calamita, DDS, MS, PhD

Lecture Description

An approach that integrates the best scientific evidence available, clinical skills, technician's expertise, team communication, and patient's preferences is required in order to achieve high quality results for every treatment. Excellence will become more predictable and consistent with the establishment of a methodical approach that integrates functional and biologic parameters into the esthetic project.

Based on the scientific based/ clinically relevant binomial, it will be discussed how to integrate traditional analog prosthodontic principles with state-of-the-art digital tools, from the treatment planning until the final equilibration. Critical aspects of occlusion will be pragmatically reviewed in order to provide parameters for the decision-making process and streamline the treatment sequence. Also, it will be discussed the key elements of strategically invasive tooth preparations and soft tissue management in order to surpass the patient's esthetic expectations, provide effective function, and long-term stability.

Objectives:
[1] How to determine the demands of the stomatognathic system for every patient that may interfere with treatment stability;
[2] A systematic and straightforward approach to incorporate the essential principles of occlusion into the smile design;
[3] Clinical strategies for effective performance and predictable outcomes.

Marcelo Calamita, DDS, MS, PhD Bio

Marcelo Calamita graduated in 1988 from the University of Sao Paulo, where he also obtained his certificate, MS, and PhD in prosthodontics. He is Visiting professor in the Department of Restorative Dental Sciences at the University of Florida and worked as Associate Professor of Prosthodontics at University Braz Cubas and University of Guarulhos in Sao Paulo. Marcelo Calamita is the former president of the *Brazilian Society of Esthetic Dentistry* and the *Brazilian Academy of Esthetic Dentistry*. He was editor-in-chief of the *Dental Press Brazilian Journal of Esthetics* and have served on the editorial board of the *Journal of Esthetic and Restorative Dentistry*, besides Brazilian editions of *International Journal of Periodontics and Restorative Dentistry* and *International Journal of Esthetic Dentistry*. In addition, he has lectured internationally, written numerous scientific publications and the book *Esthetics in Function* on treatment planning and occlusion. He also maintains a private practice in Sao Paulo focusing on comprehensive restorative and esthetic dentistry.

Oral Presentations

Friday, November 10
8:50-9:30

Multidisciplinary Approach for Minimal Invasive Rehabilitations with 4D Planning. The digital Dynamic Patient

Javier Vasquez, DDS, MS, PhD

Lecture Description

There is a big difference between multidisciplinary and interdisciplinary treatments.

Multidisciplinary treatments can happen simultaneously and they are driven by the proper digital planning that optimizes the time of treatment for the patient and guarantees the perfect communication between the physicians.

We moved from 3D planning to 4D Planning. The new dimension in planning is based in real time movements and the concept of the Digital Dynamic Patient.

In this lecture I will show the clinical workflows that allows us to obtain exceptional results, from the utilization of a facial driven software , tridimensional jaw tracker and minimal invasive ceramics.

Objectives:

[1] Learn the new technology to record real time movements and the process of planning and data collection for the proper 4D Diagnosis;

[2] Learn the new multidisciplinary approach and the benefits of digital planning for long lasting results;

[3] Advantages of multidisciplinary treatments and communication.

Javier Vasquez, DDS, MS, PhD

Dr. Vasquez obtained his Doctor in Dental Medicine degree at the Metropolitan University in 1997. He obtained his Fellowship in Fukuoka, Japan and a Mastership in the USA from ICCMO (International College of Craniomandibular Orthopedics).

Dr. Vasquez the founder of Miami Natural Smiles by Oral Design Dental Clinic where together with an amazing clinical team of Doctors develop the most comprehensive and high end esthetic cases implementing the most advanced technology, science and dental art.

As part of his education commitments Dr. Vasquez is a current Clinical Adjunct Faculty at the Dental College of Augusta University in the Prosthodontist Program where he shares educational programs several times per year and also at the Biofunctional Dynamics Academy in Dijon, France, Barranquilla, Colombia and Miami, USA .

Dr. Vasquez is one of the early adopters in CAD CAM evolution for over 18 years and in the last 6 years has been an active developer into the integration and interdisciplinary treatment using 3D Data Integration.

Dr. Vasquez is a member of the world renowned organization Oral Design founded by Master Ceramist Mr. Willi Geller. He owns Oral Design Miami, dental laboratory studio focusing on high esthetics and function.

As a dentist, master ceramist , passionate education leader, clinical consultant and international speaker in the areas of occlusion, craniocervical dysfunction and high end esthetics he lives by his motto : "The limit is the sky! to dream, to learn, and to do! Live life!

Oral Presentations

Friday, November 10
10:10-10:40

The Digital Revolution: Predictable Clinical Implementation to Achieve High Esthetic Results

Julián Conejo, DDS, MS

Dr. Conejo is the Clinical CAD/CAM Director at the Department of Preventive and Restorative Sciences, University of Pennsylvania School of Dental Medicine, Philadelphia PA, USA. He conducts research and has multiple publications in peer-reviewed scientific journals on CAD/CAM technology, prosthodontics and implant dentistry. Dr. Conejo has been the recipient of several awards in his field, to include the ICP Research Fellowship in Dental Restorative Materials in 2016, the PROSEC Research Award in 2022 and has lectured in over 35 countries.

Julián Conejo, DDS, MS

Lecture Description

This lecture focuses on highly esthetic tooth and Implant-supported restorations through the implementation of digital technologies.

A detailed update on the latest materials, workflows and techniques with will be presented.

Objectives:

[1] The main objective of this lecture is to show how treatment time optimization and better clinical outcomes are possible with the implementation of digital tools from the diagnostic phase through facially driven mock-ups to the definitive restorations;

[2] Update participants in new methods to elaborate long-term provisional and definitive restorations and their respective polishing protocols for optimal esthetics and soft tissue response;

[3] Review step-by-step clinical protocols for tooth preparations and bonding optimization of full-ceramic CAD/CAM restorations with evidence-based concepts.

Oral Presentations

Friday, November 10
10:40-11:20

The One Step-No Prep Technique: A Straightforward and Minimally-Invasive Approach for Tooth Wear Treatment

Amélie Mainjot, DDS, MS, PhD

Lecture Description:

Tooth wear, whether generalized or localized, is becoming a common issue, especially in young people. In cases where treatment is necessary, how can dental tissue be reconstructed in a simple and non-invasive way? This presentation will introduce the "one step-no prep" indirect approach for localized or generalized severe tooth wear treatment, which does not require the preparation of dental tissue or a temporary phase. This innovative protocol utilizes digital technologies and advanced composite materials for CAD/CAM processes, particularly Polymer-Infiltrated Ceramic Network (PICN) materials ("hybrid ceramics"). The benefits of interdisciplinary collaboration, especially with orthodontists in the case of localized tooth wear, will be demonstrated by clinical cases. The management of occlusion using new technologies, such as the Modjaw system, will also be discussed. Finally, the clinical research results on this protocol will be presented.

Objectives:

[1] To introduce of a straightforward and minimally-invasive approach for tooth wear treatment;

[2] To highlight the advantages of PICN materials (hybrid ceramics) in tooth wear treatment;

[3] To highlight the benefits of interdisciplinary collaboration and digital technologies in tooth wear treatment.

Amélie Mainjot, DDS, MS, PhD

Amélie Mainjot graduated from the University of Liège (Belgium), where she also completed a postgraduate program in Oral Rehabilitation. She obtained a Master of Science in Dental Materials Technology from Paris University (France) and a PhD degree from the University of Paris and the University of Liège. She was an Associate Professor at the University of Paris and she is currently Professor at the University of Liège, where she heads the Dental Biomaterials Research Unit. Her research focuses on CAD-CAM ceramics and composites, and the development of new treatment strategies. Her clinical activity as Head of Clinic in the department of Fixed Prosthodontics at the University Hospital of Liège is dedicated to esthetic and minimally-invasive dentistry. She lectures internationally and is an active member of the European Academy of Esthetic Dentistry. She is the author of numerous international publications and acts as a reviewer in the same field.

Marcio Breda, CDT

Dental technician graduated from FAESA University.

Owner of Centro de prosthesis Manzoli.

Founder of the biggest educational platform for dental technicians in the word TPDPLAY. COM.

Internacional speaker Vita Zahnfabrik.

Oral Presentations

Friday, November 10
11:20-12:00

Low Fusion Ceramic – Techniques that Improve Esthetic Results

Marcio Breda, CDT

With varied resources in the market available to the dental technician, mastering important parameters of each ceramic has become the rule.

This conference provides tools so that the professional can finalize more aesthetic and functional cases with the use of Low Fusion Ceramic.

Objectives:

[1] We will objectively treat important aspects of the firing parameters for low fusion ceramics;

[2] I'll present an authorial layering technique for the anterior segment;

[3] We will study some clinical cases in order to prove in practice the efficiency of the layering technique.

Oral Presentations

Friday, November 10
13:10-13:50

Color and Appearance in New Era of Prosthodontics – a Saga Continues

Adam J. Mieleszko, CDT

Lecture Description:

Over past decades CAD/CAM became the standard in treatment planning and prosthesis fabrication. Computer motif libraries simplified design and fabrication of restorations but in many cases lack the human touch, experience and expertise. Constant changes and upgrades in materials also create new challenges in color matching. Recognizing limitations of machines and proper material selection are key factors for optimal esthetic and restorative results.

Objectives:

[1] Post-manufacturing manual characterization;
[2] Proper material selection for color matching.

Adam J. Mieleszko, CDT

Adam J. Mieleszko, CDT graduated in 1997 from New York City Technical Collage with a degree in Dental Laboratory Technology. In 2000, he received certification in dental ceramics (CDT). Since then he has worked in close collaboration with leading prosthodontists in the field. Interacting with patients on daily bases mastered his skills in dental esthetic challenges. Adam coauthored books "Fundamentals of Color, Shade Matching and Communication in Esthetic Dentistry" (Quintessence Publishing 2004, 2011'2nd edition), "Color in Dentistry, Clinical Guide to Predictable Esthetics" (Quintessence Publishing 2017) and contributed to numerous clinical and technical articles in industry journals.

Oral Presentations

Friday, November 10
13:50 - 14:30

Natural Bleached Color in Three Variations Using VITABLOCS Material

Patrycja Miałkowska, CDT

Patrycja Miałkowska is a dental technician from Warsaw, Poland. In the world of digital dentistry since 2010. The Artizmo Dental Lab, a unique laboratory, is the heart and her space for creativity. She based her work on the CAD/CAM system created by Dentsply Sirona, whose trainer she has been since 2014. She is a user of CEREC and inLab software. From 2020, Patrycia is a certified VITA CAD/CAM materials trainer. The VITABLOCS family has become her indispensable companion in her daily work. She constantly strives to achieve the best aesthetics, and thanks to occlusal knowledge, she knows that only based on function, she will approach the natural beauty of her works.

Patrycja Miałkowska, CDT

Lecture Description:

White smile for many patients is a must have. If you want to know how to check, if the bleached color will match your patient and which VITABLOCS material will be ideal for him, just come to my lecture. You will find a solution for natural bleached restoration using feldspar ceramic. After the presentation, you will know, what to consider when preparing the teeth for the feldspar material restorations to obtain the optimal effect. I will tell you about my tips and tricks in designing and milling, taking into account the structure of the blocs. Finally, you will see my original underpainting technique for a 3D effect. Let`s see you at the SCAD conference.

Objectives:

[1] Get to know the VITABLOCS material and see the difference between Mark II, Triluxe forte and RealLife block in the context of bleached colors;

[2] Natural bleached color in shape, structure, texture and shine;

[3] 3D effect with VITA Akzent Plus staining technique.

Oral Presentations

Friday, November 10
14:30-15:10

An Update on Direct Anterior Esthetic Restorations: Success is in sight

Marcos Vargas, DDS, MS

Lecture Description:

Direct composite restorations achieve great clinical and esthetic results while being conservative and cost-efficient. Esthetics in these restorations depends on the clinician's ability to reproduce the shape and shade of natural teeth, this presentation will provide clinical tips and techniques to facilitate and streamline all aspects of the procedure, from shade selection to contouring and polishing with the ultimate goal of achieving clinical and esthetic success.

Objectives:
[1] Select shade for composite resin in 15sec;
[2] Cavity preparation for blending;
[3] Contouring and polishing direct composites.

Marcos Vargas, DDS, MS

Dr. Marcos Vargas attended Cayetano Heredia University School of Dentistry in Lima, Peru and graduated in 1985. He spent two years, 1990 to 1992, in the AEGD program at the Eastman Dental Center in Rochester, New York. Dr. Vargas received his Certificate and master's degree in Operative Dentistry in 1994 at the University of Iowa where he is currently a Professor in the Department of Family Dentistry. His primary research interests are in dental materials including glass ionomers, dentin bonding, composite resins and esthetic dentistry. Dr. Vargas is also recognized for his expertise of Direct Restorative Treatment Procedures and conducts numerous lecture and hands-on seminars in the US and internationally. Dr. Marcos Vargas has published extensively in dental adhesion and resin composites for over 25 years. He maintains a private practice limited to Operative Dentistry with an emphasis on aesthetic dentistry.

Giovanni Sammarco, DDS

Dr. Giovanni Sammarco graduates from University of Verona in 1996.

From 2015 to 2017 he was contract professor for the entire teaching of "Conservative Dentistry and Endodontics" at the Dentistry degree of University of Insubria.

Since 2015 he has been teaching Cariology at the II level Master's Degree in "Aesthetic Conservative Dentistry" at Bologna University.

Since 2010 he held the clinical cariology course "Vincere la Carie".

He is the founder and scientific director of "TRAP group Italia" (Tooth Respect and Prevention), a study and teaching institute focused on the medical approach to oral diseases.

He is an Active Member of the Italian Academy of Conservative Dentistry (AIC), and affiliate of European Academy of Esthetic Dentistry (EAED).

He has published and holds lectures in national and international contexts on the subject of caries, and minimally invasive procedures. He practices at his office in Trento, with multidisciplinary approach, focusing on "arresting the caries disease" and minimal invasive approaches.

Oral Presentations

Friday, November 10
15:40-16:20

Treatment Choice in White Discolorations Management of Esthetic Area

Giovanni Sammarco, DDS

Lecture Description:

The aesthetic demand of the people is always greater, and the importance of a bright and harmonious smile is firmly established in industrialized societies. Nowadays it is very common for the dentist to detect white discolorations in the aesthetic area: fluorosis, early caries demineralization, MIH and trauma/infection are the most frequent causes. Various "minimally invasive" systems are available for the treatment of such hypomineralizations: remineralization, resin infiltration, microabrasion and macroabrasion are some of these, which will be the subject of the presentation.

Objectives:

[1] Why is a diagnosis of white discolorations necessary?

[2] How to choose between minimally invasive approaches?

[3] When and how to copy a white discoloration in case of prosthesis or direct restoration?

Oral Presentations

Friday, November 10
16:20-17:00

What Matters about the Color of Composite Restorations?

Ronaldo Hirata, DDS, MS, PhD

Lecture Description

Esthetic Dentistry has improved its techniques and materials, impacting the use of dental ceramics and composite resins.

Color match on restorations is fundamental for a favorable outcome and relates to materials selection and applied technique. Dentistry focuses on selecting hue/chroma as the main responsible for an outstanding esthetic result of composite restorations.

The layering of different translucencies and opacities of resins, reproducing natural aspects of the teeth, impacted the management of color itself, relying on the use of correct composite selection in a correct sequence and thickness of each layer used. Brands using different sizes and shapes of fillers also influence the result obtained.

This lecture will focus on composite layering techniques from a clinical view, discussing divergence with scientific data.

Objectives:

[1] To differentiate how different layers and application techniques could affect the esthetic outcome;

[2] To visualize how thickness in the enamel could decrease the importance of hue/chroma in composite restorations: clinical view;

[3] To understand differences in composite behavior in anterior and posterior composite restorations.

Ronaldo Hirata, DDS, MS, PhD

Ronaldo Hirata finished his four years DDS course in Curitiba, Brazil, at the Federal University of Parana (UFPR), in 1995. After his degree, he followed an Operative Dentistry Specialty at the same University in a two years program. He started lecturing at the same University and began his career as an International lecturer, focusing on Esthetic Dentistry. He had been lecturing in more than 40 countries already. His private practice working with Esthetic Dentistry has always been in Curitiba.

To improve scientific formation, he did his Master's in Dental Materials from 2000 to 2003 at the Catholic University of Rio Grande do Sul (PUC-RS), finishing a research thesis working with glass and polyethylene fibers improving the mechanical properties of composites. His Ph.D. in Restorative Dentistry at the State University of Rio de Janeiro (UERJ) was done from 2005 to 2009. His focused research is on composite resins' Transmittance, Reflectance, and Fluorescence.

In 2012 he did his post-doctorate at New York University (NYU), working with Plasma application on dentin surfaces and bonding strength analysis.

Ronaldo Hirata is an Assistant Professor of the Department of Biomaterials, with a secondary appointment in the Department of Cariology at New York University. He has published more than 100 papers in English, Portuguese and Spanish. Hirata's first book, TIPS, was published in 3 languages, and his second book, SHORT-CUTS, also in 3 languages.

Dr. Hirata just launched his new book "Recipes for composite restorations" from Quintessence Publishing in 3 languages, including English. This textbook gives some "recipes" with the ingredients and instruments necessary to execute 26 restorations.

Miles R. Cone,
DMD, CDT, FACP   *Peter Pizzi,*
CDT, MDT, F.N.G.S.

Dr. Miles R. Cone is a graduate of Tufts University School of Dental Medicine, and completed a three year Prosthodontic residency program while serving in the United States Army as a field grade officer in the rank of Major. In addition to achieving board certification and diplomate status within his specialty, Dr. Cone has also successfully challenged all the requirements necessary to earn his designation as a Certified Dental Technician. Currently, Dr. Cone's career in civilian life revolves around his dual role as the owner of Nuance Dental Specialists, a private practice dental clinic limited to prosthetic dentistry in the heart of Portland, ME, and his role as a Key Opinion Leader. When Dr. Cone is not at the chair, in the classroom teaching, or at the lab bench, he can be found lecturing on the international circuit, contributing to peer-review, and relaxing at home with his wife, four children, and English Bulldog in Maine.

As an educator of dental technology and clinical procedures Mr. Peter Pizzi has found an easy transition into the lecture/clinician circuit. His personal appreciation and expertise on all phases of crown and bridge, porcelain, Implantology, muscle function, mandibular physiology, Ceramics and photography have made him a source of knowledge and motivation for his peers to draw from. Peter currently lectures nationally and internationally to both technicians and dentists for the communication process and a predictable outcome of success for the patient. He is a member of the American Academy of Esthetic Dentistry. Scientific Advisor and Mentor at Kois Center for Dental Excellence, and faculty, NYU school of dentistry International Esthetics Program. Peter has lectured to doctors and technicians throughout the United States, Europe, Australia and Asia on several different topics. He also continually studies with some of the world's top speakers and clinicians.

Oral Presentations

Saturday, November 11
8:00-9:20

Artistry, Technology and our Evolution

Miles R. Cone, DMD, CDT, FACP
Peter Pizzi, CDT, MDT, F.N.G.S.

We are at an exciting time where artistry, technology, products and processes are shaping our profession. In today,s evolving market place the importance of utilizing technology is paramount to our success. Yet the lose of the artistic process can disrupt the dental market. Our goals for the future of the dental health profession is to provide esthetic, functional restorative options to support the physical and financial needs of our patients. There is a new wave of clinicians and technicians that are well-aware of the necessity for updated education and training and are pushing the boundaries of contemporary restorations with minimally invasive protocols, traditional techniques, advanced digital technology, and hyper-real aesthetics - all in a bold effort to rekindle the love affair with the ever-evolving profession. This presentation will showcase the ways in which seamless communication and collaboration between the chair and the bench can be utilized to improve our patient outcomes.

Objectives:

[1] Combining artistry and technology;

[2] Case management, material selections;

[3] The when, where and why of minimally invasive protocols;

[4] The importance of photographic communication and perception.

Oral Presentations

Saturday, November 11
9:20-10:00

To Change a Color or Not - Different Approach, Materials and Protocols in Aesthetic Dentistry

Prof. Dubravka Knezović Zlatarić, DDS, PhD

Lecture Description

Color presents one of the most important parameters when it comes to a patient's assessment of the quality of dental treatments. Demands for procedures that restore and improve the patient's appearance in-crease every day. A great progress has been made recently in digital techniques of shade evaluation, analysis and interpretation of compo-nents responsible for dental color. At the same time, advancement in dental materials offer both clinicians and dental technicians various options to achieve the best possible solutions in respect to color. The lecture will present various clinical cases in which it was necessary to make a decision to change or retain the color of teeth or prosthodontics restorations, using minimally invasive approach - from dental whitening procedures, veneers, crowns and finally bridges, made from the newest ceramic materials.

Objectives:

[1] Discussion on the use of digital techniques in clinical shade as-sessment;

[2] Discussion on the need for implementation of at-home whitening treatment in everyday clinical practice;

[3] Discussion on the indications and use of different ceramic mate-rial to restore the color of maxillary anterior teeth successfully.

Prof. Dubravka Knezović Zlatarić, DDS, PhD

Dubravka Knezović Zlatarić is Professor of Prosthodontics in the Department of Remov-able Prosthodontics and Head of Ellective Lectures „Basics in Esthetic Dentistry" and "Clinical digital communication with dental laboratory" at the School of Dental Medi-cine, University of Zagreb, Croatia, where she gained her clinical certificate in Prosthodon-tics and completed PhD.

As a member of European Prosthetic Associ-ation she was awarded three times - for the best presented scientific study, poster pre-sentation and for the young investigators in the fields of Prosthodontics. In 2007, she was the winner of the second place for outstand-ing poster presentation at the meeting of the International College of Prosthodontists in Fukuoka, Japan. Professor has been the principle investigator and project manager of several scientific projects financed by Ministry of Science and University of Zagreb, Croatia.

Professor's research and clinical focus is on various esthetic dental treatments with em-phasis on minimally invasive procedures re-storing teeth to their natural appearance.

Miguel Ortiz, DDS

Dr. Miguel A. Ortiz is a highly accomplished Prosthodontist who has made significant contributions to the field of dental medicine. He graduated from Harvard School of Dental Medicine, where he won the Leo Talkoy Award for excellence in clinical dentistry. After completing his training, he became a Prosthodontist at the University of Illinois at Chicago in 2017. Today, Dr. Ortiz is the owner of Lit Dental Esthetics & Implant Center in Wayland, MA, where he delivers high-quality care in a wide range of treatments. He is a passionate advocate for excellence in prosthodontics, minimally invasive dentistry, implantology, cosmetic and reconstructive dentistry. In 2017, Dr. Miguel A. Ortiz Dental Photography Courses were born. The success of these sold-out courses led to LIT, a book published by Quintessence in the summer of 2019, which went on to become the #1 dental book sold in North America in 2019.

Dr. Ortiz's passion for teaching and advancing dental education led him to the found The DentLit Academy, an organization dedicated to highlighting best practices where the art and science of dentistry intersect. DentLit is a place where evidence-based dentistry truly flourishes, allowing users to find answers to common dental questions.

Dr. Ortiz also leads several annual conferences and conducts some of the most sought-after dental courses in the world, such as The Adhesive Reconstruction and Tooth Preparations Course, which has repeatedly sold out a year in advance. Other courses provided by Dr. Ortiz include The Oepic Experience, a two-day hands-on course on occlusion, dental materials, provisionalization, and impression techniques, suture techniques, dental isolation, dental photography, and more.

Oral Presentations

Saturday, November 11
10:00-10:40

Mastering In-House Restoration Finishing: Practical Protocols for Polishing, Staining, and Glazing

Miguel Ortiz, DDS

Lecture Description:

As a dental professional, your goal is to provide your patients with the best possible care. One of the most important aspects of this care is ensuring that your restorations look and function beautifully. In the past, many dental offices relied on outsourcing for the polishing, staining, and glazing of restorations. However, with the proper training and techniques, these tasks can easily be performed in-house.

The protocol presented in this lecture is designed to be simple and effective, taking into account the time and pace of a busy dental office. You will be guided through the process step-by-step, with an emphasis on practical application. By the end of the lecture, you will be equipped with the knowledge and skills necessary to perform these tasks first thing Monday morning.

Objectives:

[1] Witness the steps involved in achieving stunning in-house restorations;

[2] Learn about the various materials and techniques involved, including the Vita Enamic, Mark II and Suprinity;

[3] Examine polishing and finishing tools, and the importance of using the right stains and glazes.

Oral Presentations

Saturday, November 11
11:10-11:50

Monolithic vs. Layered Restoration: Advantages and Limits of the Materials in the Digital Era

Francesco Mintrone, DDS, MS, PhD

Lecture Description

The lecture will analyze the aesthetic and functional aspects related to the monolithic and layered restorations. In particular, will be focalized the differences in resistance and the aesthetics obtainable through the two different approaches.

Through the analysis of the type of restoration, the substrate and its location, will be evaluated the guidelines to decide whether to use a monolithic or layered approach.

Will also be evaluated a step-by-step workflow to clarify how to design an ideal aesthetic-functional restoration evaluating the 2 different techniques

Objectives:

[1] Learning when and where to use the monolith restoration;

[2] Consideration on the new materials and techniques to obtain a natural appearance in the esthetic zone;

[3] Evaluation of the Digital workflow to obtain a predictable esthetic and functional rehabilitation.

Francesco Mintrone, DDS, MS, PhD

He started his activity as a dental technician and then specialized as a ceramist in fixed prosthesis. After graduating in Dentistry with honors at the University of Modena, Italy, he attended several courses on prosthetic dentistry and implant surgery.

EAED active member. SIPRO founding member.

Winner of the 2011 and 2012 editions of the Master Clinician in Implant Dentistry at the gIDE, he is Faculty member at the gIDE for the Implant Master Program in Europe, China and Vietnam.

He has authored several articles published on international scientific magazines and he lectures nationally and internationally on topics related to digital dentistry. implants and prosthodontics.

He focuses his professional activity mainly on aesthetics and prosthetic rehabilitation on implants and natural dentition in his private practices in Modena, Italy.

Oral Presentations

Saturday, November 11
11:50-12:30

**Digital Workflow
in Esthetic Dentistry**

Eliseo Sammarco, DDS, MS

Lecture Description

The lecture will focus on the key aspects to achieve success through a digital treatment planning and execution. The protocol will describe all the steps of the process from the design to the milling process..

   Objectives:
[1]   Smart treatment planning:
      Matching files helps clinicians
      to make smart choices!
[2]   Try in your designs through
      the mock up.
      All you see in the digital world
      can be tested in your patients mouth!
[3]   Copy and paste dentistry:
      apply your original design
      to your final restorations!

Eliseo Sammarco, DDS, MS

Dr. Eliseo Sammarco was born in Manduria on January 26 1990.

After graduating at the Military High School of Milan, Dr Sammarco started to attend the European University of Madrid to study Dentistry, finishing in 2015.

After graduation he took part in different post graduate programs. The most important of these being Federico Ferraris'.

Then he became an Adhesthetics Master and published on IJED about milled materials strength.

He continues to contribute in the Adhesthetics group focusing on the digital transformation and currently works at Clinica Sammarco being in charge of treatment planning and prosthetic areas.

Oral Presentations

Saturday, November 11
12:30-13:10

CAD/CAM Ceramics
in Esthetic Adhesive Dentistry

Markus B. Blatz, DMD, PhD

Markus B. Blatz, DMD, PhD

The recent evolution in CAD/CAM, ceramic, and adhesive bonding technologies offers a whole new range of esthetic, less invasive, and long-lasting treatment options However, there are still many questions: How can I apply minimally invasive resin-bonded ceramic restorations such as laminate veneers and onlays successfully in my daily practice? How can I select the best ceramic materials and protocols to achieve optimal esthetics? How can I successfully integrate digital dentistry and chairside CAD/CAM systems into my clinical workflow? What are the best cements and bonding protocols for veneers, inlay/onlays, crowns, and bridges? How to bond zirconia to make resin-bonded bridges and partialcoverage restorations that last? And last but not least: is there any scientific evidence on all these topics?

This presentation will answer such questions based on sound science and provide a lavishly illustrated clinical update on esthetic treatment options with ceramics from conservative laminate veneers and posterior onlays to resin-bonded bridges and implant restorations.

Objectives:

[1] Differentiate modern ceramic materials and their indications;

[2] Learn about CAD/CAM technology and its diverse applications in esthetic dentistry;

[3] Understand strategies for success with ceramic restorations for teeth and implants based on the current scientific evidence;

[4] Comprehend clinical guidelines for long-lasting resin-bonded esthetic restorations from laminate veneers and onlays to resin-bonded bridges and implant-supported restorations.

Dr. Markus B. Blatz is Professor of Restorative Dentistry, Chairman of the Department of Preventive and Restorative Sciences, and Assistant Dean for Digital Innovation and Professional Development at the University of Pennsylvania School of Dental Medicine in Philadelphia, Pennsylvania. Dr. Blatz graduated from Albert-Ludwigs University in Freiburg, Germany, and was awarded additional Doctorate Degrees, a Postgraduate Certificate in Prosthodontics, and a Professorship from the same University.

Dr. Blatz is co-founder and past President of the International Academy for Adhesive Dentistry (IAAD) and a founding member of the European Academy of Digital Dentistry (EADD). He is a board-certified Diplomate in the German Society for Prosthodontics and Biomaterials (DGPro) and a member and fellow of multiple other professional organizations.

Dr. Blatz is Editor-in-Chief of Compendium of Continuing Education in Dentistry, Associate Editor of the Journal of Esthetic and Restorative Dentistry and Quintessence International, Section Editor of the International Journal of Prosthodontics, and serves on the editorial boards of numerous other recognized scientific dental journals. He is coauthor of the international bestseller "evolution –contemporary protocols for anterior single-tooth implants".

Dr. Blatz is the recipient of multiple teaching and research awards and has published and lectured extensively on dental esthetics, restorative materials, and implant dentistry. He was named one of the "World's Top 100 Doctors in Dentistry" by his peers.

SCAD Mission and Goals

The Society for Color and Appearance in Dentistry (SCAD) was founded in 2008 as a consortium of dental professionals and other experts interested in scientific investigation and application of color and appearance in esthetic dentistry.

The SCAD goals are as follows:

• To serve as a uniting force in the profession by promoting and fostering greater awareness for color and appearance;

• To advance multidisciplinary collaboration and discovery among industrial and institutional researchers, clinicians, laboratory technicians, and others with an interest in color and appearance in dentistry;

• To create and implement educational and training programs on color and appearance for dental professionals and students;

• To promote dental health for the general public through the advanced art and science of color and appearance in dentistry.

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Journal of Esthetic and Restorative Dentistry (JERD) and SCAD

The Journal of Esthetic and Restorative Dentistry (JERD), an official publication of SCAD, publishes two issues per year devoted to color and appearance in dentistry. JERD is the only journal devoted to esthetic dentistry with Impact Factor (IF), which is presently 3.2. To submit a manuscript, go to https://mc.manuscriptcentral.com/jerd

We look forward to collaborating with you in supporting and promoting the best clinical and laboratory practice and research related to color and appearance.

PROSEC gGmbH (Progress in Science and Education in Ceramics)

PROSEC initiates interdisciplinary networking in dentistry, dental technology and material sciences. It´s activities are coordinated across two committees comprising the Scientific Board: Science and application. The network assists in demonstrating the clinical advantages of ceramic and non-metallic dental materials. It creates reliable evidence- based standards for users and patients. Evidence- based recommendations are developed, continuing education courses initiated and online seminars organized. PROSEC will continuously expand its network by incorporating competent partners from universities, dental practices and dental laboratories. New developments and technologies are accompanied by the initiation of publications. PROSEC is a non.Profit organization that is active in Europe, North America and Asia.

If you are interested in dental ceramic and non-metallic materials, please join the network. (prosec.network).

Prof. Dr. Joerg Strub
President

Abstracts • Poster Presentations

Clinical Abstract #1

Chairside Maryland Bridge and Composite Restorations for Minimally Invasive Esthetics

G. Arossi*, R. Patel, A. Eisner, D. Barnes, Q. Alkhubaizi, M.A. Melo
University of Maryland School of Dentistry,
Department of Comprehensive Dentistry, AEGD Program, USA

Background: Losing an upper anterior single tooth has a pronounced impact on smile aesthetics and patient's quality of life. Furthermore, this type of rehabilitation poses a challenge for dentists, requiring precise matching of shape, and color to adjacent teeth.
Objective: This case report outlines the restoration a missing upper central incisor, highlighting the combined techniques employed in the rehabilitation process.
Case report: A 55-year-old female visited the AEGD clinic with the primary concern of a missing upper right central incisor (tooth #9). Clinical assessment revealed intact neighboring teeth with no signs of decay, or periodontal issues. Periapical radiography showed normal results. Impressions and bite registration were obtained for model mounting in a semi-adjustable articulator. The stone model underwent waxing to determine the optimal width and length for the restoration of each tooth. The plan encompassed composite restorations and a chairside ceramic Maryland bridge. Strategic application of composite on teeth #8 and #10 harmonized the missing tooth's space. Subsequent preparation of both teeth on the lingual aspect enabled intraoral scanning using the CEREC Omnicam, and the design of a two-wing retained Maryland Bridge. Lithium disilicate glass-ceramic (e-max) block was milled. Following clinical adaptation, the restoration underwent firing to finalize ceramic crystallization, and was then aesthetically enhanced through staining. The adhesive cementation process employed universal adhesive and dual-cure resin-based cement.
Clinical Considerations: Immediate and 3-month follow-up assessments confirm the esthetic success of the technique. Due to a slightly open bite, the patient's occlusion exerted minimal pressure on the restorations. The patient expressed high satisfaction with the treatment's rapid pace and the outcome.
Conclusions: This case demonstrates the efficacy of utilizing diverse materials in the restoration of anterior teeth, facilitating esthetic outcomes through a minimally invasive approach. The combination of techniques contributes to successful rehabilitation while preserving the patient's oral health and appearance.

Abstracts • Poster Presentations

Clinical Abstract #2

Replacing Resin Veneers with Translucent Zirconia 360 Veneers for Tetracycline-Stained Teeth: A Case Report

J. C. Ontiveros, C. Ruiz Brisuela*, D. LaGuardia
Department of Prosthetic Dentistry and Dental Technology,
The University of Texas School of Dentistry at Houston, USA

Background: Losing confidence in one's smile profoundly affects our well-being. The smile is an essential trait of human beings, a basic need that is part of our overall health. Therefore, I consider the opportunity to restore a patient's confidence in their smile through a conservative approach a goal and a privilege.

Objectives: This case report outlines the rehabilitation of the patient's smile, highlighting the combined materials and techniques used to restore esthetics with a conservative approach.

Case Report: A 62-year-old female patient presented to the clinic with the chief complaint of disliking her discolored resin veneers made 20 years ago to mask tetracycline-stained teeth. The patient wanted to improve the color and shape of her front teeth. The maxillary anterior sextant was treatment planned and prepped for Emax Monolithic Ceramic System veneers, and the opposing mandibular anterior sextant was planned and minimally prepped for 360 Translucent Monolithic Zirconia veneers. All restorations were bonded following the protocols for light-cured veneer cement (Rely-X Veneer cement). The bonding protocols differed in the primer used for the restorations. Silane (3M Ceramic primer) was used for the Emax crowns, and MDP primer (Z-prime) was used for the Zirconia restorations.

Clinical Considerations: One week and three months after follow-up confirmed treatment success and patient satisfaction, exceeding the patient esthetics expectations. In Mrs. X's words, "I can smile again".

Conclusions: The combination of different restoration materials facilitates a conservative approach to preserving tooth structure while high esthetic results are met.

Abstracts • Poster Presentations

Clinical Abstract #3

Color Maching Of The Maxillary Central Incisor Porcelain Crown, Case Report

D Stamenković[*1], D Pavlović[2]
[1]Dental practice „Stamenković&Team", Belgrade, Serbia
[2]Laboratory for dental technology „Denident", Belgrade, Serbia

Objectives. The objective of this case report is color matching of the maxillary central incisor all-ceramic crown and determine the color difference between that crown and contralateral intact natural incisor using the ΔE value from CIE LAB formula.

Clinical Consideration. Natural looking restoration is one of the most challenging aspects in dentistry, especially when the color of the maxillary central incisor needs to be determined. In this case report, factors that influence tooth color were analyzed, and tooth color information was assessed using the ΔE value from CIE LAB formula.

The subject of this color assessment was an all-ceramic crown for maxillary central incisor for 37-year-old female patient. The contralateral intact natural incisor was used as the target shade for the all-ceramic crown.

After tooth preparation and IO scan everything has been done at once, regarding the design of restoration and model. For this case Ivoclar ZirCAD PRIME multi A1 was used. For proper shade mapping polarized picture with grey card for digital calibration is necessary as well as one standard picture for mapping the colour effects. For tooth colour mapping was used the eLAB app. Values of this grey card are: L:79 lightness, a:00 red, b:00 yellow. These values were used for matching for the next steps. In that manner is was easy to superimpose the picture of tooth shot on the model with the polar filter picture in mouth and digital try-in. The finalisation with the layered ceramic was made by a special recipe combining knowledge and measurements.

Highest measured ΔE value was 2,7 which indicates that the color is clinically acceptable, considering acceptibility treshold value of less than 2.7 (3-years follow-up confirmed acceptable color appearance).

Conclusions. Following recommended protocol based on the eLAB software, clinically acceptable color of the all-ceramic crown was obtained.

Abstracts • Poster Presentations

Research Abstract #4

Color Stability of Additively Manufactured Provisional Materials

S. Abu Al Tamn*, A. Bike
Department of Prosthetic Dentistry and Dental Technology,
Marquette University School of Dentistry, Milwaukee, WI, USA

Objectives: This in vitro study aimed to evaluate the color stability of additively manufactured provisional materials.

Methods: 40 disc-shaped additively manufactured samples: (Dental Sand shade A2 [Harz] and [MFH C&B shade N1] (Nextdent) were printed with the following dimensions 9-mm in diameter and 2-mm in thickness. Each sample was pre-polished with 320-grit SiC paper. Samples received one of two surface treatments, (1) resin coating (DuraFinish) and (2) laboratory polishing to 4000 grit sandpaper. Following the surface treatment, samples were randomly divided into 2 subgroups (n=5): coffee and wine 2 staining solutions x 2 surface treatments each n=5.

The Samples were stored in staining solutions in an incubator for 60 hours at 37 °C. Color measurements were performed using a spectrophotometer CIEDE2000 color coordinates were calculated. Means and standard deviations were calculated. The data were analyzed using ANOVA ($α=0.05$). Color difference of $\Delta E^{ab0} \leq 2.7$ was used as a 50:50% acceptability threshold (AT) to interpret color differences.

Results:

Measured color differences by polymer, surface treatment and storage or aging condition [mean (s.d.)].

Treatment	Material	Polished	Resin Coated
Coffee	MFH	2.0 (0.9)	1.6 (0.4)
	HDS	8.8 (0.5)*	3.4 (0.9)*
Wine	MFH	8.8 (0.6)*	17.1 (0.5)*
	HDS	10.1 (0.7)	11.3 (0.5)

MFH: NextDent MFH C&B, HDS: Harz Dental Sand.
* Indicate statistical significance between Polished and resin-coated

Conclusions: The resistance to staining solution challenge is material dependent. MFH C&B showed the most resistance to the coffee staining solution, while HDS the most resistance in the wine staining solution group. Resin coating showed statistically significant differences in the HDS coffee group and the MFH wine group.

Abstracts • Poster Presentations

Research Abstract #5

Optimum Criteria of Using Er:YAG Laser in Roughening PICN Surface

S. Abuhajar*
Department of Fixed Prosthodontics, Faculty of Dentistry,
Damascus University, Damascus, Syria

Objectives: The purpose of this study was to evaluate the efficiency of Er:YAG laser irritation on the roughness (Ra) value of Enamic surface (PICN) at different energy settings, and determine the optimal energy setting for a successful pre-treatment.

Methods: The study included 5 experimental groups (N.=8), including group A, untreated group (control); surface roughness of this group was measured with surface roughness tester (profilometer), then a total number of 32 PICN discs were randomly divided into 4 groups according to the treatment conducted, group B, hydrofluoric acid-etched (HF); group C, D, E in order (150, 250, 400 mJ Er:YAG laser-irritated); and roughness was measured by the same method applied to control group. Data were collected in microns (μm) and analyzed using one-way ANOVA and post hoc comparison tests (a=0.05).

Results: All of the treatments improved surface roughness because a significant difference was observed between group A and all other groups $P<0.05$, the highest mean roughness value was in group B and E, followed by group C and D. The post hoc test showed there was no statistical difference found between groups B and E.

Conclusions: In terms of surface roughening, a conclusion can be made that irritating PICN inner surface with 400w Er:YAG can be an alternative pretreatment method to hydrofluoric acid.

Abstracts • Poster Presentations

Research Abstract #6

Color Stability of Single-Shade Resin Composites after Light Artificial Aging

F. Floriani[*], G. Carpena Lopes[2]
Department of Dentistry, Federal University of Santa Catarina, Florianopolis, SC, Brazil

Objective: To evaluate the color stability of single-shade resin composites in Class V restorations after ultra-violet light artificial aging.
Methods and Materials: Seventy upper central incisor acrylic resin tooth (ART) colors A1 (N=35) and A3 (N=35) were randomly assigned into 7 groups. The color difference (ΔE*) between baseline and after accelerated aging of ART was calculated. Then, standardized Class V cavities were bur-prepared with dimensions: mesio-distal=3.0mm, cervical-occlusal=3.0mm, and depth=1.5mm. Four resin composites were selected as experimental groups: three single-shade resin composites: Palfique Omnichroma (Tokuyama); Charisma One (Heraeus Kulzer); and, Vittra APS Unique (FGM); and, one simplified shade-options universal resin composite (SimpliShade, Kavo Kerr) color Light (indicated to restore tooth color A1) and color Medium (indicated to restore tooth color A3). A multi-shade universal resin composite (3M Filtek Universal Restorative, 3M Oral Care) colors A1 and A3 was used as control. All cavities were restored using a universal adhesive system and the resin composites in two-increments oblique technique individually light-cured (16J/cm2) using a poly-wave LED light-unit. After 24h, all specimens were finishing/polishing and underwent accelerated aging protocol through the ultraviolet light-box machine for 120 hours (simulating approx. five years of clinical service). Then, the color differences between resin composite Class V restorations placed in ART color A1 and A3 were evaluated at baseline and after aging using a spectrophotometer (CM-700d, Konica Minolta) under a standardized simulated daylight chamber and calculated using CIED2000. Data for the individual color parameters were submitted at baseline and after aging (ΔE) using t-test for paired samples (α=0.05) and effect size (Cohen's d) through the Laken's spreadsheet.
Results: All single-shade resin composites exhibited a blending effect in ART color A1, while universal resin composites demonstrated color matching in ART color A3. Palfique Omnichroma also displayed a blending effect in ART color A3. In ART color A1, all single-shade resin composites exhibited acceptable color matching and color stability after aging (Palfique Omnichroma ΔE00=1.31, Charisma One ΔE00=2.07, and Vittra APS Unique ΔE00=2.54), which was similar to the control group (3M Filtek Universal Restorative ΔE00=2.44). However, in ART color A3, only Vittra APS Unique (ΔE00=2.4) and SimpliShade (ΔE00=2.23) achieved an acceptable color match. They were similar to the control group (ΔE00=2.26).

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SimpliShade resulted in the worst color match and color stability in ART color A1 (baseline ΔE00=5.07, and after aging ΔE00=4.54). There was a statistically significant difference with a large effect size when comparing baseline and aging measurements only for Vittra APS Unique (p=0.047) and Palfique Omnichroma (p=0.038) in ART color A3, showing no color stabity after aging.

Conclusions: None of the resin composites achieved color matching and color stability in the four simulated combinations (baseline and after aging in teeth colors A1 and A3). To restore Class V in teeth color A1, single-shade resin composites demonstrated comparable color matching and color stability to universal resin composite used as a control after simulated 5 years of clinical service. Single-shade resin composites outperformed universal composite in terms of color matching at baseline. In teeth color A3, Palfique Omnichroma and Vittra APS Unique do not provide acceptable color matching with ART teeth surroundings, and proper color stability after aging process. SimpliShade in teeth color A1 had the worst result between all resin composites. Universal composites are the best options to restore Class V in teeth color A3.

Abstracts • Poster Presentations

Research Abstract #7

Defining Subdivisions of Dental Chromatic Space for VITA Classical Shades Based on Visual Matching

R. Ghinea[*1,2], E. Ismail[3], A.M. Ionescu[1], J.C. Cardona[1], M Tejada-Casado[1], J Ruiz López[1], M.M. Perez[1,2], L.J. Herrera[4]
[1]Department of Optics, Faculty of Science, University of Granada, Granada, Spain
[2]Houston Center for Biomaterials and Biomimetics, School of Dentistry, University of Texas, Houston, TX, USA
[3]Clinical Dental Sciences Department, College of Dentistry, Princess Nourah Bint Abdulrahman University, Riyadh, Kingdom of Saudi Arabia
[4]Department of Computer Architecture and Computer Technology, ETSIIT, University of Granada, Granada, Spain

Objectives: To define Perceptibility and acceptability related three dimensional subdivisions of the dental chromatic space corresponding to VITA Classical shades, according to visual matching performed by a panel of two experienced clinicians.

Methods: 600 in-vivo teeth (target teeth) were matched and rated (* to ***) to VITA Classical shades by two experienced dental clinicians. For each tooth, in case of agreement between observers, the designated shade was assigned to the tooth. In case of lack of agreement, the highly rated shade was assigned. Color of all target teeth was measured in-vivo with a clinical spectrophotometer (Easyshade 4.0, VITA Zahnfabrik). The dental chromatic space was divided into a grid corresponding to 0.2 steps in the L* a* and b* directions. For each point of the grid, the CIEDE2000(1:1:1) color difference to each of the points corresponding to the 600 target teeth was calculated, and the closest point (minimum color difference) was determined (MATLAB R2018a, Mathworks, USA). If the color difference to the closest target teeth was lower or equal to the perceptibility (PT=0.81) or the acceptability (AT=1.77) thresholds, the corresponding shade of the closest target teeth was assigned to the point on the grid. If the color difference to the closest target teeth was higher than both PT and AT, the grid point was assigned no shade.

Results: The three dimensional subdivision of the dental chromatic space according to PT and AT are presented in Figure 1 and Figure 2, respectively

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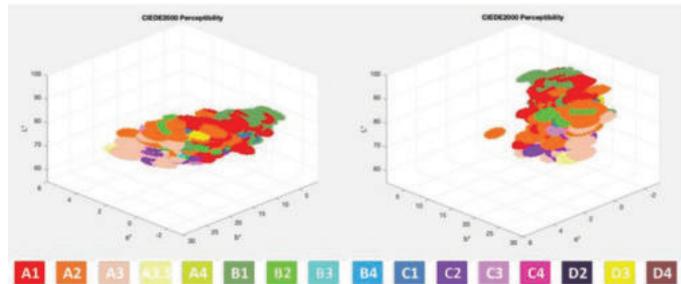
Figure 1. Three dimensional view of the subjective subdivisión of the dental chromatic sapce within accordint to the CIEDE2000 PT for dentistry.
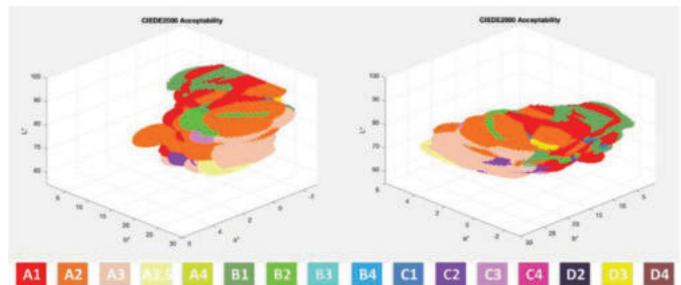
Figure 2. Three dimensional view of the subjective subdivisión of the dental chromatic sapce within accordint to the CIEDE2000 AT for dentistry.

Conclusions: Subdivisions of the dental chromatic space for VITA Classical Shades based on visual matching according to both PT and AT, were defined. The results of this study can be very useful in future research in dentistry as well as in industrial applications, such as development of new shade matching devices, development or improvement of dental shade or dental materials.

Abstracts • Poster Presentations

Research Abstract #8

Color Change of 3D-Printed Resins after Accelerated Aging: Preliminary Results

J. Ruiz-López[*], M. Tejada-Casado, C Espinar, E. Sánchez, A. M. Ionescu, M. M. Péreza.
Department of Optics, Faculty of Science, Campus Fuentenueva, University of Granada, Granada, Spain

Methods: Four 3D-printed resin systems were evaluated: DFT-Detax Freeprint (A1) Temp; FP- Formlabs Permanent Crown (B1); FT-Formlabs Temporary CB (B1); and GCT- GC Temporary (Light). Samples of each material were printed at 0º and 90º, and polished up to 1.0 mm thickness. Spectral reflectance, against black background, and spectral transmittance were measured pre- and post- aging using a CM-3610A vertical spectrophotometer (Konika Minolta, Japan), with CIE D65 standard illuminant and di/8º and di/0º geometry respectively. For accelerated aging of the samples, an aging cabinet model Solarbox3000eRH (N-WissenGmbH, Germany), and ISO 4892-2 were used. Color differences were evaluated using CIEDE2000 metric (ΔE_{00T} and ΔE_{00R}) and the 50:50% perceptibility and acceptability (PT_{00}:0.8 and AT_{00}:1.8 $\Delta E00$ units) thresholds.
Results: For reflectance measurements, CIEDE2000 color differences ranged 3.82 (FT-0º) to 5.70 (GCT-0º), and for transmittance measurements from 2.23 (FT-90º) to 8.64 (DFT-0º). Except for FT, color differences were higher for transmittance measurements and for samples printed at 0º. No correlation was found between $\Delta E00T$ and $\Delta E00R$. All the specimens demonstrated color changes above the acceptability threshold.
Conclusions: Based on the experimental conditions of the present study and according to the methodology used, the color changes of 3D-printed dental resins after aging were influenced by building orientation. Moreover, the choice of the color measurement method to evaluate the color change of 3D-printedresins for dental restorations should be considered.

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Research Abstract #9

Optical Properties Stability of 3D-Printed Dental Resins: Preliminary Results

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Objective: To evaluate transmittance, scattering, and absorption stability of 3D printed restorative dental resins.

Methods: Four 3D printed resin systems were evaluated: DFT-Detax Freeprint (A1) Temp; FP- Formlabs Permanent Crown (B1); FP- Formlabs Temporary CB (B1); and GCT- GC Temporary (Light). Samples from each material were printed at 0° and 90°, and polished up to 1.0 mm thickness. Spectral reflectance and transmittance were measured pre- and post- aging with a CM-3610A vertical spectrophotometer (Konika Minolta, Japan). For the accelerated aging of the samples, an aging cabinet model Solarbox3000eRH (N-WissenGmbH, Germany), and ISO 4892-2 was used. Scattering (S), absorption (K) and albedo (a) coefficients were calculated using Kubelka-Munk's model.

Results: Transmittance (T%) is influenced by material aging, being lower after aging for all materials, but with similar spectral behavior for all 3D printed samples evaluated. In general, the absorption coefficient (K) showed the same spectral behavior for all the resins studied, independently of the printing angle and aging, but with K values higher for pre-aging resins. Thus, they show a rapid decrease for short wavelengths, up to about 440nm from which the absorption remains close to zero. This behavior is not influenced by the printing angle orientation. The scattering coefficient (S) increases after aging for all materials and printing angles studied. As for the spectral behavior of the scattering coefficient, it is worth noting that for unaged samples S increases for short wavelengths up to about 450nm, and decreases slightly with increasing wavelength. However, this spectral behavior differs for the aged samples where, in general, there is a slight decrease up to about 440nm, and remains constant for the rest of the wavelengths. For both printing angles GCT showed a peak at 420nm. For pre and post aging, and except for wavelengths below 450 nm, albedo coefficient (a) values lower than 1 mean that scattering is the most relevant light attenuation phenomenon that occurs when light interacts with the material.

Conclusions: Understanding the optical behavior of 3D-printed restorative dental resins is crucial to optimize their clinical effectiveness. Although the 3D printed resin systems evaluated showed similar spectral optical behavior, the values of S, K, and T% change after aging, being the scattering the most relevant light attenuation phenomenon in 3D-printed resins pre and post aging. Also, the choice of the building orientation could affect the optical properties of the 3D-printed resins. Therefore, the time and the building orientation should be considered in order to improve the biomimetic capacity of 3D-printed dental restorative resins.

Abstracts • Poster Presentations

Research Abstract #10

Color Prediction of Layered Dental Resin Composites after Material Substitution

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Objectives: The main objective of this study was the development of a regression based predictive method, for color estimation of layered dental resin-based composites when the dentine shade is changed.

Methods: Monolithic samples of dentine and enamel have been combined in order to create 5 bi-layer samples of clinically relevant thicknesses. Since, 10 different dentine shades of VITAPAN Excell and one enamel shade have been used, a total of 50 bi-layered samples were obtained. A non-contact spectroradiometer with CIE 45º/0º geometry was used to measure the spectral reflectance of all samples over a standard black background. Reflectance values were converted into CIE-L*a*b* color coordinates using 2º Standard Observer and D65 Standard Illuminant. A partial-least-squares (PLS) regression algorithm was built and tested using a Cross Validation (leaving one out) approach. Therefore, for each thickness combination, the training set were the CIE-L*a*b* values of the monolithic enamel, of the 9 monolithic dentins and of the 9 bilayer samples (dentine + enamel), while the remaining dentin (unknown) was used for performance evaluation. ΔE_{00} with corresponding 50:50% acceptability and perceptibly thresholds (AT and PT) were used as performance assessment.

Results: Mean color difference among predicted and measured (real) CIE-L*a*b* values was $\Delta E_{00} = 0.48$, with a standard deviation of 0.23 color units and a maximum value of $\Delta E_{00} = 0.98$, obtaining the 100% of the color differences lower than AT and 86% lower than PT.

Conclusions: The proposed predictive method allowed, from monolithic samples data, color estimation of layered dental resin-based composites of varying thicknesses with a high degree of accuracy. These results open the way for custom design and manufacture of dental resin composites and could be a useful tool for the clinical success of dental restorations.

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Research Abstract #11

Spectral Analysis of Translucency Parameter of Resin Composites. Method Validation

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Objectives: To perform the spectral evaluation of the translucency parameter (TP) of "cloud-shade" and "one-shade" resin composites.
Methods: The "cloud-shade" composites were 3M experimental composite – 3 Shades (3ML - light, 3MM - medium, 3MD - dark), and SimpliShade – 3 Shades (SSL - light, SSM - medium, SSD - dark), while the "one shade" composites were Omnichroma (OCH), Admira Fusion x-tra (AFX), and Venus Diamond One (VDO), with n=5/shade. Polymerized composite samples (10 mm in diameter, 2-mm thick) were polished using PoGo disks for 40 seconds. TP measurements were performed using a benchtop spectrophotometer. The spectral reflection values obtained against a black background were deducted from the corresponding data against a white background in order to obtain the "TP curves" of evaluated materials. The data were analyzed by analysis of variance, at $\alpha=0.05$ level of significance, and compared with the numeric TP_{00} and TP_{ab} values.
Results: TP curves of evaluated materials are presented in the figure.
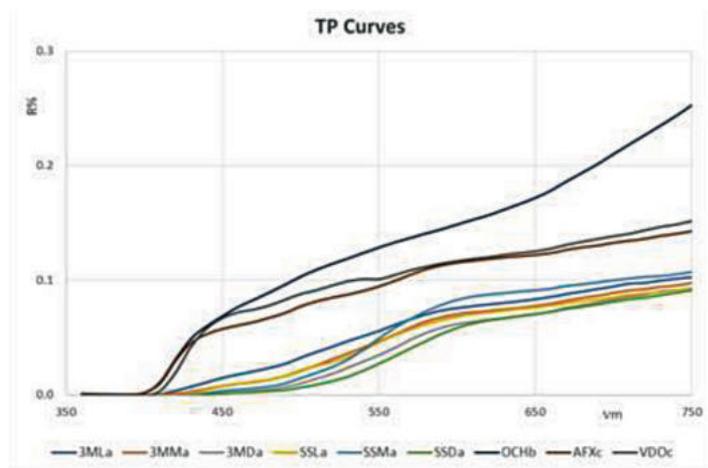
The TP curves provided in-depth information on the translucency of evaluated materials throughout the visible spectrum as compared to the traditional TP, which is a single number. The "cloud-shade" composites exhibited lower reflection values of the TP curves (corresponding to lower TP) as compared to "one-shade" composites ($p<0.05$). The average TP curve values were highly correlated with the numeric TP_{00} and TP_{ab} values (r=0.98).

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Conclusions: The method of generating TP curves based on TP measurements introduced new knowledge and understanding of the translucency parameter, compared to the traditional "single number" TP values. A high correlation between TP curves and corresponding TP values validated the proposed supplementary method of analysis of translucency in dentistry.

Abstracts • Poster Presentations

PROSEC Excellence Awards
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Abstract PROSEC1

The Effect of Different Polishing and Finishing Procedures on CAD/CAM Resin Composite: in Vitro Roughness and Color Variation

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CAD/CAM resin composite blocks are used for indirect, single-visit restorations. After milling, these materials are submitted to one of the different finishing and polishing systems available, and they might influence how the material performs in the oral environment. **Objective**: This study aims to assess the effect of different systems on roughness and color variation of resin composite blocks after aging.

Methods: Disk-shaped specimens (n=32) were made of CAD/CAM resin composite blocks (3D Paradigm MZ100), shade A3 (ø=5mm x 2mm) using an IsoMet low-speed precision cutter. Specimens were manually finished with fine-grit diamond bur and polished with either a single-step (Enhance Finishing Point) or a multi-step (3M Sof-Lex™ discs) finishing systems, while unpolished specimens were used as controls. Baseline roughness with Mitutyo Roughner Tester, and color measurements with intra-oral Vita Easy Shade spectrophotometer were obtained. All samples were immersed in coffee for 3 days. After aging, another set of measurements was taken. Statistical analysis was done using a Kruskal-Wallis One-Way ANOVA test.

Results: Before aging, unpolished samples (median=1.004) presented significantly greater roughness ($p < 0.05$) than both single-step and multi-step systems (median=0.549 and 0.146, respectively). Single-step polished system (median= 0.549) presented a significantly rougher surface (p=0.004) compared to multistep systems (median= 0.146). After aging, multistep systems (median= 0.11) presented significantly lower values of roughness ($p < 0.05$) than single-step systems (median= 0.439) and unpolished samples (median=0.574). Regarding color variation (ΔE), multistep polishing systems (median= 3.401) presented significantly lower values ($p < 0.05$) compared to single systems (median=3.779) and unpolished samples (median=5.472).

Conclusion: Multistep polishing systems presented better outcomes regarding roughness and ΔE of CAD/CAM resin composite blocks after aging in coffee. Aging produces clinically detectable ($\Delta E > 3.7$) color change in unpolished and single-step system polished samples. The multistep polishing system produced aged samples with ΔE values in clinical acceptable range.

Abstracts • Poster Presentations

Abstract PROSEC2

Achieving Optimum Esthetics Monolithic Restorations Stained with Liquid Ceramics

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Objectives: One of the main goals for clinicians is to deliver natural-looking restorations which have optimal mechanical properties. Bilayered restorations offer great esthetic results, however, many mechanical complications are reported such as chipping and layer delamination. The MiYO color enhancement system can improve the aesthetic outcome of monolithic restorative material. without negatively influencing the mechanical properties.

Clinical Consideration: MiYO can be used in various clinical scenarios. Case 1, 42Y Pt presented with defective restorations FPD#9-11, single crown #8, and implant provisional #7. MiYO was used for the esthetic enhancement of the 3Y monolithic restorations. Case 2, 74Y male with unrestored implant on #26. Definitive restorations include custom Ti abutment and 3Y zirconia Monolithic crown for screwmentable restoration. MiYO esthetic system was used to match adjacent dentition. Case 3, 21Y male presented with unrestored implant #8. The restorations include a ti base and a 3Y zirconia crown. The coloring and surface texture were enhanced by using the MiYO system to match the adjacent incisor. Case 4, Pt was diagnosed with terminal dentition and the restorative Tx was all on 4 using 4Y Monolithic zirconia cemented over Titanium bar and enhanced with MiYO esthetic system to create natural-looking teeth and gingival color.

Conclusion: The aesthetic outcome of monolithic restorations can be improved with liquid ceramic systems such as MiYO. Advantages include what you see is what you get experience, and handling properties allowed to be easily mastered by clinicians and lab technicians.

Abstracts • Poster Presentations

Case 1

Initial presentation

Wax-Up

3Y Monolithic zirconia after recontouring

3Y Monolithic Zirconia after MiYO application-on cast

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3Y Monolithic Zirconia after MiYO application - intra oral after cementation

6 months follow-up after cementation

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Case 2

Initial presentation

3Y monolithic zirconia after recontouring and root form creation and before MiYo application

3Y zirconia crown on Custom made Ti abutment-Intra oral after MiYo application

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Case 3

Initial presentation

3Yzirconia crown on Ti base after MiYo application

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Case 4

Initial presentation

4Y monolithic zirconia full arch prosthesis
after recontouring and before MiYo application

4Y monolithic zirconia full arch prosthesis cemented over Ti bar
after MiYo application-on cast

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4Y monolithic zirconia full arch prosthesis
cemented over Ti bar after MiYo application-Intra oral

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Abstract PROSEC3

Long-Term Color Stability of Microinvasive Esthetic Restorative Treatment for Deep Enamel White Spot Lesions

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Objectives: To determine the color changes on resin infiltration treatment over one year of simulated service inside the mouth. Resin infiltration treatment is a microinvasive restorative technique for white spot lesions (WSLs). This technique uses flowable resin monomers to infiltrate a demineralized region to change the refractive index of the white spot lesions to match the surrounding enamel, providing a more aesthetic appearance. However, the long-term stability of this color match is uncertain.

Methods: Twenty anterior teeth were selected. Artificial white spot lesions were created over the esthetic area of each tooth using a demineralization solution. For that, selected areas of the teeth were immersed in a 4.4 pH demineralizing solution for four days. These newly formed WSLs were treated with resin infiltration treatment. The treated teeth were then subjected to artificial aging by thermocycling, in which 10,000 cycles of intermittent hot and cold water can stimulate the hydrolysis of unprotected collagen fibrils by repetitive contraction/expansion stress, resulting in gap propagation along the adhesive interface, thereby allowing water and pathogenic oral fluid penetration. Then, the tooth shade was evaluated using a VITA Easyshade color spectrophotometer, reported in standard CIELAB color space values - L representing the lightness, and a/b representing the amount of hue. These values were inputted into the ΔE formula, providing an overall value for the color that can be compared to ΔE < 2.7, which is considered the clinically acceptable level.

Results: The ΔE values following 6 months and 1 year of thermocycling were an average of 18.66 ± 4.37 and 5.25 ± 3.95, respectively, which were significantly different from the baseline.

Conclusion: Significant color instability of resin infiltration following thermocycler aging, suggesting a loss of the esthetic outcome of icon-treated white spot lesions.

Abstracts • Poster Presentations

Abstract PROSEC4

Chairside Fabrication of an "Odd Shade"

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Objectives: This article will review the principles of shade matching for natural dentition and dental restorations. In case of need for chairside restoration of a shade that is not in routine shade guides, using composite restorative material along with "Color Modifiers", desired shade could be created.
Methods: Using a light source with optimal color temperature of 5,500 Kelvin, light intensity of 150-200 Foot Candle, neutral background intra-oral contraster, Optragate, following principles of shade matching (28 principles); components of the shade is dissected and analyzed. When it is noticed that the desired share could not be found as a "standard available shade", by distinguishing Value, Chroma, Hue and Translucency of existing dentition (with odd shade), new restoration could be created and fabricated by combination of composite restorative material and "Color Modifiers" to match existing shade. Step by step of this method is explained in this article.
Results: Although some shades might not be available in a routine standard shade guide, a skillful dentist who is familiar with principles of Color components and restorative materials along (Composite and color modifiers), can create and match the "odd shade".
Conclusions: Matching odd shades (particularly if they do not appear in routine standard shade guides) can be a challenging task for a dental professional. A skillful practitioner who is familiar with principles of Color and Shade; (Value, Chroma, Hue and Translucency), Composite systems, Color Modifiers and Shade Matching principles, can create and match a restoration to the existing dentition utilizing various dental materials available in the field of esthetic dentistry.

Abstracts • Poster Presentations

Abstract PROSEC5

Staining- and Aging-dependent Changes in Color and Translucency of 3D-printed Resin-modified Ceramics

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Objective: To evaluate staining- and aging-dependent changes in the color and translucency of 3Dprinted resin-modified ceramics (RMCs).
Materials and methods: Specimens (n=5 per condition and material) were fabricated from test materials: Permanent Crown Resin (PCR), Crowntec (CT), Vita Enamic (VE) and Tetric CAD (TC). Specimens were stained in wine, coffee, tea, and water (control) and exposed to artificial accelerated aging (AAA). Color measurements were obtained using a spectrophotometer at baseline (T0) and at three and a half (T1) and seven (T2) days after immersion. For AAA, measurements were obtained at baseline (T0) and after exposure to controlled irradiance of 150 kJ/m^2 (T1) and 300 kJ/m^2 (T2). Mean CIEDE2000 color differences (ΔE_{00}), changes in the translucency parameter (TP_{00}), and standard deviations were calculated. Differences between materials and test conditions were tested by one-way ANOVA (α= 0.05). Results were additionally interpreted using visual color difference thresholds in dentistry ΔE_{00}= 0.8 for the 50:50 perceptibility threshold (PT) and ΔE_{00}= 1.8 for the 50:50 acceptability threshold (AT). TP_{00} values were interpreted using 50:50 TPT_{00}= 0.6 and 50:50% TAT_{00}= 2.6.
Results: Statistically significant differences were found among the materials when exposed to the different test conditions. At the T0-T1 time interval, the highest color difference was found with wine (0.1-2.2) on all materials except CT, which showed the highest ΔE_{00} value with AAA (2.5). The second highest color differences were obtained upon exposure to AAA (0.2-2.5) and tea (0.5-1.1). The TP_{00} at baseline ranged from 5.1 to 9.8. Significant differences in TP_{00} were found among the tested materials and staining/aging conditions, but no significant differences were found among the staining/aging intervals (T0-T1, T0-T2 and T1-T2).
Conclusions: The evaluated 3D-printed resin-modified ceramics exhibited differences in color stability after exposure to four staining conditions and artificial accelerated aging at different time intervals/exposure times. Differences in the translucency parameter (TP_{00}) were recorded among resinmodified ceramic materials and testing conditions (four staining solutions and accelerated aging). No changes were found at three different time intervals/exposure times.

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Abstract PROSEC6

Color Stability of Commonly Used Silicone Extraoral Maxillofacial Prosthetic Elastomers

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Objectives: The most common reason for the remaking of extraoral maxillofacial prosthesis is color fading. The purpose of this study was to determine the effects of opacifiers and pigments on the color stability of three commonly used silicone elastomers after being subjected to artificial aging.
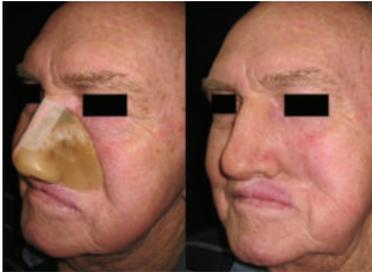
Courtesy od MDACC

Methods: Fifty-four specimens were made using a 1:1 ratio of base: crosslinker of silicone A-2000, A-2006, and A-2009. Each type of silicone included 6 subgroups: no pigment (control), opacifier only, red, yellow, blue, and a mixed pigment group of primary colors (red+blue+yellow). All specimens were subjected to energy exposure of 450 kJ/m2 in an artificial aging chamber. Baseline and post-artificial aging color measurements were read using a reflection spectrophotometer from which the color differences (ΔE^*) were calculated. For interpretation, a color difference of ΔE^*=3.0 was used as a 50:50% acceptability threshold, while ΔE^*= 1.1 was used as a 50:50% perceptibility threshold. All means were compared using ANOVA and Tukey HSD test at the level of α=0.05..

Results: There was significant difference ($P<0.05$) between pigmentation groups in all types of silicones tested. From the table below, the bolded values represent $\Delta E^* > 3.0$ and is considered clinically unacceptable color changes. Red pigment showed the highest color change in A-2006 and A-2009 silicones, while yellow pigment exhibited the highest color change in A-2006 silicone. Furthermore,

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there was no statistical difference between the control, opacifier, and mixed pigmentation groups at all three silicone elastomer levels,

	A-2000			A-2006			A-2009		
	Mean (SD)	Min	Max	Mean (SD)	Min	Max	Mean (SD)	Min	Max
Control	2.23 (0.56)	0.84	3.62	1.90 (0.46)	0.74	3.05	1.17 (0.19)	0.70	1.63
Opacifier	2.47 (0.77)	0.55	4.40	1.86 (0.58)	0.43	3.29	1.48 (0.46)	0.34	2.62
Red	7.89 (0.81)	5.87	9.90	10.20 (0.42)	9.16	11.24	10.78 (0.34)	9.93	11.64
Yellow	7.24 (0.90)	4.99	9.49	11.80 (0.07)	11.63	11.96	6.57 (0.12)	6.28	6.86
Blue	2.34 (0.83)	0.29	4.39	3.68 (0.14)	3.34	4.03	6.29 (0.25)	5.67	6.91
Mixed	1.42 (0.21)	0.91	1.94	1.46 (0.33)	0.63	2.29	2.14 (1.18)	0.78	5.06

which is within the acceptable threshold of $\Delta E^* = 3.0$.

Conclusions: Overall, A-2000 is the most color-stable silicone tested. Pigments affect the color stability of silicones differently. Clinicians should exercise caution when incorporating varying amounts of each pigment into silicones to match patients' skin shades.

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Abstract PROSEC7

In Vitro Comparative Study between Full-Arch Abutment Level Implant Impressions with Different Scan Bodies - a Pilot Study

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BioHorizons titanium scan bodies help to identify the implant platform when using intraoral scanners (IOS). There is sufficient evidence to support digital impression techniques in partially edentulous patients but the evidence for the use of intraoral scanners in restorative digital workflows for these patients is still limited. The purpose of this in vitro study is to measure and compare the accuracy of different full-arch digital implant impressions of BioHorizons titanium scan bodies with that of Elos Accurate scan bodies. A reference mandibular model with 4 implants (3.5mm Tapered Internal Plus Dental Implant, BioHorizons) was scanned by the inEos X5 scanner and Primescan. Using Geomagic Control X, the root mean squared (RMS) values were calculated by superimposing the scans of the Elos Accurate scan bodies with its respective control, and by superimposing the scans of the BioHorizons titanium scan bodies with its respective control. Our data has demonstrated that digital impressions using Elos Accurate multi-unit scan bodies (RMS value of 0.0053362) are as accurate as that of BioHorizons titanium scan bodies (RMS value of 0.0028134). Future studies should investigate the accuracy of scan bodies on milled frameworks made from full-arch digital implant impressions with intraoral scanning.

Objectives: This in vitro study measures and compares the accuracy of different full-arch digital implant impressions with different scan bodies.

Methods: A reference mandibular model was used to place four implants (3.5mm Tapered Internal Plus Dental Implant, BioHorizons) and multi-unit abutments were inserted into the implants and torqued to 30 N/Cm. Specimens were divided into different groups according to the impression technique used:

Group Control 1: Intraoral scan bodies (Elos Accurate multi-unit scan body) were positioned and tightened by hand on each implant abutment replica. The reference model was scanned with a high-resolution reference scanner (inEos X5, DentsplySirona) and a Standard Tessellation Language (.STL) file was obtained.

Group Control 2: Intraoral scan bodies (Titanium Scan Body, BioHorizons) were positioned and tightened by hand on each implant abutment replica. The reference model was scanned with a high-resolution reference scanner (inEos X5, DentsplySirona) and a Standard Tessellation Language (.STL) file was obtained.

Group 1: Intraoral scan bodies (Elos Accurate multi-unit scan body) were positioned and tightened by hand on each implant abutment

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replica. Five intraoral scans (Primescan, DentsplySirona) were made at the abutment level (3.5mm multi-unit abutment, straight) and exported as .STL files.

Group 2: Intraoral scan bodies (Titanium Scan Body, BioHorizons) were positioned and tightened by hand on each implant abutment replica. Five intraoral scans (Primescan, DentsplySirona) were made at the abutment level (3.5mm multi-unit abutment, straight) and exported as .STL files.

For all groups, the digital impression's STL files were exported to a 3D inspection software (Geomagic, 3D Systems). In Geomagic, the digitized models from the different scan bodies were superimposed with the .STL file of their respective control. From the superimposed files, the root mean square (RMS) values were calculated. These RMS values were analyzed with a one-way ANOVA analysis and a Tukey's Honest Significant difference test.

Results: Using Geomagic Control X, root mean squared (RMS) values were calculated from superimposed control and digital scans. The BioHorizons titanium scan body group showed a lower RMS value (0.0028134) than the Elos Accurate scan body group (0.0053362). There was no significant difference found in the RMS values from the different scan bodies (P>0.05).

Conclusions: Digital impressions using Elos Accurate multi-unit scan bodies seem to be as accurate as that of BioHorizons titanium scan bodies. Future studies should investigate the accuracy of scan bodies on milled frameworks made from full-arch digital implant impressions with intraoral scanning. The differences in the scan bodies' length and geometry may have led to an inaccurate comparison..

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Abstract PROSEC8

Calibration and Harmonization of Color Measurements in Dentistry

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Objectives: This multicenter study evaluated the effectiveness of instrument calibration and inter-instrument harmonization of color measurements of spectrophotometers with the same optical geometry using tooth-colored, translucent dental ceramic materials.
Methods: The coordinating center (*CC*) spectrophotometer was calibrated using NPL CERAM SERIES II ceramic tile set (National Physical Laboratory). Two sets of 10 tooth-colored ceramic specimens, labeled 1 to 10 and I to X (1-mm in thickness), were tested at *CC* and three research sites (*RS*) using spectrophotometers of same optical geometry (d/8°). Correction factors (CF) were calculated for each material and site to obtain the average CF for set 1-10, set I-X, and their combination. The differences among the non-corrected (*NC*) and corrected (*CO*) reflection values were calculated using CIEDE2000 color difference formula (α=0.05).
Results: Means (standard deviations) of ΔE_{00} color differences between pairs of *CC* and *RS* for non-corrected (*NC*) and corrected (CO) measurements, and same for the RS pairs are shown in Table.

Pair	NC	CO	Pair	NC	CO
CC-RS1	8.3 (1.1) A,a	1.4 (0.7) B,a	*RS1-RS2*	16.5 (1.4) A,a	2.6 (1.4) B,a
CC-RS2	6.6 (1.4) A,b	1.5 (0.7) B,a	*RS1-RS3*	11.4 (1.2) A,b	1.9 (1.0) B,ab
CC-RS3	1.9 (0.4) A,c	0.5 (0.2) B,b	*RS2-RS3*	5.2 (0.7) A,c	1.6 (0.9) B,b

Different capital letters in the row and small letters in columns represent significant differences, according to the Tukey test (p<0.05). The reduction between corrected as compared to non-corrected and ΔE_{00} values for *CC-RS1*, *CC-RS*2 and *CC-RS*3 comparisons were 83.1%; 77.2% and 73.6%, respectively. The corresponding ΔE_{00} values for *RS1-RS2*, *RS1-RS3* and *RS2-RS3* comparisons (indirectly compared in the experiment) were 84.2%; 82.8% and 68.5%, respectively.
Conclusions: Calibration and harmonization using tooth-colored, translucent dental ceramic specimens significantly decreased color differences between coordinating center and research sites and pairs of research sites, thus validating the used method and procedure.