



International College  
of Prosthodontists



Sociedad de Prótesis y  
Rehabilitación Oral  
de Chile

2017



34<sup>th</sup> Year & 17<sup>th</sup> Biennial Meeting of the International College of Prosthodontists  
CentroParque Convention Center | Santiago, Chile | September 7-9, 2017

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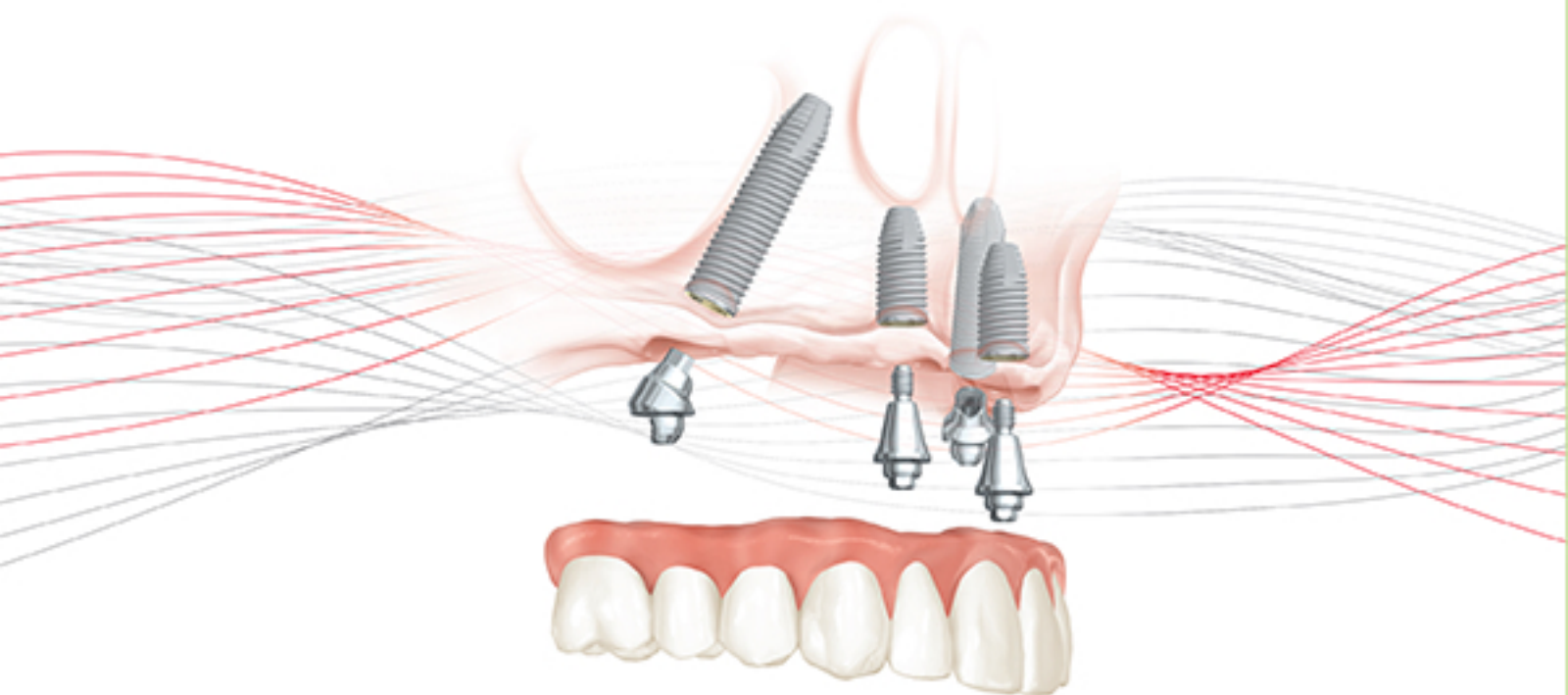
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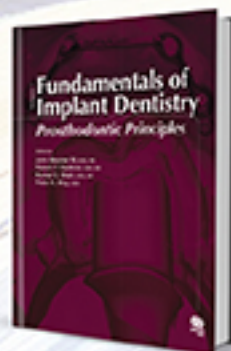
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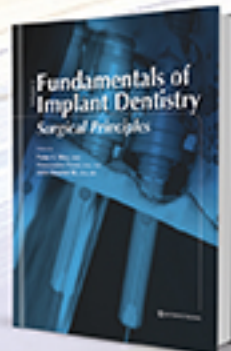
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## SAVE THE DATE

**Riccione, April 13-14, 2018**

### Topics

**Occlusion. Contacts, schemes, and instruments: what is necessary and what is too much?**

**Treatment planning. Keeping the teeth or replacing them with implants: where do we draw the line?**

**Full-arch on implants. What is the best prosthetic solution?**

### Poster session

**Prof. Francesco Simionato Award**

Colleagues are encouraged to submit an abstract for poster presentation.

Poster abstract submission date: **February 12, 2018**

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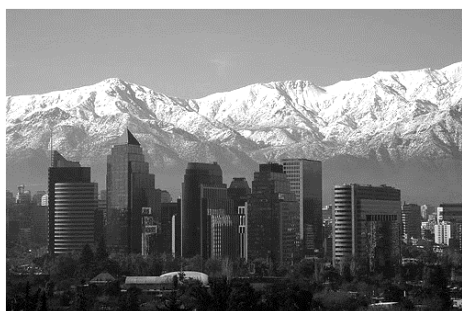
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***September 7-9, 2017***



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# Welcome Letter from the ICP Presidents

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Dear Colleagues:

Your Co-Presidents welcome all members and colleagues on behalf of the International College of Prosthodontists (ICP) to the 17th International Biennial Meeting in Santiago, Chile. Since the conception of the College in 1982, the ICP has matured into a broadly representative international organization of prosthodontists dedicated to promoting prosthodontic education, research and clinical advancement. The ICP has hosted successful international meetings for more than 30 years and membership has grown progressively to over a thousand members representing more than 70 countries. ICP meetings are large yet intimate enough for delegates to meet and network with the foremost leaders in the specialty of prosthodontics and learn from renowned international clinicians, teachers, researchers and academics. Another tradition of ICP meetings is the fostering of international fellowship and the promise of engaging social outings and fun activities. This tradition is guaranteed to continue here in Santiago.

This is the first occasion the ICP has held a scientific meeting in South America. Santiago is the capital of Chile nestled in the country's central valley at an elevation of 520m and within the embrace of the Andes. Santiago is a modern city with a charming history dating back to its foundation in 1541. In addition to the high value scientific meeting, there is much to see and do in and around Santiago, as well as it being the gateway this beautiful country. The venue for the 17th Biennial Meeting is the conveniently located CentroParque.

The ICP meeting is being held in conjunction with the Sociedad de Protesis y Rehabilitacion Oral de Chile (SPROCh). Our scientific program committee, headed by Drs. Dean Morton and Eugenio Neito Grez, have assembled a comprehensive field of national and international presenters that promises an outstanding program and learning experience. All fields of prosthodontic learning will be covered, as well as sessions dedicated to maxillofacial prosthodontics and special needs/geriatric dentistry.

The digital revolution is imposing considerable change within the entire health professions and the specialty of prosthodontics is not immune. Digital diagnostic protocols, access to digital surgical and restorative treatment protocols combined with CAD/CAM technologies has made it much easier for dental professionals to provide more complex, invasive and irreversible prosthetic interventions. The access to these technologies has no restriction and can include dental practitioners from the entire spectrum of training and experience. The scientific program committee considered it important to address this speed of information transfer with a focus on a core ethical principle of providing the least invasive and simplest treatment intervention aimed at meeting a patient's needs. The theme of "Less is More" was adopted to address this issue.

All ICP and SPROCh members and guests will be welcomed to Santiago in the time-honored manner with the promise of an outstanding learning experience and good fellowship. Your presence will benefit both yourself and the future welfare of your patients. Enjoy your time here with us in Santiago.

Sincerely,



A handwritten signature in black ink, appearing to read "Mario Bresciano".

**Dr. Mario Bresciano**  
Private Practice  
Torino, Italy



A handwritten signature in black ink, appearing to read "Brian Fitzpatrick".

**Dr. Brian Fitzpatrick**  
Private Practice  
Brisbane, Australia



# Welcome Letter from SPROCh President

---

Dear Colleagues:

It is a great pleasure for us, the Chilean Prosthodontic Society SPROCh, to welcome all of you. Thank you for taking a time off your busy schedules and come to our narrow piece of land in South America, geographically far, separated by millennial ices, arid deserts, high mountains and a vast ocean.

We are very proud that the ICP has given us the responsibility of hosting the first global meeting in South America and in a Spanish speaking country. The challenge is big and we have worked very hard for delivering up to your expectations.

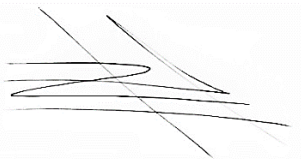
Hosting this meeting means very much for us, it is a great opportunity to have an event of this magnitude in our country, with all the presentations and knowledge from mainstream clinicians and researchers, and above all, the possibility to share with fellow colleagues from around the globe, which I believe have more things in common than separating us.

We feel privileged to have you here and being the world center of Prosthodontics for these three days. I'm sure you will leave an undeletable memory in Chilean Prosthodontic history.

Hope you enjoy your stay at Chile, it is a perfect time of the year, Spring is right around the corner, trees blossoming and still some snow to enjoy the slopes.

Have a great time in our country. Colleagues, welcome to Chile!

Sincerely,

A handwritten signature in black ink, consisting of several fluid, overlapping strokes.

**Dr. Carlos Parra Atala**  
President

Chilean Prosthodontic Society, SPROCh

# Welcome Letter from the Scientific Program Chairs

---

Dear Colleagues:

We are very honored to have been selected by the ICP to collaborate in this great event. We are grateful to co-Presidents Bresciano and Fitzpatrick, and all members of the Scientific Program Committee for their support in bringing such an exciting event together.

The ICP is a cross-border organization that transcends the boundaries of continents and nations, to bring together prosthodontic professionals who want to improve their knowledge and to increase contacts with colleagues around the world.

We recognize that many problems encountered by prosthodontists are common throughout the world, and solutions are sometimes hidden in the vast volume of information available. We know that our speakers will present a balance of contemporary information relevant to all participants and consistent with the theme of the meeting, 'Less is More'.

With the understanding that we live in the era of the immediate information, we appreciate the desire you will bring to this face-to-face event. We have included valid interlocutors, without commercial commitments and know they will each demonstrate what moves the world: the passion for our profession and our specialty.

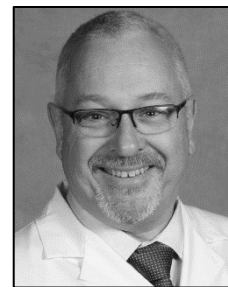
So, colleagues, we warmly welcome you to our congress, with the best wishes that we increase our knowledge and friendship.

Sincerely,



*Eugenio Nieto G.*

**Dr. Eugenio Nieto Grez**  
Cirujano-Dentista  
Especialista en Rehabilitación Oral e Implantología  
Santiago, Chile



*Dean Morton*

**Dr. Dean Morton**  
Indiana Dental Association Professor and Chair  
Department of Prosthodontics  
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## Supporting Organizations & Institutions

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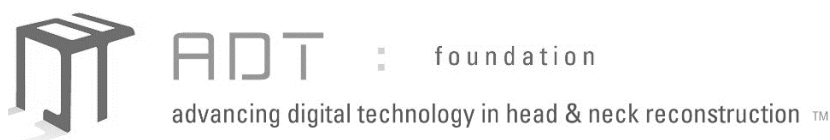
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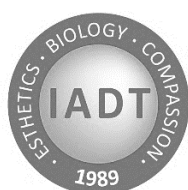


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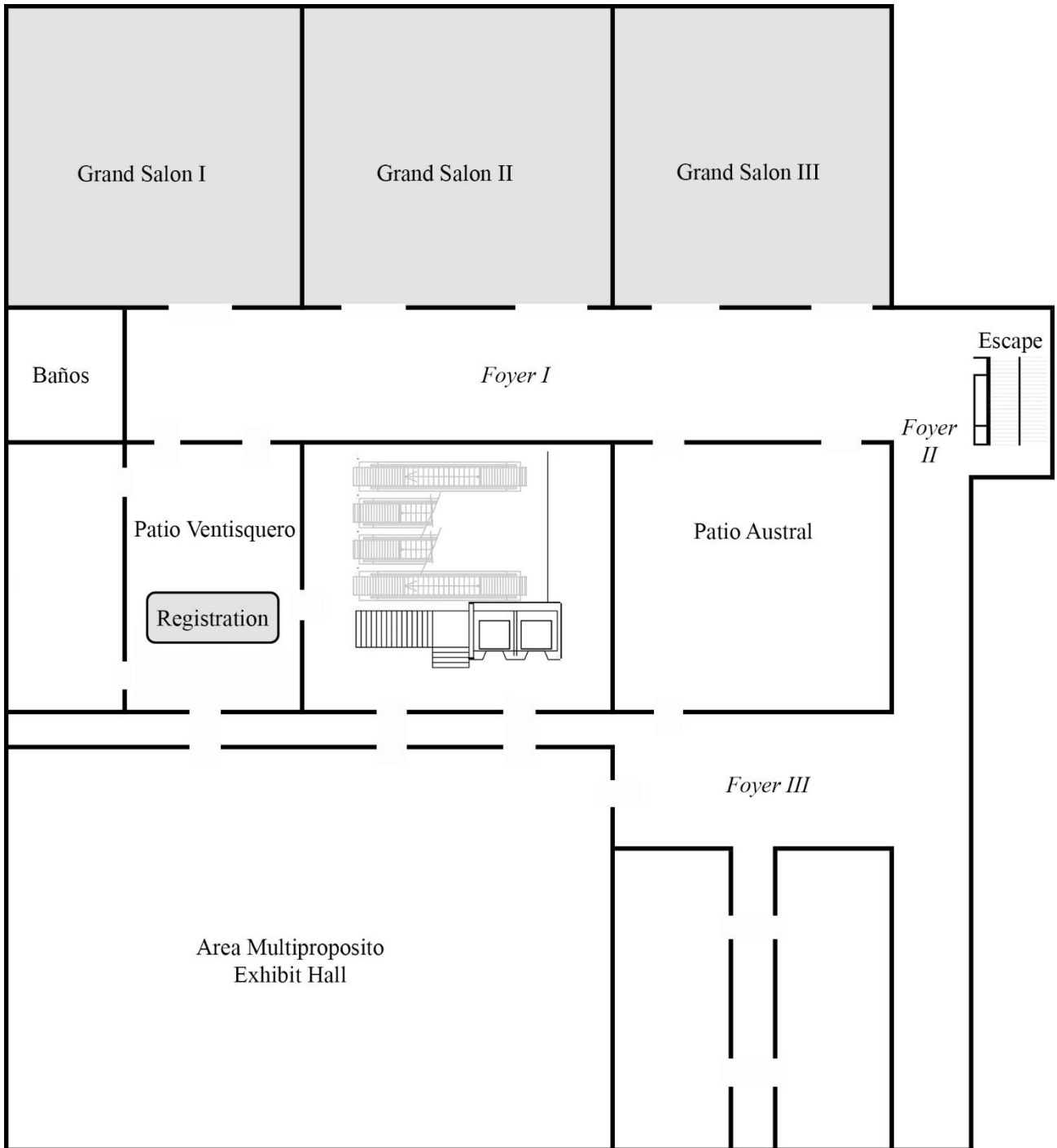
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## Elective Events

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Elective events are optional and are offered at an additional fee. Subject to availability.

### Wednesday, September 6<sup>th</sup>



Session 1

#### **Nobel Biocare Master Class Session #1 (09:00 - 12:00)**

##### ***TREFOIL CONCEPT- A Revolutionary Fixed Solution for Treating the Edentulous Mandible***

**Speaker:** Dr. Ruben Rosenberg

**Description:** Definitive teeth in a day - Dental implant patients increasingly are demanding immediate restorations. To meet those demands, dental professionals are seeking solutions with fewer surgical steps, shorter treatment time, high success rates, high patient satisfaction and function on the day of surgery. Trefoil is a cost-effective solution that makes fixed and definitive teeth on the day of implant surgery\* an option for more patients, using a prefabricated bar and just three implants.

**Objective:** In this master class participants will acquire the knowledge and understanding of the Trefoil Concept, how to identify the right patient plus clinical overview of surgical and prosthetic protocol. Clinical cases and patient insight on how Trefoil can transform patient's quality of life by delivering definitive prosthesis on day of surgery.

*Prior Registration Required* – see registration desk to check availability  
Workshop Fee: \$30.00 USD per person



Session 2

#### **Nobel Biocare Master Class Session #2 (14:00 - 17:00)**

##### ***All-On-4 Treatment Concept for an Immediate Temporary Bridge***

**Speaker:** Professor Sreenivas Koka

**Description:** All-On-4 treatment concept and review of various implant restorative solutions for the completely or soon to be edentulous patients. The hands-on workshop will focus on useful tips and tricks in conversion of denture into an All-On-4 provisional. Hands-on experience with components and steps to improve and make this chair-side step easier and more time efficient.

**Objective:** To provide full understanding of All-On-4 treatment concept, become familiar with restorative components for fabricating temporary bridge.

*Prior Registration Required* – see registration desk to check availability  
Workshop Fee: \$30.00 USD per person

### Thursday, September 7<sup>th</sup>



#### **Daily Spouse/Guest Tour: City Tour of Santiago (08:30 – 13:00)**

Join us for a city tour to the most interesting sites in Santiago, beginning with the historic downtown district, visiting Main Square, Cathedral, Post Office Headquarters, and Santiago City Hall. We will also see the Government House “La Moneda”. Afterward, we will take you to East Santiago, where you may appreciate modern buildings, with offices, apartments, shopping centers and restaurants.

08:30- Pick up at the Santiago Marriott- meet in hotel lobby  
13:00- Transferred back to the Santiago Marriott

Includes: transportation, English speaking guide, entrance fees

*Registration Required* – see registration desk  
Fee: \$35.00 USD per person

## Friday, September 8<sup>th</sup>



### **Daily Spouse/Guest Tour: Culinary Tour (10:00 – 13:00)**

The group will start at 10:00 AM savoring the morning, first at the Mercado Central, Santiago's celebrated fresh fish market which was listed by the National Geographic as one of the Top 10 Food Markets in the world; and we continue then to La Vega, the popular fruit and vegetable market and the perfect place to discover new flavors. The chef-instructor will guide you through the preparation of simple but delicious Chilean recipes and reveal some of her culinary secrets. Her knowledge of not only the cuisine but the culture of the region adds an energetic dimension to the class.

10:00- Pick up at the Santiago Marriott- meet in hotel lobby

13:00- Transferred back to the Santiago Marriott

Includes: transportation, English speaking guide, entrance fees

*Registration Required* – see registration desk

Fee: \$105.00 USD per person



### **ICP Reception & Banquet (19:30 – 22:30)**

Delegates and guests are invited to attend this gala event for the recognition of participating countries and their representatives, presentation of awards and installation of new officers. Entertainment, light appetizers, dinner and wine are included in this banquet event. The banquet will be held at the Santiago Marriott Hotel.

*Registration Required* – see registration desk

Fee: \$125.00 USD per person

Accompanying Guest/s requires "Guest Fee"

## Saturday, September 9<sup>th</sup>



### **ICP Social Outing (13:00 – 19:30)**

This year's social outing will take place at the Santa Rita Vineyard. The Santa Rita Vineyard represents a fascinating trip around the cultural heritage of Chile and the wine tradition, located just 45 minutes away from Santiago.

Includes: Private Cellars Tour plus tastings of 3 reserve wines, guided visit to Andean Museum, lunch at the Dona Paula Restaurant and transportation.

*Registration Required* – see registration desk

Fee: \$125.00 USD per person

Accompanying Guest/s requires "Guest Fee"

If you are interested in attending an event, please see the registration desk to check availability.

One voucher ticket will be provided per person.

Voucher tickets will be collected at the start of each event.

## Session Moderators

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### Thursday, September 7<sup>th</sup>

#### **Focus Session I Keynote Presentations**

Room Location: Grand Salon II & III

Mario Bresciano & Brian Fitzpatrick (09:00-12:00)

#### **Special Needs – Geriatrics**

Room Location: Grand Salon III

Steven Eckert & Dale Howes (13:30-15:30)

James Dudley & Marcio Grossi (16:00-17:40)

#### **Ceramics & Esthetics**

Room Location: Grand Salon II

Dean Morton & Eugenio Neto Getz (13:30-15:30)

Alon Preiskel & Hirofumi Yatani (16:00-17:40)

#### **Patient Specific Presentations**

Room Location: Grand Salon I

Ami Smidt & Xinquan Jiang (13:30-15:30)

Limor Avivi-Arber & Kaz Baba (16:00-17:40)

### Friday, September 8<sup>th</sup>

#### **Implant Prosthodontics**

Room Location: Grand Salon III

David Bartlett & David A. Felton (9:00-11:00)

Iven Klineberg & Raúl Frugone Zambra (11:30-13:00)

#### **Implants & Materials**

Room Location: Grand Salon III

Brian Fitzpatrick & Sreenivas Koka (14:30-15:50)

Thomas Taylor & David Chvartzaid (16:20-17:50)

#### **Digital Technology**

Room Location: Grand Salon II

Kenneth Malament & Rodrigo A. Giacaman (9:00-11:00)

Terry Walton (11:30-13:00)

#### **Fixed & Removable / Occlusion**

Room Location: Grand Salon II

Harold Preiskel & Winfried Walther (14:30-15:50)

Carlos Parra & Mats Kronstrom (16:20-17:50)

#### **Multidisciplinary Cooperation in Maxillofacial Rehabilitation: Not Always Less is More?**

Room Location: Grand Salon I

Claudio Brenner & Johan Wolfaardt (9:00-13:00)

### Saturday, September 9<sup>th</sup>

#### **Focus Session II Keynote Presentations**

Room Location: Grand Salon II & III

Nicola Zitzmann & Nico Creugers (9:00-12:15)



# Program Schedule Overview

## Tuesday, September 5<sup>th</sup>

09:00 - 17:00	<b>ICP Board Meeting</b> ( <i>Councilors Only</i> )
19:00	<b>Private President's Dinner</b> ( <i>Invite Only</i> )

## Wednesday, September 6<sup>th</sup>

09:00 - 17:00	<b>ICP Board Meeting</b> ( <i>Councilors Only</i> )
09:00 - 12:00	<b>Nobel Biocare Hands-On Session #1: TREFOIL CONCEPT- A Revolutionary Fixed Solution for Treating the Edentulous Mandible</b> ( <i>Elective- registration required</i> )
14:00 - 17:00	<b>Nobel Biocare Hands-On Session #2: All-On-4 Treatment Concept for an Immediate Temporary Bridge</b> ( <i>Elective- registration required</i> )
17:00 - 18:30	<b>Welcome Reception- Registration Opens</b>
18:30 - 20:00	<b>YPE Reunion</b> ( <i>Past YPE Delegates- Invitation Only</i> )

## Thursday, September 7<sup>th</sup>

(09:00 - 12:00)	<b>Focus Session I- Keynote Presentations</b> Moderators: Mario Bresciano & Brian Fitzpatrick		
09:00	* <b>Frank Spear:</b> <i>Enhancing Esthetic Outcomes by Integrating a Minimally Invasive Approach to Complex Dental Programs</i>		
09:30	* <b>Martin Chin:</b> <i>Less is More: New Window into How Bone Works</i>		
10:00 - 10:45	<b>AM Break / Exhibit Review</b>		
10:45	* <b>Kenneth Malament:</b> <i>Ceramic Science in Modern Prosthodontics</i>		
11:15	* <b>Ruben Rosenberg:</b> <i>An Adaptive Prefabricated Framework on Three Implants in the Mandible: The Trefoil Concept</i>		
11:45	<i>Discussion</i>		
12:00 - 13:30	<b>Conference Luncheon</b>		
(13:30 - 17:40)	<b>Special Needs - Geriatrics</b> Moderators: Steven Eckert & Dale Howes	<b>Ceramics &amp; Esthetics</b> Moderators: Dean Morton & Eugenio Neto Getz	<b>Patient Specific Presentations</b> Moderators: Ami Smidt & Xinquan Jiang
13:30	* <b>Clark Stanford:</b> <i>Concepts of Health, Oral Health and the Value Proposition for Tooth Replacement Therapies</i>	* <b>Markus Blatz:</b> <i>New Ceramics, CAD/CAM, and the APC Zirconia Bonding Concept</i>	<b>Claudio Morata:</b> <i>Determining the Occlusal Vertical Dimension through Craniometric Method in the Chilean Population</i>
13:40			<b>Noorein Hajira:</b> <i>Research Waste in Implant-related Research</i>
13:50	* <b>Frauke Müller:</b> <i>Implant Therapy in the Geriatric Patient</i>	* <b>Mauro Tosta:</b> <i>Esthetic Integration around Teeth and Implants</i>	<b>Carlos Parra:</b> <i>Orthodontic Site Development- An Alternative to Grafts in Implant Patient: A 7 Year Follow Up</i>
14:00			<b>Yuqiong Wu:</b> <i>Evaluation of Osteogenesis and Angiogenesis of Icarin in Local and Systemic Delivery for Calvarial Defect</i>

14:10	<i>cancellation</i>	<b>*Luiz Gonzaga:</b> <i>Overcoming Challenges in the Esthetic Zone with Materials and Techniques for Dental Implants Reconstructions</i>	<b>Sebastian Ordenes:</b> <i>Treatment of Diminished Vertical Dimension in a Patient with a History of Drug Addiction</i>
14:20			<b>Sudhir Bhandari:</b> <i>Impact of Unplanned Radiotherapy on Future Prosthodontic Treatment in Head and Neck Cancer Patients</i>
14:30	<b>*Jocelyn Feine:</b> <i>Implant Treatment and Quality of Life in Edentulous Elders</i>	<b>*Dean Morton:</b> <i>Contemporary Prosthodontics: Key Factors for Long-Term Success</i>	<b>Iven Klineberg:</b> <i>Occlusion, Mastication and Cognition</i>
14:40			
14:45			
14:50	<b>*Rodrigo A. Giacaman:</b> <i>Caries in the Elderly; Understanding the Disease, its Prevention and Evidence-based Treatment</i>	<b>*Diego Bechelli:</b> <i>Interdisciplinary Esthetic Approach Treating Tooth and Implants</i>	<b>Karen Bennie</b> (Grad Student): <i>A Full Mouth Rehabilitation: Factors to Consider in Treatment Planning</i>
15:00			<b>Avish Jagathpal</b> (Grad Student): <i>A Novel Case of Graftless Palatal Closure</i>
15:10	<b>Pooran Chand:</b> <i>Evaluation of Mandibular Advancement Device in Patients of Obstructive Sleep Apnea with Type 2-Diabetes Mellitus</i>	<b>*Terry Walton:</b> <i>Less is More or More is Better. Which Applies to Implant-related Site Preservation and Augmentation?</i>	<b>Jinhong Park</b> (Grad Student): <i>Full-mouth Rehabilitation by Maxillary Implant Overdenture and Mandibular Tissue Bar Retained Removable Partial Denture</i>
15:15			
15:20	<b>Marcio Grossi:</b> <i>Gender Differences in Temporomandibular Disorders: A Systematic Review and Metanalysis</i>		
15:30 - 16:00	<b>PM Break / Exhibit Review</b>		
	<b>Special Needs - Geriatrics (Cont.)</b> Moderators: James Dudley & Marcio Grossi	<b>Ceramics &amp; Esthetics (Cont.)</b> Moderators: Alon Preiskel & Hirofumi Yatani	<b>Patient Specific Presentations (Cont.)</b> Moderators: Limor Avivi-Arber & Kaz Baba
16:00	<b>Niraj Mishra:</b> <i>Assessment of Swallowing and Masticatory Performance in Obturator Wearers: A Clinical Study</i>	<b>Byung Suk Jung:</b> <i>The Fracture Resistance of Ceramic Materials</i>	<b>Yoav Pietrokovski:</b> <i>Evaluation of a Fluorescence Based Caries Aid Detector- An in Vivo Study - Preliminary Results</i>
16:10	<b>Elisabetta Bellia:</b> <i>Masticatory Function and Nutrients Intake in the Elderly: A Review of the Literature</i>	<b>Alejandra Seguel:</b> <i>Esthetic and Functional Management of Soft Tissue in Implant Dentistry</i>	
16:15			<b>Asher Zabrovsky:</b> <i>Retrospective Evaluation of Implant-Retained Mandibular Overdentures made by Students in Hadassah Dental School</i>
16:20	<i>cancellation</i>	<b>Ernesto Borgia:</b> <i>Posterior Bonded Ceramic Inlays/Onlays: Can they Survive for more than Ten Years in Function?</i>	
16:30	<b>Sunyoung Ma:</b> <i>Mandibular Single-Implant Overdentures: 7-Year Results of Randomized Controlled Trial</i>	<b>Eran Zenziper:</b> <i>Enhancing and Stabilizing Occlusion with Resin Bonded Restorations- A Minimally Invasive and CAD/CAM Approaches</i>	<i>cancellation</i>

16:40	<b>Gul Bahar Isik-Ozkol:</b> <i>Oral Health Related Quality of Life in Diabetic Elderly Patients</i>	<b>Shanshan Liang:</b> <i>Effect of Ferrule on the Fracture Resistance of Endodontically Treated Teeth</i>	
16:45			<b>Shalinie King:</b> <i>Developing a Type 2 Diabetic Rodent Model to Study the Effect of Diabetes on Osseointegration</i>
16:50	<b>Balendra Pratap Singh:</b> <i>Complete Edentulism: A Cause of Nutritional Deficiency in Elderly Women - A Randomized Controlled Trial</i>	<b>Baiping Fu:</b> <i>The Effects of Different Regions and Different Cut Directions on Bovine Enamel Bonding Strengths</i>	
17:00	<b>Leslie Laing:</b> <i>The Grouch Index: Almost Guaranteed to Bring a Smile</i>	<b>Tunde Radics:</b> <i>A Novel Method to Improve Adhesion between MDP Containing Resin Cements and Zirconia-Based Ceramics</i>	<b>Lianyi Xu:</b> <i>BMP-2 Based Gene Therapy Increases Bone Formation in the Rat</i>
17:10	<b>Matshediso Mthopi-Peri:</b> <i>Maxillofacial Rehabilitation in HIV Patients: The South African Experience</i>	<b>Siqian Wang:</b> <i>The Low Temperature Degradation Behavior of Zirconia Ceramic Sintered by Different Methods</i>	
17:15			Discussion
17:20	<b>Naofumi Niizeki:</b> <i>Effect of Powder-Water Ratio and Water Temperature of Alginate Impression Materials</i>	<b>Wieslaw Hedzelek:</b> <i>Effect of Grinding on Zirconia Dioxide Surface</i>	
17:30	<b>Sun Jong Kim:</b> <i>Retrospective Study on MRONJ in Patients with Maxillary Sinusitis</i>	<b>Philippe Mojon:</b> <i>Digital Dentistry and Metal-free Prosthodontics in Switzerland</i>	
17:40	<b>Session Adjourns</b>		
17:45 - 19:45 <b>Poster Session &amp; Exhibit Reception</b>			

## Friday, September 8<sup>th</sup>

(09:00 - 13:00)	<b>Implant Prosthodontics</b> Moderators: David Bartlett & David A. Felton	<b>Digital Technology</b> Moderators: Kenneth Malament & Rodrigo A. Giacaman	<b>Multidisciplinary Cooperation in Maxillofacial Rehabilitation: Not Always Less is More?</b> Moderators: Claudio Brenner & Johan Wolfaardt
09:00	<b>*Adam Hamilton:</b> <i>Immediate Loading with Digitally Prefabricated Restorations- is this the New Frontier?</i>	<b>*Daniel Wismeijer:</b> <i>Digitalisation: The Paradigm Shift in Dentistry</i>	<b>Harry Reintsema:</b> <i>Welcome</i>
09:10			
09:15			<b>Claudio Brenner:</b> <i>Zigomatic Implants and Microvascular Reconstruction- A Novel Approach to Maxillary Defects</i>
09:20	<b>David Chvartzaid:</b> <i>Multiple Implant Failure- The Current Evidence</i>	<b>Alon Preiskel:</b> <i>Corporate Dentistry: Friend or Foe?</i>	
09:30			
09:40	<b>*Steven Eckert:</b> <i>Minimally Invasive Dental Implant Treatment: Doing More with Less</i>	<b>*Christopher Evans:</b> <i>Implant Restorations- Can We Leave Castings Behind?</i>	<b>Felipe Bustos:</b> <i>Medical Factors and Decision Making in Microvascular Head and Neck Reconstruction</i>
09:50			
10:00	<b>*Waldemar Polido:</b> <i>Short and Ultra-Short Implants: Is Smaller Better?</i>	<b>*Wei-Shao Lin:</b> <i>Implant Dentistry in the Digital World</i>	<b>Ivan Caro:</b> <i>Digital Surgical Planning- Simplified Guides in Oncology</i>
10:10			

10:20	<b>*Thomas Taylor:</b> <i>Occlusion and Dental Implants: What Gives?</i>	<b>*Alejandro Lanis:</b> <i>Optimizing Dental Implant Treatment Through Digital Planning and Computer Guided Execution</i>	<b>Rodrigo Montes:</b> <i>Functional Reconstruction: Head and Neck Surgery and Maxillofacial Rehabilitation Together</i>
10:30			
10:40	<i>cancellation</i>	<i>cancellation</i>	<b>Rodrigo S. Gamarra:</b> <i>High Definition 3D Face Models for Facial Prosthesis Fabrication</i>
10:50	<b>Nicolás Riveros:</b> <i>Prosthetic Protocol for Complete Immediate Loading</i>	<b>Hiroki Kato:</b> <i>Evaluation of Wear Resistance of Indirect Composite Adopted Nano-Filler Technology</i>	<i>Discussion</i>
11:00 - 11:30	<b>AM Break / Exhibit Review</b>		
	<b>Implant Prosthodontics (Cont.)</b> Moderators: Iven Klineberg & Raúl Frugone Zambra	<b>Digital Technology (Cont.)</b> Moderators: Terry Walton	<b>Multidisciplinary Cooperation in Maxillofacial Rehabilitation: Not Always Less is More? (Cont.)</b> Moderators: Claudio Brenner & Johan Wolfaardt
11:30	<b>Raghuwar Dayal Singh:</b> <i>Three-dimensional Quantitative Analysis of the Bone Density of Mandibular Condyle in Dentulous and Edentulous Jaws</i>	<b>Caroline Nguyen:</b> <i>An Acrylic Repositioning Stent for Radiation Therapy: Description of a New Technique and Feasibility Study</i>	<b>Pablo Vasquez:</b> <i>Functional Outcomes in Head and Neck- Exploring Prehabilitation</i>
11:40	<b>Winfried Walther:</b> <i>Analysis of Clinical Complications of Functional Components in Dental Implant Treatment</i>	<b>Limor Avivi-Arber:</b> <i>Neurophysiological Considerations in Treatment Planning Dental Implant Therapy</i>	
11:50	<b>Sang Wan Shin:</b> <i>Treatment Outcomes of Mandibular Mini-implant Supported Overdentures: A 30-month Prospective Clinical Study</i>	<b>Thiago Dinato:</b> <i>CAD/CAM in Implant Dentistry</i>	<b>Veronica Sanhueza:</b> <i>Orthodontics in Maxillofacial Rehabilitation</i>
12:00	<b>Elham Emami:</b> <i>Tying Evidence-based Dentistry to Patient-centred Care: A Mixed-methods Analysis of Immediate Loading of Implant-overdenture</i>	<b>Pablo Atria:</b> <i>Digital Scanning Technique Versus Chemical Enamel Dissolution, Reliability of a Novel Non-destructive Three-dimensional Technique</i>	
12:10	<b>Chun Xu:</b> <i>Evaluation of Outcomes of Dental Implants Inserted by Flapless or Flapped Procedure: A Meta-analysis</i>	<b>Rodrigo S. Gamarra:</b> <i>Using a Smartphone to Obtain 3D Models: An Accessible Method for Making Facial Prostheses</i>	<b>Sue Gosen:</b> <i>Quality of Life- Patient Centered Outcomes in Head and Neck</i>
12:20	<b>Kyoungwoo Roh:</b> <i>Clinical Evaluation of Mandibular Implant Overdentures using Locator Implant Attachment and Locator Bar Attachment</i>	<b>Kyeonghwan Kang:</b> <i>Is it Possible for New Polymer Pekkton® to Replace the Conventional Prosthetic Framework?</i>	
12:30	<b>Christian Rochefort:</b> <i>Cementing of the Locator Fixing System</i>	<i>cancellation</i>	<i>Discussion</i>
12:40	<i>Discussion</i>	<i>Discussion</i>	
12:50			
13:00 - 14:30	<b>Conference Luncheon &amp; ICP Business Luncheon</b>		



(14:30 - 17:50)	<b>Implants &amp; Materials</b> Moderators: Brian Fitzpatrick & Sreenivas Koka	<b>Fixed &amp; Removable / Occlusion</b> Moderators: Harold Preiskel & Winfried Walther
14:30	~ <b>Julián Conejo:</b> <i>In-vitro Comparative Loading Capacity of CAD/CAM Monolithic Implant-Supported Crowns with 3 Different Materials</i>	* <b>David A. Felton:</b> <i>Complete Dentures without Dental Implants— No Longer a 'Plan B' Option</i>
14:50	* <b>Paul van Zyl:</b> <i>Less is More: Occlusal Considerations in the Interception and Treatment of Dental Attrition and Erosion</i>	* <b>Nicola Zitzmann:</b> <i>Combining Aesthetics and Good Cleanability- Design the Optimal Implant-Suprastructure</i>
15:10	* <b>Danielle Layton:</b> <i>In Research: To Assess the Less and More of More and Less</i>	* <b>David Bartlett:</b> <i>Wearing Away</i>
15:30	* <b>Thomas Salinas:</b> <i>Maxillofacial Reconstruction: From Intuitive Two-dimensional Planning to Modern Day Approach and Application</i>	* <b>Charlotte Stilwell:</b> <i>Strategic Use of Implant Abutments for Removable Partial Dentures</i>
15:50 - 16:20	<b>PM Break / Exhibit Review</b>	
	<b>Implants &amp; Materials (Cont.)</b> Moderators: Thomas Taylor & David Chvartzaid	<b>Fixed &amp; Removable / Occlusion (Cont.)</b> Moderators: Carlos Parra & Mats Kronstrom
16:20	* <b>Stephen M. Parel:</b> <i>The Edentulous Mandible Revisited- Is Less More?</i>	* <b>Iven Klineberg:</b> <i>The Evolution of Understanding and Management of the Occlusion- Reflections over the Last 50 Years</i>
16:40	<b>Xinquan Jiang:</b> <i>Enhanced Hard and Soft Tissue Integration Around Biofunctional Polyetheretherketone Implants</i>	* <b>Raúl Frugone Zambra:</b> <i>The Occlusal Plane within the Vertical Dimension: Analysis and Occlusometry Proposal</i>
16:50	<b>Yan Wang:</b> <i>The Osteogenesis Effect of a Titanium Surface with Nano-tubular Topography</i>	
17:00	<b>Michael Michael:</b> <i>Accurate Transfer of all Prosthodontic Diagnostic Information to Immediately-loaded Full-arch ISP: The MVD Appliance</i>	<b>Jung-Bo Huh:</b> <i>A Clinical Study of Distal Extension Removable Partial Denture with Implant Surveyed Bridge or Attachment</i>
17:10	<b>Asja Celebic:</b> <i>Mini Dental Implants in Strategic Positions for Better Retention and Stability of Removable Partial Dentures</i>	<b>Sunit Kumar Jurel:</b> <i>Functional Evaluation of Maxillectomy Patient undergoing Prosthetic Rehabilitation</i>
17:20	<b>Tsung-Chieh Yang:</b> <i>Bonding Strength and Irritation Test of New Tissue Conditioner using ATBC and High-molecular Weight Plasticizer</i>	<i>cancellation</i>

17:30	<b>Marco Roy:</b> <i>Photofunctionalization to Improve Peri-implant Seal and Abutments Bio-compatibility</i>	<i>cancellation</i>
17:40	<b>Nawal Alharbi:</b> <i>Additive Manufacturing in Prosthodontics: Facts and Challenges</i>	<i>cancellation</i>
17:50	<b>Session Adjourns</b>	
19:30 - 22:30	<b>ICP Reception &amp; Banquet</b> ( <i>Elective- registration required</i> )	

## Saturday, September 9<sup>th</sup>

07:00 - 08:00 **ICP Board Meeting** (*Councilors only*)

(09:00 - 12:15)	<b>Focus Session II- Keynote Presentations</b> Moderators: Nicola Zitzmann & Nico Creugers	
09:00	* <b>Johan Wolfaardt:</b> <i>Advanced Digitally- Driven Occlusion-Based Jaw Reconstruction: When More is Less</i>	
09:30	* <b>Ami Smidt:</b> <i>The Role of Retaining Teeth and Roots in the Comprehensive Prosthetic Rehabilitation Following Disease or Trauma</i>	
10:00 - 10:45	<b>AM Break / Exhibit Review</b>	
10:45	* <b>William C. Martin:</b> <i>Esthetic Risk Driving Implant Rehabilitation; Key Factors that Influence Outcomes</i>	
11:15	* <b>Jorge Jofré:</b> <i>Minimal Intervention Procedures in Implant Prosthodontics</i>	
11:45	<i>Discussion</i>	
12:00	<b>Conference Announcements</b>	
12:15	<b>Meeting Adjourns</b>	
13:00 - 19:30	<b>ICP Social Outing</b> ( <i>Elective- registration required</i> )	

### KEY

\* : Invited Speaker

~ : Winner of the Ivoclar Vivadent / ICP Research Fellowship in Dental Restorative Materials

(*Elective- registration required*): offered at an additional fee, subject to availability – see registration desk

Taking photos and/or videos of the presentations is strictly prohibited.  
Kindly be sure to silence your cell phones and devices during the presentations.



Views expressed by the presenters at the ICP Meeting are solely their own and do not necessarily reflect the positions or policies of the ICP. The ICP reserves the right to cancel or modify its program as circumstances might dictate.

# List of Poster Presentations

Listed by Presenting Author – Alphabetical (Last Name, First Name) by Topic:

## ► Digital Technology

#	Last, First	Poster Presentation Title
1	Daza, Victor	<i>One Session Plural Fixed Prosthesis with CAD-CAM System (CEREC System)</i>
2	Hashido, Kodai	<i>3D-Evaluation of CAD/CAM Crown Fit Utilizing Micro-computed Tomography</i>
3	Hsu, Chihyuan	<i>Evaluation of Denture Base Adaptation by CAD/CAM, 3D Printing and Conventional Method</i>
4	Igai, Fernando	<i>Comparative Analysis of the Accuracy of Printed Models Obtained from Intraoral Scanning</i>
5	<i>cancellation</i>	<i>cancellation</i>
6	Matsuda, Takashi	<i>Part-digitizing System for Complete Denture Fabrication using Digital Impression and Specialized CAD/CAM Tray</i>
7	Park, Yunjae	<i>Marginal and Internal Fit of Lithium Disilicate Crowns</i>
8	Taniguchi, Asuka	<i>Fabricating Removable Partial Dentures with CAD/CAM and Rapid Prototyping Technologies</i>
9	Velasco Guzman, Andrés	<i>Digital Articulators in the Reproduction of Static and Dynamic Interocclusal Contacts: A Narrative Review</i>
10	Xiong, Yaoyang	<i>Adaptation of Complete Denture Base Plates Cast from Wax Patterns Fabricated using a 3DP Technique</i>
11	<i>cancellation</i>	<i>cancellation</i>

## ► Esthetics and Ceramics

#	Last, First	Poster Presentation Title
12	Hadzelek, Wieslaw	<i>Influence of Different Light Sources on Tooth Shade Selection for Indirect Restorations</i>
13	Huang, Cui	<i>Quercetin/Ethanol as a Simple but Versatile Primer in Dentin Bonding</i>
14	Roulet, Jean-Francois	<i>The Effect of Ceramic Light Scattering and Beam Profile on the Irradiance of Luting Cements</i>
15	Henrique Rubo, José	<i>Fit of Y-TZP Copings in Function of the Dimensional Changes from the Sintering Process</i>
16	Thokoane, Meriting	<i>Aesthetics, Not Just a Smile</i>
17	Zhu, Ziyuan	<i>Influence of Thickness and Low-temperature Degradation on Properties of Dental Zirconia</i>

## ► Fixed and Removable / Occlusion

#	Last, First	Poster Presentation Title
18	<i>cancellation</i>	<i>cancellation</i>
19	Berteretche, Marie Violaine	<i>Evaluation of Masticatory Performances of Patients with Shortened Dental Arches</i>
20	Fernández, Enrique	<i>Occlusal Vertical Dimension by Anthropometry of Hand's Fingers</i>
21	Geerts, Greta	<i>Neutral Zone or Conventional Mandibular Dentures: A Cross-over Trial Comparing Oral-health Related Quality of Life</i>
22	Hong, An	<i>Three Dimensional Finite Element Study on the Restoration of Anterior Teeth with Abnormal Anterior Teeth</i>
23	Iida, Takashi	<i>Effect of Bruxism for Brain Structure</i>
24	Jang, Geunwon	<i>Removable Partial Denture Repair using DMLS Technique: Case Report</i>
25	Jiang, Qingsong	<i>The Effect of Occlusal Support Loss on Cognitive Impairment in Rats with Chronic Cerebral Ischemia</i>

26	Jo, Yujin	<i>Gold Coping-supported Overdenture Treatment in a Patient with Severely Worn Dentition: A Case Report</i>
27	Jung, Sua	<i>Complete Suction Denture for Edentulous Patient with Excessive Flabby Tissue and Severe Alveolar Bone Resorption</i>
28	Kim, Taeyoon	<i>Comparison Edentulous Impression Surfaces Between Open and Closed Mouth Technique through Three Dimensional Analysis</i>
29	Larrucea, Carlos	<i>Distribution and Intensity of Oclusal Contacts Between Common and Non-Common Side of Bite</i>
30	Lee, Gyeongje	<i>Eccentric Occlusal Contact Analysis of Bruxism Patients</i>
31	Nishimori, Hideta	<i>Effect of Relief Space for Impression Pressure in Edentulous Model</i>
32	Osman Latib, Yasmin	<i>The Penetration and Disinfection of Candida Albicans in Denture Base Resin</i>
33	Phang, Ziying	<i>Success and Survival of Post-retained Fixed Dental Prostheses in Premolars</i>
34	<i>cancellation</i>	<i>cancellation</i>
35	Sato, Yuji	<i>Denture Status in Elderly in Japan as the Top Runner in Ultra-aged Society</i>
36	<i>cancellation</i>	<i>cancellation</i>
37	Tezvergil-Mutluay, Arzu	<i>Fracture Strength and Fatigue Resistance of Fiber-reinforced Cantilever Restorations</i>
38	<i>cancellation</i>	<i>cancellation</i>

## ► Implants / Materials

#	Last, First	Poster Presentation Title
39	Abduo, Jaafar	<i>Prospective Randomized Controlled Clinical Trial Comparing Encode Protocol against Conventional Protocol for Restoring Single Implants</i>
40	Abe, Yuka	<i>Assessment of OHRQoL in Patients Treated with Implant Assisted Removable Dentures</i>
41	Bhandari, Sudhir	<i>Designing Mandibular Central Incisors on One, Single Piece Implants: 4 Years Outcome</i>
42	Carrasco, Oscar Eduardo	<i>Conservative Rehabilitation of the Completely Edentulous Patient</i>
43	Chen, Su	<i>FEA of Occlusion on Prostheses for Completely Edentulous Mandibles with All-on-4 Concept</i>
44	Costa, Tiago	<i>Immediate vs. Early Loading of Single Dental Implants: A Systematic Review and Meta-analysis</i>
45	Del Rio Highsmith, Jamie	<i>In Vitro Study of Screw Loosening of Abutments with Internal Connection Depending on the Angulation</i>
46	Dinato, Thiago	<i>Marginal Bone Loss in Implants Placed in the Maxillary Sinus Grafted with Anorganic Bovine Bone</i>
47	Hajira, Noorien	<i>Diagnosis and Management of Biological Implant Complications: A Case Report</i>
48	<i>cancellation</i>	<i>cancellation</i>
49	Huang, Bo	<i>Degradation of Resin-Dentin Interface In Vitro is Dependent on Restorative Materials and MMP Inhibition</i>
50	Iegami, Carolina	<i>Survival Rate of Titanium-zirconium Narrow Diameter Dental Implants: A Systematic Review</i>
51	Kanazawa, Manabu	<i>Immediate Loading of Two-implant Mandibular Overdentures: 5-year Prospective Study</i>
52	Kim, Sun Jong	<i>Maxillary Implant-supported Telescopic Overdentures with CAD/CAM Customized Abutment and Arch-friction-soft System</i>
53	King, Shalinie	<i>Developing a Type 2 Diabetic Rodent Model to Study the Effect of Diabetes on Osseointegration</i>
54	Komagamine, Yuriko	<i>Comparison of Patient-reported Outcomes Between Immediately and Conventionally Loaded Mandibular Two-implant Overdentures</i>
55	Kwon, Kung-Rock	<i>The Effect of Cyclic Loading on the Retentive Force of the Cementless Fixation (CLF) System: A Novel Retrievable Type of Implant Prosthesis</i>
56	Lin, Yen-Yu	<i>Correlation Between Implant Stability Parameters in Iliac Bone Blocks of Swine</i>
57	Pei, Dandan	<i>Effect of Nano-hydroxyapatite Desensitizing Paste on Dentin Tubular Occlusion and Bond Strength of Self-etch Adhesive</i>



58	Ponce de León Yáñez, Enrique	<i>Osseointegrated Implants as Auxiliary Pillars in Removable Partial Dentures: Case Report</i>
59	Seguel, Alejandra	<i>The Strategic Use of the Nasopalatine Canal for Full Arch Implant Rehabilitation</i>
60	Sun, Jian	<i>Effects of Ceramic Density and Sintering Temperature on Mechanical Properties of Polymer Infiltrated Ceramic</i>
61	Wang, Siqian	<i>Effect of Different Surface Treatments on Shear Bond Strength of Zirconia Cemented to Veneering Ceramic</i>
62	Watanabe, Megumi	<i>The Effect of ELF Pulsed Magnetic Fields on Osteoblast Differentiation via MAP Kinase Pathways</i>
63	Yoon, Hyung-In	<i>Three-dimensional Deformation of Internal Implant-abutment Connection: A Biomechanical Comparison Between Titanium and Zirconia</i>

## ► Maxillofacial Rehabilitation

#	Last, First	Poster Presentation Title
64	Barrio, Pamela	<i>Prosthetic Rehabilitation in a Patient with Osteogenesis Imperfecta</i>
65	Bennie, Karen	<i>Metamerism of Three Different Pigments for Facial Prostheses and a Method to Improve Shade Evaluation</i>
66	Bwerinofa, Dikhabiso Vivian	<i>Osseointegration and Radiation in Head and Neck Malignancy</i>
67	Celebic, Asja	<i>Preliminary Study on the Usefulness of Plasma Rich Fibrin (PRF-i) in TMD Intra-articular Painful Conditions</i>
68	Chung, Yoojin	<i>Prosthetic Rehabilitation of a Fully Edentulous Patient after Maxillectomy</i>
69	Ryu, Junghyun	<i>Implant Rehabilitation using Orthodontic Treatment for an Oligodontia Patient with Loss of Vertical Dimension</i>
70	Saito, Konatsu	<i>Effect of EMG Biofeedback Training for Daytime Clenching on Regulation of Grinding during Sleep</i>
71	Zavada, Richard	<i>Prefabricated Radial Bony Forearm Free Flap for Secondary Reconstruction in Cleft Lip and Palate</i>

## ► Special Needs / Geriatrics

#	Last, First	Poster Presentation Title
72	Freitas De Souza, Raphael	<i>Single-implant Overdentures Retained by the Novaloc Attachment System: Protocol for a Mixed-methods Randomized Trial</i>
73	Kishimoto, Takahiro	<i>Differences in Prefrontal Activities Under Sensory Integration Task: Comparison Between Incisor and Molar Teeth</i>
74	Laing, Leslie	<i>Sjögren's Syndrome and Edible Oils: More than Whistle-Whetting Agents</i>
75	Moipolai, Pusetso Dineo	<i>Post-Graduate Specialist Prosthodontic Training in South Africa- Where is it going?</i>
76	Niibe, Kunimichi	<i>Novel Spheroid Culture of Mesenchymal Stem Cells for Regenerative Prosthodontics</i>
77	Takaharu, Goto	<i>Influence of Solitary Eating in the Elderly on Symptoms on "Oral Frailty" and "Physical Frailty"</i>
79	Wang, Huey-Jen	<i>Use of Geranylgeraniol (GGOH) to Rescue Bone Regeneration Impaired by Bisphosphonate- An In Vivo Study</i>
79	Zheng, Dongxiang	<i>Effect of Subpressure Technique on the Penetration Ability of Pit and Fissure Sealant in Vitro</i>

Views expressed by the presenters at the ICP Meeting are solely their own and do not necessarily reflect the positions or policies of the ICP. The ICP reserves the right to cancel or modify its program as circumstances might dictate.

# Invited Speakers



*Listed in Presenting Order, as seen on the Program Schedule*

## Invited Speakers

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*Listed in Presenting Order, as seen on the Program Schedule:*



**Frank M. Spear, DDS, MSD**  
Spear Education  
Scottsdale, Arizona, USA

As the founder and director of Spear Education, Dr. Spear continues to be recognized as one of the premier educators in esthetic and restorative dentistry in the world today. Dr. Spear earned his dental degree from the University of Washington in 1979, and an MSD in periodontal prosthodontics in 1982, also from the University of Washington. Dr. Spear is an Affiliate Professor in the graduate prosthodontics program at the University of Washington. He and longtime practice partner Dr. Gregory Kinzer maintain a private practice in Seattle limited to esthetics and fixed prosthodontics. Dr. Spear has been recognized by numerous associations for his contributions to dentistry. In 1993, he was awarded the Christensen Award for Excellence in Restorative Education from the Chicago Dental Society. In 1995, the American Academy of Cosmetic Dentistry presented him with a special award for having advanced the Art and Science of cosmetic dentistry in the United States. In 1996, he received the Saul Schluger Memorial Award for Excellence in Diagnosis and Treatment Planning from the Seattle Study Club. He and colleague Vincent G. Kokich were awarded the first ever Presidents Award for excellence in education from the American Academy of Esthetic Dentistry. He also earned the 2004 Distinguished Alumnus Award from Pacific Lutheran University his undergraduate Alma Mater. And in 2013 was named Distinguished Alumnus for the University of Washington School of Dentistry.



**Martin Chin, DDS**  
Oral & Maxillofacial Surgery  
California Pacific Medical Center  
San Francisco, California, USA

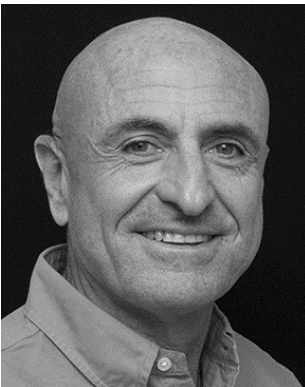
Martin Chin, DDS is an oral and maxillofacial surgeon. He completed dental and specialty training in oral and maxillofacial surgery at the University of California, San Francisco. He is a diplomate of the American Board of Oral and Maxillofacial surgery and a fellow of the American College of Dentists. He maintains a private practice at California Pacific Medical Center in San Francisco. His practice focuses on orthognathic, craniofacial, and dental implant surgery. He developed devices and techniques for distraction osteogenesis of the orbit, midface and alveolar process. Multiple US and international patents have been granted to him for these innovations. His combined interest in craniofacial disorders and developmental anatomy resulted in the development of new treatment concepts that exploited preserved embryonic processes to achieve successful regeneration. He is the founder and director of the Beyond Faces Foundation that supports treatment of children with craniofacial disorders.



**Kenneth A. Malament, DDS, MScD**

President-Elect, Academy of Prosthodontics  
Secretary, American Academy of Esthetic Dentistry  
Clinical Professor at Tufts University  
Course Director in Postgraduate Department of Prosthodontics  
Boston, Massachusetts, USA

Dr. Malament received his D.D.S. from N.Y.U. College of Dentistry and a specialty certificate and Master's degree from Boston University School of Graduate Dentistry. Dr. Malament has a full-time practice limited to prosthodontics in Boston that includes a dental laboratory with master dental technologists. A Past-President of the American Board of Prosthodontics, he is a Clinical Professor at Tufts University and a Course Director in the postgraduate department of Prosthodontics. Dr. Malament is a Fellow of the American College of Prosthodontists, Academy of Prosthodontics, Greater New York Academy of Prosthodontics, and Northeastern Gnathological Society and a Past President of the Greater New York Academy of Prosthodontics, Northeastern Gnathological Society and the American Academy of Dental Science. He has served as the Secretary and Director of the American College of Prosthodontists and Secretary-Treasurer of the International College of Prosthodontists. He presently serves as President-elect of the Academy of Prosthodontics and Treasurer of the American Academy of Esthetic Dentistry. Dr. Malament has been the recipient of significant awards in Prosthodontics including the American College of Prosthodontists' Clinician / Researcher Award, Daniel F. Gordon Award for Lifetime Achievement and Distinguished Lecturer Award, the American Academy of Fixed Prosthodontics' George Moulton Award for Outstanding Achievement, the Greater New York Academy of Prosthodontics Distinguished Lecturer Award, the European Academy of Esthetic Dentistry John McLean Honorary Lecture Award and the first Frank V. Celenza Memorial Award from the Northeastern Gnathological Society. Dr. Malament was on the research and development teams for two different well-known ceramic products and developed instrumentation used in clinical practice.



**Ruben Rosenberg, DDS**

Oral Surgeon  
Director Nobel Biocare Training Center  
Clinical Researcher Multicentric Research Nobel Biocare  
Director Ruben Rosenberg & Associates Clinic  
Santiago, Chile

Dr. Ruben Rosenberg received his DDS degree from University of Chile in 1981 and then in Cagliari University Italy his postgraduate education in Oral Surgery was held at Pierre et Marie Curie University France, was formed in advanced osseointegration surgery by Prof Per Ingvar Branemark, He has published as co-author two textbooks with Prof Branemark. Visitor Prof at: University of Chile, University Francisco Marroquin Guatemala, University Cayetano Heredia Peru and Catholic University Uruguay. Dr. Rosenberg is in private practice since 1985 working exclusively in Implant surgery with over 130.000 implants placed. He is currently Head of Nobel Biocare Training Center in Chile. In his practice, he mostly focused on immediate loading as well in atrophic and discontinued maxillary bones. He is currently conducts a number of courses in his private clinic and has been speaker at scientific meetings worldwide.





**Clark M. Stanford, DDS, PhD**  
UIC Distinguished Professor and Dean  
The University of Illinois at Chicago College of Dentistry  
Chicago, Illinois, USA

Dr. Clark Stanford DDS, Ph.D. is UIC Distinguished Professor and Dean, The University of Illinois at Chicago, College of Dentistry in Chicago, Illinois. He holds a secondary appointment the Department of Bioengineering, College of Engineering. He received his BS (1984), DDS (1987), Certificate in Prosthodontics and Ph.D. (Cell Biology; 1992) from the University of Iowa. He was on the Iowa faculty until 2014. He is the author of 24 chapters and more than 150 papers. He is the recipient of 15 academic awards including the 2007 State of Iowa Regents Award for Faculty Excellence and the IADR Distinguished Scientist Award (2007).



**Frauke Müller**  
Professor & Chair  
Gerodontology & Removable Prosthodontics  
University of Geneva  
Geneva, Switzerland

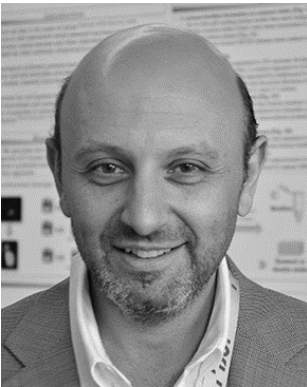
Frauke Müller is professor and chair for gerodontology and removable prosthodontics at the University of Geneva. She was born in Kiel, Germany and studied dentistry in Bonn, where she received her Dental and Doctorate Degree. Until 2003, she worked at the Department of Prosthetic Dentistry of the University of Mainz, Germany where she received her habilitation (PD). She spent several years at the London Hospital Medical College, England. Professor Müller is Past-President of the ECG (European College of Gerodontology), the GORG of IADR (Geriatric Oral Research Group) and the Swiss Society for Gerodontology and Special Care Dentistry (SSGS). Since 2017 she is President of the Prosthodontic Research Group of the IADR. She is member of the ITI Board of Directors (International Team for Implantology) and author of the ITI Treatment Guide no 9 on “Implant therapy in the Geriatric Patient”. Frauke Müller is Associate Editor of Gerodontology and edited the textbook “Oral Healthcare and The Frail Elder” and author of the ITI Treatment Guide “Implant therapy for the Geriatric Patient”. In 2013, she was awarded the IADR Distinguished Scientist Award in Geriatric Oral Research. Her research activity is mainly related to gerodontology, oral function as well as complete and implant prosthodontics.



**Jocelyne F. Feine, DDS, MS, HDR**

Oral Health & Society Division  
Faculty of Dentistry, McGill University  
Assoc. Member  
Dept. of Epidemiology & Biostatistics, Dept. of Oncology  
Faculty of Medicine, McGill University  
Montreal, QC, Canada

Jocelyne Feine is Professor in the Faculty of Dentistry and Associate Member in the Department of Epidemiology & Biostatistics and the Department of Oncology, Faculty of Medicine, McGill University, Canada. She is recipient of the ADA Norton Ross Award in Clinical Research, the IADR Distinguished Scientist Award and the IADR Service Award; she is also Editor-in-Chief of the JDR Clinical and Translational Research (JDR CTR). Professor Feine is a recognized world leader in the assessment of therapies for chronic orofacial conditions, particularly pain and tooth loss. Her national and international studies emphasize the quality of life and patient-based outcomes most relevant for therapeutic goals. A proponent of interdisciplinary research, Professor Feine works with expert teams of local and international collaborators in relevant fields. The manuscripts produced from these studies have been published in high quality, peer-reviewed international dental and medical journals. Professor Feine's work has been presented to university and professional audiences worldwide.



**Rodrigo A. Giacaman, DDS, PhD**

Associate Professor and Director of the Graduate School  
Director of the Cariology Unit  
Founder of the Research Group of Geriatric Dentistry  
University of Talca  
Talca, Chile

Dr. Rodrigo A. Giacaman is a DDS (1994) and Prosthodontist (1999) from the University of Chile. He earned the PhD in Oral Biology at the University of Minnesota, USA in 2007. Currently Dr. Giacaman is Associate Professor of the Department of Oral Rehabilitation at the Faculty of Health Sciences of the University of Talca, Chile and the Director of the Graduate School of the Academic Vice-rectory of the University of Talca. At the University of Talca, Dr. Giacaman is the director of the Cariology Unit, teaches several undergraduate and graduate level courses and is faculty member for the Master's Program in Geriatric Dentistry and for the doctoral program in Biomedical Sciences, where he has served as advisor for many undergraduate, Master's and PhD students in Chile and abroad, mainly in Cariology topics. Dr. Giacaman was the founder of the Geriatric Dentistry Research Group (GIOG), the Cariology Unit and coordinates the Interdisciplinary Excellence Research Program in Healthy Aging (PIEI-ES) of the University of Talca. He has authored more than 50 indexed publications ISI/SCOPUS/PubMed/Scielo and has worked as principal investigator in many national and international grants, all of them related to caries research. He is also part of the editorial committee and is reviewer in several national and international journals. Dr. Giacaman actively participates in the Cariology Group of IADR and in ORCA and he has been regularly invited as keynote speaker in national and International conferences.



**Markus B. Blatz, DMD, PhD**  
Department of Preventive & Restorative Sciences  
University of Pennsylvania School of Dental Medicine  
Philadelphia, Pennsylvania, USA

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, where he also founded the Penn Dental Medicine CAD/CAM Ceramic Center. Dr. Blatz graduated from Albert-Ludwigs University in Freiburg, Germany, and was awarded additional Doctorate Degrees, a Postgraduate Certificate in Prosthodontics, and, most recently, Professorship from the same University. Dr. Blatz is co-founder and past President of the International Academy for Adhesive Dentistry (IAAD). He is a Board-certified Diplomat in the German Society for Prosthodontics and Biomaterials (DGPro) and a member of multiple other professional organizations, including the American and the European Academies of Esthetic Dentistry, the International and the American College of Prosthodontics, Academy of Osseointegration, and O.K.U. Honor Dental Society. He serves on the editorial boards of numerous recognized scientific dental journals and is Associate Editor of Quintessence International as well as 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.



**Mauro Tosta, DDS, MSc, PhD**  
Private Practice  
Tosta Odontologia  
São Paulo, Brazil

Mauro Tosta, DDS, MSc, PhD, is a specialist in Periodontology and Dental Implantology; an active international lecturer and owns a private practice focused in Esthetic Dentistry, Oral Rehabilitation, Periodontics and Implantology in São Paulo, Brazil. He is the author of Wiley Blackwell new upcoming textbook entitled: "Decision Making in Dental Implantology: Atlas of Surgical and Restorative Approaches".



**Luiz H. Gonzaga, DDS, MS**  
Clinical Assistant Professor  
Oral & Maxillofacial Surgery  
Center for Implant Dentistry  
University of Florida, College of Dentistry  
Gainesville, Florida, USA

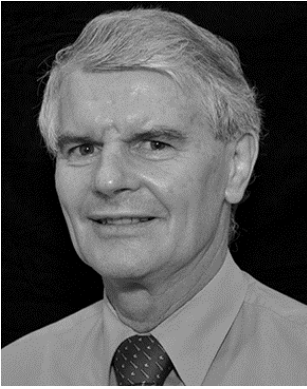
Luiz H. Gonzaga, DDS, MS graduated from the Catholic University of Brasilia College of Dentistry in 2004. After working in private practice and taking perio/implants CE courses for one year he was accepted for the Implant/Periodontic specialty training, graduating in 2009. Dr. Gonzaga was awarded with the ITI scholarship in 2010 and completed his OMFS fellowship that same year. He was accepted to the graduate Prosthodontics program at the University of Florida in 2011 and is the current Clinical Assistant Professor at the University of Florida Center for Implant Dentistry. Dr. Gonzaga is a ITI speaker and Fellow of the International Team for Implantology, the American College of Prosthodontics, the American Equilibration Society, the Academy of Osseointegration.



**Diego Bechelli, DDS**  
Authorized Professor AOA  
Associate Professor, University of Rosario  
Private Practice  
Buenos Aires, Argentina

Dr. Bechelli graduated from the University of Buenos Aires (Argentina) in 2000. After that, he made his specialization in Periodontology (2007) and also became ITI member. He is speaker and fellow of the ITI Argentina & Uruguay Section and also runs a Study Club in Buenos Aires. Dr. Bechelli is a private practitioner in Buenos Aires and leads and interdisciplinary team (grupo ABC) teaching and publishing in the field of Rehabilitation and Implantology locally and internationally.





**Terry Walton AM, BDS (Syd), MDSc,(Syd) MS (Mich),  
FRACDS, FICD**  
Professor Affiliate in Clinical Dentistry  
University of Sydney  
Sydney, Australia

Dr. Terry Walton graduated Bachelor of Dental Surgery and Master of Dental Science from the University of Sydney in 1974 and 1979 respectively; Master of Science (Prosthodontics) from the University of Michigan in 1981 and Doctor of Dental Science from the University of Sydney in 2013. He is a Fellow of the Royal Australasian College of Dental Surgeons, the International College of Dentists and the Pierre Fauchard Academy. Dr. Walton has been in Specialist Prosthodontist practice in Sydney since 1983 and holds the title of Professor Affiliate in Clinical Dentistry at the University of Sydney. He is a member of many Australian and International dental organizations and was the Co-President of the International College of Prosthodontists during 2000 and 2001. Dr. Walton has been involved in practice-based clinical research into the long-term outcome and patient evaluation of tooth and implant-supported dental prostheses.



**Adam Hamilton, BDS, DCD**  
Lecturer in Advanced Graduate Implant Dentistry  
Department of Restorative Dentistry & Biomaterial Sciences  
Harvard School of Dental Medicine  
Boston, Massachusetts, USA

Dr. Adam Hamilton is a full-time lecturer in Advanced Graduate Implant Dentistry and the interim director of the Division of Regenerative and Implant Sciences at the Harvard School of Dental Medicine. He completed his general dental education at the University of Western Australia and has a Doctorate in Clinical Dentistry in the specialty of Prosthodontics from the University of Melbourne, Australia. He is a Fellow of the Royal Australasian College of Dental Surgeons and the International Team for Implantology (ITI). He was the recipient of an ITI scholarship through which he completed a Fellowship in Oral and Maxillofacial Surgery at University of Florida's Center for Implant Dentistry. He has conducted research into the fit of CAD/CAM implant abutments and has a special interest in dento-facial esthetics and implant rehabilitation of the edentulous patient. He also maintains a part time clinical practice focusing on prosthodontic and implant treatment at the Harvard Dental Center.



**Steven Eckert, DDS, MS**  
Professor Emeritus in Dentistry  
Mayo Clinic College of Medicine  
Edina, Minnesota, USA

Steven Eckert attended the Ohio State University College of Dentistry and completed a General Practice Residency at Mt. Sinai Hospital in Chicago. This was followed by a private practice with teaching responsibilities at Loyola University School of Dentistry. In 1985, he elected to pursue graduate training at the Mayo Clinic in the Specialty of Prosthodontics. He completed this program along with a Master of Science degree and was invited to remain on staff at the Mayo Clinic where he served as Graduate Program Director for Prosthodontics. In 2010, he retired from the Mayo Clinic only to begin a full time private practice devoted to implant dentistry. He remains Professor Emeritus in Dentistry at the Mayo Clinic College of Medicine. His professional career has allowed him the opportunity to be involved in many organizations within dentistry. He has been president of the Academy of Osseointegration, American Academy of Maxillofacial Prosthetics, Academy of Prosthodontics and the American Board of Prosthodontics. In 2017, he received the Brånemark Award from the Osseointegration Foundation. Dr. Eckert has written extensively about implant dentistry and other prosthodontic topics. He has been an editor for three scientific journals and is currently Editor-in-Chief for the International Journal of Oral and Maxillofacial Implants, a position he has held for more than a decade.



**Waldemar D. Polido, DDS, MS, PhD**  
Oral and Maxillofacial Surgery  
Indiana University School of Dentistry  
Indianapolis, Indiana, USA

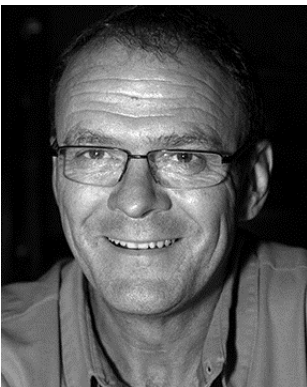
Clinical Professor, Director of the Pre-Doctoral Oral and Maxillofacial Surgery Program and Co-Director of the Center for Implant, Esthetic and Innovative Dentistry, Indiana University School of Dentistry, Indianapolis, USA. Oral and Maxillofacial Surgeon, with a MS and PhD degrees from the PUCRS School of Dentistry, Porto Alegre, RS, Brasil. Residency in Oral and Maxillofacial Surgery, University of Texas, Southwestern Medical Center at Dallas, USA. He is a fellow of the ITI - International Team for Implantology. Waldemar is a member of the ITI Education Committee, 2015-2018. Education Delegate for the ITI Brasil Section 2016-2019; Coordinator of the ITI Education Week Porto Alegre, Brasil. He is a Board Member and Diplomate of the IBCSOMS (International Board for Certification of Specialists in Oral and Maxillofacial Surgeons). Reviewer for the IJOMS (International Journal of Oral and Maxillofacial Surgery), and IJOMI (International Journal of Oral and Maxillofacial Implants). His focus on advanced and complex surgical treatments in Implant Dentistry.



**Thomas D. Taylor, DDS, MSD, FACP**

Professor & Head, Dept. of Reconstructive Sciences  
Chairman, Division of Prosthodontics  
University of Connecticut School of Dental Medicine  
Farmington, Connecticut, USA

Dr. Taylor is professor and head, Department of Reconstructive Sciences and chairman, Division of Prosthodontics at the University of Connecticut School of Dental Medicine. He is involved in both clinical and laboratory research and has published extensively in the prosthodontic literature. He is a past editor of the International Journal of Oral and Maxillofacial Implants. Dr. Taylor currently serves as executive director of as well as being past president of the American Board of Prosthodontics. He is also past president of the American College of Prosthodontists, the International College of Prosthodontists and the International Team for Implantology (ITI). He is past president of the Academy of Prosthodontics and the Greater New York Academy of Prosthodontics.



**Paul van Zyl, BChD, MChD**

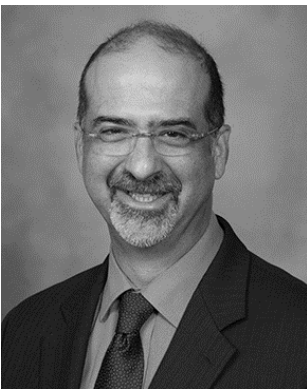
Private Practice, Prosthodontist  
Cape Town, South Africa

Dr. Paul van Zyl obtained his dental degree (B.Ch.D.) from the University of Stellenbosch Dental Faculty, South Africa, in 1984. After a few years in general practice he started his post-graduate studies at the same university in 1989. He obtained his Masters Degree in Prosthodontics cum laude (M.Ch.D.) in 1992. Since then he has held a private practice as a prosthodontist in the Northern Suburbs of Cape Town. Dr. van Zyl has been involved with dental education since he graduated as a prosthodontist. He was a consultant for post graduate students at the University of Stellenbosch, later the University of the Western Cape. He lectures and presents hands on courses to the post-graduate diploma programmes at the University of Pretoria. He has been a fellow of the ITI since 2001 and was a member of the ITI Consensus Conferences in 2008 (Stuttgart, Germany) and 2013 (Basel Switzerland). He was the ITI Education Delegate for the ITI Southern African section from 2007-2016 and is currently the Chairman of this section. He has been a member of APSA (Academy of Prosthodontics South Africa) since 1992 and was chairman of this Academy from 1994-2000. He is also a member of the SAAO (South African Association of Osseointegration), currently the chairman of the Western Cape Branch. He lectures regularly at South African CE courses presented by the ITI, SADA, SAAO and APSA. He is also a lecturer and prosthodontic coordinator of the ITI Education Week hosted at the University of Pretoria, ITI Centre of Excellence.



**Danielle Layton, BSc(Hons)(Qld), MSc Oxon, MDSc (Hons)(Syd), DPhil Oxon**  
Adjunct Associate Professor  
University of Queensland  
Private Practice  
Brisbane, Australia

Adj A/Prof Danielle Layton graduated with a Bachelor of Dental Science with honours and the University medal at the University of Queensland; a Master of Dental Science in prosthodontics with honours at the University of Sydney; and a Master of Science and Doctor of Philosophy in Evidence Based Health Care at Oxford University, United Kingdom. She is in private prosthodontic practice in Brisbane, and is an Adjunct Associate Professor at the University of Queensland. Dr. Layton is a reviewer for the International Journal of Prosthodontics, International Journal of Oral and Maxillofacial Implants, Clinical Oral Implants Research and Journal of Prosthetic Dentistry; and continues to contribute to dental societies and academies through committee and scientific roles. She publishes and lectures widely, and explores research interests in survival outcomes, medical indexing and the influence of withdrawn data.



**Thomas Salinas, DDS**  
Executive Secretary/Treasurer, American Academy of  
Maxillofacial Prosthetics  
Department of Dental Specialties  
Mayo Clinic  
Rochester, Minnesota, USA

Thomas Salinas is Professor of Dentistry at the Mayo Clinic, where his time is dedicated to rehabilitation of patients with complex care needs. A native of New Orleans, Louisiana, he received prosthodontic training at Louisiana State University Health Science Center and maxillofacial prosthetic fellowship from MD Anderson Cancer Center. He serves as program director for Advanced Prosthodontics Education. He has authored over 75 publications related to prosthodontics and interdisciplinary care. His research interests are biomaterial behavior and clinical outcome studies.



**Stephen M. Parel, DDS**

Professor, UTHSC, San Antonio School of Dentistry (Ret)  
Professor, Baylor College of Dentistry,  
TAMHSC, Dallas, Texas (Ret)  
Past President, American Board of Prosthodontics  
Branemark Award Recipient, AO, 2015  
Dallas, Texas, USA

Dr. Parel is a Diplomate of the American Board of Prosthodontics, the American and International College of Dentists, and is a member of many professional organizations, including the American Dental Association, the Academy of Prosthodontics, and the American College of Prosthodontics. His literature contributions include over 45 scientific articles as principal author, and multiple textbook contributions. He was editor and co-author of *Esthetics and Osseointegration*, a landmark reference source for implant dentistry. He authored his second book, *The SmiLine System* in 1991, and completed a third book, *Esthetic Implant Restorations* several years later. He was co-founder of *Osseointegration Seminars, Incorporated*, and has been president of *The American Academy of Maxillofacial Prosthetics*, *The Academy of Osseointegration*, and *The Osseointegration Foundation*. He has received the *Andrew J. Ackerman Award* for meritorious lifetime service in the field of Maxillofacial Prosthetics, the *Distinguished Lecturer* and *Dan Gordon Awards* from the American College of Prosthodontics, and has served as an examiner and President of *The American Board of Prosthodontists*. He recently received the *Brånemark Award* for lifetime achievement in the field of Implant dentistry, the highest honor bestowed by the Academy of Osseointegration's Foundation and *The Titanium Society*. Dr. Parel has served as a professor at *Baylor College of Dentistry—Texas A&M University System Health Science Center*. Since that time until 2013, he served as the founder and director of Prosthodontics at a private *Implant Specialty Clinic* in Dallas, Texas. He is presently in private practice, and serves as a consultant to several companies in the implant industry.



**Daniel Wismeijer, DDS, PhD**

Professor  
Head, Department of Oral Implantology & Prosthetic Dentistry  
ACTA (Dental Faculty Free University of Amsterdam)  
Amsterdam, The Netherlands

Daniel Wismeijer graduated from dental school in 1984. He is a past president of the Dutch Prosthodontic Association and the Dutch Association for Gnathology. He is an ITI member since 1993 and has served as member of the ITI education Core Group and the ITI research committee. In 2013 was elected as an ITI board member and in 2015 he was elected chairman of the ITI education committee. In 2006, he accepted the position of Professor and head of the department of Oral Implantology and Prosthetic Dentistry at ACTA Amsterdam which he combines with his referral practice. The research areas that his department is focused on are CAD/CAM technology, Digital Dentistry, treatment evaluation and workflow, 3D printing, implant surface and bone substitute optimization, peri-implantitis, as well as the evaluation of different implant based treatment modalities. In his workshop as a hobby he restores cars.





**Christopher Evans. BDS Sc Hons (Melb), MDS Sc (Melb), MRACDS**  
Specialist Private Prosthodontic Practice  
Consultant Prosthodontists, Royal Australian Navy  
Clinical Demonstrator, Graduate Diploma in implant dentistry at  
University of Melbourne  
Brighton, VIC, Australia

Dr. Evans graduated from the University of Queensland with first class honours. After 3 years as a dentist in the Royal Australian Navy, and as a general dentist on the Mornington Peninsula, he completed a Master of Dental Science degree in Prosthodontics at Melbourne University, leading to registration as a specialist prosthodontist. He has been in specialist Private Prosthodontic Practice in Brighton, Victoria since 1997. He is a Member of the Royal Australasian College of Dental Surgeons. He maintains a branch practice in Albury, NSW, has been consultant prosthodontist to the Royal Australian Navy and a Clinical Demonstrator for the Graduate Diploma in implant dentistry at the University of Melbourne. He is a Visiting Demonstrator for Graduate Periodontics and Prosthodontic Students at Melbourne University. Dr. Evans is a full member of the Australian and New Zealand Academy of Prosthodontists and is an ITI Fellow. He has lectured extensively at national and international meetings on implant related topics and reconstructive dentistry, and was on the Editorial Board of Clinical Oral Implants Research for 4 years from 2008-2012. He is a past president of the Australian Prosthodontic Society, Victorian Branch and Victorian Crown and Bridge Society and a committee member of the Australian Osseo-integration Society, Victorian Branch. Dr. Evans has been actively involved in clinical research projects relating to dental implants, ranging from multi-centre international research projects to local research projects.



**Wei-Shao Lin, DDS**

Associate Professor  
Director of the Division of Prosthodontics  
Director of the ITI Implant Scholarship Program  
Department of Oral Health and Rehabilitation  
University of Louisville, School of Dentistry  
Louisville, Kentucky, USA

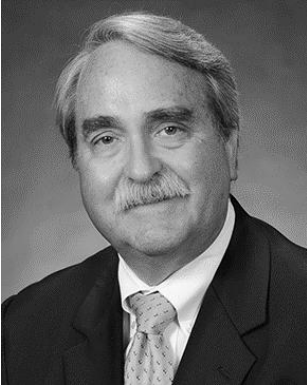
Dr. Wei-Shao Lin, DDS is an Associate Professor at the University of Louisville, Department of Oral Health and Rehabilitation, where he is currently the Director of the Division of Prosthodontics, and ITI Implant Scholarship Program. He teaches fixed, removable, and implant prosthodontics at the predoctoral and graduate prosthodontics levels. He received the DDS in 2003 from Chung-Shan Medical University, Taiwan; Certificate in Prosthodontics and Certificate in Surgical Implant Fellowship at the University of Rochester in 2010. Dr. Lin's research interests include clinical dental implant research, ceramic restorations and digital dentistry, and has published many research and clinical articles in peer-reviewed journals. Dr. Lin is a Fellow of the International Team for Implantology (ITI). He maintains an intramural prosthodontics practice at the University of Louisville, Dental Associates.



**Alejandro Lanis, DDS, MS**

Professor, Graduate Program in Computerized Dentistry -  
University of Chile / ACHIP  
Professor, Oral Implantology -  
University San Sebastian  
Private Practice  
Santiago, Chile

Dr. Alejandro Lanis graduated from University of Valparaiso in 2008 and followed a residency program in Oral and Maxillofacial Implantology at the University of Chile where he obtained his specialist degree in 2012. In 2013, he moved to Ann Arbor MI, where he was an ITI Scholar at the University of Michigan School of Dentistry under the tuition of Prof. Dr. William Giannobile. Currently he is working in Santiago de Chile in Alvarez & Lanis Odontología, a specialized dental center dedicated to advanced prosthodontics, implantology and digital dentistry. Dr. Lanis is an ITI Fellow, ITI Registered Speaker and Constituent Member of the International College of Prosthodontists.



**David A. Felton, DDS, MS**

Past President, ACP

Editor-in-Chief, Journal of Prosthodontics

Dean & Professor

University of Mississippi Medical Center, School of Dentistry

Jackson, Mississippi, USA

Dr. Felton completed his DDS degree (1977) and MS Degree in Prosthodontics (1984) at the University of North Carolina at Chapel Hill School of Dentistry. He taught in the Department of Prosthodontics at UNC from 1984-2011, serving as Director of Graduate Prosthodontics (1982-1992) and Chair of Prosthodontics (1992-2002). He moved to the West Virginia University School of Dentistry as Dean in 2011, serving in that role for three years. In January 2016, he assumed the position of Dean at the University of Mississippi Medical Center (UMMC) School of Dentistry in Jackson, MS. Dr. Felton is the immediate past-president of the Academy of Prosthodontics, Editor-in-Chief of the Journal of Prosthodontics, and Secretary/Treasurer and examiner for the American Board of Prosthodontics. He is past-president of the American College of Prosthodontists. Dr. Felton has authored over 50 peer reviewed journals articles, lectures nationally and internationally, and holds memberships in multiple dental organizations.



**Nicola Ursula Zitzmann, DDS, PhD**

Co-Vice President, ICP

Clinic of Periodontology, Endodontology and Cariology

University of Basel

Basel, Switzerland

Nicola Ursula Zitzmann is Professor at the Clinic for Periodontology, Endodontology and Cariology at the University of Basel (and representative of the head of the Department, Prof. R. Weiger). She is an ITI fellow and education delegate for Switzerland, vice president of the International College of Prosthodontics, and member of the Swiss Society of Periodontology (SSP) and the Swiss Society of Reconstructive Dentistry (SSRD). From 1994 to 1997, N.U. Zitzmann completed the postgraduate program at the Department of Fixed and Removable Prosthodontics and Dental Material Sciences in Zurich, Switzerland (Prof. P. Schärer). From 1997, she worked as Assistant Professor at the Department of Fixed and Removable Prosthodontics and TMJ Disorders at the University of Basel (Switzerland, Prof. C.P. Marinello) and completed the specialist training in Reconstructive Dentistry in 2001. She finished her habilitation thesis (equivalent to Ph.D.) entitled “Prosthodontic treatment of the edentulous patient with particular consideration given to implant-supported restorations” in 2004. Nicola Zitzmann has been a Visiting Assistant at the Department of Periodontology at the University of Göteborg, Sweden (Proffs. J. Lindhe and T. Berglundh), and achieved her Ph.D. degree in the field of Periodontology in 2006.



**David Bartlett, BDS, FDS RCS, PhD**  
Secretary, ICP  
Head of Prosthodontics and Graduate Training  
Kings College London Dental Institute  
London, United Kingdom

Professor David Bartlett is secretary of the ICP and Head of Prosthodontics and Graduate training at Kings College London Dental Institute. David has published over 130 research publications, written 3 books, numerous chapters and is internationally known for his research on erosive tooth wear. He was awarded the distinguished scientist award in Prosthodontics for 2017 and is a member of the Academy of Prosthodontics, sec. David is an internationally respected specialist in Prosthodontics and runs the largest specialty training programmes in Prosthodontics in Europe.



**Charlotte Stilwell**  
Specialist in Prosthodontics  
Harley Street Dental Clinic  
London, United Kingdom

Charlotte Stilwell is a specialist in prosthodontics with particular interest in removable prosthetics. She qualified from The Royal Dental College in Copenhagen in 1983 and moved to London for five years of post-graduate training in removable prosthodontics at The London Hospital Dental School. This was followed by nine years in general dental practice before she took up her current position as a referral specialist in private multi-disciplinary practice in Harley Street, London. Charlotte is also a part-time senior lecturer at the Dental Faculty, University of Geneva, member of the ITI Education Committee and editor-in-chief of the ITI Online Academy.



**Iven Klineberg AM, RFD, BDS, BSc, MDS, PhD (Lond),  
FDSRCS (Lond, Edin), FRACDS, FICD**  
Professor and Chair of Prosthodontics  
Faculty of Dentistry and Westmead Centre for Oral Health  
University of Sydney  
Sydney, Australia

Iven Klineberg graduated from the University of Sydney in dentistry and science, and clinical training in prosthodontics. He gained his PhD in the University of London at the Royal College of Surgeons of England and Fellowship in Dental Surgery; and an Honorary Fellowship from the Royal College of Surgeons Edinburgh. Visiting Associate Professor in the Department of Occlusion, University of Michigan. Professor and Head of Prosthodontics, University of Sydney (from 1980) and Nobel Biocare Chair of Oral Rehabilitation (2007 -2012); and from 2012 Professor of Prosthodontics. Appointed Dean, Faculty of Dentistry, University of Sydney 1991-8 and 2003-4. Is Director of postgraduate Prosthodontics and co-ordinates the specialty training program in prosthodontists at the University of Sydney. Clinical commitments: Established a) an Orofacial Pain Clinic in 1982 for management of TMD and orofacial pain, and for clinical training of specialty postgraduates in prosthodontics; b) an Implant Centre in 1982 - as an interdisciplinary initiative with Oral Surgery at Sydney Dental Hospital and Oral and Maxillofacial Surgery and at Westmead Centre for Oral Health. This allowed postgraduate training and CPD courses from 1986 to introduce the Brånemark Implant System.



**Raúl Frugone Zambra, BDS, DDS, MS, PhD (c)**  
Prosthodontist and TMD & Orofacial Pain Specialist  
TMD & Orofacial Pain Program Director  
Universidad de Los Andes, Chile  
Private Practice  
Linares, Chile

DDS, Chilean Board Certified Prosthodontist  
Temporomandibular Disorders Master in sciences.  
Doctor in Health Sciences (c)  
Associate professor, Universidad de Chile o 2008.  
Faculty Member: Dentistry School, Sciences Faculty of Universidad de La Serena, Oral Physiology and Occlusion.  
Faculty Member. Faculty of Dentistry, Universidad de los Andes, Director of the Temporomandibular Disorders and Orofacial Pain Specialty





**Johan Wolfaardt, BDS, MDent (Prosthodontics), PhD**  
Professor, Division of Otolaryngology- Head and Neck Surgery  
Department of Surgery  
Faculty of Medicine and Dentistry  
University of Alberta/Institute of Reconstructive Sciences in  
Medicine (iRSM)  
Edmonton, AB, Canada

Dr. Wolfaardt is a Full Professor, Division of Otolaryngology-Head and Neck Surgery, Department of Surgery, Faculty of Medicine and Dentistry, University of Alberta. Dr. Wolfaardt is a co-founder of iRSM. His clinical and research interests are in the area of Maxillofacial Prosthodontics with particular emphasis in the area of head and neck reconstruction, osseointegration and advanced digital technologies in surgical design and simulation. Dr. Wolfaardt has published widely in refereed journals and contributed to a variety of texts. He has lectured both nationally and internationally on maxillofacial prosthodontic care, head and neck reconstruction, osseointegration, and advanced digital technology. Dr. Wolfaardt has served on Boards of the International College of Prosthodontists, the American Academy of Maxillofacial Prosthetics, the International Society for Maxillofacial Rehabilitation, and the Advanced Digital Technology Foundation (ADT) for Head and Neck Reconstruction. Dr. Wolfaardt is past President of the International Society for Maxillofacial Rehabilitation and the ADT Foundation. Dr. Wolfaardt was awarded Honorary Membership by the Canadian Dental Association in 2011. The Alberta Dental Association and College presented the Award of Excellence to Dr. Wolfaardt in 2013. In 2014, the American Academy of Maxillofacial Prosthetics honored Dr. Wolfaardt with the Andrew J. Ackerman Memorial Award. In 2016, the British Prosthodontic Society awarded Honorary Membership to Dr. Wolfaardt. In 2017, the Edmonton Zone Medical Staff Association bestowed upon Dr Wolfaardt the Life Achievement – Medal of Service Award.



**Ami Smidt, DMD, MSc**

Board of Councilors, ICP

Head, The Center for Graduate Studies in Prosthodontics

Department of Prosthodontics

The Hebrew Univ.- Hadassah, Faculty of Dentistry

Tel-Aviv, Israel

Prof. Smidt, former head of the center for graduate studies in Prosthodontics, Department of Prosthodontics Hebrew University-Hdassah School of Dental Medicine, Jerusalem, Israel. He received his D.M.D. degree from Jerusalem's Hebrew University in 1986 and his M.Sc. degree in Oral Microbiology (Cum Laude) in 1988. In 1990, he received his certificate in Prosthodontics. Prof. Smidt is a Diplomat of the Israeli Board of Prosthodontics and held teaching, research, and clinical positions at this University. Prof. Smidt has published extensively and serves as a member on the editorial review boards of several international publications. He lectures frequently in international forums on topics related to orthodontics for better prosthodontics and esthetic and implant dentistry. His current research focuses on bleaching materials and their effect on tooth structure, the effect of newly developed temporary cement on crown marginal leakage and on developing new intra oral scanning procedures. Prof. Smidt served as President and Editor of the Israel Society of Prosthodontics, is a member of several professional organizations, and maintains a private practice dedicated to prosthodontics and esthetic dentistry in Tel Aviv, Israel.



**William C. Martin, DMD, MS, FACP**

Clinical Professor

Director, Center for Implant Dentistry

Department of Oral and Maxillofacial Surgery

University of Florida College of Dentistry

Gainesville, Florida, USA

Will Martin, DMD, MS, is a Clinical Professor in the Department of Oral and Maxillofacial Surgery at the University of Florida's College of Dentistry. He received his DMD from the University of Florida and completed his MS and Certificate in Prosthodontics from Baylor College of Dentistry. Dr. Martin joined the faculty at the University of Florida in 1999 and currently serves as the Director of the Center for Implant Dentistry. Dr. Martin is a Diplomat of the American Board of Prosthodontics and a fellow of the American College of Prosthodontists, International College of Dentists, International Team for Implantology and Associate Fellow of the Academy of Prosthodontics. Dr. Martin has authored numerous peer-reviewed scientific articles and abstracts. He has co-authored several textbooks on implant dentistry, specifically the ITI Treatment Guide Vol.1, S.A.C. Classification in Implant Dentistry and most recently the ITI Treatment Guide Vol.10. He maintains a part-time practice limited to Prosthodontics within the Center for Implant Dentistry and lectures both nationally and internationally on esthetic and implant dentistry.



**Jorge Jofré, DDS, PhD**

Head of Center for Advanced Prosthodontics & Implant Dentistry  
University of Concepcion  
Concepcion, Chile

Jorge Jofré is a full-time professor and head of the Center for Advanced Prosthodontics and Implant Dentistry- CRAI at the University of Concepcion, Chile.

Dental Surgeon from the University of Concepcion, he got a PhD at the Department of Prosthodontics of the University Eberhard Karl, in Tübingen, Germany.

He has been working in applied clinical research, which has concluded in products as the Easy2Fix™, the PiezoSmile™, and the Prosthodontics™.

# Oral Presentation Abstracts



*Listed in Presenting Order, as seen on the Program Schedule*

# Oral Presentation Abstracts

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Listed in Presenting Order, as seen on the Program Schedule:

## Thursday, September 7<sup>th</sup>

### ► Focus Session I (Grand Salon II & III)

1 \*

#### **ENHANCING ESTHETIC OUTCOMES BY INTEGRATING A MINIMALLY INVASIVE APPROACH TO COMPLEX DENTAL PROBLEMS**

**Spear, Frank \***  
**Spear Education**  
**Scottsdale, Arizona USA**

**Abstract:** Over the last 25 years, the ability to provide esthetically excellent and predictable restorations has improved due to advancements in adhesive dentistry and all ceramic materials. However, the challenges of producing a beautiful final result are still burdened by the necessity of managing gingival margin and papilla levels, which are highly dependent upon bone levels. This challenge is increased any time we remove anterior teeth, often resulting in what, at best, may be considered an acceptable compromise. An obvious solution to this challenge is to not remove the teeth, using them to maintain bone and gingiva. This presentation will focus on several commonly encountered problems that typically result in the removal of teeth, and ask the question, “is removal really necessary?” Long-term cases will be presented showing that many of our patients with these problems can have their treatment managed over several decades, instead of attempting to cure the problem with tooth removal, creating an entirely new set of problems to manage.

**Learning Objectives:**

1. The concept of management vs cure
2. How to systematically address the prognosis of tooth removal and replacement prior to performing it.
3. How staging treatment over several decades may be preferential to acting now.
4. When action must be taken, how the concept of, “what is next”, may help in the decision process of how to act.

2 \*

#### **LESS IS MORE: NEW WINDOW INTO HOW BONE WORKS**

**Chin, Martin \***  
**Oral & Maxillofacial Surgery**  
**California Pacific Medical Center**  
**San Francisco, California, USA**

**Abstract:** Predictable and efficient reconstruction of missing teeth, periodontal systems, and structural bone is best accomplished employing mechanisms that created these structures in the embryo. This presentation reveals a new window into the system that regulates bone formation and skeletal structural architecture. The same mechanism controls osseointegration and periodontal regeneration.

Contained within the skeleton is an unrecognized network of specialized collagen fibers that regulate the important aspects of bone physiology. At the surface of the skeleton, this network is visible as Sharpey fibers associated with muscle attachments, periodontal ligaments, and anchorage of periosteum. Visualization of this network within bone requires special specimen handling and immunohistochemical labelling. This imaging technique reveals an extensive matrix of connecting collagen fibers that interact with all aspects of structural bone. The network is separate from the nervous system but has functional relationships with it.

As bone resorbs and is replaced as part of physiologic remodeling, the Sharpey fiber matrix remains relatively constant. That is because the collagen fibers are not calcified and are not demineralized during normal bone remodeling. There is strong evidence that this Sharpey fiber matrix network directs the assembly of structural bone created in response to injury.

This presentation demonstrates the existence of this newly revealed anatomic system. How this system may direct osseointegration and periodontal regeneration is discussed. A strategy is outlined to use this powerful bone regulation mechanism to improve surgical healing response. The efficacy of this method is demonstrated through clinical cases with long-term follow-up.



### 3 \*

## CERAMIC SCIENCE IN MODERN PROSTHODONTICS

**Malament, Kenneth A. \***

**President-Elect, Academy of Prosthodontics**

**Secretary, American Academy of Esthetic Dentistry**

**Clinical Professor at Tufts University**

**Course Director in Postgraduate Department of Prosthodontics**

**Boston, Massachusetts, USA**

**Abstract:** Dentistry that is esthetic to the patient is an important clinical objective. The knowledge within dental technology, dental science and dental practice has dramatically expanded leading to better quality; artistry and more standards based clinical applications. Ceramics are the most consistently predictable esthetic dental material. Today dentists can offer more treatment options for patient's complex problems. The single phase or monolithic all-ceramic materials have become increasingly more popular and do not chip as do all bi-layered ceramic materials. These types of dental ceramic materials are dominating the market and future development bringing with it more long-term success. Metal-ceramics and monolithic Zirconia are the "state of the art" for complex implant prosthodontics.

Understanding methods to manage simple and complex restorative issues are critical to improving patient acceptance and even long-term ceramic success. Methods to integrate the efforts of laboratory technologists and managing occlusion and patient's desires can have a profound impact in the practice of dentistry.

All-ceramic materials were developed to improve ceramic color and marginal fit. Until recently few research reports attempted to study their long-term use or factors that relate to their performance without modeling the data. Present bi-layered all-ceramic crowns on molars have reached their full potential. Despite substantial improvements in material strength and toughness, they still fail because of breakage and chipping at relatively high rates. The Lithium Disilicate E Max and Zirconia mono-layered all-ceramic material is changing dentistry and the realization of long-term ceramic survival. Original research will be presented that studied the clinical behavior of almost seven thousand all-ceramic restorations and specifically more than 3000 E Max Lithium Disilicate restorations.

Understanding methods to manage simple and complex restorative issues are critical to improving patient acceptance and even long-term ceramic success. Methods to integrate the efforts of laboratory technologists and patient's desires, managing occlusion and final cementation protocols can have a profound impact in the practice of dentistry.

#### **Learning Objectives:**

1. To understand what factors and concerns a prosthodontist would have treating patients that require "esthetic procedures".
2. To understand the controversies that exists with modern dental materials.
3. To understand what clinical factors impact on long term survival of dental ceramic materials. The e max lithium disilicate ceramic restoration has proved with over 3200 restorations and 12 years to be the most successful ceramic ever studied.
4. To understand the restoration of dental implants in complex conditions.

### 4 \*

## AN ADAPTIVE PREFABRICATED FRAMEWORK ON THREE IMPLANTS IN THE MANDIBLE: THE TREFOIL CONCEPT

**Rosenberg, Ruben \***

**Oral Surgeon**

**Director Nobel Biocare Training Center**

**Clinical Researcher Multicentric Research Nobel Biocare**

**Director Ruben Rosenberg & Associates Clinic**

**Santiago, Chile**

**Abstract:** Treatment of the edentulous mandible with implant supported prostheses offers considerable functional and esthetic advantages over traditional removable dentures. Here we introduce preliminary results from a study of an innovative treatment concept that uses a standardized prefabricated framework, fitted with a specialized adaptive mechanism designed to allow passive fit, secured on three strategically placed implants between the mental foramina.

Within the constraints of these preliminary findings, the Trefoil concept demonstrates good early outcomes in terms of prosthetic and implant survival rates. This innovative, adaptive, prefabricated framework supported on 3 implants allows for immediate loading of a final fixed solution for the edentulous mandible. 6-month and up to 1-year outcomes will be reported at the time of presentation.

Clinical cases will be exposed.

## ► Special Needs – Geriatrics (Grand Salon III)

5 \*

### **CONCEPTS OF HEALTH, ORAL HEALTH AND THE VALUE PROPOSITION FOR ROOTH REPLACEMENT THERAPIES**

**Stanford, Clark \***

**UIC Distinguished Professor and Dean**

**The University of Illinois at Chicago College of Dentistry**

**Chicago, Illinois, USA**

**Abstract:** Patient often present with complex set of needs and the health system(s) creates substantial challenges due to a lack of clear diagnostic and understanding of therapeutic outcomes of care. Outcomes of Health also depend on the presenting condition(s), noting that we will have condition specific expectations which need to be framed within the framework of oral rehabilitation for many of our patients. The impact of care may derive a differential in which we weight the importance of the patient's total health (Total Health defined within the framework of the four domains of Function, Economics, Physiological and Psychological). To help our patients, we need to tie concepts of health and patient-oriented outcomes to all of the therapies we propose, pursue or advocate for.

**Learning Objectives:**

1. Understand the importance of variable definitions of health, oral health and the value proposition that the concepts of Quality are creating.
2. Understand the role of tooth replacement therapies within this framework of Quality.
3. Understand the role of inquiry and point-of-care research in developing patient-oriented measures of relevant outcomes to the oral health care we provide.

6 \*

### **IMPLANT THERAPY IN THE GERIATRIC PATIENT**

**Müller, Frauke \***

**Professor & Chair**

**Gerodontology & Removable Prosthodontics**

**University of Geneva**

**Geneva, Switzerland**

**Abstract:** When tooth loss occurs later in life, ageing and multimorbidity impact dental treatment decisions. There is sufficient evidence to state that the mandibular implant overdenture is a well-established treatment modality, certainly in non-dependent edentulous individuals, but little is known on the very old and geriatric edentulous patients. They often present unfavourable anatomical conditions, xerostomia and a lack muscle control. Although the benefits of dental implants are well documented, elderly adults are often reluctant to agree to an implant insertion, even if cost is removed as limiting factor. The main reasons for implant refusal are the fear of surgery and pain. The present talk therefore describes the use of minimal-invasive and simple treatment concepts for elderly, edentulous patients. It further highlights possible complications which may arise with the onset of dependency and/or frailty and advises further simplification of the implant-restorations when needed. Recall and maintenance in this group of patients is crucial to assure the patients' benefit from the intervention until late in life.

7 *cancellation*

## 8 \*

### **IMPLANT TREATMENT AND QUALITY OF LIFE IN EDENTULOUS ELDERS**

**Feine, Jocelyn \***  
**Oral Health & Society Division**  
**Faculty of Dentistry, McGill University**  
**Assoc. Member**  
**Dept. of Epidemiology & Biostatistics, Dept. of Oncology**  
**Faculty of Medicine, McGill University**  
**Montreal, QC, Canada**

**Abstract:** Much of what we do as dentists involves treatment of infectious disease. With modern therapies, we are usually able either to eliminate or to control the process.

However, when disease or socioeconomic factors result in complete tooth loss, we must focus on replacement of structure and function. This is when consideration of our elder patients' quality of life becomes a part of treatment planning.

In this talk, Professor Feine will discuss how the use of implants can improve the lives of edentate elders. She will present the issues that older patients consider important, as well as their concerns about the process of implant rehabilitation.

## 9 \*

### **CARIES IN THE ELDERLY; UNDERSTANDING THE DISEASE, ITS PREVENTION AND EVIDENCE-BASED TREATMENT**

**A. Giacaman, Rodrigo \***  
**Associate Professor and Director of the Graduate School**  
**Director of the Cariology Unit**  
**Founder of the Research Group of Geriatric Dentistry**  
**University of Talca**  
**Talca, Chile**

**Abstract:** The world is rapidly aging and elderly people are retaining more teeth, increasing the demand for care. Definitive teeth that appear at 6 years-old constitute a "biological asset" that must be preserved healthy and functional until the age of 90 years or more. Public and private offer is not and will not be sufficient to meet the needs of the elderly, nonetheless. Traditional restorative treatment is not accessible to everyone, which increases social inequalities, a widely recognized problem in many developed and developing countries.

Dental caries is the most common disease of the human being, affecting worldwide about 35% and in Latin America about 45% of the population. Besides the detriment in the masticatory function, caries decreases quality of life and self-esteem of affected people. Caries is a disease caused by sugars consumption. Prevention, therefore, should be based primarily on intake restriction. Once lesions have developed, in the crown as well as in the root, traditional dentistry will solve the problem by removing the affected tissues and placing restorations, which involves the removal of healthy tissues. Adding to the access problem, these restorations will inevitably fail in the short or medium term and must be replaced with increasingly complex and costly restorations. The relatively novel approach of the "minimally invasive dentistry" involves using conservative and ultraconservative techniques to treat carious lesions, selectively and partially removing affected tissues. These techniques allow retaining much more sound structures and sometimes do not even need to remove affected tissues. The advantages are obvious; Maximum preservation of teeth, painless procedures, very short treatment times and very low cost. Unfortunately, clinical dentistry still holds the more traditional restorative principles. Generating changes in professional behavior is a time-consuming process requiring intensive advocacy from universities, opinion leaders, industry, and political authority. The lack of access to oral health by the population will not improve until these changes take place, as the enormous cost reduction implied by this new approach will increase coverage and access to oral health with a more efficient and rational use of the resources. Only in this way, the "biological capital" will remain functional until the end of our days making people age with a smile in their face.

## 10

### EVALUATION OF MANDIBULAR ADVANCEMENT DEVICE IN PATIENTS OF OBSTRUCTIVE SLEEP APNEA WITH TYPE 2-DIABETES MELLITUS

Chand, Pooran \* Baslas, Varun; Jurel, Sunit; Tripathi, Shuchi; Arya, Deeksha; Tripathi, Suryakant; Singh, Balendra Pratap; Dubey, Abhishek  
King George's Medical University, Lucknow  
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**Keywords:** Mandibular advancement device, obstructive sleep apnea, diabetes mellitus

**Purpose/Aim:** Objective and subjective evaluation of mandibular advancement device (MAD) in patients having OSA as well as Type-2 Diabetes Mellitus (T2DM).

**Materials and Methods:** Patients visited hospital clinic having OSA as well as T2DM were recruited. After taking informed consent, participants were divided into three equal sized groups of three grades of OSA (mild, moderate and severe) and intervened by MAD at 50% of maximum mandibular protrusion and 20% of maximum interincisal opening. Objective outcomes were HbA1c level and apnea hypopnea index score (AHI). Subjective outcomes were Epworth sleepiness scale (ESS) and Berlin Questionnaire. All outcomes were assessed before and after three months of intervention.

**Results:** Statistically significant difference was seen in all outcomes after intervention with MAD ( $P < .01$ ) in all groups except HbA1c level in participants having severe OSA.

**Conclusions:** MAD may be recommended in patients having OSA as well as T2DM within the limitations.

## 11

### GENDER DIFFERENCES IN TEMPOROMANDIBULAR DISORDERS: A SYSTEMATIC REVIEW AND METANALYSIS

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**Keywords:** systematic review, temporomandibular disorders, sex

**Purpose/Aim:** The aim of the study was to evaluate the existence of gender differences in temporomandibular disorders (TMD) based on population studies, which used the research diagnostic criteria for temporomandibular disorders (RDC/TMD) axis I as a diagnostic tool.

**Materials and Methods:** A systematic review was performed in PUBMED, EMBASE, WEB OF SCIENCE and LILACS; with no restrictions on the year of publication. The search was conducted by two reviewers independently and in duplicate. A manual search both in the references of the included articles, and in the literature review articles previously published, and in the gray literature was performed. Data were analyzed quantitatively by both combining the results in a meta-analysis and presenting them in a Forest Plot graph. The measure effect used was the odds ratio (OR). The quality of the articles was assessed by a questionnaire adapted from "The Newcastle - Ottawa Scale (NOS)", and the publication bias was evaluated by means of a visual method with a Funnel Plot graph.

**Results:** The electronic search in the database returned a total of 6,104 articles for further analysis according to the eligibility criteria. One-hundred and twelve abstracts were selected for full-text reading. Only 1 study was recovered by manual research, and only five articles were included in the final analysis. Women had, for the most part, higher prevalence of TMD in all diagnostic groups of the RDC/TMD axis I. The meta-analysis yielded an OR of 2.24 for global TMD, 2.09 for Group I, 1.6 for Group II, and 2.08 for Group III.

**Conclusions:** In this study, we were able to show the importance of gender in the context of TMD, identifying it as an important risk factor, and indicating a 2.2 times higher risk for women to develop TMD in the global prevalence of the RDC/TMD axis I as compared to men.

## 12

### ASSESSMENT OF SWALLOWING AND MASTICATORY PERFORMANCE IN OBTURATOR WEARERS: A CLINICAL STUDY

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**Keywords:** obturator, Swallowing, Mastication

**Purpose/Aim:** To assess function by identifying changes in swallowing and masticatory performance in maxillary obturator prosthesis wearers.

**Materials and Methods:** Sixty subjects were recruited for the study, of which 20 were obturator wearers, 20 were completely dentulous and 20 had removable partial/complete dentures with similar Eichner's Index. Swallowing ability was evaluated with and without obturator using the "Water Drinking Test"; Masticatory performance was evaluated with the Sieve test; and maximum occlusal force was recorded with the help of a digital bite sensor. The data was analyzed using the Statistical Package for Social Science version 15.0 with a confidence level at 95%.

**Results:** Profile, behavior of drinking and time taken to drink were significantly improved ( $P < .001$ ) in subjects after wearing obturator. Masticatory performance was not significantly different ( $P = .252$ ) in obturator wearer when compared with dentulous or removable partial/ complete denture wearer, but significantly ( $P < .001$ ) high inter group difference in maximum occlusal force existed. Correlation between masticatory performance and maximum occlusal force was not significant ( $P = .124$ ).

**Conclusions:** Swallowing ability was significantly improved after wearing obturator but masticatory performance was not significantly different from those having similar occlusal support zone in their dentition.

## 13

### MASTICATORY FUNCTION AND NUTRIENTS INTAKE IN THE ELDERLY: A REVIEW OF THE LITERATURE

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**Keywords:** nutrients intake, masticatory efficiency

**Purpose/Aim:** With ageing, the progressive teeth loss determines a change of nutrition habits, depending on the compensation performed by the dentist intervention. If lost teeth are not replaced, a modification of the masticatory system occurs. Removable prosthetic rehabilitation is unable to fully restore the masticatory function to that of a dentate patient, regardless of the congruity of the prosthesis itself. Thus, the impaired masticatory performance of these patients has been considered associated with macro and micronutrients deficiency in their diet. The aim of the study was to investigate the association between mastication and nutrients intake by means of a literature systematic review.

**Materials and Methods:** The following data base were used: PubMed, Web of Science, Cochrane Library e Tripdatabase. Articles were selected using the key words "denture" OR "mastication" AND "nutrition" OR "elderly". The search comprised articles written in English and published between 1991 and 2015. Overall, 841 studies were analysed, 44 fulfilled the inclusion criteria, among which 34 trasversal studies and 10 clinical trials, 6 of them RCTs

**Results:** 27 out of 34 trasversal studies reported that a better masticatory performance provides the elderly with a higher micro and macro-nutrients intake, in particular vegetables and fibers, while the other 7 studies didn't highlight any differences. 3 RCTs showed an increased macro and micro-nutrients intake after inserting a new prosthesis or following the improvement of masticatory conditions, while the other 3 RCTs didn't show any variations.

**Conclusions:** Nutrients intake in the elderly depends not only on oral conditions and masticatory performance, but the influence of other factors is suggested. Nevertheless, nutritional counselling is an important factor to improve nutrients intake in the elderly and it is recommended to be associated with the prosthetic rehabilitation treatment.



## 14 *cancellation*

## 15

### **MANDIBULAR SINGLE-IMPLANT OVERDENTURES: 7-YEAR RESULTS OF RANDOMIZED CONTROLLED TRIAL**

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**Keywords:** single, implant overdenture, older

**Purpose/Aim:** Literature has shown that older edentulous patients rehabilitated with mandibular two-implant overdentures opposing maxillary complete dentures have significantly better OHRQoL. However, in order to reduce the financial and surgical burden for this cohort, providing only one mandibular implant could be an alternative. This randomized controlled trial will present the 7-year data on the success of mandibular single-implant overdentures using three different types of attachment systems.

**Materials and Methods:** Thirty-six edentulous participants (mean age: 68 years $\pm$ 9.2) were randomly assigned to three different attachment system groups (n=12) supporting mandibular single-implant overdentures. The attachment systems included  $\phi$ 2.25mm ball abutments with regular diameter implants (control),  $\phi$ 5.9mm large overdenture abutments with 8mm diameter implants and nylon male inserts with regular diameter implants. The participants were reviewed annually during which marginal bone level changes, peri-implant tissue measurements and prosthodontic maintenance issues were recorded. Qualitative analysis of the patient-centered outcomes was also done at Year 5 recall.

**Results:** The number of participants attending the annual recalls decreased from 34 to 23 throughout the 7 years due to deaths, illness and dropouts. There was one early implant failure and one participant died prior to Year 1 recall. No other implants failed during the observation period. Mean marginal bone loss at Year 1 was 0.19mm $\pm$ 0.39 and increased to 0.7mm $\pm$ 1.39 at Year 7. Peri-implant mucosal

complication was rare, although persistent plaque build-up with inner part of abutments was apparent. This contributed significantly towards the prosthodontic maintenance issues in Year 1, 2 and 7. Two participants from the 2.25mm ball abutment group also required multiple occasions of matrix activation and several participants requested for a new set of prostheses by Year 7. Participants expressed significant improvement with their masticatory efficiency, speech and comfort after receiving mandibular single-implant overdentures and believed that one implant was sufficient for meeting their needs.

**Conclusions:** Mandibular single-implant overdentures can be a clinically-acceptable treatment option for older edentulous patients while minimizing the burden of surgical and prosthodontic treatment commitment. However, appropriate attachment systems should be chosen to suit patients with limited manual dexterity.

## 16

### **ORAL HEALTH RELATED QUALITY OF LIFE IN DIABETIC ELDERLY PATIENTS**

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**Keywords:** Diabetes, diabetics, oral health related quality of life

**Purpose/Aim:** Diabetes is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. It is a common health problem and leading to several complications. The purpose of this study was to evaluate the oral health-related quality of life (OHRQoL) and associated parameters in elderly patients with diabetes.

**Materials and Methods:** The sample of elderly with diabetes mellitus (n=100), aged 65 years or more, attending clinics in Istanbul University Dental Faculty Department of Prosthodontics, was selected. The study included non-diabetic elderly (n=65) as a control group. Data were collected from a questionnaire including the patient (age, gender and education level), prosthetic appliances (age, type and location) and diabetes disease (type, length of time diagnosed and type of anti-diabetic medication) characteristics. OHRQoL was evaluated using the Geriatric Oral Health Assessment Index (GOHAI) and the Oral Health Impact Profile (OHIP-14). The data were analysed using SPSS Statistics 22.0.

**Results:** According to results, out of 100 diabetic elderly, 41% were men and 59% were women, 74% were between 65-74 years old, 26% were more than 75 years old. The mean age of diabetic respondents was 70.9±6 years. Nine percent use their dentures less than 5 years, 19% use between 5-10 years and 72 % use more than 10 years. The length of time since patients were diagnosed as diabetic ranged from 1 to 30 years with a mean of 11 years. Gender, age and education did not show any significant relation to the GOHAI and OHIP 14 scores. Prosthetic status was significantly associated with the results of the GOHAI and OHIP 14. GOHAI score (47.8±8) and OHIP 14 score (59.6±7.7) of diabetic respondents were found low, indicating they had low perception of oral health related quality of life.

**Conclusions:** Diabetic elderly patients did not show acceptable oral health related quality of life.

## 17

### **COMPLETE EDENTULISM: A CAUSE OF NUTRITIONAL DEFICIENCY IN ELDERLY WOMEN - A RANDOMIZED CONTROLLED TRIAL**

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**Prosthodontics and Crown & Bridges**  
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**Keywords:** randomized controlled trial, nutrition, complete denture

**Purpose/Aim:** To evaluate the role of complete denture fabrication in improving the nutritional status and masticatory efficiency in elderly women as well as role of dietary supplements on nutritional status.

**Materials and Methods:** This randomized controlled trial was conducted from 2012 to 2016 in tertiary care institution and patients were recruited after taking written consent form. This study included 126 cases (complete edentulous) and 63 control (complete dentition) participants. Inclusion criteria were female from 45-65 yrs, class I complete edentulous (2-6 months) with no history of dental wearing for case group and class I complete dentition occlusion for control group. Exclusion criteria were any metabolic disease/malignancy, osteoporosis, taking any food supplement. Various biochemical (hemoglobin, calcium, albumin, vitamin D), masticatory efficiency & radiological investigations were conducted. Case group divided into equal size group into with and without food supplement after rehabilitation with complete denture. All the investigations would be repeated 3 and 6 months after fabrication of the denture and dietary supplementation. Level of significance was set as 0.05 and SPSS version 21 was used to analyse the study.

**Results:** A statistically significant difference was found in biochemical parameters after rehabilitation with complete denture before and after complete denture fabrication. ( $P < .05$ ) Statistically no difference was noted between complete denture wearer with or without taking nutritional supplements on biochemical parameters, masticatory efficiency.

**Conclusions:** This study find that complete denture itself enhance masticatory efficiency which may increase patient choices of food taken. So this study do not find food supplement to added benefit after rehabilitation with complete denture.

## 18

### THE GROUCH INDEX: ALMOST GUARANTEED TO BRING A SMILE

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**Keywords:** shortened dental arch, vertical dimension of occlusion, quality of life

**Purpose/Aim:** The fullness of a patient's lips and the position of the corners of the mouth when at rest were identified as predictors of the state of the posterior dentition. With the loss of the mandibular molars there was a marked decrease in lip fullness and a greater downward turn of the corners of the mouth when in repose giving a greater wrinkling and therefore aging effect. If the mandibular molars were present but worn down occlusally, the effect was lessened. Regardless of the extent of the tooth loss, the overall loss of vertical dimension of occlusion gave the patient somewhat of a "grouchy" appearance despite the patient's disposition. This lead to the development of the "Grouch Index": a quick, extra-oral, dental assessment of posterior teeth. Smiles were elicited from the patient when told that through the provision of the new dentures, not only would the functional aspects be addressed but that their "Grouch Factor" would be decreased. To determine whether the "Grouch Factor", as determined by the fullness of the lips and the position of the corners of the resting mouth, could be decreased by means of restoring the posterior dentition.

**Materials and Methods:** Patients with shortened dental (Kennedy Class I) or completely edentulous arches who were treatment planned for fabrication of removable lower dentures were invited to participate in the Grouch Index (GI) Project. Extra-oral photos were taken prior to treatment with/without the current prostheses in place, at the occlusal rim try-in appointment, and upon insertion of the final dental prostheses. Measurements were taken of the fullness of the lips at the midline and at the depths of the corner position (CP) of the mouth compared to the midline position (MP) prior to and after delivery of the prostheses. A GI score of "0" was given if there was no difference in CP compared to MP, "1" with  $\leq 1$  mm difference, and "2" with  $>1$  mm difference.

**Results:** All patients in the present study increased their lip fullness upon delivery of the prostheses and decreased their GI scores, eliciting smiles/laughter upon hearing the results.

**Conclusions:** Although the restoration of function is of primary importance when providing patients with dental prostheses in efforts to improve their oral health-related quality of life, by providing them with a concurrent, less grouchy ergo more youthful appearance, the patient's satisfaction with the treatment is increased. The introduction of the "Grouch Index" offers a quick assessment of the posterior dentition that is almost guaranteed to bring a smile.

## 19

### MAXILLOFACIAL REHABILITATION IN HIV PATIENTS: THE SOUTH AFRICAN EXPERIENCE

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**Case Presentation:** The South African history of HIV is arguably one of the most controversial and interesting of most countries around the world. An understanding of the social, economic and political background of this country is important for an appreciation of this history. Today ordinary South Africans are paying a hefty price for the mistakes of the country's past. In 2016, it was estimated that 7 million of the 55.9 million South Africans are HIV positive, the highest number anywhere in the world. The use of anti-retroviral therapy has improved the life expectancy of many patients living with HIV such that it is now regarded as a chronic disease. The focus therefore needs to be more on improving the quality of life of these patients. Head and neck infections and cancers are still one of the biggest challenges for HIV patients. Management of these conditions often leads to maxillofacial defects which require some form of rehabilitation. To date, there has been little if anything reported in the literature about maxillofacial rehabilitation in HIV positive patients. As a result, there is a lack of evidence based protocols. This presentation will look into the experiences and challenges of the team at the University of the Witwatersrand, Johannesburg, when rehabilitating HIV positive patients.

## 20

### EFFECT OF POWDER-WATER RATIO AND WATER TEMPERATURE OF ALGINATE IMPRESSION MATERIALS

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**Keywords:** alginate impression material

**Purpose/Aim:** Recently, GC corporation had developed the new alginate impression material. In daily practice at dental office, Powder-water ratio of alginate impression material is changed to control properties with some deviation. The purpose of this study was to evaluate the effectiveness of powder-water ratio on strength of alginate impression material.

**Materials and Methods:** Alginate impression materials used in this study are GC Pas/Cion(GC), Aroma fine plus normal set(AF, GC), Jeltrate Plus(JP, DENTSPLY) and Avagel(AG, DENTSPLY). Initial setting time, Elastic recovery test and Strain-in-compression were tested according to ISO 21563:2013. Compressive strength were tested according to ISO 1563:1990.

**Results:** The highest compressive strength value (MPa) was obtained by -15% water of Pas/Cion (0.71) followed by standard water of Pas/Cion (0.58), +15% water of Pas/Cion (0.50), Aroma fine (0.54), Jeltrate plus (0.50) and Avagel (0.19). All powder-water ratio of PC has not less than other product even it had higher water contents. Water temperature effected to initial setting time but did not effected to other properties. Less water contents made faster initial setting time, higher compressive strength and lower strain-in-compression. More water contents made slower initial setting time, lower compressive strength and higher strain-in-compression.

**Conclusions:** Alginate impression material is designed to use with standard powder-water ratio. However, GC Pas/Cion has reliable characteristic and robustness for less technical error such as tearing at thin margin area in daily practice even it is used as varied powder-water ratio and water temperature.

Products	PC					AF	JP	AG
	-15%	Standard			15%	Standard	Standard	Standard
Powder-water ratio								
Water temperature(degree)	23	4	23	30	23	23	23	23
Initial setting time	1'40"	2'45"	2'10"	1'15"	2'20"	2'05"	2'10"	2'50"
Compressive strength (MPa)	0.71	0.57	0.58	0.55	0.5	0.54	0.5	0.19
Elastic recovery test (%)	95.6	95.5	95.9	96	97	97.5	97.4	97.5
Strain-in-compression (%)	10.3	12.2	12.1	12.7	14.1	14	16.7	17.8

## RETROSPECTIVE STUDY ON MRONJ IN PATIENTS WITH MAXILLARY SINUSITIS

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Oral and Maxillofacial Surgery  
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**Keywords:** MRONJ, Sinusitis, FESS

**Purpose/Aim:** The purpose of this study is to investigate the outcome and prognosis of MRONJ in patients with Maxillary sinusitis

**Materials and Methods:** Patients with MRONJ affecting maxillary posterior areas with concomitant maxillary sinusitis who undergone surgical and functional endoscopic sinus surgery at Ewha Womans University Mokdong Hospital from January 2006 to 2016. Computed tomography scans and panoramic radiographs were performed as diagnostic tools. Age, sex, type of medication, duration of medication, clinical symptoms, onset, location, MRONJ stage, improvement of maxillary sinusitis, fistula closure and recurrence were evaluated.

**Results:** Thirteen patients (Male: 1, Female: 12) were included in the study with a mean age of 74 years old. Five patients presented MRONJ on the maxillary left posterior area, 6 on the maxillary right posterior area and 1 patient have both sides affected. Post-operative follow-up presented resolution of maxillary sinus inflammation and consequently, MRONJ resolution.

**Conclusions:** Sequestrectomy for MRONJ treatment in the affected maxillary posterior area in conjunction with functional endoscopic approach when the maxillary sinus is involved is an effective way of treating MRONJ in the maxillary posterior area. It is paramount to understand the association of these conditions if present to provide a more effective and holistic treatment.

## ► Ceramics & Esthetics (Grand Salon II)

22 \*

### **NEW CERAMICS, CAD/CAM, AND THE APC ZIRCONIA BONDING CONCEPT**

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Philadelphia, Pennsylvania, USA**

**Abstract:** The recent evolution in ceramic and CAD/CAM technologies is breathtaking but leaves many open questions in restorative and implant dentistry. What new ceramics are available and what are their properties? Is all zirconia the same and how does manufacturing affect physical and optical properties? How to cement and bond zirconia? This presentation will answer those and other common questions based on decades of research and the latest scientific evidence will be presented.

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### **ESTHETIC INTEGRATION AROUND TEETH AND IMPLANTS**

**Tosta, Mauro \***

**Private Practice  
Tosta Odontologia  
São Paulo, Brazil**

**Abstract:** The presentation will focus on surgical and prosthetic strategies for treating highly demanding esthetic situations involving teeth and implant-born restorations

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### **OVERCOMING CHALLENGES IN THE ESTHETIC ZONE WITH MATERIALS AND TECHNIQUES FOR DENTAL IMPLANTS RECONSTRUCTIONS**

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Oral & Maxillofacial Surgery  
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**Abstract:** Dental implants are increasingly used as the primary choice to restore function and esthetics in our patients. Therefore, clinicians are seeing an increase in biological, mechanical and technical complications associated with these rehabilitations. The restorative doctor and/or dental laboratory have many materials from which to choose for laboratory fabrication of the final implant restoration. Historically, ceramic fused to metal utilizing a “cast to” abutment has shown excellent long-term results and superb esthetics, but the pursuit of even more predictable esthetics and greater manufacturing efficiencies has led to metal-free restorations and milled ceramic/ titanium abutments. This presentation will focus on key factors in treatment planning; implant reconstructions, such as implant position and prosthesis design.



**25 \***

## **CONTEMPORARY PROSTHODONTICS: KEY FACTORS FOR LONG-TERM SUCCESS**

**Morton, Dean**  
**Indiana Dental Association Professor and Chair**  
**Department of Prosthodontics**  
**Assistant Dean for Strategic Partnerships & Innovation**  
**Director, Center for Implant, Esthetic &**  
**Innovative Dentistry**  
**Indianapolis, Indiana, USA**

**26 \***

## **INTERDISCIPLINARY ESTHETIC APPROACH TREATING TOOTH AND IMPLANTS**

**Bechelli, Diego \***  
**Authorized Professor AOA**  
**Associate Professor, University of Rosario**  
**Private Practice**  
**Buenos Aires, Argentina**

**Abstract:** Facing esthetic challenges involves, most of the time, a team work where two or more specialized clinicians should interact along the treatment phases. The step-by-step interrelation is crucial in arriving to a pleasant esthetic result. This lecture presents different situations compromising teeth and implants, where an interdisciplinary approach and different treatment options are indicated. The rationale for predictable treatment and some clinical tips are also discussed.

**Learning Objectives:**

1. Highlight the esthetic risk factors that anterior area includes
2. Consider tissue modification around tooth and implants
3. Indicate the different uses of ceramics as final prostheses

## 27 \*

### LESS IS MORE OR MORE IS BETTER: WHICH APPLIES TO IMPLANT-RELATED SITE PRESERVATION AND AUGMENTATION?

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**Abstract:** There is currently much advocacy for site preservation and site augmentation procedures to enhance the “correct” placement and “aesthetic” restoration of implant-supported procedures. Indeed, it is almost accepted that these procedures are paramount and essential, especially in the esthetic zone. Prospective studies and meta-analyses in systematic reviews, which quote mean marginal bone levels to three decimal places, do claim statistically significantly more coronal levels and increased bucco-palatal bone width with these procedures. However, they are not always predictable, are morbid and often have unintended consequences. They also significantly increase the costs of treatment. In a recent study of single implant crowns, patients rate cost as the factor that most impacts on their satisfaction. So who is driving this paradigm? The clinical relevance of these procedures, their unintended consequences, and their effect on patient satisfaction, pose questions for both their efficiency and efficacy in a large number of cases. Perhaps less is more.

## 28

### THE FRACTURE RESISTANCE OF CERAMIC MATERIALS

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Department of Prosthodontics  
Yangsan, Kyungsangnamdo, Korea (South)

**Purpose/Aim:** The purpose of this study was to determine fracture resistance and failure modes of three-unit fixed dental prostheses (FDPs) made of lithium disilicate pressed on zirconia (LZ), monolithic lithium disilicate (ML), and monolithic zirconia (MZ).

**Materials and Methods:** Co-Cr alloy three-unit metal FDPs model with maxillary first premolar and first molar abutments was fabricated. Three different FDPs groups, LZ, ML, and MZ, were prepared (n = 5 per group). The three-unit FDPs designs were identical for all specimens and cemented with resin cement on the prepared metal model. The region of pontic in FDPs was given 50,000 times of cyclic preloading at 2 Hz via dental chewing simulator and received a static load until fracture with universal testing machine fixed at 10°. The fracture resistance and mode of failure were recorded. Statistical analyses were performed using the Kruskal-Wallis test and Mann-Whitney U test with Bonferroni's correction ( $\alpha=0.05/3=0.017$ ).

**Results:** A significant difference in fracture resistance was found between LZ ( $4943.87 \pm 1243.70$  N) and ML ( $2872.61 \pm 658.78$  N) groups, as well as between ML and MZ ( $4948.02 \pm 974.51$  N) groups ( $P < .05$ ), but no significant difference was found between LZ and MZ groups ( $P > .05$ ). With regard to fracture pattern, there were three cases of veneer chipping and two interfacial fractures in LZ group, and complete fracture was observed in all the specimens of ML and MZ groups.

**Conclusions:** Compared to monolithic lithium disilicate FDPs, monolithic zirconia FDPs and lithium disilicate glass ceramics pressed on zirconia-based FDPs showed superior fracture resistance while they manifested comparable fracture resistances

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### ESTHETIC AND FUNCTIONAL MANAGEMENT OF SOFT TISSUE IN IMPLANT DENTISTRY

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Ashman Department of Periodontology and Implant Dentistry  
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**Keywords:** Soft Tissue, Management, Esthetic

**Case Presentation:** Problems of soft tissue quantity and quality are usually managed before or during implant therapy to enhance the soft tissue around implant-supported restoration interface. However, it is often necessary to improve soft tissue esthetics after the placement of the final implant-supported restoration. The purpose of this case report was to introduce a new predictable and simple technique to increase facial peri-implant soft tissue volume in maxillary site.

## POSTERIOR BONDED CERAMIC INLAYS/ONLAYS: CAN THEY SURVIVE FOR MORE THAN TEN YEARS IN FUNCTION?

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Montevideo, Uruguay**

**Keywords:** Bonded ceramics, functional survival, inlays/onlays.

**Purpose/Aim:** The improvements in the biomechanical and aesthetic properties of new bonded ceramics, have increased their use in posterior teeth as replacements for amalgams and alloy inlays/onlays. Furthermore, clinical researches in posterior bonded ceramic restorations (PBCRs) have shown very good results. However, long-term (i.e., > 10 years) longitudinal clinical studies are scarce. Therefore, the aim of this oral presentation, is to discuss the retrospective clinical performance of PBCRs, placed by the author in his private practice, in a 5 to 18-year period.

**Materials and Methods:** The patients to be evaluated, must have been treated in the office for at least 7 years and still in the practice up to year 2013, with complete dental arches (sound or restored teeth). To be included, the PBCR must have been in function for at least five years. Two-hundred and ten patients fulfilled the inclusion criteria. Of these, a randomly selected sample of 130 patients, that was considered statistically representative, were examined. The clinical exams were blinded between the author and two independent experienced dentists. The examiners were previously calibrated. Clinical data were recorded on specially designed forms. Ninety-three bonded ceramic inlays/onlays, had been placed on posterior teeth in 47 patients. Fourteen variables were analyzed to evaluate the clinical performance of PBCRs. A modified Ryge's criteria was applied to establish the quality of the restorations. Cohen's Kappa coefficient, on the quality analysis of the restorations, ranged from 0.78 to 1. Fisher's exact test, Chi Square test, Kruskal-Wallis's test and Mann-Whitney's non-parametric test were indicated to analyze significant differences.

**Results:** At the moment of the examination, 87 (93.5%) restorations were in function and 6 failed (6.5%). Eighty-one (93%) were rated as Clinical Success. The observed mean survival time of those that remained functional was 11 years. The pattern standard deviation was 4 years, with a 95% CI for the overall observed mean survival time (10 years - 11 years 9 months).

**Conclusions:** Posterior bonded ceramic onlays, represent a predictable, esthetic and functional treatment, technique sensitive with acceptable longevity. However, several factors must be considered to reach an excellent clinical outcome.

## ENHANCING AND STABILIZING OCCLUSION WITH RESIN BONDED RESTORATIONS: A MINIMALLY INVASIVE AND CAD/CAM APPROACHES

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Tel Aviv, Israel**

**Keywords:** Monolithic Zirconia cap, Occlusal wear, minimal invasive dentistry

**Case Presentation:** Occlusal restoration of the dentition has classically been divided into considerations of planning for sufficient posterior support, occlusal vertical dimension and eccentric guidance to provide comfort and aesthetics. Planning and executing optimal occlusion schemes is an integral part of the fixed and removable restorations. When we choose the material to rehabilitate with, we must consider the opposing jaw and our ability to maintain the occlusal contacts with time. The presentation shows new technology in order to enhance stabilization of the occlusion, using a Lithium Disilicate restoration for fixed restorations and a monolithic zirconia cap to a partial denture in order to resist the occlusal changes that occurred due to wear of the denture's teeth. Bonding partial restorations to teeth, enable us to modify an occlusal disharmony, where contacts of opposing occlusal surfaces are not in harmony with other tooth contacts. When combined with Occlusal reshaping, we can choose a minimal invasive dentistry approach without compromising and fixating an occlusal problem on one hand, while not crowning full arches on the other hand. We should always consider preserving tooth material versus enhancing aesthetics. A treatment plan should consider the patient's individual clinical determinants. Furthermore, when we rehabilitate one jaw with a full or partial denture opposing a natural dentition or a fixed dental prosthesis, we often encounter a problem with excessive wear of the weakest link, the teeth of the denture. When the teeth are worn, an excessive force may be applied on the remaining teeth in partial dentures, causing harmful changes. The occlusal wear in full dentures cause changes in vertical dimensions, changes in excursive guidance and a faster resorption of the edentulous areas. Bonding partial restorations can also be applied to Artificial teeth. When we cover the denture's occlusion with a material that has a similar Modulus of Elasticity, we might enhance the stability of the teeth of the denture. We can use a high-tech Cad/ Cam to enhance the conventional dentures.

## EFFECT OF FERRULE ON THE FRACTURE RESISTANCE OF ENDODONTICALLY TREATED TEETH

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**Keywords:** ferrule, ferrule effect, fracture resistance

**Purpose/Aim:** To critically analyze and synthesize the effect of ferrule on fracture resistance of endodontically treated teeth (ETT).

**Materials and Methods:** A systematic search of articles in English published in 2006-2016 was conducted in PubMed, MEDLINE, Cochrane Library, Embase, and Science Direct databases. Laboratory studies exposing data related to ferrule (ferrule height or length, width or thickness, location or position) and fracture resistance of ETT were included and further classified according to main topics.

**Results:** 49 in vitro studies were identified as meeting the inclusion criteria. Compared with no ferrule (0 mm), ferrule of 0.5-5mm height could increase the fracture resistance of restored ETT and an increased height of ferrule provided a greater strength. Fracture resistance of ETT varied as different ferrule location (0, 1, 2, 3 or 4 walls). Specimens with no ferrule (0 wall) showed the lowest mean of fracture strength, while a circumferential ferrule (4 walls) or incomplete ferrule (2 or 3 walls) with 1 or 2 mm height had much higher fracture resistance. To various tooth type and position of ETT, the ferrule effects on fracture resistance might be a little different.

**Conclusions:** Based on this systematic review, it was concluded that: (1) presence of ferrule had a positive effect on the fracture resistance of ETT; (2) ferrule location has a significant influence on the fracture resistance, and a circumferential or incomplete ferrule is considered a better option than no ferrule; (3) current literature lacks the information on optimal ferrule thickness.

## THE EFFECTS OF DIFFERENT REGIONS AND DIFFERENT CUT DIRECTIONS ON BOVINE ENAMEL BONDING STRENGTHS

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**Keywords:** Enamel microstructure, Self-etch adhesive, Microtensile bond strength

**Purpose/Aim:** The study investigated the effects of different regions and different cut directions on bovine enamel microtensile bond strengths (MTBS) of self-etch adhesives, and enamel self-strength.

**Materials and Methods:** Thirty bovine mandibular incisors were randomly assigned into 11 groups according to the different cut directions (labial (tangential), horizontal and longitudinal) and different regions at incisal, middle and cervical thirds. Half horizontal fragments at incisal, middle and cervical thirds and half longitudinal fragments were further prepared with a 45 degree bevel. All the sectioned surfaces applied with one of six self-etch adhesives before they were placed with the respective composite resin from the same manufacturer. They included Clearfil SE Bond?Clearfil S3 BOND + Majesty, Kuraray-Noritake Co.?iBOND + Venus?Hereaus-Kulzer GmbH?G BOND + Gradia Direct?GC?Adper Easy One + Filtek Z350?3M ESPE?and Xeno III + Spectrum TPH3?Densply. The specimens were prepared into multiple micro-beams for MTBS test after 24-h water storage. Another sixteen bovine mandibular incisors were either horizontally or longitudinally sectioned to obtain the pure enamel micro-beams for enamel self-strength tests. All the sectioned surfaces were analyzed by SEM.

**Results:** The longitudinal section resulted in lowest enamel MTBS among the all groups in agreement with the weak horizontal enamel self-strength ( $p < 0.001$ ). A 45 degree bevel could not significantly improve enamel MTBS in all groups ( $p > 0.05$ ) due to similar enamel micro-structures at presence and absence of a 45 degree bevel. The cervical third of bovine incisors resulted in significantly higher enamel MTBS than the incisal and middle thirds of horizontal and tangential sections ( $p < 0.001$ ). The two-step self-etch adhesive Clearfil SE Bond achieved significantly higher enamel MTBS than the other five one-step self-etch adhesives.

**Conclusions:** The bovine enamel MTBS might be correlated to the enamel microstructures of different regions and different sections. A 45 degree bevel could not greatly improve the enamel MTBS. The longitudinal enamel crack could not be repaired by contemporary dentin adhesives due to the weak horizontal enamel self-strength and enamel micro-structures. The two-step self-etch adhesive Clearfil SE Bond could achieve significantly higher enamel MTBS than one-step self-etch adhesives.

## A NOVEL METHOD TO IMPROVE ADHESION BETWEEN MDP CONTAINING RESIN CEMENTS AND ZIRCONIA-BASED CERAMICS

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**Keywords:** adhesion, zircon, bond strength

**Purpose/Aim:** (1) to evaluate the effect of a novel surface modification method on the bond strength of MDP containing resin luting materials to zirconia. (2) to compare its effects on polished, sandblasted and ceramic primed zirconia surfaces.

**Materials and Methods:** Thirteen groups of sintered zirconia plates (n=12) were prepared with different surface treatment methods, either polished (P) or sandblasted (SB). Four of these groups (2 polished and 2 sandblasted) were surface modified with low energy silicon ion beam produced by an Electron Cyclotron Resonance Ion Source (ECRIS) from silane gas. Specimens were prepared by bonding cylinders of luting cements (φ=2,5mm, h=3mm). Shear bond strengths were measured with a universal testing machine. The following resin based luting materials and proposed primers were used in this study: Panavia F 2.0 cement (Kuraray), Clearfil Ceramic Primer (Kuraray), G-Cem LinkAce cement (GC), Ceramic Primer II. (GC). A resin reinforced glassionomer cement Fuji Plus (GC) on polished zirconia surface served as control (Group C). Both resin cements were tested on polished and sandblasted surfaces without and with the application of ceramic primers. G-Cem LinkAce cement (GC) was tested on silicon ion beam surface modified zirconia plates as well.

**Results:** The highest bond strengths were measured on silicon ion beam surface modified specimens in each subset. The difference was significant on polished surface when compared G-CEM LinkAce groups with G-CEM LinkAce applied on ion beam modified surfaces. The bond strength of G-CEM LinkAce was significantly higher than those of Panavia F 2.0 in each subset. Sandblasting increased significantly the adhesion of both examined luting materials. Both Clearfil Ceramic Primer and Ceramic Primer II. increased bond strength.

**Conclusions:** Mechanical and chemical treatment increased adhesion to zirconia. Surface modification by silicon ion beam resulted in further improvement on bond strength to polished zirconia surface.

## THE LOW TEMPERATURE DEGRADATION BEHAVIOR OF ZIRCONIA CERAMIC SINTERED BY DIFFERENT METHODS

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**Keywords:** low temperature degradation, zirconia ceramics, microwave sintering

**Purpose/Aim:** The low temperature degradation (LTD) behavior plays an important role in the deleterious effect on the stability of dental zirconia. The different sintering methods along with distinct conditions inevitably influence the LTD behavior of zirconia ceramics, however, these phenomena remains largely unveiled. The purpose of this study was to compare LTD behavior of zirconia ceramic sintered by microwave and conventional sintering process.

**Materials and Methods:** 80 zirconia specimens were randomly divided equally into a microwave sintering and conventional sintering group. The samples from the 2 groups were divided into 4 sub-groups according to different thermal cycle time at 134°C and 0.2 MPa pressure (0 h, 5 h, 10 h and 15 h). Zirconia specimens were polished and sintered. Three-point bending strength test was performed before and after aging treatment, scanning electron microscopy (SEM) were used to observe the alteration of microstructure and finally X-ray diffraction (XRD) was applied to detect the crystal phase transition under different conditions.

**Results:** With the increase in the aging time, the three-point bending strength of zirconium ceramics sintered by two methods both gradually declined, while the values of microwave sintering groups were superior to the conventional sintering ones (P<0.05). The results of XRD showed that the degree of the zirconia phase transformation increased with aging time, while the values of microwave sintering groups were less than the conventional sintering ones (P<0.05).

**Conclusions:** Within the limitations of this study, we found that microwave sintering result in more resistance to low temperature degradation of zirconia ceramic in comparison of conventional sintering method.

## EFFECT OF GRINDING ON ZIRCONIA DIOXIDE SURFACE

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**Purpose/Aim:** Zirconium dioxide has been widely used in dental prosthodontics. It presents a phenomenon known as allotropy, that is same chemical composition but different atomic arrangement, namely: orthorhombic, monoclinic, tetragonal, cubic and liquid. At room temperature, the natural state is monoclinic while to convert it to tetragonal phase it has to be heated above 1170 ° C and above 2370 ° C to produce the cubic one. The best mechanical properties needed in dentistry have been described for the tetragonal phase of the crystal. The aim of the study was to evaluate the impact the impact of grinding zirconia surface on its topography and if could induce a phase transformation from tetragonal to monoclinic.

**Materials and Methods:** SEM (Scanning Electron Microscopy) operating with 14 mm working distance and 3-10kV accelerating voltage. A series of diffraction measurements (XRD) were performed using a modified diffraction system HZG-4 and high-voltage generator TUR (30Ma, 34 kV). Peak FIT software was used to fit the results in a Gaussian line and converted into percentage values and normalized to 100%.

**Results:** The metastable form is dependent on the composition, shape and size of the zirconia particles. Changes in surface morphology were appreciated after grinding. The phase transition from tetragonal to monoclinic was induced by grinding. With an increase of monoclinic phase and therefore increasing the surface volume inducing compression strength.

**Conclusions:** The surface was analyzed before and after grinding. Finding a correlation between the grit of the bur and the surface modification. Moreover, it was appreciated the percentage of transformation on the tetragonal phase to monoclinic.

## DIGITAL DENTISTRY AND METAL-FREE PROSTHODONTICS IN SWITZERLAND

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 Geneva, Switzerland

**Keywords:** Digital dentistry, All-ceramic, Survey

**Purpose/Aim:** During the last decade, the dental industry made the new digital technology more user friendly and cost-efficient. The Prosthodontic graduate program at University of Geneva relies heavily on these technologies and the graduate students are exposed to state-of-the-art equipment. Little is known, however, on penetration of these new technologies among the private practitioners. The aim of this study was to evaluate the use of various types of ceramic restoration and new digital technologies in Switzerland.

**Materials and Methods:** In 2016, we conducted an online survey among the French-speaking dentists using a questionnaire specifically designed to evaluate changes in practices over the last 5 years. The questionnaire was tested among part-time faculties of the Dental School. The Swiss Dental Society agreed to provide the list of their members as they represent about 80% of the profession.

**Results:** After 6 weeks, 93 questionnaires were collected which represents a participation of about 20%. The internal reliability of the questionnaire was good with a Cronbach  $\alpha$  of 0.914. One-fifth of the Dentists reported using only classic restoration techniques such as PFM restorations. The main concern among these dentists was related to fracture and the lifespan of All-Ceramic restorations. On the other hand, 10% had acquired a CAD-CAM equipment. The most frequently used techniques were all-ceramic crowns (69%) and ceramic onlays (45%). All-ceramic FPD was used by 36% and 30% reported using ceramic abutment for implant. Only 6 participants placed ceramic dental implants. On average, participants evaluated that the number of onlay restorations placed in their practice over the last 5 years increased by a factor of 6. All-ceramic crowns increased by a factor of 4.5 and all-ceramic FPD by a factor of 6.8. Concerning the decision-making process, the main incentive for using these techniques was the demand by the patients and the better esthetic obtained according to the practitioner. The cost of treatment ranked last.

**Conclusions:** In conclusion, the new digital and metal-free technologies have progressed markedly over the last 5 years. The demand by the patients and better esthetic results seem the main incentive for the change. Yet, many dentists are still concerned by fracture and survival of these restorations. While anecdotic reports indicate drastic changes in some countries, more time will be needed for these technologies to substitute itself for the classic techniques in Switzerland.



## ► Patient Specific Presentations (Grand Salon I)

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### DETERMINING THE OCCLUSAL VERTICAL DIMENSION THROUGH CRANIOMETRIC METHOD IN THE CHILEAN POPULATION

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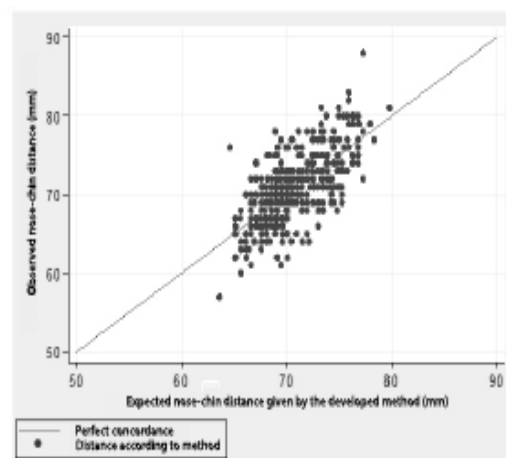
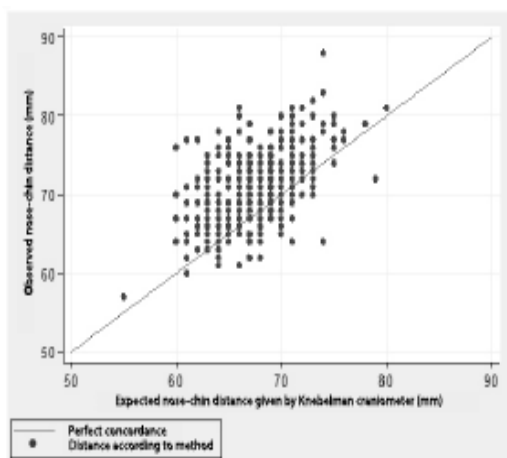
**Keywords:** Occlusal vertical dimension, Knebelman, Facial biotype

**Purpose/Aim:** Using a variation of the Knebelman craniometrical method for determining the occlusal vertical dimension in the Chilean population, by facial biotype and sex, with an anatomical measurement instrument, and comparing this method to that described by Knebelman.

**Materials and Methods:** The distances specified by Knebelman in his method, i.e. chin to nose, and ear to eye on both the right and left sides, were measured at the INDISA Clinic on 385 healthy Chilean subjects aged 18 to 50 and classified by sex and facial biotype according to an overall morphology index, using a computer designed gauge marked in millimetres and manufactured in machined aluminum. The variables were analyzed using the Pearson correlation coefficient, to further build a predictive model through multiple regression analysis for determining the occlusal vertical dimension. This was compared to the Knebelman method using a Bland-Altman plot.

**Results:** The left ear to eye distance must be used as a chin to nose distance predictor of the various facial biotypes. The proposed model for determining the occlusal vertical dimension showed a 69.58% predictive capability, while Knebelman's method only offers 53.72%.

**Conclusions:** The left ear to eye distance may be used as a chin to nose distance predictor in the Chilean population, using an anatomical measurement instrument, and considering variables like sex and facial biotype.



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### RESEARCH WASTE IN IMPLANT-RELATED RESEARCH

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**Abstract:** Implant-based patient care is a highly efficacious treatment modality in a very broad number of clinical applications and is an important aspect of contemporary Prosthodontics. The utilization of osseointegrated implants is well-supported by basic and clinical research, including numerous long-term outcome studies. Implant dentistry continues to attract significant research interest, and a tremendous amount of implant-related research is undertaken each year relative to other topics in Prosthodontics. But is this continued pre-occupation with further research in implants warranted? Are we perhaps over-emphasizing implant-based research and funding for this research at the expense of other non-implant-related topics in Prosthodontics?

Research waste occurs when research is redundant or when research results are ignored, cannot be found, or cannot be used. The amount of research time and funding are limited, and concentration of research efforts and funding support on some topics results in the lack of attention for other topics. This leads to another source of research waste – wasted opportunity to answer some clinical questions because the limited resources were redundantly invested to continue to address clinical questions that have already been answered.

Several factors help explain continued growth of research output in implant dentistry. Implant therapy allows for relatively easy standardization of clinical protocols and implant-related parameters (implant type, location, number and distribution). The tremendous explosion of constantly evolving and novel implant brands provides a strong steady stream of research funding as industry and marketing pressures lead to implant companies' search for external validation and brand differentiation.

The field of Prosthodontics is not immune to redundant research and wasted research opportunities. Long-term clinical outcome trials assessing interventions with osseointegrated implants have already repeatedly validated very high clinical success rates achieved by providers with various levels of expertise, with various implant types and treatment methodologies, and on a multitude of patient populations. This presentation will explore how allure of novelty and commercial pressures channel research efforts and research funding into implant-oriented research, while other areas of Prosthodontics suffer from limited support and attention.

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### **ORTHODONTIC SITE DEVELOPMENT, AN ALTERNATIVE TO GRAFTS IN IMPLANT PATIENT: A 7 YEAR FOLLOW UP**

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**Keywords:** orthodontic site development, mini implants, skeletal anchorage

**Case Presentation:** The interdisciplinary treatment of a young partially edentulous woman combining orthodontics, alveolar development for implant placement and prosthodontics is presented. The treatment plan included surgical, orthodontic and prosthodontic procedures, combined with implant site development using a Split crest osteotomy and mini screws for orthodontic anchorage.

The treatment allowed 10 mm. sagittal movement of a premolar increasing ridge width for implant placement, simplifying further prosthodontics procedures and avoiding the need of grafts. This approach provided satisfactory results, which have been stable on the long term, as evidenced by the 7-year follow-up records that are presented.

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### **EVALUATION OF OSTEOGENESIS AND ANGIOGENESIS OF ICARIIN IN LOCAL AND SYSTEMIC DELIVERY FOR CALVARIAL DEFECT**

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**Keywords:** Icariin, CPC, BMSC

**Purpose/Aim:** Typically, bone regenerative medicine is applied to repair bone defects in patients with osteoporosis. Meanwhile, there is an urgent need to develop safe and cheap drugs that induce bone formation. Icariin, which is reported to promote the osteogenesis of stem cells in vitro, is the main active component of Herba Epimedii. However, whether icariin could repair bone defects caused by osteoporosis remains unknown.

**Materials and Methods:** In this study, an osteoporosis model in rats was established by an ovariectomy first, and then, the osteogenic and angiogenic differentiation of bone mesenchymal stem cells (BMSCs) treated with icariin was evaluated. Furthermore, calcium phosphate cement (CPC) scaffolds loaded with icariin were constructed and then implanted into nude mice to determine the optimal construction. To evaluate its osteogenic and angiogenic ability in vivo, this construction was applied to calvarial defect of the ovariectomized (OVX) rats accompanied with an icariin gavage.

**Results:** This demonstrated that icariin could up-regulate the expression of osteogenic and angiogenic genes in BMSCs. Meanwhile, osteoclast formation was inhibited. Moreover, CPC could act as a suitable icariin delivery system for repairing bone defects by enhancing osteogenesis and angiogenesis, while the systemic administration of icariin has an antiosteoporotic effect that promotes bone defect repair.

**Conclusions:** In the present study, we demonstrate that icariin promotes the osteogenic differentiation and expression of angiogenic factors in BMSCs. In addition, it inhibits osteoclastic differentiation. In the OVX calvarial defect model, icariin loaded on CPC scaffolds enhances both osteogenesis and angiogenesis, while the system of local sustained release of icariin combined with systemic administration achieves a better effect for bone defect regeneration. The present study may provide a promising new strategy for repairing bone defects and suggests that icariin is a candidate drug that it achieves better repair with systemic administration.

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### TREATMENT OF DIMINISHED VERTICAL DIMENSION IN A PATIENT WITH A HISTORY OF DRUG ADDICTION

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**Keywords:** vertical dimension, CAD-CAM, functional anterior guidance.

**Case Presentation:** Oral rehabilitation treatment involves different pathways to bring a case success. Removable and fixed prosthesis including implant treatment will be discussed in the present case. A 48 years old male patient, with history of 20 years of drug abuse came to the office motivated to improve his oral and integral health. At the clinical exam the patient presents gastroesophageal reflux, Skeletal relation Type II, generalized chronic periodontitis and a diminished vertical dimension resulting in a aesthetic alteration, invasion of occlusal planes and a functional and anatomical malocclusion. Early stages of the treatment involve stabilizing mandibular position and achieve aesthetic parameters through removal prosthesis. In this stage we re-establish vertical dimension, jaw position and size and tooth position enabling a correct surgical and restorative placement of Implants. The remaining teeth were endodontically treated and reconstructed using cast post and core through a direct impression technique. DSD was used to distinguish what teeth need a crown lengthening. Anterior region was rehabilitated with metal free crowns (Emax CAD-CAM Phibo) and due to the maxillary mandibular relation we can achieve a more retruded position to compensate the aesthetic desarmy and at same time a more functional anterior guidance. Once the rehabilitation procedure ended the patient uses a rigid occlusal splint to manage the new masticatory forces. At year's control the patient presents good hygiene, articulation without symptomatology, and affirms no drug use.



## IMPACT OF UNPLANNED RADIOTHERAPY ON FUTURE PROSTHODONTIC TREATMENT IN HEAD AND NECK CANCER PATIENTS

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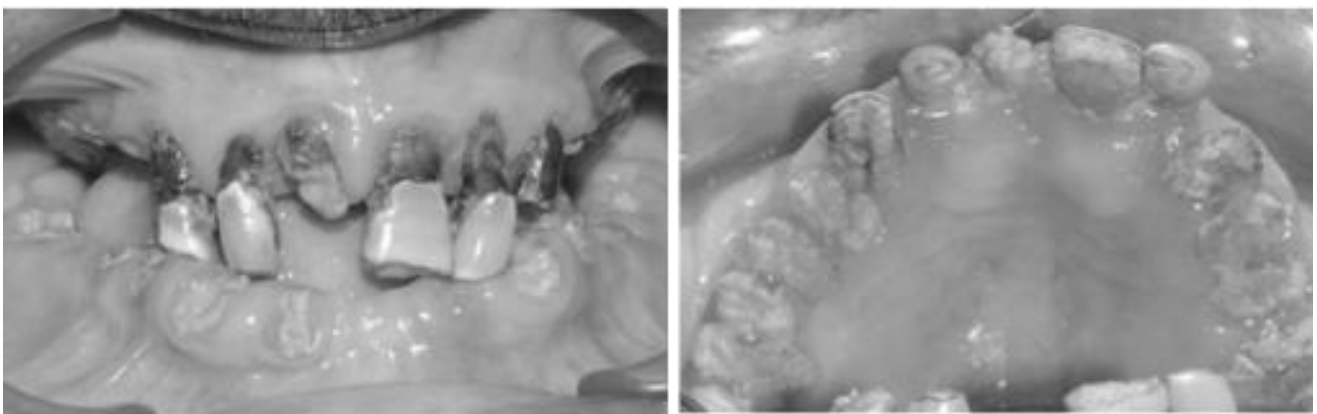
**Keywords:** Head and Neck Cancer, Oral Treatment, Radiotherapy

**Purpose/Aim:** Of the long-term head and neck cancer survivors treated with radiation therapy, 77% to 100% have mild-to-severe radiation damage of oral soft and hard tissues. Such inevitable complex oral complications compromise the prosthodontic treatment initiation and results in suboptimal treatment outcomes. Such a scenario negatively impact their oral health related quality of life. Further, those patients who could not get any dental evaluation and prophylactic treatment before initiation of radiotherapy present an enormous challenge to the treating dentist to fulfill their oral treatment needs. It is of immense importance to control oral diseases before the initiation of radiotherapy, to at least decrease the severity of post treatment complications.

**Materials and Methods:** 45 head and neck cancer survivors (6 females and 39 males) in the age ranges of 32-68 years were evaluated for their oral complaints and prosthodontic treatment needs. Due to many factors, no oral care was done for these patients before and/or during the radiotherapy. The data of the clinical presentation with respect to severity of adverse effects, xerostomia related quality of life, general oral care needs, and treatment limitations were recorded. Further, these patients were classified according to the ACP Prosthodontic Diagnostic Index (PDI) for partial edentulism to evaluate the appropriate treatment required. Appropriate treatment was rendered wherever it was feasible. A regime for oral care before, during, and post radiotherapy protocol is proposed for the patients undergoing radiotherapy for head and neck cancer.

**Results:** More than 85% of the patients were fitting in Class IV PDI. 100% of the patients presented with one or more missing teeth and compromised abutments. 95% (n=43) of the patients suffer from mucositis, xerostomia, periodontitis and/or radiation caries. 9% (n=4) of patients had DMFS index score of 100 (signifying complete breakdown of all teeth) and were scheduled for staged extractions. Trismus in more than 40% (n=18) of the patients precluded any attempt to treatment and their oral care was restricted to muscle reprogramming exercise and palliative care. Two patients could be treated for their prosthodontic needs by conventional complete overdentures.

**Conclusions:** Implementation of preventive oral care regime pre-radiotherapy and perpetual oral care promises decrease in the severity of post radiotherapy complications in head and neck cancer survivors. An organized treatment approach comprising, early identification of future prosthodontic treatment needs, preservation of future abutments, and a sustainable oral environment has potential to increase prostheses longevity and aid in improving quality of life in cancer survivors.



## OCCLUSION, MASTICATION AND COGNITION

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**Keywords:** cognition, occlusion, function

**Purpose/Aim:** Patients undergo a treatment protocol of progressive oral rehabilitation (POR) which has involved the transition of fully edentulous patients from upper and lower complete dental prostheses to a lower implant-retained dental prosthesis. Progression to fixed implant retained prostheses is an option.

The aims of the study are to assess changes in masticatory performance and quality of life induced by POR on cortical activity and cognitive function. It is hypothesised that improvements in mastication with POR is associated with enhanced cellular activity in specific brain areas related to cognition. Preliminary data will be discussed.

**Materials and Methods:** Following screening for eligibility:

1. Clinical examination and RDC/TMD screening the following questionnaires were completed - SCL-90R, 3MS, OHQoL-UK 2.

Recruitment into the study required informed consent

Part 1

2. Fabrication of new complete removable prostheses (Prostheses A)

3. Wear for at least one month

4. Assessment of outcome measures:

i. Evaluation of masticatory function

ii. Neurocognitive assessments

iii. Cortical evaluation with fMRI

iv. Quality of life assessment

5. Wear prosthesis A for at least three months

6. Treatment planning and implant planning (NobelClinician) using mandibular prosthesis as template for radiographic guide

7. Guided implant placement (NobelGuide) and prosthesis design

i. Four Nobel Biocare (NP/RP) dental implants to be placed in the anterior mandible

ii. Two medial implants to have healing abutments (1-stage protocol if possible, 2-stage is surgically indicated)

iii. Two distal implants to have cover screws and buried

iv. Minimum of three-month healing period

v. Placement of abutments attachments

8. Fit mandibular implant-retained prosthesis

9. Assessment of outcome measures (see 4.) after one week

10. and one month after issue

**Results:** Data indicates a significant improvement in presenting TMD and a reduction in several SCL-90R domains including somatisation, anxiety; improved masticatory function and OHQoL.

Data from fMRI will be shown to specify the regional changes in BOLD signals in areas of the CNS known to be involved in cognition including the prefrontal cortex, striatum and hippocampus.

**Conclusions:** Data has confirmed that POR has multiple benefits of improved comfort, function and by implication diet and nutrition, and OHQoL. The changes in activity of specific regions of the CNS indicate the plasticity of the CNS supporting the physical and quality of life improvements.

The change for edentulous patients with new complete prostheses is the first stage in rehabilitation and this may be sufficient to improve all aspects of an individual's needs.

Whether progression to an implant stabilised mandibular prosthesis is needed is based in individual patient requirements for function. Further progression to fixed implant prostheses may sometimes be indicated, but in the context of "less is more" this would be progressed for a relatively small number of completely edentulous individuals.

## A FULL MOUTH REHABILITATION: FACTORS TO CONSIDER IN TREATMENT PLANNING

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**Case Presentation:** Patients may present with numerous oral pathologies, which require a careful multidisciplinary approach to rehabilitation. A case is described of a 56-year-old female patient who presented with several oral conditions including missing teeth, periodontitis, denture stomatitis, non-physiological tooth surface loss, and caries. The patient also reported a day-time and night-time bruxing habit. These factors influenced the rehabilitative options and materials used. This case illustrates how various modifying factors must be considered in the treatment planning process to allow a holistic approach to rehabilitation.

## A NOVEL CASE OF GRAFTLESS PALATAL CLOSURE

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**Case Presentation:** Adenoid cystic carcinoma is a malignant neoplasm that arises within secretory glands. The most common occurrence is in the major and minor salivary glands. The treatment of choice is surgical resection with radiotherapy. This clinical report describes the sequence of restorative treatment of a 50-year-old male with a Brown's Class 2b defect following partial resection of the maxilla in treatment of a large adenoid cystic carcinoma of the palatal minor salivary glands. The patient received a hemi-maxillectomy that included the right maxilla, right premaxilla and left premaxilla preserving only teeth 23 - 28. At the time of resection, one zygomatic implant (Zygomaticus Implant, Southern Implants, South Africa) was placed into the zygomatic bone ipsilateral to the defect in order to retain an obturator. This allowed bilateral support of the obturator; both from the residual native dentition and the implant. The obturator design extended from the contralateral dentition to the exposed buccal fat pad to ensure satisfactory isolation of the defect from the oral cavity. Bismuth-Iodine-Paraffin (BIP) gauze was packed into the defect to prevent infection of the exposed tissue and promote secondary-intention healing of the surgical site. The obturator was affixed to the zygomatic implant. The patient presented at 3 months post-surgery, reporting mobility of the obturator. Intraoral investigation, however, revealed a granulated pseudo-palate bridging the ipsilateral buccal mucosa to the contralateral residual maxilla. An angulated implant (Co-axis implant, Southern Implants, South Africa) was placed in the contralateral native anterior maxilla and allowed to osseointegrate. Following osseointegration, a metal-reinforced acrylic denture was fixed to the implants restoring form and function. This procedure represents a novel use of a zygomatic implant and obturator to induce a graft-less palatal closure.



## **FULL-MOUTH REHABILITATION BY MAXILLARY IMPLANT OVERDENTURE AND MANDIBULAR TISSUE BAR RETAINED REMOVABLE PARTIAL DENTURE**

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**Keywords:** tissue bar, non-splint, maxillary overdenture

**Purpose:** To describe an optimized treatment plan and sequence for a patient who has mandibular anterior teeth and fully edentulous maxillary dentition based on clinical evidence to achieve treatment objectives.

**Patient's Brief History:** A 71-year-old male patient came to Korea university Guro hospital and requested to fabricate upper and lower dentures for the restoration of chewing function. He denied systemic disease and allergies. Several of his teeth were extracted, due to severe mobility and caries in the past 20 years. Although the patient had made dentures after extraction, he was unsatisfied because of discomfort and loosening.

### **Clinical Examinations:**

- 1)Maxilla: generalized severe alveolar bone resorption and fully edentulous arch
- 2)Mandible: (1) poor oral hygiene, (2) generalized gingival swelling and redness, (3) 44-47 missing; #35-37 severe alveolar bone resorption; #33, 34 and 43 dental carious.

### **Diagnosis:**

- 1)Loss of teeth due to extraction or local periodontal disease on #11-17, 21-27, and #44-47,
- 2)Chronic periodontitis on mandible (esp. #35, 36 and 37),
- 3)Dental caries on #33, 34 and 43.

**Treatment Objectives:** To establish an acceptable masticatory function, speech, and aesthetics for the patient.

**Treatment Options:** 1)Maxilla: Plan A - conventional complete denture; Plan B – implant supported overdenture (using splinted or non-splinted implant attachment) 2)Mandible: Plan A – conventional removable partial denture (and surveyed bridge or tissue bar on anterior area); Plan B – tooth supported overdenture; Plan C - implant supported fixed partial denture on posterior area (and fixed bridge on anterior area)

**Final Decision:** The use of dental implants in replacing missing teeth is an integral part of restorative dental treatment. Implant retained overdentures offer a stabilized removable solution for the edentulous maxilla, which provides improved patient satisfaction and quality of life. Although there are no specific guidelines for the maxillary overdentures, several studies reported the possibility of using non-splinted implant supported overdenture on a fully edentulous maxilla. Furthermore, bar-retained RPD has some advantages compared to conventional RPD with fixed prosthesis. Tissue bar can act as an indirect retainer that may improve the lateral and anterior-posterior stability and reduce the cost by reducing the number of fixed prosthesis. Finally, non-splinted implant retained overdenture in the maxillary arch and tissue bar supported RPD in the mandibular arch were fabricated to establish an acceptable masticatory function, speech, and aesthetics for the patient.

**Acknowledgement:** This study was supported by the Korea Health Industry Development Institute (2015-2017 Project No. HI15C0620).

## EVALUATION OF A FLUORESCENCE BASED CARIES AID DETECTOR- AN IN VIVO STUDY - PRELIMINARY RESULTS

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**Keywords:** caries, diagnosis, Fluorescence Based Aid Detector

**Purpose/Aim:** The aim of this study was to evaluate the efficacy of a fluorescence-based caries detection system in detecting occlusal caries compared to a clinical evaluation by experienced dentists.

**Materials and Methods:** After approval of the hospital ethics committee, adult patients in need of a clinical checkup were recruited from the students' clinic of the Hebrew University-Hadassah faculty of dental medicine. Images of surfaces of teeth suspected with caries were taken using an intra oral fluorescence caries detection aid device (Spectra® Air Techniques, Melville, NY) by an experienced dentist (15 years of experience and trained in the use of the fluorescence device).

Treatment plan based on the students' examination and diagnosis of carious lesions, were approved by the instructor, an experienced dentist and were compared to the lesions detected by the SPECTRA. The student and instructor were blinded to the fluorescence caries detection aid device results. Data analysis: Results of all teeth that have records from the two examination methods were entered into excel data sheet, and later transferred to SPSS software for further analysis.

Results were presented on a 2x2 table in order to calculate sensitivity, specificity, positive and negative predictive values. The statistical significance of the agreement or variance between the two methods were assessed by calculating Cohen's kappa coefficient. Good agreement was considered when  $\kappa \geq 0.6$ , while 0.4-0.6 was considered as moderate agreement.

**Results:** 84 pairs of decisions were available for analysis at this stage. These cases represented 14 patients, whose treatment plans were approved by 5 dentists. In 53 out of the 84 pairs (63.1%) there was agreements between the clinical decision and the Spectra readings. There were slightly more agreements of "not to treat" (30/53, 56.6%) than the decision to treat (23/53, 43.4%). The level of agreement (Cohen's kappa coefficient) was 0.6. The positive predictive value was 62, and the Negative Predictive Value was 68.7. There were more agreements in lower teeth than in upper teeth (73% vs. 55%).

**Conclusions:** The agreement level found at this stage may be regarded as moderate. Since there was no "gold standard", and the clinical decision making regarding occlusal and smooth surface lesions is highly dependable on operators experience and attitude. More cases and more analyses are required to understand how this technology may be efficiently utilized in the diagnosis procedure.

## RETROSPECTIVE EVALUATION OF IMPLANT-RETAINED MANDIBULAR OVERDENTURES MADE BY STUDENTS IN HADASSAH DENTAL SCHOOL

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Prosthodontic Department  
Jerusalem, Israel

**Purpose/Aim:** The 'McGill Consensus stated that the first treatment of choice for edentulous patients in the lower jaw, should be a mandibular implant-retained overdenture. The aim of our study is to describe the biological and technical complications related to implant retained mandibular overdenture.

**Materials and Methods:** 20 patients treated by students according to the McGill treatment protocol were invited to a clinical follow-up exam. All patients received implant-supported overdentures on 2 implants in the lower jaw. Clinical examination included (1) implant assessment (probing depth, BOP, mobility, plaque score); (2) prosthetic parts assessment (screw loosening, wear); (3) radiological assessment and (4) assessment of retention, support and stability of the denture.

**Results:** The survival rate of implants was 100%. The mean follow-up was 2.5 years. Low rates of BOP and an average PD of 3.75 mm was demonstrated. Radiographically, 25% of the implants showed an exposure of more than two threads. 50% of the dentures showed diminished retention, and reduced stability. 16% of the locator attachments were loose, 30% of the locator attachments were worn. 40% of the rubber bands were not retentive at all. During 2.5 years of follow-up each patient went to not more than one maintenance meeting.

**Conclusions:** Implant supported overdenture is a predictable treatment with high survival rates of the implants. Biological complications are minimal, in contrast to a high rate of wide range of mechanical complications. maintenance meetings are crucial to the success of implant retained mandibular overdentures. There is no clear protocol for the maintenance of Implant-Retained Mandibular Overdentures.

## 50 *cancellation*

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### **DEVELOPING A TYPE 2 DIABETIC RODENT MODEL TO STUDY THE EFFECT OF DIABETES ON OSSEOINTEGRATION**

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Sydney, NSW, Australia**

**Keywords:** Osseointegration, Diabetes, Bone

**Purpose/Aim:** The aims of this study were to develop a high fat, high sugar diet-induced rodent model of type 2 Diabetes Mellitus (T2DM) to analyse the effects of diet induced T2DM on the osseointegration of titanium implants.

**Materials and Methods:** Four female Sprague Dawley rats were randomly assigned to two groups: 1) Normal diet (ND), and 2) High fat high sugar (HFHS) diet. Titanium implants 4.1mm length x 1mm diameter with a sandblasted and acid etched surface (Institut Straumann AG, Switzerland) were placed in the right tibia at week 1 in the ND group and observed for a 4 week period. The HFHS group were placed on a special diet (high fat chow – 60% fat and fructose enriched water – 25%w/v) at week 1 and the implant placed in the right tibia at week 3 and observed for a 4 week period. Two-dimensional changes to bone quality were determined using dual energy X-

ray absorptiometry (DEXA) scans to analyse bone mineral density (BMD), Bone mineral composition (BMC), lean weight (LW) and fat percent. Metabolic changes were measured by insulin tolerance and oral glucose tolerance tests. Three dimensional bone morphological structures, relative bone volume (BV/TV), relative bone surface (BS/TV), trabecular thickness (Tb.Th), trabecular separation (Tb.Sp), trabecular number (Tb.N) and bone-to-implant contact (BIC) were analysed using microCT analysis.

**Results:** Whole body DEXA scans at week 5 following implant placements demonstrated reduced BMD ( $178.95 \pm 19.86$  Vs  $181.63 \pm 11.43$ ), reduced BMC ( $6113.67 \pm 94.00$  Vs  $6816.08 \pm 94.34$ ), reduced LW ( $108.08 \pm 27.05$  Vs  $157.88 \pm 3.72$ ) and increased fat percent ( $40.18 \pm 11.56$  Vs  $22.51 \pm 1.14$ ) in the HFHS group compared to the ND group. Insulin tolerance tests at week 3 and week 4 demonstrated reduced sensitivity to insulin in the HFHS diet group compared to the ND group. Analysis of the trabecular bone in a 0.5mm radius around the implant demonstrated reduced BV/TV ( $21.3 \pm 6.47$  Vs  $25.57 \pm 3.29$ ), reduced BS/TV ( $5.37 \pm 0.85$  Vs  $6.28 \pm 0.22$ ), reduced Tb.Th ( $0.15 \pm 0.03$  Vs  $0.16 \pm 0.03$ ), reduced Tb.N ( $1.38 \pm 0.17$  Vs  $1.63 \pm 0.09$ ), and increased Tb.Sp ( $0.32 \pm 0.03$  Vs  $0.29 \pm 0.03$ ) in the HFHS group compared to the ND group. Finally, the BIC in the HFHS group was reduced compared to the ND group ( $54.8 \pm 9.7$  Vs  $62.3 \pm 19.8$ ).

**Conclusions:** This model demonstrates a high fat, high sugar diet reduces insulin sensitivity in rodents, mimicking changes observed in diet-induced T2DM in humans. Although frank diabetes was not induced in this short study period, these early metabolic changes were shown to alter bone structure and morphology, and, importantly, negatively affect osseointegration.

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### **BMP-2 BASED GENE THERAPY INCREASES BONE FORMATION IN THE RAT**

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**Keywords:** gene therapy, bone regeneration, immunology

**Purpose/Aim:** Gene therapy approaches to bone tissue engineering have been widely explored. Here, we intended to compare the efficiency of linoleic acid-substituted polyethylenimine (PEI-LA) assistant transfection through ex/in vivo methods in craniofacial bone regeneration via the trigger of osteogenesis and immunological modulation.

**Materials and Methods:** Six groups each involved six animals received 1) Gelatin; 2) BMSCs/Gelatin; 3) GFP-transfected-BMSCs/Gelatin; 4) BMP2-transfected-BMSCs/Gelatin; 5) plasmid-GFP/polymer/Gelatin; 6) plasmid-BMP2/polymer/Gelatin tissue-engineered bone in the bilateral defects on rat's skull. Trichromatic fluorescent labeling was conducted at 2, 4, and 6w post-implantation. All rats were sacrificed 8w post-operation. Bone forming was systematically assessed by micro-CT scanning, Von-Gieson staining, HE/Masson staining. Immunological reaction triggered by plasmids, polymer, and their complexes were assessed in ex vivo tests on stimulated CD4+CD25-T from mouse spleen.

**Results:** All ex/in-vivo-transferring groups demonstrated obvious bone formation compared to the control group. Specifically, the BMP2-transfected-BMSCs/Gelatin group and the plasmid-BMP2/polymer/Gelatin group formed the largest amount of new bone. Surprisingly, the plasmid- GFP/polymer/Gelatin repaired the defect as much as the BMSCs/Gelatin and the GFP-transfected-BMSCs/Gelatin groups did. And the immunological modification stimulated by polymer/plasmid complex on CD4+ T cells were found to trigger an inflammatory/regenerative balance toward the bone forming processes without the delivery of bone forming protein.

**Conclusions:** Ex/in vivo transferring of BMP-2 gene increased bone formation, raising the possibility that stem cells/gene therapy propels the differentiation of MSCs toward an osteogenic destination with the cooperation of immunological modification induced by gene transferring procedure. Our therapy should have potential clinical applications for patients needing bone regeneration, who are suffering from masticatory function deficiency and normal appearance damage after various acquired/congenital diseases.

**Friday, September 8<sup>th</sup>**

► **Implant Prosthodontics** (Grand Salon III)

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## **IMMEDIATE LOADING WITH DIGITALLY PREFABRICATED RESTORATIONS- IS THIS THE NEW FRONTIER?**

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**Harvard School of Dental Medicine**

**Boston, Massachusetts, USA**

**Abstract:** Innovation in digital technology has brought to reality the prefabrication of implant restorations in combination with virtual implant planning and guided implant surgery, for partially edentulous and fully edentulous patients. This lecture will discuss the digital workflows available including their benefits and drawbacks, as well as a scientific update as to the indications for the immediate loading of dental implants.

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## **MULTIPLE IMPLANT FAILURE - THE CURRENT EVIDENCE**

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**Prosthodontics**

**Toronto, ON, Canada**

**Keywords:** multiple implant failure

**Case Presentation:** Osseointegrated dental implants are used to retain a variety of prosthesis types in partially and completely edentulous patients. Since their first introduction, dental implants have had a significant positive impact on the scope, delivery, predictability, and outcome of prosthodontic rehabilitations. While implant therapy has undergone significant evolution, one fundamental element remains unchanged – the whole process hinges on the ability of the endosseous dental implant to fuse with the adjacent bone (i.e., osseointegration). Although high implant success rates have been consistently reported in the literature in a diversity of clinical situations and patient populations, not all surgical implant placement procedures result in a favourable immediate or time-dependent bone healing response. Implant failure can have significant negative impact on the status of current or planned prosthodontic therapy and can result in the need for additional treatment. Multiple implant failure – defined as failure of more than 1 implant in the same patient – is a rare but particularly serious complication of implant treatment. At an extreme, multiple implant failure can result in the loss of all implants and implant-supported prostheses in a patient's mouth. The desire to avoid implant failure has fueled significant research efforts into the factors that govern the creation or maintenance of the osseointegration response. Despite significant progress in our understanding of implant failure and multiple implant failure, much is still unknown. Furthermore, the investigation of implant treatment outcomes, interpretation of results and comparison of results to other studies are often hampered by inconsistent definitions, evolution of treatment protocols, existence of several proposed aetiologies without a consistent and distinct clinical presentation, and low implant failure rate. This presentation will summarize the available literature on multiple implant failure and the challenges that exist in the study of this phenomenon. The limited available scientific knowledge appears to suggest that multiple implant failure is more likely in edentulous maxillae and that patients who experience implant failure may be at a higher risk of future biological complications.

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### MINIMALLY INVASIVE DENTAL IMPLANT TREATMENT: DOING MORE WITH LESS

**Eckert, Steven \***

**Professor Emeritus in Dentistry  
Mayo Clinic College of Medicine  
Edina, Minnesota, USA**

**Abstract:** This lecture will touch upon the following topics:

- Short and or thin implants
- Cantilevers (getting two for one)
- Single implant overdenture (everything but support)
- Fixed partial dental prostheses
- Full arch prostheses
- All on two, three, or four

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### SHORT AND ULTRA-SHORT IMPLANTS: IS SMALLER BETTER?

**Polido, Waldemar D. \***

**Oral and Maxillofacial Surgery  
Indiana University School of Dentistry  
Indianapolis, Indiana, USA**

**Abstract:** This lecture outlines implant strategies in elderly patients that aim to achieve three objectives: reduce risk and morbidity, maintain predictability, and allow maintenance and retrievability. Key points of treatment planning, appropriate preoperative care, and surgical techniques applied to the elderly patient will be presented, as well as the role of digital planning and guided surgery.

Cases will be discussed combining surgical and restorative options for a variety of clinical situations – single missing tooth, partial edentulism, and complete edentulism. The concepts of reducing invasiveness using short and/or reduced diameter implants to avoid major grafting will be discussed.

**Learning Objectives:**

1. Understand that implant surgeries in elderly patients are demanding and should not be performed by beginners
2. Discuss why digital planning and guided surgery may be appropriate for less invasive surgeries, but require a thoughtfully sequenced treatment plan and clinical experience
3. Understand that successful dental implant treatment in the elderly depends on the specific nature of the disease, local bone quality and quantity at the implant site, and the experience of the surgeon

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### OCCLUSION AND DENTAL IMPLANTS: WHAT GIVES?

**Taylor, Thomas D. \***

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Chairman, Division of Prosthodontics  
University of Connecticut School of Dental Medicine  
Farmington, Connecticut, USA**

**Abstract:** The biomechanical basis for implant component design has evolved dramatically since the early days of implant dentistry. Changes in thread profile, surface treatment, materials, connector configurations and many other aspects have improved the strength, stability and esthetic outcome of implant supported restorations. Unfortunately, many of the assumptions dentists and dental implant manufacturers continue to work under are not based on scientific evidence and may, in fact, be erroneous. Issues such as axial vs. nonaxial loading, progressive loading, occlusal overload and occlusion related bone loss are areas of concern to the dentist who places and/or restores dental implants and will be the topic of this review.

**Learning Objectives:**

1. Have an understanding of the state of the science is relative to dental implants and occlusion.
2. Be able to differentiate between high and low risk factors associated with functional loading of dental implants.
3. Be aware of how implant design and failure mode can be related.



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**PROSTHETIC PROTOCOL FOR COMPLETE IMMEDIATE LOADING**

**Riveros, Nicolás \***  
**Santiago, Chile**

**Keywords:** immediate loading, full arch, implants

**Case Presentation:** The overall aim for this presentation is to introduce a protocol for performing a complete immediate load on osseointegrated implants. We show our 20 years of experience on this subject, especially on full arches, from the Branemark Novum System, to the protocol we use today. We highlight the advantages of performing provisionals on immediate loading, contrasting it with traditional protocols of delay loading. We describe the clinical steps of preparation of several cases, from the correct way to determine an occlusal plane, up until teeth selection. We then show these stages through clinical cases, suggesting the impression technique and the way of obtaining and recording the vertical dimension of occlusion. Finally, we enumerate and justify the mandatory characteristics, upon us, of provisional prosthesis, together with the indications that must be given to the patient to achieve successful osseointegration.

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### THREE-DIMENSIONAL QUANTITATIVE ANALYSIS OF THE BONE DENSITY OF MANDIBULAR CONDYLE IN DENTULOUS AND EDENTULOUS JAWS

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**Keywords:** Bone density, dentulous and edentulous, mandibular condyle

**Purpose/Aim:** Studies have reported that masticatory function and occlusal force are low in edentulous patients, which brings about a change in the density, thickness, and alignment of bony trabeculae. However, studies that have quantitatively measured the differential cortical and medullary bone densities of the mandibular condyle in vivo remain rare. Hence, this study was planned to determine and compared the cortical and medullary bone density of the mandibular condyle in dentulous and edentulous jaws, using multidetector computed tomography (CT).

**Materials and Methods:** Forty mandibular condyles with no clinical signs of temporomandibular disorders were investigated in two groups with 10 subjects (aged 50 - 80 year) in each group (group A: dentulous subjects with maintained occlusion; group B: completely edentulous patients) with multidetector CT. The density of condylar cortical and medullary bone was determined by using bone density analysis algorithms available within the proprietary software. Data were analyzed statistically with the one-way analysis of variance test ( $p < 0.05$ ).

**Results:** The mean cortical bone density of the right and left condyles of group A was  $686.11 \pm 102.78$  Hounsfield unit (HU) and  $775.91 \pm 89.62$  HU, respectively and that of group B was  $531.33 \pm 289.73$  HU and  $648.53 \pm 294.39$  HU, respectively. The mean medullary bone density of the right and left condyles was maximum in group A subjects ( $429.69 \pm 102.62$  HU and  $486.62 \pm 108.60$  HU, respectively) than in group B subjects ( $214.89 \pm 104.37$  HU and  $205.36 \pm 90.91$  HU, respectively) with a statistically significant decrease in the mean scores ( $p < 0.001$ ).

**Conclusions:** Within the limitations of this study, it can be concluded that the cortical and medullary densities of the mandibular condyle are more in dentulous than the edentulous jaws.

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### ANALYSIS OF CLINICAL COMPLICATIONS OF FUNCTIONAL COMPONENTS IN DENTAL IMPLANT TREATMENT

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**Keywords:** implant, restoration, complication

**Purpose/Aim:** Clinical research in implant-prosthodontic treatment outcomes, includes analysis of comparable aspects of recorded specific complications associated with different therapeutic protocols. A classification of analyzed complications in a selected patient population group treated with implant-supported prostheses was developed to help determine the reproducibility of recorded complications.

**Materials and Methods:** A convenience group 126 patients was treated with 321 Astra implants which supported 46 removable and 80 fixed implant supported prostheses. Clinical treatment outcome analyses during a 5-year observation period revealed 748 technically related complications that impaired function of implant, abutment or the prosthesis. The complications were analyzed regarding functional units involved and the frequency of occurrence.

**Results:** The observed clinical complications were divided into 12 different categories: implant (mechanical destruction), provisional prosthesis, abutment, screw, cementation, retention (of the removable prosthesis part), bar (mechanical destruction), mucosa/prosthetic base interface, veneer/prosthetic tooth, denture base (defects, required extension), partial revision, complete revision of the final prosthesis. The focus of the preservation measures for removable prostheses was on corrections of retention, adaptation regarding the mucosa/restoration interface and on repair of the prosthetic base. The most frequent complications with fixed prostheses were related to screws, abutments and veneering.

**Conclusions:** The results of this study suggest an easy identification of shortcomings of specific prosthetic treatment protocols while assisting development of targeted improvement approaches. The described classification lends itself to similar assessments of available implant systems and permits comparisons between different prosthodontic treatment concepts

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### TREATMENT OUTCOMES OF MANDIBULAR MINI-IMPLANT SUPPORTED OVERDENTURES: A 30-MONTH PROSPECTIVE CLINICAL STUDY

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**Keywords:** Mini-implant, Overdenture, Treatment outcome

**Purpose/Aim:** This study was aimed to evaluate treatment outcomes of mandibular mini-implant overdentures for fully edentulous patients in terms of cumulative survival rate of implant (CSR), peri-implant tissue condition, prosthetic maintenance and complications, and patient satisfaction in five aspects (mastication, articulation, esthetics, pain, and overall).

**Materials and Methods:** This clinical trial investigated treatment outcomes of mandibular mini-implant retained overdentures in 45 edentulous patients. SlimLine® implant (Dentium, Korea) and MDI® implant (3M ESPE, USA) were randomly installed on anterior mandible in each group (24/21 patients) by flapless surgical approach. Opposing part of mandibular complete dentures on mini-implants were relined with COE-SOFT(GC, USA) immediately and female attachments were applied on the dentures at least six weeks after implant placement based on perio-test values (PTV). Clinical and radiographic data were collected during follow up period (baseline, 3Mns, 6Mns, 12Mns). The treatment outcomes were statistically evaluated and risk factors related the implant survival was analyzed by multivariate regression analysis. Statistical analysis was performed using SPSS software version 22.0 (SPSS Inc., Chicago, IL, USA,  $\alpha=0.05$ ).

**Results:** A total of 177 mini-implants were inserted on the anterior mandible of 45 totally edentulous patients. There were five implant failures in this study (97.2% survival rate) and there was no significant difference between two implant groups. Most of mini-implants showed stable initial perio-test values (iPTV) with an average  $1.03\pm 3.65$ , and mean marginal bone loss (MBL) was  $0.50\pm 0.75$ mm at 12 months. Patient satisfaction was significantly improved after implant installation. The multiple regression analysis revealed that implants of 2.4 mm in diameter had higher PTV than those of 2.8 mm and the iPTV influenced significantly implant failure.

**Conclusions:** There was no significant difference on the treatment outcomes of mandibular mini-implant overdentures between the SlimLine® and MDI® groups in terms of CSR, peri-implant tissue condition, prosthetic maintenance and complications, and patient satisfaction. Wide diameter of mini-implants showed higher initial stability. The higher initial stability of mini-implants may induce higher implant survival.

## TYING EVIDENCE-BASED DENTISTRY TO PATIENT-CENTRED CARE: A MIXED-METHODS ANALYSIS OF IMMEDIATE LOADING OF IMPLANT-OVERDENTURE

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**Keywords:** patient-centred care, immediate loading, mandibular 2-implant overdenture

**Purpose/Aim:** The patient's perceptions and experience with their illness and treatment is the core of shared treatment decision-making. However, the hierarchy of evidence in evidence-based dentistry underestimates the value of patient-centred care. Accordingly, research needs to turn more to a mixed-method approach to provide holistic evidence for treatment response. The objective of this illustrative analysis is to provide patient-centred evidence on the impact of immediate loading on mandibular implant-overdenture outcomes.

**Materials and Methods:** Using a mixed-methods sequential explanatory design, quantitative and qualitative data were collected in two consecutive phases within one quasi-experimental trial and over a 2-year period. Study participants (n=16, mean age: 62.4±7.7years) received 2-unsplinted-implant mandibular overdentures through immediate-loading protocol. For the quantitative approach, clinical outcomes and patient-oriented outcomes were collected at baseline and at 2-year follow-up using validated measures. The Brunner-Langer approach was used for statistical analysis. With a thematic analysis, the qualitative phase explored the patients' perspective via interviews.

**Results:** Quantitative data findings showed that immediate-loading protocol did not negatively affect clinical outcomes, satisfaction, and quality of life of patients wearing 2-unsplinted-implant mandibular overdenture. Qualitative analysis revealed that adequate information, immediate gratification and social confidence, as well as low cost are the elements that encourage patients to accept immediate-loading protocol.

**Conclusions:** This mixed-methods outcome analysis suggests that oral health care providers should provide patient-centred evidence on immediate -loading protocol for edentate patients who decide to receive mandibular-implant overdenture. Patient-centred evidence will empower patients in their treatment decision-making.

## EVALUATION OF OUTCOMES OF DENTAL IMPLANTS INSERTED BY FLAPLESS OR FLAPPED PROCEDURE: A META-ANALYSIS

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Department of Prosthodontics  
Shanghai, China

**Keywords:** dental implant, flapless, flapped

**Purpose/Aim:** The main purpose of this meta-analysis was to evaluate the failure risk and marginal bone loss of dental implants inserted by a flapless or flapped procedure.

**Materials and Methods:** Studies were identified by searching 3 databases, including PubMed, Web of Knowledge and the Cochrane Library within 10 years, along with a hand search of the reference lists of the retrieved articles. Risk ratio was used to evaluate

dichotomous outcomes such as failure rate, while mean difference in millimeters was used to evaluate continuous outcomes such as marginal bone loss. Each had a confidence interval of 95%.

**Results:** A total of 1637 articles were filtered following the searching strategy. After reviewing, 31 studies were finally selected in this meta-analysis, comprising 9 retrospective studies and 22 prospective studies. In the meta-analysis, failure rate of dental implants which suited the fixed-effects model was statistically affected by different insertion procedures (flapless or flapped) of the implants with a risk ratio of 1.75 (95% confidence interval: 1.16, 2.65;  $P=0.007$ ; heterogeneity:  $I^2=0.0\%$   $P$  heterogeneity = 0.98). Subgroup analysis indicated that in the situation of delayed loading, flapless or flapped procedure showed no statistically significant effect on the failure rate of dental implants (risk ratio = 1.18; 95% confidence interval: 0.59, 2.38;  $P=0.64$ ; heterogeneity:  $I^2=0.0\%$   $P$  heterogeneity = 0.87). While in the situation of immediate loading, flapless or flapped procedure showed statistically significant effect on the failure rate of dental implants, with a risk ratio of 2.15 (95% confidence interval: 0.98, 4.70;  $P=0.06$ ; heterogeneity:  $I^2=0.0\%$   $P$  heterogeneity = 0.85). Mean difference of marginal bone loss between the flapless group and the flapped group was statistically significant, with a mean difference of  $-0.10\text{mm}$  (flapless vs flapped; 95% confidence interval:  $-0.18, -0.02$ ;  $P=0.02$ ; heterogeneity:  $I^2=88.4\%$   $P$  heterogeneity = 0.00), which indicated that flapless procedure showed less marginal bone loss in comparison with flapped procedure.

**Conclusions:** This meta-analysis revealed that flapless procedure may increase the failure risk of the dental implants in comparison with flapless procedure, especially in the situation of immediate loading. Nevertheless, flapless procedure showed a superiority in preserving bone tissues over flapped procedure.

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### CLINICAL EVALUATION OF MANDIBULAR IMPLANT OVERDENTURES USING LOCATOR IMPLANT ATTACHMENT AND LOCATOR BAR ATTACHMENT

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**Purpose/Aim:** The aim of this study was to evaluate the clinical findings and patient satisfaction on implant overdenture designed with Locator implant attachment or Locator bar attachment in mandibular edentulous patients.

**Materials and Methods:** Implant survival rate, marginal bone loss, probing depth, peri-implant inflammation, bleeding, plaque, calculus, complications and satisfaction were evaluated on 16 patients who were treated with mandibular overdenture and were used for at least 1 year. (Locator implant attachment:  $n=8$ , Locator bar attachment:  $n=8$ )

**Results:** Marginal bone loss, probing depth, plaque index of Locator bar attachment group were significantly lower than Locator implant attachment group ( $p<0.05$ ). There was no significant difference on bleeding, peri-implant inflammation, patient satisfaction between the two denture types ( $p>0.05$ ) Replacement of attachment components was the most common complication in both groups. Although there was no correlation between marginal bone loss and plaque index, significant correlation was found between marginal bone loss and probing depth.

**Conclusions:** Locator bar attachment group indicates lesser marginal bone loss and need for maintenance compared with Locator implant attachment group. This may be due to the splinting effect among implants rather than the types of Locator attachment.

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### CEMENTACIÓN OF THE LOCATOR FIXING SISTEM

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**Keywords:** Overdenture, dental cement, Locator

**Purpose/Aim:** Compare the traction resistance of several kinds of cement agents, based on compound resin and Zinc Phosphate, in order to fix the Locator retainer in teeth that have been removed and treated endodontically.

**Materials and Methods:**  $N=24$  removed mandibular lower premolars were selected. These dental pieces received an endodontic treatment according to the established protocols. After that, a partial filling extraction of the canals was performed. The Locator devices

(Female Phase/Fase Hembra) were cemented to the dental pieces with 4 types of dental cements, divided in 4 groups (n=6). The cement agents used were: Zinc Phosphate cement (Goldsmith), compound resin cement Relyx U200 (3M-ESPE), compound resin cement Relyx Ultimate (3M-ESPE) and the compound resin cement Panavia F 2.0 (Kuraray).

After the cementation of the Locator devices, the samples were put in a heat-regulated machine at 37° Celsius for 24 hours. Lastly, each group was tested in an Instron machine (Model 3369, Instron Corp.) to determine the traction resistance of the different groups of cement, measured in Newton (N). The information obtained was analysed by the statistical software STATA12.

**Results:** The results obtained determined that the Relyx Ultimate cement was superior in terms of traction resistance, with an average of 834.1 N and an sd of 136.2 N. The second best was the cement agent Relyx U200 (Average= 536.8 N with an sd of 170.5 N). In the third place, Panavia F 2.0 cement (Average= 311.2 N with an sd of 107.2 N). The one with the lowest performance was the Zinc Phosphate cement (Average= 217 N with an sd of 62.2 N). The results show that there is a significant statistical difference in the results of the traction resistance tests of the different types of cements that were tested. Due to mistakes made in the manipulation of Panavia cement (not using Alloy Primer), the test and results of this cement are not valid

**Conclusions:** The hypothesis presented is confirmed and accepted regarding the efficiency of cements based on compound resin (Relyx U200, Relyx Ultimate). They show a better traction resistance compared to other kind of cement, such as the Zinc Phosphate cement when used in the cementation of the Locator fixing system in removed and endodontically treated pieces. Being superior the variation that uses acid etching to the self-etching. Lastly, choosing a cement depending on its nature, is critical in order to obtain good results at an adhesive level

## ► **Implants & Materials** (Grand Salon III)

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### **IN-VITRO COMPARATIVE LOADING CAPACITY OF CAD/CAM MONOLITHIC IMPLANT-SUPPORTED CROWNS WITH 3 DIFFERENT MATERIALS**

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**Abstract:** This report describes results from our pilot study to measure and compare the loading capacity of three different materials bonded to Ti-bases with one resin cement: IPS e.max CAD, Vita Enamic IS, inCoris Zi meso. The results indicate differences in fracture behavior and load-at-fracture values between the materials under investigating. Simulated aging through thermo-mechanical load causes substantial wear on some of the materials under investigation. It was, therefore, decided to eliminate thermomechanical load from the definitive study to ensure the same material thickness of all crown materials.

**Hypothesis:** There is a difference in load capacity between silicate ceramic, hybrid ceramic and zirconia bonded to Ti-Bases with a resin cement.

**Materials and Methods:** For the pilot study, 6 implant-supported standardized premolar crowns were fabricated from 3 different materials (n=2):

- IPS e.max CAD A (Silicate Ceramic, Ivoclar Vivadent)
- Vita Enamic IS (Hybrid Ceramic, Vita)
- inCoris ZI meso (Zirconia, Sirona)

Before bonding them to the titanium bases, all specimens were cleaned with alcohol (ethanol). Subsequently, the ceramic bonding surface were treated with phosphoric acid (35% PH for 5 s, with K-ETCHANT gel, Kuraray Noritake), water spray for 10 s, dried for 20 s, application of ceramic primer (Clearfil Ceramic Primer Plus, Kuraray Noritake) and a resin cement (PANAVIA V5, Kuraray Noritake). Ti-Bases were sandblasted with aluminum oxide and treated with a primer (Alloy Primer, Kuraray Noritake). Specimens were placed in the alignment apparatus and a load of 1000 g was applied for 10 minutes. Excess resin was removed with the use of foam pellets. All specimens were irradiated after mixing for 20 s from three sides for a total of 60 s.

**Storage and Testing Method:** After fabrication, the specimens were stored again in deionized water and subjected to thermo-mechanical aging with a load of 45 N for 1.2 million chewing cycles in a computer-controlled dual-axis chewing simulator. Concurrently, the specimens were exposed to thermocycling (6000 cycles, 5° C and 55° C for 120 s each, with a small pause between cold and warm water cycles). This procedure is supposed to mimic intraoral function of approximately 5 years. For recording any events including cracking of the ceramic materials and crown fractures, all specimens were examined daily during and at the end of artificial aging in the chewing simulator under a stereomicroscope. Flat, polished Zirconia antagonists were used according to the loading jig of the static Voss test. Representative examples of each group after thermo-mechanical aging are demonstrated in Figures 1-3. After thermo-mechanical aging, specimens were placed consecutively in a universal testing machine (Instron) and loaded axially to the implant until fracture. A steel ball was adjusted in the center of the occlusal surface with a 0.2 mm thick tin foil placed between the ball and the occlusal surface to attain homogeneous stress distribution (Figure 4). Fracture load values were recorded.

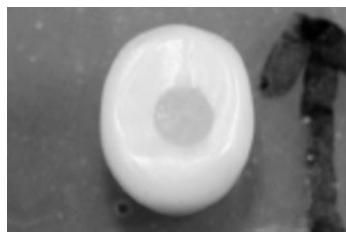


Fig. 1: Zirconia crown

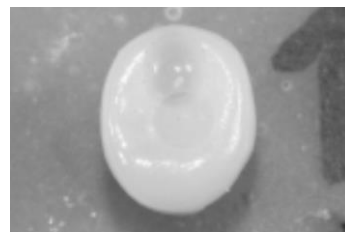


Fig. 2: IPS e.max CAD crown

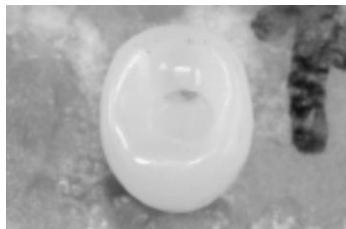


Fig. 3: Vita Enamic



Fig. 4: Instron test set-up

**Results:**

Material	Value	Observations
Zirconia crown 1	Did not break	Screw loosened
Zirconia crown 2	500 N	Crown fractured and separated from TiBase
E.Max crown 1	750 N	Crown fractured and separated from TiBase
E.Max crown 2	688 N	Crown fractured in the ceramic
Enamic crown 1	400 N	Crown chipped, then fractured.
Enamic crown 2	490 N	Crown fractured and separated from TiBase

E.max and Enamic crowns fractured before any screw loosening or fracture of the TiBase or implant. One zirconia crown suffered screw loosening before fracturing. Load-at fracture values differed between different materials. Thermo-mechanical load was applied to simulate intraoral conditions and aging. However, the functional surfaces of the crown materials were affected quite differently by the functional load. E.max and Enamic crowns suffered significant structural wear during the aging process and exhibited substantial material loss after chewing simulation. It must be assumed that similar studies reported in the literature had similar phenomena. However, none of them addressed how this affected the study outcomes.

The substance loss was so severe (Figures 1-3) that an effect on the ultimate fracture strength must be expected, negating direct comparisons between the crown materials.



**Conclusions:** This pilot study demonstrated differences in fracture behavior and load-at-fracture values between the materials under investigating. Simulated aging through thermo-mechanical load causes substantial material wear on some of the materials under investigation and, therefore, was identified as an influencing parameter that makes direct comparisons difficult. Based on these findings, it was decided to eliminate

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### **LESS IS MORE: OCCLUSAL CONSIDERATIONS IN THE INTERCEPTION AND TREATMENT OF DENTAL ATTRITION AND EROSION**

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**Abstract:** Dental attrition and erosion is commonly neglected to a point where dentine is exposed, the enamel is undermined and more aggressive treatment becomes necessary. Traditionally the treatment of advanced tooth structure loss involved periodontal and/or endodontic treatment with full coverage restorations.

In this presentation, I will describe a conservative additive treatment concept to re-establish a vertical dimension of occlusion (VDO) and centric occlusion (CO) in harmony with centric relation (CR) with acceptable aesthetic contours of the affected teeth. In severe cases, the definitive restorations can involve minimally invasive prosthodontic procedures, but also, when intercepted at an early stage, can function for an extended period of time.

**Learning Objectives:**

1. Understand the effects of dental attrition and erosion on the VDO and CO
2. Understand the Dahl principle of increasing the VDO on the anterior teeth and the re-establishment of a stable occlusion in CR over time.
3. Comprehend that by re-establishing the original tooth shape and contours can intercept further destruction and simplify the treatment to a very minimalistic approach.

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### **IN RESEARCH: TO ASSESS THE LESS AND MORE OF MORE AND LESS**

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**Abstract:** Will numbers express or suppress, progress or success? How to address the more and less? Price estimated that the number of scientific journals would double every 13 years, with recent figures indicating that the numbers of articles themselves doubled in less than a decade. Who examines the details of the increasing complex branches of sub-branches of dental research? "The most educated person in the world now has to admit... that he or she knows less and less, but at least knows less and less about more and more." When you see a patient in your clinic, where a missing single lateral incisor is to be replaced, what treatment would you complete? What evidence would you consult? Would you look for studies reporting on survivals or material choice? Would you look for studies that were randomised trials, cohort studies or systematic reviews? Would you consider whether the studies were completed in a private practice,

hospital or university and whether they included patients who were similar in age and medical conditions to yours? So much information: Too much information? Is it, “The more you know, the less you believe”. How can more research become less, so that less data can be more, to help clinical decisions... forevermore?

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### **MAXILLOFACIAL RECONSTRUCTION: FROM INTUITIVE TWO-DIMENSIONAL PLANNING TO MODERN DAY APPROACH AND APPLICATION**

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**Mayo Clinic**

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**Abstract:** The problem posed of surgical and prosthetic reconstruction of complex maxillofacial defects has undergone evolution over the last three decades. Starting with advances made in microvascular surgery, autotransplant of composite tissues became feasible and was the pilot concept used to advance reconstruction of mandibular defects. Increasing awareness of predictability and the demand for repair of simple and multi-planar defects of the orofacial region made an indelible footprint in the approach made with these patients. Concurrent technology capabilities have increased the scope of this unique application such that preoperative planning has afforded less operative time and fewer sequential procedures to traverse traditional healthcare barriers. Assessments of this approach will relate to convalescent, psychological, and economic advantages that lend a perspective if our care for patients has improved.

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### **THE EDENTULOUS MANDIBLE REVISITED- IS LESS MORE?**

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**Professor, Baylor College of Dentistry, TAMHSC, Dallas, Texas (Ret)**

**Past President, American Board of Prosthodontics**

**Branemark Award Recipient, AO, 2015**

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**Abstract:** The plight of the edentulous patient has presented therapeutic challenges to the dental profession for centuries. Given the predilection for denture induced bone loss in the mandible to be up to four times that of the maxilla, the lower jaw is often where most patients suffer the indignities of edentulism to the greatest degree

Even though early implant options offered some improvement in functional outcomes, there was never a predictable, consistently applied, or bone sparing approach that could be reasonably applied to the mandible until the advent of osseointegration. Professor Branemark's work gave us the first real hope for physiologic longevity of a third dentition, with a corresponding measure of denture stability that raised functional expectations to a level close to that of the natural dentition.

There is also no question that an osseointegrated approach to mandibular rehabilitation will dramatically slow the rate of bone loss, but the numeric array of implants required to attain this level of steady state continues to be a topic for debate. This presentation will review the geometric progression of mandibular full arch implant numbers, with underlying literature support and potential clinical complications which may influence the possibility that less is really more.

## ENHANCED HARD AND SOFT TISSUE INTEGRATION AROUND BIOFUNCTIONAL POLYETHERETHERKETONE IMPLANTS

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**Keywords:** polyetheretherketone, soft tissue, integration

**Purpose/Aim:** Polyetheretherketone (PEEK) possesses a similar elastic modulus as cortical bone but yet suffers from bio-inertness and poor osteogenesis. In this work, titanium plasma immersion ion implantation (PIII) was applied to modify carbon-fiber-reinforced PEEK (CFRPEEK) surface as implant neck to establish early peri-implant soft tissue seals. Bioactive elements (Si/Sr) were doped into PEEK surface by electron beam evaporation (EBE) to achieve rapid osseointegration.

**Materials and Methods:** After modification, morphology and chemical characterization of modified surfaces were examined. Human gingival fibroblasts (HGFs) were seeded onto the PIII-modified CFRPEEK for evaluating cell attachment, proliferation, migration and collagen secretion ability. Rat bone marrow mesenchymal stem cells (BMSCs) were cultured on element-doped PEEK to investigate the influence of modified surface on osteogenic differentiation in vitro. Then, in vivo, the rat femur model was used to evaluate the osseointegration ability of PEEK implants.

**Results:** Scanning electron microscopy (SEM) reveals the formation of nanopores with TiO<sub>2</sub> nanoparticles embedded on both the sidewall and bottom on CFRPEEK surface after PIII. In vitro study shows HGFs present improved adhesion, migration and collagen secretion ability which are important in peri-implant soft tissue integration. The bioactive elements doped PEEK can effectively improve the initial adhesion activity of BMSCs and promote osteogenic differentiation of these cells in vitro. Moreover, osseointegration of modified PEEK implants are largely enhanced in rat femur model after 8 weeks.

**Conclusions:** Our results indicate that a surface with multifunctional biological properties can be produced by multilevel surface engineering and application of PEEK to dental implants can be broadened and expedited based on this scheme.

## THE OSTEOGENESIS EFFECT OF A TITANIUM SURFACE WITH NANOTUBULAR TOPOGRAPHY

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**Keywords:** titanium implant, topography, bioactivity

**Purpose/Aim:** To investigate the osteogenesis enhancement effect of a titanium surface with nano-tubular topography and compare with other traditional surface treatments.

**Materials and Methods:** Titanium nanotubes were fabricated on top of pure titanium surface by anodization (TNT group). Other 3 surface treatments were applied to the Ti implants, namely machined smooth Ti (control group), sandblasted and acid etched Ti (SLA group), and sandblasted/acid etched TiO<sub>2</sub> nanotubes (SLA/TNT group). The topography of the four Ti surfaces were observed by scanning electron microscope (SEM). Bone marrow stem cell(MSC) adhesion, morphology and proliferation on different titanium surfaces were observed and ALP activities were measured through in-vitro cell study. Furthermore, the 4 groups of Ti implants were randomly implanted in the lower femurs of New Zealand Rabbits. Specimens consisting of the titanium implants and surrounding bone tissue were prepared for histological analysis and removal torque test after 8 weeks to compare the osteogenesis effect of the TNT with the other treatments.

**Results:** Although the values of the initial cell adherence at 60 min among TNT, SLA and TNT/SLA were not different, SLA and SLA/TNT presented to be rougher and suppressed the proliferation of MSC. TNT demonstrated a hydrophilic surface and balanced promotion of adhesion, proliferation and differentiation of MSC. After implanted in rabbit femur models, TNT displayed the best osteogenesis inducing ability as well as strong bonding strength to the substrate.

**Conclusions:** Nano-scale TNT provides favorable surface topography for improving the clinical performance of endosseous implants compared with SLA and machine polished surfaces, suggesting a promising and reliable surface modification strategy of titanium implants for clinical application.

## ACCURATE TRANSFER OF ALL PROSTHODONTIC DIAGNOSTIC INFORMATION TO IMMEDIATELY-LOADED FULL-ARCH ISP: THE MVD APPLIANCE

Michael, Michael \*

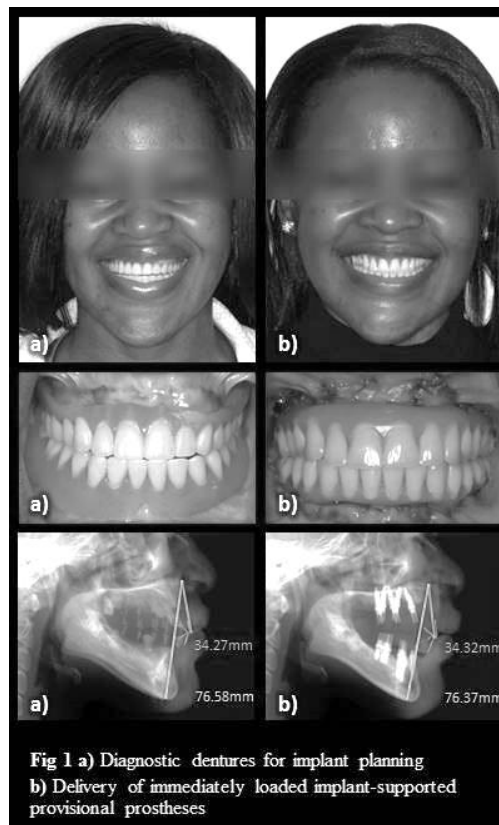
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**Keywords:** Immediate-loading, jaw-relation, edentulous

**Case Presentation:** When embarking on complex dental rehabilitation with the use of tooth-supported fixed prostheses, a provisional phase is required to assess the definitive outcome. This not only affords patients the opportunity of an aesthetic preview of tooth shape and arrangement, but in addition, technical aspects such as the maxillo-mandibular relationship can be determined and assessed over a period of time to determine a patient-specific treatment position. The vertical dimension of occlusion and the position of the anterior teeth are of particular importance as they are directly related to aesthetics, speech and comfort. In the instance of rehabilitation with removable prostheses, try-in steps are helpful to assess these aspects. For implant supported-prostheses, the method of prosthetic support changes. This creates challenges when immediately loading as there is no provisional phase. The prosthodontic diagnosis for implant-supported prostheses in edentulous patients requires the use of diagnostic dentures. The difficulty arises when this information is to be transferred to the implant-supported prosthesis. Very little has been published describing methods of accurately transferring this prosthodontic diagnostic information. Intra-operatively, there is a lack of reference points when using conventional tissue-borne jaw-relation guides. Surgical preparation for implant sites requires raising mucoperiosteal flaps and alveoplasty, and this prevents the accurate seating of such guides. These guides are further limited in providing information related to tooth position and the occlusal plane, and recording the maxillo-mandibular treatment position is particularly unpredictable while the patient is in a supine position under general anaesthetic. This case series of patients transitioning from either their natural dentition or mucosa-borne prostheses to immediately-loaded full-arch implant-supported prostheses shows the rationale and fabrication of the Michael Vertical Dimension Appliance (MVDA). The MVDA is based on a prosthodontically driven diagnosis for implant planning. Its accuracy is validated with the use of lateral cephalometric radiographs where the position of the anterior maxillary incisors and vertical dimension are measured in the diagnostic phase and correlated to the same positions post-loading.



## MINI DENTAL IMPLANTS IN STRATEGIC POSITIONS FOR BETTER RETENTION AND STABILITY OF REMOVABLE PARTIAL DENTURES

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**Keywords:** mini dental implants, removable partial denture, support

**Purpose/Aim:** Majority patients with severely reduced dentition receive a removable partial denture (RPD) retained by clasps, attachments or conus crowns. However, the proportion of dissatisfied patients can reach up to 40% over time. Placement of standard size implants in strategic positions for better retention and stability of RPDs has already shown benefits. However, clinical outcomes of slim mini dental implants (MDIs) in similar cases has not been reported yet, or longitudinally studied.

**Materials and Methods:** Seventy-six RPD wearers with severely reduced dentition (linear support) and slim alveolar ridges (<5 mm) participated. Panoramic radiographs and/or CBCTs were obtained. Each patient received 2 MDIs (1.9-2.9 mm wide; 10-14 mm long) one or two tooth width distally from the last remaining tooth. MDIs were inserted without flap reflection and immediately or early loaded; 52 patients received MDIs in the mandible, 24 in the maxilla. Patients filled in 3 questionnaires: Oral health impact profile (OHIP14), chewing function questionnaire (CFQ) and orofacial esthetic scale (OES) at baseline, after receiving new dentures and all adjustments finished, and after 1 year; 40 patients after 3 years and 22 patients after 4 years of observation. Panoramic radiographs or periapical images were obtained at the recalls. Periimplant tissue and oral hygiene were assessed.

**Results:** One hundred fifty-two implants were inserted. Two patients lost one implant and one patient lost both implants (mandible) before receiving new denture. One patient lost one MDI after 2 years, resulting in the 96.6% MDI survival. Patients improved significantly orofacial esthetics, chewing function and OHRQoL ( $p < 0.05$ ) with consistent results through the 1, 3 and 4 years. There was almost no bone loss or periimplantitis, albeit oral hygiene was not always good. Only one natural tooth was lost. Two O rings were changed. No denture fractures (CoCr framework) were reported. Only one matrix was loosened after 1 year.

**Conclusions:** Insertion of MDIs in strategic positions provide more favorable retention for a RPD and change linear into polygonal more favorable support, thus protecting remaining teeth and reducing a RPD subsidence. It seems that it is a viable and reliable clinical procedure; however more patients and more years of observation are necessary to approve the protocol.

**Acknowledgement:** Croatian Science Foundation for support of the project 1218 (Mini Dental Implants)



## BONDING STRENGTH AND IRRITATION TEST OF NEW TISSUE CONDITIONER USING ATBC AND HIGH-MOLECULAR WEIGHT PLASTICIZER

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**Keywords:** tissue conditioner, bonding strength, irritation

**Purpose/Aim:** The purpose of this study was to evaluate the bonding strength and irritation test of new tissue conditioner using acetyl tributyl citrate (ATBC) and high-molecular weight plasticizer in long-term observation.

**Materials and Methods:** The new tissue conditioner (NTU-TC) contained plasticizers of ATBC (Mw: 402.48; 78.3 wt%), hyperbranched polyester (Mw: 4245; 8.7 wt%), and EtOH (13 wt%) in liquid. NTU-TC and two commercial (Lynal, dentsply; Soft liner, GC) tissue conditioners were connected to PMMA resin block (n=10; each group). Tensile strength (MPa) of adhesion was assessed by dividing maximum force at the day 0, 1, 3, 7, 14 and 28 with the use of universal testing machine (cross head speed: 10 mm/min). In the mucosa-membrane irritation test, the PMMA resin disks (diameter: 5 mm; control group; n=6) and NTU-TC attached to PMMA resin disks (n=10) in the same manner were fixed into hamster cheek pouch (Syrian Hamster; Age: 60-70 days). The histopathological evaluation was undergone at 14 and 28 days. The biological reaction of inflammation was also scored by measuring the mucosa directly.

**Results:** The bonding strength of NTU-TC were compatible with two different commercial materials from day 1 to day 14. At day 28, the bonding strength was lower in NTU-TC than those in the other materials. However, the NTU-TC exhibited stable bonding strength from 1 to 28 d. In the irritation test and biological reaction of inflammation regarding the mucosa-membrane contact with the material, the histopathological symptoms of NTU-TC were found to be identical with those in control group at 14, 28 d.

**Conclusions:** Within the limitation of the study, the new tissue conditioner using ATBC and high-molecular weight plasticizer exhibited stable bonding strength with relevant biocompatibility.

## PHOTOFUNCTIONALIZATION TO IMPROVE PERI-IMPLANT SEAL AND ABUTMENTS BIO-COMPATIBILITY

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**Keywords:** photofunctionalization, zirconium oxide, UVC

**Purpose/Aim:** Dental implant-prosthodontics has become the standard in rehabilitating the edentulous or partially edentulous patient. To achieve long term success, it is imperative to not only focus on implant osseointegration but also on the interface between prosthetic abutment and soft tissue. The most common materials used to manufacture the abutments are titanium oxide and zirconia oxide. Both crystal structures of these oxides after production present Oxygen vacancies and defects, which are highly reactive. In the atmosphere there are plenty of hydrocarbons present which can react thanks to their carboxylic group with the surface of these oxides. This process of hydrocarbon contamination is called biological ageing. It results in a negative effect on the attachment capacity of the cells and their bio-activity, therefore reducing the possibility of creating a strong soft tissue seal around the abutment. The goal of the study was to evaluate the effect of UVC irradiation of the surface, also known as photofunctionalization, to remove the contaminating hydrocarbons leaving the possibility for the carboxylic group of the proteins on cells outer surface to interact directly with the abutment surface.

**Materials and Methods:** The XPS (X-ray photoelectron spectroscopy) AES (Auger electron spectroscopy) XRD (X-ray diffraction) and wettability test have been used to analyze the effect of the UVC irradiation on the chemico-physical composition of the titanium and zirconia oxide

**Results:** UVC irradiation has proven to be highly effective in removing the carbon contamination up to threefold. Moreover, carbon decontamination was not correlated with any changes in the crystal structure or surface roughness, especially important for tetragonal Yttria-stabilized Zirconia Oxide. Instead correlation was found during the wettability test, where the hydrocarbon contaminated surface had a contact angle of 85° therefore hydrophobic whereas on the almost carbon free surface it was 6 ° becoming super-hydrophilic. In general, the changes in chemical composition of the surfaces in the in vitro studies showed an increase of fibroblasts attachment/proliferation

**Conclusions:** From a clinical point of view being able to modify the titanium and zirconia oxides surfaces without sacrificing the mechanical strength of the materials to create a better seal at the abutment/soft tissue interface could improve the long-term success of implants.

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### **ADDITIVE MANUFACTURING IN PROSTHODONTICS; FACTS AND CHALLENGES**

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**Keywords:** additive manufacturing; 3D-printing; prosthodontics

**Purpose/Aim:** Recently there has been a burgeoning increase in the implantation of digital tools in the dental field. Digital technology involves computer-aided design/computer-aided manufacture (CAD/CAM) through either additive (3D-printing) and/or subtractive (milling) techniques. This presentation will provide a comprehensive summary on the scientific background, current implementation of additive manufacturing techniques in the field of fixed Prosthodontics. Special emphasis is given to the technical factors that influence the additive manufacturing process.

**Materials and Methods:** Stereolithography (SLA) and Digital Light Processing (DLP) techniques were used for printing of dental restorations from hybrid composite resin. The influence of build direction and support configuration on the dimensional accuracy and mechanical properties were assessed. The marginal and internal fit of 3D-printed full coverage dental restoration were also evaluated.

**Results:** Printed restorations exhibit adequate dimensional accuracy, mechanical properties, marginal and internal fit for potential clinical applications.

**Conclusions:** Additive manufacturing offers promising potentials for the fabrication of dimensionally accurate dental restorations. Understanding the factors involved with the manufacturing process is inevitable for a successful outcome.



## ► Digital Technology (Grand Salon II)

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### **DIGITALISATION: THE PARADIGM SHIFT IN DENTISTRY**

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**Professor**

**Head, Department of Oral Implantology & Prosthetic Dentistry**

**ACTA (Dental Faculty Free University of Amsterdam)**

**Amsterdam, The Netherlands**

**Abstract:** Digital tools are changing the world. We see major paradigm shifts in all areas of society be it education, transport, retail or in our case (dental) health care. The dental technicians and large dental labs are industrializing their planning and production methods. Small dental labs are becoming more and more dependent on large(r) production facilities to support their facilities as they can no longer invest into milling and 3Dprinting hard ware.

Materials that we use in restorative dentistry are also changing. Digital designs lead to milling and 3D printing of restorations and as such also dictate materials that then can be used. As our patients have not been exposed to these modern materials for that long a time we are not sure how these will perform in the long run. Still industry is pushing dental labs and dentists to use these as only then can the investment in the production sites be earned back. The upside is that the materials are getting cheaper. The materials costs for a 3D printed composite crown for long term use in the mouth is around 40-euro cents.

The care provider is also confronted with new tools. Intra oral scanners, extra oral cameras, CBCT scanner, planning software, digital design of individual restorations or the total smile let alone full mouth rehabilitation, occlusion and articulation registration etc. The full digital patient for diagnosis and planning is not far away. The new tools mean new ways of working and thinking. Modern dentists must be prepared to learn, unlearn and relearn the “tools of our trade” if he is to keep themselves up to standard.

In this presentation, we will try to show where we are when digitizing the patient for diagnosis and treatment planning and how this will make “the art of dentistry” simpler and cheaper to perform.

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### **CORPORATE DENTISTRY: FRIEND OR FOE?**

**Preiskel, Alon \***

**Guys Hospital, London**

**Prosthodontics**

**London, United Kingdom**

**Purpose/Aim:** This paper investigates practice consolidation in dentistry together with the effects of corporate owned groups on our profession.

**Materials and Methods:** The last 15 years has seen a drive to consolidate dental practices with studies predicting that corporate finance owned groups will dominate the provision of patient care in the next 20 years. This study represented a combination of literature reviews, subject interviews and industry analysis. It investigated the drivers of consolidation, together with the effects of corporate ownership upon dentists’ clinical judgment. The influence of corporate ownership on the profession was also examined.

**Results:** Increased regulation, competition and generous practice valuations encourage an ever-increasing number of dentists to sell practices to corporate groups. Growth is primarily driven by financial arbitrage that allows corporate owners to make profits by trading practice groups in financial markets. Corporate owned groups are motivated to make financial gain, often in a time frame, driven by factors in the financial markets irrelevant to dentistry. Little or no money is invested into dentistry. In fact, corporate finance is employed to dominate a fragmented market and take over existing assets for maximising profit. Corporate groups change the management structure to that of an industrial/corporate group. This approach often limits clinical freedom leaving the dentist as a technical labourer rather than a professional.

**Conclusions:** Corporate dentistry may represent a threat to the manner in which dentistry is practiced. To date corporate groups are primarily interested in maximising profits in relatively short time periods affecting dentists and the patients they serve. New ownership models must be developed in order to compete with these groups and allow dentists to maintain control of their profession.

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## **IMPLANT RESTORATIONS- CAN WE LEAVE CASTINGS BEHIND?**

**Evans, Christopher \***

**Specialist Private Prosthodontic Practice**

**Consultant Prosthodontists, Royal Australian Navy**

**Clinical Demonstrator, Graduate Diploma in implant dentistry at University of Melbourne**

**Brighton, VIC, Australia**

**Abstract:** Often the surgeon is blamed for placing the implant in a suboptimal position. However, the restorative dentist usually has final say over the outcome and ensuing maintenance issues that can occur if the restoration is biomechanically or biologically insensitive. This presentation considers the advantages that contemporary fabrication methods offer for producing implant prostheses when compared to and traditional methods of restoration. Processes for achieving optimal restoration outcomes with newer materials and techniques will be outlined.

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## **IMPLANT DENTISTRY IN THE DIGITAL WORLD**

**Lin, Wei-Shao \***

**Associate Professor**

**Director of the Division of Prosthodontics**

**Director of the ITI Implant Scholarship Program**

**Department of Oral Health and Rehabilitation**

**University of Louisville, School of Dentistry**

**Louisville, Kentucky, USA**

**Abstract:** This presentation will focus on maximizing the relevance and benefits of current computer software and digital technology options for improving evaluation and treatment outcome of implant patients. Further, the role of the computer software and associated digital technology in the effective transfer and utilization of information between treatment team members (restorative dentists, surgeons, and dental laboratory technicians) will be discussed and considered. The presentation will start with digital impression making, the management of digital data, the transfer of digital information to laboratory partners, the utilization of virtual implant planning software and to the design and manufacturing of CAD-CAM implant restorations.

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## **OPTIMIZING DENTAL IMPLANT TREATMENT THROUGH DIGITAL PLANNING AND COMPUTER GUIDED EXECUTION**

**Lanis, Alejandro \***

**Professor, Graduate Program in Computerized Dentistry - University of Chile / ACHIP**

**Professor, Oral Implantology - University San Sebastian**

**Private Practice**

**Santiago, Chile**

**Abstract:** The incorporation of virtual engineering into our profession and the digitalization of information are allowing us new perspectives and innovative alternatives for dental treatment modalities. The use of computer-guided implant planning software allows the radiographic, prosthetic, surgical and laboratory fields to be combined under a common virtual scenario, permitting an optimization of the complete surgical-restorative process.

## EVALUATION OF WEAR RESISTANCE OF INDIRECT COMPOSITE ADOPTED NANO-FILLER TECHNOLOGY

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Tokyo, Japan

**Keywords:** GRADIA PLUS, wear resistance, indirect composite

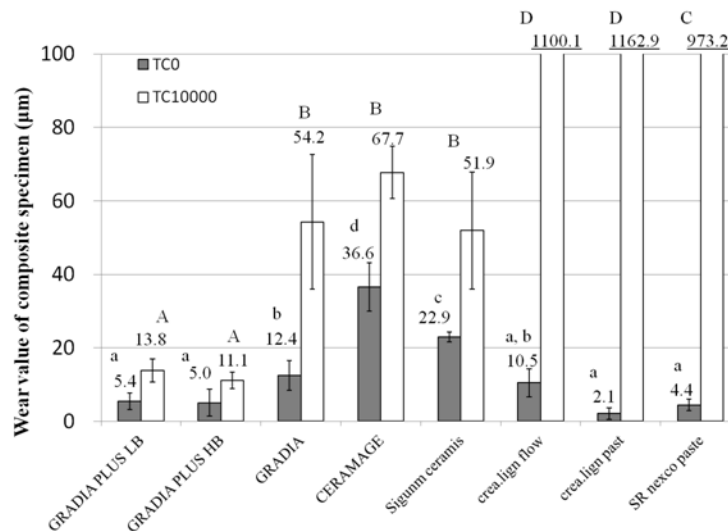
**Purpose/Aim:** A new indirect composite system has been developed, GRADIA PLUS LB (Light Body, flowable type) / HB (Heavy Body, paste type). GRADIA PLUS overcomes weaknesses of conventional composite resin, Micro-Filled Resin (MFR), by adopting nano-filler technology, so it demonstrates with high gloss retention and high mechanical properties. The purpose of this study is to evaluate the wear resistance of GRADIA PLUS and other indirect composites against an enamel antagonist after three-body wear test.

**Materials and Methods:** GRADIA PLUS LB/HB (GPL/GPH), GRADIA: GC (GR), CERAMAGE: Shofu (CRM), Signum ceramis: Heraeus Kulzer (SC), crea.lign flow: bredent (CLF), crea.lign paste: bredent (CLP) and SR nexco paste: Ivoclar/Vivadent (NP) were examined as indirect composites in this study. All specimens were stored in 37 °C water for 24 hours or under thermal cycling (5-55° for 10,000 cycles) after light curing. Three-body wear test was performed with wear test machine for 100,000 cycles (load 0.84 MPa). Antagonist was bovine enamel, and slurry mixture of PMMA and Glycerin was applied to contact area during performing test. Wear value was calculated from a difference of specimen height in before and after wear test. Results were analyzed by one-way ANOVA ( $p < 0.05$ ).

**Results:** Wear value of each specimen were shown (Figure). GPL and GPH exhibited significantly lower wear value of specimen compared to the other indirect composite before and after thermal cycling. Glass filler particle size of GPL and GPH is nano-order.

However, GR, SC, CLF, CLP and NP are MFR type composite and contain micro size pre-polymerized filler. There was hardly any hydroxyl group for silane-treatment on surface of pre-polymerized filler due to low filler content, so pre-polymerized filler was difficult to be silane-treated to bond to resin matrix. Therefore, crack was generated from interface between pre-polymerized filler and resin matrix by stress of expansion/contraction of filler during thermal cycling. However, GPL and GPH were not much affected by thermal cycling thanks to containing most suitable silane-treated nano-filler.

**Conclusions:** GRADIA PLUS LB and HB had higher wear resistance thanks to nano-filler content and most suitable silane-treatment for filler. GRADIA PLUS should lead to clinical longevity.



**Figure** Wear value of indirect composite after three-body wear test  
 ※Same superscript indicates no statistically difference.

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### AN ACRYLIC REPOSITIONING STENT FOR RADIATION THERAPY: DESCRIPTION OF A NEW TECHNIQUE AND FEASIBILITY STUDY

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 Oral Health Sciences  
 Vancouver, BC, Canada

**Keywords:** radiation therapy, radiation stent, bite block

**Purpose/Aim:** Radiation therapy is one of the main treatment modalities for malignant head and neck cancers. To minimize the damage to normal tissues during radiation therapy, various methods of stabilization have been utilized, including thermoplastic facemasks and bite blocks. Our goal is to assess the feasibility of a customized oral repositioning stent and its potential benefits.

**Materials and Methods:** Ethics Approval: Approval for this project was obtained through the BC Cancer Agency Research Ethics Board. Participants: 10 consecutive patients scheduled to undergo Intensity Modulated Radiation Therapy (IMRT) for cancers of the maxillary sinus, nasal cavity or oral cavity were recruited and consented to participate in the study. Radiation stent fabrication: Hard baseplate wax was used to create a customized wax pattern of the proposed acrylic stent at chair side and the customized wax pattern was processed in heat-cured clear hard acrylic overnight. Measuring the Stability of the Patient Position: Utilizing data from the daily KeV images, the relative stability of the patient setup was assessed. Monitoring of side effects: Participants completed a questionnaire to evaluate side effects. Assessments were performed at four-time points at: baseline; 3 weeks (mid-treatment); last day of radiation (6-weeks); and 3-months post-IMRT.

**Results:** A new workflow protocol has been developed and implemented at the BCCA. Patient stability data demonstrated mean vertical, longitudinal and lateral variations that were not statistically different when compared to two retrospective cohorts. Descriptive analysis of the questionnaire data seems to indicate a similar trend for self-reported oral symptoms as described in the literature.

**Conclusions:** It is possible to fabricate customized repositioning stents for HN cancer patients without affecting their IMRT treatment timeline. In addition, while utilizing the customized repositioning stent we were also able to maintain patient stability comparable to prior protocols and within a range of clinical guidelines as no patients' treatments were aborted.

## NEUROPHYSIOLOGICAL CONSIDERATIONS IN TREATMENT PLANNING DENTAL IMPLANT THERAPY

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Prosthodontics  
Toronto, ON, Canada

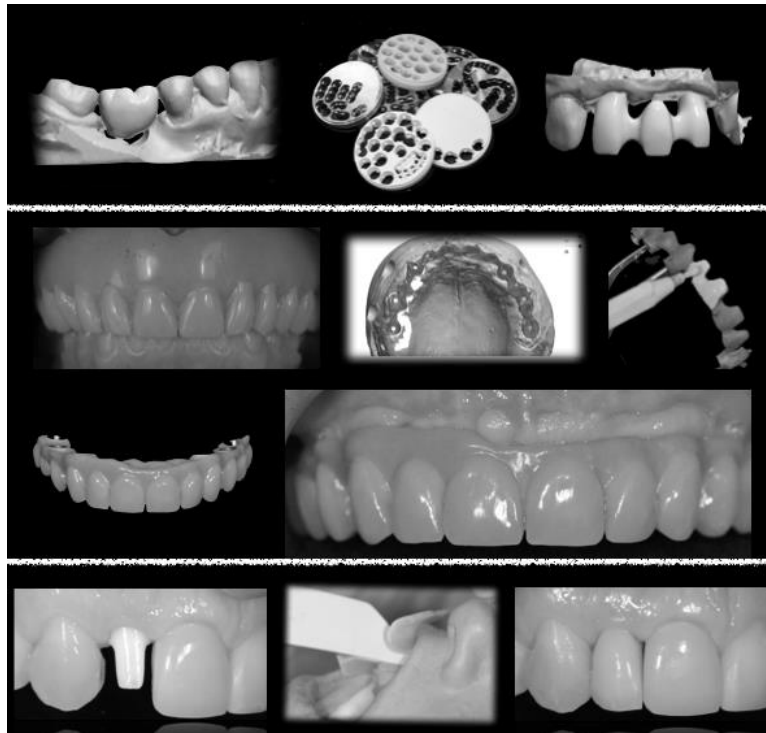
**Case Presentation:** Numerous studies have addressed possible causes for dental implant mechanical complications including implant, prosthesis and occlusal design, but have largely ignored neurophysiological considerations and the importance of incorporating proprioception in oral rehabilitation in general as well as in dental implant therapy. Failure to address these aspects can not only reduce the effectiveness of rehabilitation and treatment outcome with dental implants, but it may also increase the risks of mechanical complications. Thus, this presentation will address this gap in the literature by emphasizing current knowledge and by providing new perspective to the understanding and minimizing the risks of mechanical complications in dental implant therapy.

## CAD/CAM IN IMPLANT DENTISTRY

Dinato, Thiago \*  
Porto Alegre, Brazil

**Keywords:** CAD/CAM, dental implants

**Case Presentation:** CAD/CAM is in the trending topics of dentistry nowadays, with different companies presenting their possibilities and advantages. It is known that it revolutionized prosthodontics in terms of marginal adaption and the speed of manufacture of the prosthesis. The purpose of this presentation is to show the possibilities of the CAD/CAM technology in implant dentistry, from planning to prosthetic finalization. The topics will cover guided surgery planning and execution and the rehabilitation of single implants, besides partial and total rehabilitations.



## DIGITAL SCANNING TECHNIQUE VERSUS CHEMICAL ENAMEL DISSOLUTION, RELIABILITY OF A NOVEL NON-DESTRUCTIVE THREE-DIMENSIONAL TECHNIQUE

Atria, Pablo \* Malta Barbosa, J; Sampaio, C; Jorquera, G; Mahn, E; Coelho, P.G; Hirata, R; Mahn, G  
 Universidad De Los Andes  
 Department of Biomaterials  
 Santiago, Chile

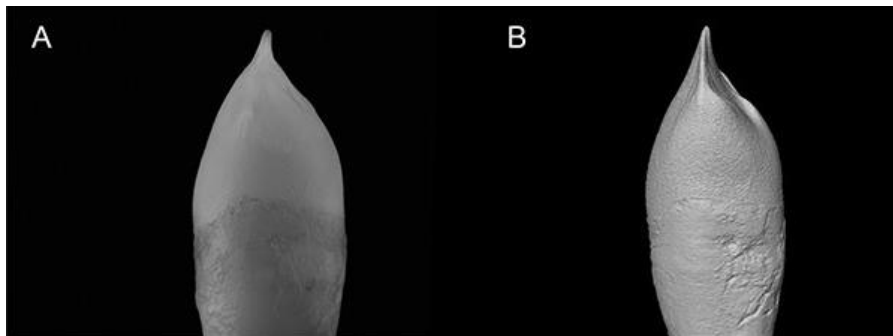
**Keywords:** three-dimensional, morphology, esthetic

**Purpose/Aim:** The aim of this study was to prove the reliability of a new digital acquisition method for studying the dental morphology and to compare it with chemical enamel dissolution.

**Materials and Methods:** Different types of sound extracted teeth (canines, central and lateral incisors) were scanned using micro-computed tomography equipment (µCT 40; Scanco Medical AG) and three-dimensionally reconstructed via software processing (Amira v5.5.2). After that, teeth were treated with 5% formic acid at room temperature for 5 days. Six different measurements were obtained per tooth, for both micro-computed tomography scans and enamel dissolution evaluations. Collected data from both methodologies were submitted to statistical analysis, specifically concordance coefficient measurements and linear regression were performed.

**Results:** Data showed to behave as a straight line, indicating a positive correlation between both methods, with no statistical difference between them. There was a concordance correlation coefficient of 97% between both micro-computed tomography and chemical enamel dissolution.

**Conclusions:** The non-destructive µCT three-dimensional reconstructing method is a reliable way for analyzing tooth morphology, achieving results that highly mimic nature, without the need of dissolving tooth structures, being a conservative technique of analysis. Results can be extrapolated in order to achieve personalized and “tailored made” esthetic restorations.



## USING A SMARTPHONE TO OBTAIN 3D MODELS: AN ACCESSIBLE METHOD FOR MAKING FACIAL PROSTHESES

S. Gamarra, Rodrigo \* Seelaus, Rosemary; Moraes, Cicero; Da Silva, Jorge; Dib, Luciano  
 Universidade Paulista  
 Pós Graduação  
 São Paulo, Peru

**Keywords:** 3D printing, 3D photogrammetry, 3D modeling

**Purpose/Aim:** The aim of this study is to present the development of a new technique to obtain 3D models using photogrammetry by a mobile device and free software, as a method for making digital facial impressions of patients with maxillofacial defects for the final purpose of 3D printing of facial prostheses.

**Materials and Methods:** With the use of a mobile device, free software and a photo capture protocol, 2D captures of the anatomy of a patient with a facial defect were transformed into a 3D model. The resultant digital models were evaluated for visual and technical integrity. The technical process and resultant models were described and analyzed for technical and clinical usability. 3D models were 3D printed in a prototype that was transformed into a wax sculpture. Wax was manually finished into the final sculpture on the patient that was used to obtain the final silicone customized prostheses.

**Results:** Generating 3D models to make digital face impressions was possible by the use of photogrammetry with photos taken by a mobile device. The facial anatomy of the patient was reproduced by a \*.3dp and a \*.stl file with no major irregularities. 3D printing was possible and useful for manually making the final facial prosthesis

**Conclusions:** An alternative method for capturing facial anatomy is possible using a mobile device for the purpose of obtaining and designing 3D models for facial rehabilitation. Free software and low-cost equipment could be a feasible solution to obtain 3D models for making digital face impressions for maxillofacial prostheses, improving access for clinical centers that do not have high cost technology considered as a prior acquisition.



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## IS IT POSSIBLE FOR NEW POLYMER PEKTON® TO REPLACE THE CONVENTIONAL PROSTHETIC FRAMEWORK?

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Department of Prosthodontics  
Seoul, Korea (South)

**Keywords:** PolyEtherKetoneKetone (PEKK), framework

**Purpose/Aim:** PAEK (PolyArylEtherKetone) is high-performance thermoplastic polymer materials used for many conditions because of its high strength and rigidity within a wide temperature range. It is widely used throughout the medical field because of its excellent biocompatibility. In the dental field, PEEK (PolyEtherEtherKetone), one of the PAEK family, has already been used in removable dentures and temporary prostheses. PEKK (PolyEtherKetoneKetone) was also recently introduced and has an 80% greater compressive strength than PEEK. Recently, high-performance polymers have been suggested for framework as a metal-free solution. The fabrication of the implant prostheses framework seems to be useful because of its possibility for both milling and pressing processes, light of weight and, veneer compatible material. However, no long-term evaluation and biomechanical studies on PEKK framework prostheses have been reported. Therefore, this series of studies were undertaken to evaluate the PEKK as a replacement of conventional prosthetic framework.

**Materials and Methods:** Implant- and tooth-supported fixed prostheses were fabricated using a new high performance polymer PEKK, Pekkton?(C&M, Switzerland) framework for fully or partially edentulous patients in Korea University Medical Center. And each case was evaluated in terms of esthetics, mechanical properties and longevity. Shear bond strength (SBS) test and elastic modulus test were performed in laboratory. And virtual comparison with other framework materials was conducted by 3D-FEA simulated with real clinical cases.

**Results:** In clinical cases, each patient was pleased with the esthetic and functional outcome of the prostheses and there were no pathogenic signs or loss of function. However, in a case, veneered composite resin on Pekkton? framework were fractured several times. Mean values of SBS ranged from 8.64 Mpa to 17.52 Mpa. And mechanical surface pre-treatment groups (alumina particle abrasion and silica coated alumina particle abrasion) showed the highest SBS, regardless of bonding materials. Pekkton? showed an elastic modulus



of 3.4 GPa which is similar to that of natural bone. However, the value was much lower than zirconia (260 GPa) or titanium (110 GPa). In 3D-FEA included safety analysis, when a low elastic modulus material, Pekkton® was used as the framework material, less stresses were placed on the framework itself. However, higher stresses were transmitted to adjacent prosthetic structures. It may be presumed that low elastic modulus of Pekkton? framework accelerate the fracture of veneered resin and induce lower long-term safety.

**Conclusions:** Even though the possibility for both milling and pressing processes and light of weight are advantages of Pekkton? framework, the durability of the framework for permanent prostheses are still questionable. Therefore, further laboratory and clinical studies are required for whether this framework is suitable in oral condition for long-term success.

## **92 *cancellation***

## ► Fixed & Removable / Occlusion (Grand Salon II)

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### COMPLETE DENTURES WITHOUT DENTAL IMPLANTS- NO LONGER A 'PLAN B' OPTION

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**Past President, ACP**  
**Editor-in-Chief, Journal of Prosthodontics**  
**Dean & Professor**  
**University of Mississippi Medical Center, School of Dentistry**  
**Jackson, Mississippi, USA**

**Abstract:** According to World Health Organization (WHO) guidelines, edentulous patients meet the WHO criteria for being physically impaired, disabled, and handicapped. While the rate of edentulism continues a moderate decline globally, many seniors above the age of 65 years have no teeth. While dental implant retained prostheses have been reported to be the first-choice standard of care, particularly for the treatment edentulous mandible, many patients simply cannot afford the added expense of dental implant therapy. This presentation will review the treatment options for the edentulous patient, and revisit the concept of providing an optimal removable complete denture prosthesis to meet the needs of the edentulous population who cannot afford dental implant therapy. Concepts regarding what make an optimal complete denture prosthesis will be discussed, along with supporting documentation for their effective use.

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### COMBINING AESTHETICS AND GOOD CLEANABILITY- DESIGN THE OPTIMAL IMPLANT-SUPRASTRUCTURE

**Zitzmann, Nicola \***  
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**Clinic of Periodontology, Endodontology and Cariology**  
**University of Basel**  
**Basel, Switzerland**

**Abstract:** When designing the optimal implant superstructure, requirements such as esthetics, stability and cleanability have to be considered. These aspects influence implant number and location, the surgical procedures and the restorative treatment phase. Surgical faults influencing cleanability comprise implants too close together, vertical discrepancies, missing keratinized mucosa and inadequate system selection. Among reconstructive aspects cement excess and blocked interimplant spaces are most critical. If screw-retention is not feasible, cement removal has to be ensured by accessible margins and sufficient tissue maturation prior to cementation. This lecture provides a structured sequence for treatment planning and restoration design ensuring peri-implant health. Cleanability according to patient's abilities, convex tissue surfaces and open embrasure spaces have to be ensured and established during a temporary phase, particularly if esthetics and phonation in the anterior is decisive.

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### WEARING AWAY

**Bartlett, David \***  
**Secretary, ICP**  
**Head of Prosthodontics and Graduate Training**  
**Kings College London Dental Institute**  
**London, United Kingdom**

**Abstract:** The presentation will cover:

1. Review the causes of tooth wear and how they impact upon management
2. Recent changes to our understanding of progression and how this affects prevention
3. A brief overview on management and experiences from Kings

## STRATEGIC USE OF IMPLANT ABUTMENTS FOR REMOVABLE PARTIAL DENTURES

**Stilwell, Charlotte \***  
**Specialist in Prosthodontics**  
**Harley Street Dental Clinic**  
**London, United Kingdom**

**Abstract:** Removable partial dentures continue to be an important treatment modality for many people. Even so, there are challenges to overcome in achieving patient satisfaction and reducing the biological risks associated with their use. This particularly applies to partial dentures where strategic natural tooth abutments are missing. This lecture will explore the combination of hygienic design principles, emphasis on esthetic outcomes and strategic use of single implants as an effective means of enhancing the performance of removable partial dentures and increasing patient acceptance.

## THE EVOLUTION OF UNDERSTANDING AND MANAGEMENT OF THE OCCLUSION- REFLECTIONS OVER THE LAST 50 YEARS (1967-2017)

**Klineberg, Iven \***  
**Professor and Chair of Prosthodontics**  
**Faculty of Dentistry and Westmead Centre for Oral Health**  
**University of Sydney**  
**Sydney, NSW, Australia**

**Abstract:** Prosthodontics has undergone a profound change in the last 50 years from a mechanical understanding which developed from complete denture prosthodontics which depended on laboratory technology to a biological basis for all aspects of patient care.

The mechanical focus dominated prosthodontic and general dental practice and included:

- A belief in articulators (and especially the more complex fully adjustable ones), as a means of duplicating 3-D jaw movements and as a result their application for diagnostic purposes.
- A commitment to occlusal adjustment to manage jaw habits – especially bruxism, TMD and jaw muscle pain. This belief was justified by the Ramfjord's 1961 study on the importance of tooth contact interferences as a cause of bruxism and TMD.
- A belief that posterior jaw support introduced by Costen (a perceptive ENT specialist), who observed that many of his patients with ear pain had posterior teeth missing and linked that as a cause of TMD; and the management approach of restoring lost posterior teeth became a focus for prosthodontic treatment. The implication as well was a commitment to retain posterior teeth was accepted and often second and third molars were routinely restored often with extensive treatments including restorations and where indicated endodontics, post cores and crowns.
- The development of philosophies of occlusion each of which justified expert opinions, and polarised clinicians who followed a particular philosophy with a commitment that was akin to guru following.

Those of particular importance are: Gnathology – point centric; Pankey-Mann + Dawson – Long centric; Ramfjord and Ash – Freedom in centric – each of which was based on condyles in centric relation and maximum tooth contacts.

A biological focus- depended on an evolving maturity and a realisation of the importance of the head and face in a biological context. Sensorimotor, psychological and cognitive components are accepted as important to the individual, as well as the neurophysiological controls that define muscle behaviour and the neuroplastic changes that are ongoing to allow adaptability with physical, biological and psychological challenges. As a result, occlusion should be considered more broadly within the framework of modulation of the neural feedback from mechanoreceptors in oral, facial, joint and muscle tissues, and by the central nervous system, as well as the modulating influences of sensorimotor neuroplasticity. The latter is essential to adjust jaw movements to an altered occlusal and/or oral condition, after changing jaw position or placing new restorations, and leads as well to altering tongue position and oro-pharyngeal space. These complex mechanisms, rather than the type of occlusion, ultimately determine whether an individual adapts to oral perception changes inherent with all dental treatments.

Within this contemporary understanding, clinical interventions should be minimal – the concept of minimal intervention initially referring to restorative procedures embraces prosthodontics - with the recognition that LESS IS MORE.

This is captured in:

- The shortened dental arch philosophy with reduced occlusal contacts (minimum of 10 pairs of teeth) where posterior tooth replacement is considered on the basis of what the patient believes is necessary for them rather than what the clinician believes is required;
- Minimal intervention with TMD and orofacial pain – no involvement of the occlusion; the use of home care strategies following the American Association for Dental Research Guidelines.
- Use of dental implants with a particular focus on minimal intervention – mandibular implant overdentures for those who need improved stability for function - the use of 1 or 2 implants is an equally effective protocol. This is challenged by implant companies where complex procedures are encouraged and accepted by clinicians and patients. Such company-driven protocols potentially undermine prudent clinical decision making and provision of the least invasive interventions.

## THE OCCLUSAL PLANE WITHIN THE VERTICAL DIMENSION: ANALYSIS AND OCCLUSOMETRY PROPOSAL

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**Introduction:** The occlusal plane is related to the cranium, the spine, and the face through the fascias and represents an area where all forces have to be distributed. Biomechanically, the forces will tend to rotate the cranium around the craniocervical articulation.

**Objective:** To validate the relation of the occlusal plane with respect to the cranium, the spine and the face, and present a new technique to determine the orientation of the occlusal plane within the vertical dimension.

**Method:** A timeline with 7 studies is presented. An instrument called "Occlusometry" is suggested based on these studies, and on Delaire's architectural and structural analysis. Data of normal distribution were analyzed to validate this instrument. Student t-test, ANOVA and a Bi-variated Correlation were performed.

**Results:** Our results show that: (a) a cranial rotation of the occlusal plane develops in patients with severe tooth wear (b) in children, there is a tendency to have an inclined occlusal plane tilted towards the side of their head inclination; (c) in subjects with a tilted occlusal plane, body imbalance in the frontal plane tended to be higher when the inclination of the occlusal plane was greater than 2 degrees in relation to the bipupilar plane; (d) there is a tendency to find a relationship between head tilt, masticatory functional angle and bruxism behavior; (e) in healthy subjects with a mandibular overdenture of 4mm height, there is a minor loss of sagittal balance based on the variation in the displacement of the pressure center; (f) the occlusal plane projects towards the craniocervical joint through an area in the lower portion of the atlas body with an angle of 9 degrees with respect to the base of the cranium.

**Conclusion:** The position of the occlusal plane is important to maintain body balance. Hence, occlusion has to be related to the spine through craniocervical components to respond to biomechanical requirements. The proposed occlusometry tracing technique aims to lay the foundations to obtain the position and orientation of the occlusal plane within the limits of the occlusal vertical dimension.

## A CLINICAL STUDY OF DISTAL EXTENSION REMOVABLE PARTIAL DENTURE WITH IMPLANT SURVEYED BRIDGE OR ATTACHMENT

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Dental Research Institute, Institute of Translational Dental Sciences, Bk21 Plus Project, School of Dentistry,

Pusan National University, 49 Pusan University-Ro

Department of Prosthodontics

Yongsan, Gyeongnam, Korea (South)

**Keywords:** Removable partial denture, implant bridge, clinical study

**Purpose/Aim:** This study was performed to make comparative analysis of the clinical findings between the two different types of the implant-assisted removable partial dentures: removable partial dentures using implant surveyed bridge as an abutment (ISBRPD) and overdenture-type of removable partial denture using implant attachment (IARPD).

**Materials and Methods:** Among the patients treated with the implant-assisted removable partial denture manufactured in Pusan National University Dental Hospital from 2008 to 2016, the patients who used the denture for at least 1 year under functional loading with regular checkup were subjected in this study. The subjects of this study were selected from the patients who were deemed to need implants for additional support and stability in Kennedy class ? or ? type distal extension removable partial denture, where the antagonists are mainly complete or partial denture. A total of 24 patients were divided into two groups according to the clinical application method of implant-assisted removable partial dentures. The partial dentures are classified as the Implant Surveyed Bridge Removable Partial Denture (ISBRPD) group which was made in conventional design after a fixed surveyed prosthesis for partial denture abutment was made on top of the implant, and the Implant Attachment Removable Partial Denture (IARPD) group (n = 12) which was made as overdenture type using the implant and Locator implant attachment. Implant cumulative survival rate, implant marginal bone resorption, probing depth, peri-implant inflammation, bleeding, plaque, calculus, and complications were evaluated on 24 patients. For the statistical analysis, the independent T-test and Pearson's chi-square test was used at a significance level of 5%.

**Results:** There was no failed implant and all implants were functioning without clinical mobility. Marginal bone loss of ISCRPD ( $1.44 \pm 0.57$  mm) were significantly lower than IARPD ( $p < 0.05$ ). There was no significant difference on probing depth, peri-implant inflammation, bleeding, and plaque between the two groups ( $p > 0.05$ ), while the calculus was significantly more observed in ISCRPD than IARPD ( $p < 0.05$ ). The retention loss of IARPD was the most common complication.

**Conclusions:** Within the limits of the present study, it was found that well-planned ISBRPD was clinically appropriate. These results may be a pilot reference for implant-assisted removable partial denture with implant surveyed crowns, and longitudinal and systematic clinical studies are necessary to confirm these results.



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## FUNCTIONAL EVALUATION OF MAXILLECTOMY PATIENT UNDERGOING PROSTHETIC REHABILITATION

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King George's Medical University, Lucknow

Prosthodontics and Crowns & Bridges

Lucknow, India

**Keywords:** maxillectomy, speech, mastication

**Purpose/Aim:** To evaluate the effect of prosthetic rehabilitation on the speech and swallowing ability of maxillectomy patients.

**Materials and Methods:** This before-and-after study recruited 48 patients underwent to maxillectomy. Inclusion criteria were 18 to 70 years male and female, Aramany's class 1-6 defects. Exclusion criteria were physical and mental disabilities that would interfere with the study, active malignant disease or recurrence of disease, resections in other regions of the oral cavity and/or oropharynx, severely restricted mouth opening. All investigations were repeated at three different experimental conditions without obturator, with obturator and customized obturator.

Participants were assessed for speech intelligibility using to perform spontaneous conversation for 30 seconds in their native language, count from 1 to 20 in their native language, and to repeat 4 sets of words from the Chapel Hill Multilingual Intelligibility Test (CHMIT) in Hindi language. Speech intelligibility from the various test stimuli were assessed and rated using a 6-point scale. Nasal resonance was judged only by three Speech Language Pathologists by listening the various speech stimuli, using a 13-point scale. Swallowing ability was examined with the "water-drinking test" in which subjects were instructed to drink 30 ml of water in one swallow. The profile of each subject while drinking water was categorized as either 'normal' or 'suspected disability' or 'disability' in accordance with the specific criteria of this test. Palatography was done using red coloured indicating material as a marking media. Level of significance of this study was .05 using SPSS version 24.0.

**Results:** The Speech intelligibility scores were significantly different between the different experimental conditions ( $p < .05$ ). Similarly, the comparisons of nasal resonance scores in our study as evaluated by trained listeners revealed a significant difference in the three experimental conditions. ( $p < .05$ )

Water Drinking Test exhibiting normal drinking profile increased from two (9.1%) to eleven (50%) ( $p < .05$ ). Also, the number of subjects exhibiting suspected disability and disability reduced from 14 (63.6%) to 10 (45.5%) and from 6 (27.3%) to 1 (4.5%), respectively ( $p < .05$ ). After customizing the palatal contours of the obturator for each subject, the profiles further improved with fourteen subjects (63.6%) showing a normal profile, only eight subjects (36.7%) showing suspected disability and none of the patients exhibited disability. ( $p < .001$ ) The mean drinking time was  $10.3 \pm 4.8$  seconds when the subject was not wearing the obturator which reduced to  $6.7 \pm 3.3$  seconds with the conventional obturator ( $p < 0.004$ ).

**Conclusions:** The speech of the patients after maxillectomy became highly unintelligible and was associated with increased nasal resonance. The swallowing function of the patients also deteriorated to a large extent.

**101** *cancellation*

**102** *cancellation*

**103** *cancellation*



► **Multidisciplinary Cooperation in Maxillofacial Rehabilitation:  
Not Always Less is More?** (Grand Salon I)

**104**

**ZIGOMATIC IMPLANTS AND MICROVASCULAR RECONSTRUCTION-  
A NOVEL APPROACH TO MAXILLARY DEFECTS**

**Brenner, Claudio \***  
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**Staff Head & Neck Surgery, National Cancer Institute Chile**  
**Santiago, Chile**

**Abstract:** The residual mid face defect from a maxillectomy represents a real challenge for functional and aesthetic reconstruction. The use of prosthetic obturators or closure with various microvascular flaps offer different degrees of functional outcomes. The use of zygomatic implants in the severely resorbed edentulous maxilla is widely reported with high success rates. A surgical-prosthetic protocol using zygomatic oncologic implants will be discussed for infrastructure maxillectomy where the zygomatic bone is available and for suprastructure maxillectomy where the zigoma is removed in the oncological resection, both combined with microvascular flaps for defect closure.

**105**

**MEDICAL FACTORS AND DECISION MAKING IN MICROVASCULAR  
HEAD AND NECK RECONSTRUCTION**

**Felipe, Bustos \***  
**Head & Neck Surgeon**  
**National Cancer Institute Chile**  
**Santiago, Chile**

**Abstract:** Ablative surgery in the head & neck region is a key procedure for oncologic outcome but creates a challenging situation for the patient and for the reconstructive team. The selection of different free flaps according to the type of defect, local factors and general medical factors determines the success of the overall treatment. A rationale for microvascular flap selection considering these factors will be discussed based on the long term follow up at the National Cancer Institute Chile.

**106**

**DIGITAL SURGICAL PLANNING- SIMPLIFIED GUIDES IN ONCOLOGY**

**Caro, Ivan \***  
**Industrial Designer**  
**Professor, Catholic University- Chile**  
**Staff, Head & Neck Surgery**  
**National Cancer Institute Chile**  
**Santiago, Chile**

**Abstract:** Digital surgical planning is becoming a standard practice in different surgical teams throughout the world. Implementing this service can be challenging as it requires a dedicated team that understand how the technology work. Patient-centered custom-made treatment plans were designed on a routine basis. A simplified protocol for “cutting guides” was developed in a collaborative transdisciplinary work at the head & neck surgery team for mandibular reconstruction with fibula free flaps at the National Cancer Institute Chile.

## FUNCTIONAL RECONSTRUCTION: HEAD AND NECK SURGERY AND MAXILLOFACIAL REHABILITATION TOGETHER

Montes, Rodrigo \*

Chief Head & Surgery Team

National Cancer Institute Chile

Head & Neck Surgeon, Clinica Las Condes

Santiago, Chile

**Abstract:** Success in head & neck oncology at the National Cancer Institute is achieved when oncological treatment ensures survival of the patient with low toxicity, reduced treatment sequelae, functional and aesthetic reconstruction and social reinsertion. The refinement of microvascular flaps allows us today to plan in detail with the aid of surgical guides functional reconstructions with dental implants in one procedure prior to radiotherapy. A protocol for mandibular functional reconstruction will be presented considering a patient centered outcomes and patients concerns.

## HIGH DEFINITION 3D FACE MODELS FOR FACIAL PROSTHESIS FABRICATION

S. Gamarra, Rodrigo<sup>1</sup> \* Cícero André da Costa Moraes<sup>2</sup>; Everton Luis Santos da Rosa<sup>3</sup>; Rosemary Seelaus<sup>4</sup>; Jorge Vicente Lopes Da Silva<sup>5</sup>; Luciano Lauria Dib<sup>6</sup>

1 DDS, PhD Student, UNIP Postgraduate Dental School, Universidade Paulista, São Paulo, Brazil

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4 CCA, MAMS, Senior Anaplastologist, The Craniofacial Center, University of Illinois at Chicago, Chicago, USA

5 PhD, Chief of the 3D Technologies Division of the Centro Tecnológico da Informação Renato Archer, Campinas, Brazil

6 DDS, PhD Professor, UNIP Postgraduate Dental School, Universidade Paulista, São Paulo, Brazil

**Purpose:** The aim of this study is to present a workflow to obtain realistic 3D models of a human faces, using tools and features of a free software.

**Methods:** Faces of 6 subjects of different ages were digitalized by monoscopic photogrammetry freeware through a mobile device. Resultant OBJ file with it map texture was imported into Blender®. 3D modeling and attribution of modifiers were applied on the 3D models.

**Results:** Faces of subjects were digitalized by monoscopic photogrammetry freeware and low-cost devices. Resultant 3D models with mid quality of realistic features on the mesh, were imported into free software Blender® and it was possible to be enhanced up to a very high quality of realistic features of the human face of the subjects. Facial anatomy was possible to be reproduced in an \*.STL, \*.OBJ and other files with no major irregularities.

**Conclusions:** The combined use of modifiers allowed us to increase the resolution of the mesh and to reproduce realistic features of the human face. This workflow allows us to obtain digital models with realistic features of the faces, which may be used for different digital analysis or 3D printable purposes.

**109**

## **FUNCTIONAL OUTCOMES IN HEAD AND NECK- EXPLORING PREHABILITATION**

**Vasquez, Pablo \***  
**Speech & Language Pathologist**  
**Rehabilitation Unit National Cancer Institute**  
**Santiago, Chile**

**Abstract:** Today in the treatment of head and neck cancer survival is not enough. Function is vital if the ultimate goal is social reinsertion and a normal life after recovery from illness. For this reason, the evaluation of changes in the functions of these territories has become an important challenge in the approach of these patients. Functional evaluation in HNC involves swallowing, speech, voice, mastication, hearing, among others. These functions must be evaluated in pre- and post-surgery periods, to see the changes produced by the treatment, including the results of functional reconstructions and implantology. The initial configuration of a functional evaluation unit is presented, highlighting the importance of the pre-rehabilitation management, to improve and quantify functional outcomes.

**110**

## **ORTHODONTICS IN MAXILLOFACIAL REHABILITATION**

**Sanhueza, Veronica \***  
**Specialist in Orthodontics**  
**Director of Clinics, Orema Clinic & Foundation**  
**Santiago, Chile**

**Abstract:** Occlusion is a key feature in long term stability of maxillary and mandibular reconstruction affecting functions such as mastication, swallowing, speaking and the combination ultimately affects psychological comfort. Orthodontics have an important role in restoring the opposing and remaining dental arch associated to complex oncologic reconstructions when a reverse planning is adopted by the team. Cleft lip and palate sequelate adult patients are always challenging. Combining orthodontics and prosthodontics provide predictable results for these patients. Periodontally Activated Osteogenic Orthodontics PAOO opens a new revolutionary treatment option for these patients.

**111**

## **QUALITY OF LIFE- PATIENT CENTERED OUTCOMES IN HEAD AND NECK**

**Gosen, Sue \***  
**Specialist in Prosthodontics**  
**MSc Public Health**  
**Santiago, Chile**

**Abstract:** Patients undergoing head and neck reconstruction require a rigorous follow up from the beginning, during and at the end of the treatment. It is necessary to understand the way health professionals interact through the treatment stages as a team. Quality of life tools reveal information regarding how patients prioritize dental support among other variables. Dentistry in the team is crucial for patients with reconstruction. Awareness, understanding, and tailoring practice communication are needed to redefine the clinical treatment protocol to a patient-based one. Association between clinical work and research in practice provides resources to patients, enhancing their quality of life and therefore treatment success.

**Saturday, September 9<sup>th</sup>**

► **Focus Session II (Grand Salon II & III)**

**112 \***

## **ADVANCED DIGITALLY- DRIVEN OCCLUSION-BASED JAW RECONSTRUCTION: WHEN MORE IS LESS**

**Wolfaardt, Johan \***

**Professor, Division of Otolaryngology- Head and Neck Surgery**

**Department of Surgery**

**Faculty of Medicine and Dentistry**

**University of Alberta/Institute of Reconstructive Sciences in Medicine (iRSM)**

**Edmonton, AB, Canada**

**Abstract:** The two digital enablers of advanced jaw reconstruction have had a profound effect the resection-reconstruction-rehabilitation continuum of head and neck cancer surgery. Surgical design applications and additive manufacturing have made possible the ability to design, simulate and transfer patient specific 3D surgery plans to the operating room. This has meant that intuitive intraoperative approaches to resection, microvascular reconstruction and rehabilitation of the jaws are no longer necessary. The digital enablers have allowed concepts such as occlusion-based reconstruction developed by Rohner to be incorporated into a digital workflow. This provides for the resection-reconstruction-rehabilitation continuum to become a single digitally driven workflow. This trend is advancing rapidly with the introduction of navigation and robotics being added to the technology equation. Head and neck cancer care is cited as the most expensive cancer to manage and so sensitivity to resource allocation in adopting new technology cannot be ignored. Equally, head and neck cancer patients identify function as the primary desired outcome in survivorship. Reconciling responsible resource allocation related to introduction of digitally driven workflow against patient desires in outcomes of care creates a balance that must be accounted for within a health system. A not uncommon perception of migration to a technology driven workflow is that this must add significant escalation of cost of care. The presentation will explore these issues and, in the context of advanced digitally driven occlusion-based jaw reconstruction, demonstrate work that points towards more upfront input with technology resulting in less long-term cost of care. Perhaps with a digital workflow more will prove to be less over time.

**113 \***

## **THE ROLE OF RETAINING TEETH AND ROOTS IN THE COMPREHENSIVE PROSTHETIC REHABILITATION FOLLOWING DISEASE OR TRAUMA**

**Smidt, Ami \***

**Board of Councilors, ICP**

**Head, The Center for Graduate Studies in Prosthodontics**

**Department of Prosthodontics**

**The Hebrew Univ.- Hadassah, Faculty of Dentistry**

**Tel-Aviv, Israel**

**Abstract:** It is common knowledge that healthy soft and hard tissues have a major role in the life like appearance of prosthetic restorations. Dental implants, although surviving successfully for years, cannot guarantee the stability of the bone around, especially in the buccal areas. Changes that occur in the position of implant neighboring teeth with the time, is a call for an evaluation. Surgical procedures to re-establish 3-dimensional architecture of lost hard and soft tissues extraction or trauma, were presented for use during the years. However, these pre-prosthetic procedures demand case selection, high skills, and are considered technique sensitive, lacking proof of stability for long years and still presents a challenge. Failures and difficulties to restore large resorbed areas, brought forward the prosthetic restoration of pink missing tissues as a mimicking alternative to regenerative procedures when such is not feasible or in cases where patients negate extensive procedures or demand immediate restorations. Teeth, resected molars and hopeless teeth may serve in maintaining and acquiring positive topography in the tissues supporting a future restoration, minimizing the surgical extent or the actual need. Combining adjunct orthodontics in comprehensive treatment plans, influence positively the supporting tissues and may well decrease the need for surgical acts. There should always be a call to foresee the next treatment and thus, preserving teeth or discard them in correct timing has to be carefully considered.

The presentation will discuss the various aspects of using teeth, roots and hopeless teeth to preserve ridges and develop sites for dental implants, minimize surgeries and sometimes avoid them, in caries or periodontal disease and in trauma cases. Less is more!

## 114 \*

### **ESTHETIC RISK DRIING IMPLANT REHABILITATION; KEY FACTORS THAT INFLUENCE OUTCOMES**

**Martin, William C. \***

**Clinical Professor**

**Director, Center for Implant Dentistry**

**Department of Oral and Maxillofacial Surgery**

**University of Florida College of Dentistry**

**Gainesville, Florida, USA**

**Abstract:** Esthetic outcomes and patient satisfaction are indispensable components of modern implant dentistry. On a daily basis, clinicians are faced with demanding decisions on the diagnosis and treatment of esthetically challenging situations. When dental implants are utilized in the esthetic zone, they can show a wide variation in results with differing levels of predictability. This presentation will introduce a patient assessment tool designed to improve the predictability and longevity of esthetic implant-based treatment. The Esthetic Risk Assessment (ERA) table is a patient assessment system that guides the clinician in evaluating thirteen clinical parameters that can influence both positive and negative outcomes when placing and restoring implants in the esthetic zone. These clinical factors are utilized to drive the consultation, planning and treatment of the patient, and in many situations, will guide the treatment team on when to seek alternative treatment options that have less risk with esthetic compromise.

**Goals and Objectives:**

1. To recognize factors of significance in the assessment of treatment outcomes, with particular reference to dental implant esthetics
2. Become familiar with the components of the Esthetic Risk Assessment (ERA) table.
3. Utilize the Esthetic Risk Assessment to evaluate a patient for esthetic risk and compare it to treatment outcomes.

## 115 \*

### **MINIMAL INTERVENTION PROCEDURES IN IMPLANT PROSTHODONTICS**

**Jofré, Jorge \***

**Head of Center for Advanced Prosthodontics & Implant Dentistry**

**University of Concepcion**

**Concepcion, Chile**

**Abstract:** Minimal Intervention Dentistry came up as an alternative for treating patients on a non-traumatic basis. Although, these rational strategies for slightly invasive treatments require more technology, they have important benefits for people, as lower costs, least trauma and almost immediate recovery.

This presentation shows minimal intervention procedures in a wider spectrum of clinical therapies in implantology, ranging from the improvement of esthetic outcomes to the rehabilitation of severely resorbed edentulous areas.

# Poster Presentation Abstracts



*Listed by Presenting Author – Alphabetical (Last Name, First Name) by Topic*

# Poster Presentation Abstracts

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Listed by Presenting Author – Alphabetical (Last Name, First Name) by Topic:

## ► Digital Technology

1

### ONE SESSION PLURAL FIXED PROSTHESIS WITH CAD-CAM SYSTEM (CEREC SYSTEM)

**Daza, Victor \* Carrasco, Oscar; Larrucea, Carlos; Valdés, Ricardo; Pino, Nicolás; Chamorro, Rodrigo**  
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Postgrado De Rehabilitación Oral Mención Implantología  
Talca, Chile

**Keywords:** fixed prosthesis, CAD-CAM System, Cerec System

**Introduction:** Plural fixed prostheses are an alternative treatment that has been widely used for replacement of lost teeth, but now they are losing ground in dentistry due to rise and improvement of implant techniques, besides that the fact that economic costs of both treatments are very similar. Nevertheless, fixed plural prosthesis are not the first choice, they become the best treatment for those cases where the amount of bone, time and systemic factors are poor, and the correct development of a therapy through osseointegrated implant is not successful (Gómez et al.,2014). The present work shows that in one session it is possible to perform a plural fixed three-piece prosthesis using CAD-CAM system (Cerec System), demonstrating the feasibility of solving cases in a short period of time and with a widely supported predictability by the scientific literature (Bohner et al.,2016).

**Clinical Case:** A 66-year-old female patient with medical history of controlled HTA, upper and lower partial toothless. Reason for consultation: Existing bay on the right side of the jaw. In the anamnesis, patient reports low tolerance to surgical procedures, so she wishes quick and painless rehabilitative option. In view of the requirement, it is suggested to carry out three-part plural fixed prosthesis using the CAD - CAM system (Cerec System). Clinical and radiographic exams, the patient presented p 1.6 mesialized, endodontically treated, with defective restoration. This tooth will be made by placing a fiber pole of quartz, brand RTD D.T. Light-post X-RO ILLUSION, cemented with self-etching cement U200 (3M), and later rebuild the stump with Filtek z350 composite resin. In the teeth 1.4, will be performed a vital peripheral preparation. Once the stumps are parallelized, virtual printing is performed with Omnican (Cerec System), and digital design is development. It is made a prosthetics structure of 3-part in Emax. This structure is cemented with cement U200 (3M)

**Discussion:** Dental treatments performed by CAD CAM systems significantly reduce patient care time, improve the quality of the treatments because of the adjustment and avoid mayor pulp damage in vital parts due to the possibility of immediate sealing after a dental preparation.

**References:** Gómez-de Diego R, Mang-de la Rosa Mdel R, Romero-Pérez MJ, Cutando-Soriano A, López-Valverde-Centeno A (2014). Indications and contraindications of dental implants in medically compromised patients: update. *Med Oral Patol Oral Cir Bucal.* 1;19(5):e483-9. Bohner LO Neto PT, Ahmed AS, Mori M, Laganá DC, Sesma N (2016). CEREC Chairside System to Register and Design the Occlusion in Restorative Dentistry: A Systematic Literature Review. *J Esthet Restor Dent.* 28(4):208-20

2

### 3D-EVALUATION OF CAD/CAM CROWN FIT UTILIZING MICRO-COMPUTED TOMOGRAPHY

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Restorative & Biomaterials Sciences  
Sakado, Saitama, Japan

**Keywords:** CAD/CAM crown, CT, marginal and internal gap

**Purpose/Aim:** The purpose of this study was to determine the marginal and internal gaps of a CAD/CAM crown fabricated with a hybrid resin block using an intra-oral scanner under different convergence angles.

**Materials and Methods:** On a dental arch jaw model (D50FE, NISSIN), an abutment tooth for a CAD/CAM crown was prepared on an artificial maxillary right first premolar (A5A-500, NISSIN) by traditional methods. Three types of abutment teeth were prepared, with convergence angles of 12°, 16°, and 20°. An intra-oral scanner (CS3500, Carestream) and milling procedure (ARCTICA Engine, KaVo)

were used for CAD/CAM crown fabrication. The cement space was set at 50  $\mu$ m, after which the as-milled crown was cemented to the abutment tooth so that the marginal and internal gaps could be determined by a desktop-type  $\mu$ CT scanner (SKYSCAN 1172, Kontich). The parameters for CT acquisition were as follows: 100 kVp and 100 $\mu$ A, with an image size of 1280  $\times$  1024 pixels and a 0.5 mm Al filter. From the three-dimensional morphologic data obtained, five cross-sectional images from both the mesial-distal and bucco-lingual directions were selected for measurement, and the marginal gap (MG), absolute marginal discrepancy (AMD), axial gap (AG), and occlusal gap (OG) were evaluated.

**Results:** MG, AMD, AG, and OG measurements were as follows: for the 12 $^\circ$ abutment; 81.4  $\pm$  20  $\mu$ m, 123.0  $\pm$  32.4  $\mu$ m, 71.8  $\pm$  18.3  $\mu$ m, and 97.7  $\pm$  17.8 $\mu$ m, respectively, for the 16 $^\circ$ abutment; 78  $\pm$  17.2  $\mu$ m, 134.2  $\pm$  32.6  $\mu$ m, 67.4  $\pm$  19.0  $\mu$ m, and 83.7  $\pm$  18.3  $\mu$ m, respectively, and for the 20 $^\circ$ abutment; 64.6  $\pm$  20.7  $\mu$ m, 104.4  $\pm$  25.6  $\mu$ m, 64.0  $\pm$  18.3  $\mu$ m, and 91.6  $\pm$  21.7  $\mu$ m, respectively. Although all groups demonstrated clinically acceptable marginal and internal gaps, there were significant differences between 12 $^\circ$ and 20 $^\circ$  for MG and between 16 $^\circ$ and 20 $^\circ$  for AMD ( $p < 0.05$ , Scheffé).

**Conclusions:** In all groups, marginal and internal gaps tended to become smaller as the convergence angle became larger. Within the limitations of the study design, the 20 $^\circ$  convergence angle could be concluded to lead to better fit compared with that achieved with either the 12 $^\circ$  or 16 $^\circ$  angle. However, further studies involving retention and luting materials are required to resolve this issue.

### 3

## EVALUATION OF DENTURE BASE ADAPTATION BY CAD/CAM, 3D PRINTING AND CONVENTIONAL METHOD

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Prosthodontics  
Taipei, Taiwan, China

**Keywords:** CAD/CAM, 3D printing, complete denture

**Purpose/Aim:** The purpose of this in vitro study was to compare the denture base adaptation of conventionally manufactured (pack and press), 3D printing and CAD/CAM techniques for fabricating complete dentures to determine which process produces the most accurate adaptation.

**Materials and Methods:** Two completely edentulous maxillary and mandibular models were fabricated by cobalt-chrome alloy. And three spherical reference spheres (4mmx4mmx4mm) were added on the bilateral tuberosities, anterior midline at maxillary and on the bilateral posterior crest, anterior midline at mandibular ridge respectively. These two metal reference models were served as the master models for the fabrication of the entire sets of denture base specimens evaluated in this study. 9 denture bases were fabricated by three different manufacturing techniques (group 1: conventional method by heat cure PMMA resin (Luciton 199, Densply) n = 3; group 2: 3D printing (MiiCraft resin BV005, MiiCraft+) n=3; group 3: CAD/CAM process (POLYWAX PMMA blank, imes-icore CORiTEC 250i) n = 3). After specimens for each of the 3 techniques had been fabricated, adaptation was assessed by measuring the thickness of an intervening layer of silicone impression material with the dial thickness gauge (Peacock G-7C) under 49N vertical loading between the base and the master model. Evaluation of thickness in the following areas: crest of the ridge, palate, tuberosity and post-dam at maxilla; crest of the ridge, retromolar pad, and buccal shelf at mandible.

**Results:** The CAD/CAM group showed better overall denture base adaptation (average thickness 0.552mm at maxilla and 0.328mm at mandible) compared with the conventional method (average thickness 0.881mm at maxilla and 0.799mm at mandible) and 3D printing group (average thickness 0.794mm at maxilla and 0.485mm at mandible). The 3D printing group showed the best adaptation at the bilateral tuberosities and retromolar pads region. Besides, the pack and press technique showed the lowest overall denture base adaptation of the tested techniques.

**Conclusions:** Within the limitation of the study, the higher adapted denture base overall was CAD/CAM process, followed by 3D printing and conventional method.



## 4

### COMPARATIVE ANALYSIS OF THE ACCURACY OF PRINTED MODELS OBTAINED FROM INTRAORAL SCANNING

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**Keywords:** dimensional measurement accuracy, dental models

**Purpose/Aim:** The accuracy of the model in which the prosthesis will be made has a direct influence on the results of the prosthetic work. Nowadays, it is possible to make the prosthesis without the need of a real model, as well as, through the printing of this digital model, a real model can be obtained. This real model can be very necessary to accomplish some laboratorial steps. The present study objective was to perform a study of the precision between printed (P) models, obtained by means of intraoral scanning (IS) and printing of digital archives (PDA), and gypsum models (G), obtained by the conventional impression.

**Materials and Methods:** A Dental mannequin was used as the master model and five gypsum models were made ( $n = 5$ ), by the double impression technique with addition silicone, and five printed models ( $n = 5$ ) from an IS and PDA, by means of A 3D stereolithography method printer. The experimental unit was mm (millimeters). The printed (P) and gypsum (G) models were compared to the master model by means of linear measurement analysis at four measurement sites (M1, M2, M3 and M4) using an image measuring machine.

**Results:** The results were submitted to Student's t-test. The measurement sites M1 "G" (-0.47) M1 "P" (-0.46); M2 "G" (-0.12), M2 "P" (-0.31); M3 "P" (-0.89); M4 "G" (-0.25), M4 "P" (-0.42), were statistically different from the master model. Only the measurement site M3 "G" (-0.07) showed no significant differences ( $p < 0.05$ ) from the master model

**Conclusions:** It can be concluded that the Gypsum and printed models showed statistically significant differences in relation to the master model. However, it must be investigated whether or not these differences are clinically relevant.

## 5 *cancellation*

## 6

### **PART-DIGITIZING SYSTEM FOR COMPLETE DENTURE FABRICATION USING DIGITAL IMPRESSION AND SPECIALIZED CAD/CAM TRAY**

**Matsuda, Takashi \* Kurahashi, Kosuke; Ishida, Yuichi; Goto, Takaharu; Nagao, Kan; Ichikawa, Tetsuo**  
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Department of Oral and Maxillofacial Prosthodontics  
Tokushima, Japan

**Keywords:** digital impression, complete denture, CAD/CAM

**Purpose/Aim:** There are few reports on the digitalization of complete denture fabrication, particularly for the process of impression and bite registration for totally edentulous ridge. The purpose of this study was to present a part-digitizing system for complete denture fabrication using digital impression and specialized CAD/CAM tray with an accuracy measurement.

**Materials and Methods:** Three participants were recruited into this clinical trial. Preliminary impressions were taken using a ready-made tray and an alginate impression material, after making study casts. These casts were digitized by a dental three-dimensional scanner (Dental Wings 7 series, Dental Wings Inc., Montreal, Canada). The specialized custom trays for the final impressions and interocclusal record, which were designed using a CAD software (Rhinoceros 4.0, Robert McNeel & Associates, USA), had a cross-arch occlusal rim for the interocclusal record. The trays were fabricated using a three-dimensional printer (Projet 460Plus, 3D systems, USA). The final impression was obtained using the trays according to a conventional procedure, which involved border modeling and distribution of the final impression material. And then the interocclusal relationship was determined by standard gentle tapping movements. Additionally, the border molding and final impression were obtained with the same impression materials using the conventional custom tray and then compare it with the procedure using the specialized trays. Each working cast was fabricated in the same way as for the study cast and digitized with the same scanner. The surface images of the casts were superimposed and examined qualitatively using an imaging software (Gom Inspect V7 SR2, GOM mbH, Braunschweig, Germany).

**Results:** The accuracy of the part-digitizing system was almost the same as that of conventional final impression method based on the mean differences between the conventional final impression and the digital preliminary impression, and between the conventional final impression and the final impression using the specialized tray.

**Conclusions:** It is considered that the part-digitizing system for complete denture fabrication using digital impression and specialized CAD/CAM tray is feasible for clinical use.

## 7

### **MARGINAL AND INTERNAL FIT OF LITHIUM DISILICATE CROWNS**

**Park, Yunjae \* Kim, Ha-Young; Pae, Ah-Ran; Kim, Hyeong-Seob; Woo, Yi-Hyung**  
Kyunghee University  
Prosthodontics  
Seoul, Korea (South)

**Purpose/Aim:** The aim of this study was to evaluate the marginal and internal fit of pressed and milled ceramic crowns fabricated with conventional method and two digital workflows.

**Materials and Methods:** One typodont maxillary left first molar prepared for a all-ceramic crown was scanned with intraoral scanner (TRIOS, 3shape, Copenhagen, Denmark). Zirconia master die was fabricated from scan data. Marginal and internal fit of 3 groups of 10 lithium disilicate crowns fabricated with conventional method, model scan method and intraoral scan method. Comparison was performed using the triple-scan protocol; scans of master die, the crown on the master die, and the intaglio of the crown were superimposed. Absolute

marginal discrepancy, marginal gap, axial internal gap, and line angle internal gap were measured at buccopalatal, mesiodistal sections. One-way ANOVA and Kruskal-Wallis test were used for statistical analysis ( $\alpha=0.05$ ).

**Results:** Absolute marginal discrepancy, marginal gap, and internal line angle gap obtained from conventional group were significantly smaller than that obtained from the other groups ( $P<0.05$ ). Axial internal gap obtained from conventional group was significantly greater than that obtained from the other groups ( $P<0.05$ ). No significant differences were found between model scan group and intra-oral scan group ( $P>0.05$ ).

**Conclusions:** Lithium disilicate crowns fabricated with conventional method had better marginal fit, smaller internal line angle gap, greater axial internal gap than crowns fabricated with model scan method and intraoral scan method. Conventional method, model scan method, and intraoral scan method were found to produce crowns with clinically acceptable marginal and internal fit.

## 8

### FABRICATING REMOVABLE PARTIAL DENTURES WITH CAD/CAM AND RAPID PROTOTYPING TECHNOLOGIES

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**Purpose:** Over the last decade, digital dentistry based upon computer-aided design and computer-aided manufacturing (CAD/CAM) has become increasingly popular and the workflow for the fabrication of crowns and fixed partial dentures has dramatically changed. More recently, CAD/CAM based complete denture fabrication methods have been introduced. In contrast, few reports have been published on the use of digital technologies for removable partial denture (RPD) fabrication. This clinical report introduces a new developed method for RPD fabrication using CAD/CAM and rapid prototyping (RP) technologies.

**Materials and Methods:** A 67-years-old woman, who had a mandibular Kennedy class I conventional RPD, participated to the study (The Ethics Committee of Showa University (#2011-032) after giving informed consent. The clinical and laboratory procedures, which included impression making and the working cast fabrication, were the same as those for the conventional method. The working cast was first scanned with a laboratory digital scanner and then its 3D image was imported to 2 different CAD software ("Dental System D-810", 3shape, Denmark and "Freeform", 3D SYSTEMS, U.S.A.). The designing of major and minor connectors, clasps, and artificial teeth were worked out by using "Dental System D0810", while that of denture bases was by "Freeform". All these designed data were stored in a stereolithography (STL) format. Connectors, clasps, and artificial teeth were milled from ceria stabilized zirconia and alumina composite blanks (Ce/TZP-A, Yamakin, Japan), polyetheretherketone (PEEK, EVONIK, Germany), and composite resin blanks ("VITA ENAMIC", VITA, Switzerland), respectively using separate milling system depending upon the component. Denture bases were molded by the 3D printer ("D30", rapidshape, Germany) using polymethyl methacrylate ("Base", NextDent, Netherlands). Finally, all these components were incorporated into the correct position on the working cast and bonded with adhesive material ("Super-Bond", SUN MEDICAL, Japan).

**Results:** Using fully digital laboratory workflow, the RPD was successfully fabricated and delivered to the patient. No clinical complications were reported or observed for 3 months after the denture delivery.

**Discussion:** This is the first clinical report describing the fully digital workflow for RPD fabrication. While a lot of studies introduced digital fabrication techniques for denture bases and artificial teeth, there are only a limited number of studies on digital framework fabrication techniques. We have already applied Ce/TZP-A, which has sufficient rigidity similar to Co-Cr alloy, to denture framework for completed dentures. The current study incorporated PEEK, which has higher flexibility, for the clasp component of the Ce/TZP-A framework. As a result, this fully digital denture fabrication technique also allows fabrication of completely metal-free RPDs, clearly a benefit to patients with allergies/sensitivities to metal. Within the limitations of this clinical case report, the reported removable partial denture fabrication techniques have potential to change laboratory workflow from analogue to digital.

## 9

### DIGITAL ARTICULATORS IN THE REPRODUCTION OF STATIC AND DYNAMIC INTEROCLUSAL CONTACTS: A NARRATIVE REVIEW

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**Purpose/Aim:** Describe the study and treatment of dental occlusion and how it has been revolutionized with the emergence of virtual articulators, by way of example; the virtual articulator CEREC 4.5 of Sirona, offers the possibility of determining both static and dynamic characteristics, using a previous digital record of both arches.

**Materials and Methods:** With the phrase "occlusal contact and virtual articulator", in Google Scholar and in a search of articles related to "Virtual articulator for the analysis of dental occlusion: an update", the articles with the following criteria of inclusion were selected: all date and language, describing the number and position of static and dynamic occlusal contacts for the design and preparation of prosthetic restorations and delivery of occlusal diagnosis. In addition, CEREC 4.5 catalogs and the videos retrieved from the SICAT Function website were used. The articles were read and summarized in tables, specially designed.

**Results:** With the phrase "occlusal contact and virtual articulator", we found 1,540 results and with the search for related articles 101 results of which six were selected with the inclusion criteria.

**Conclusions:** The virtual articulator has been designed for the deep analysis of static and dynamic occlusion, these give the clinician the possibility to work very efficiently, quickly and accurately, even for the making of restorations.

## 10

### ADAPTATION OF COMPLETE DENTURE BASE PLATES CAST FROM WAX PATTERNS FABRICATED USING A 3DP TECHNIQUE

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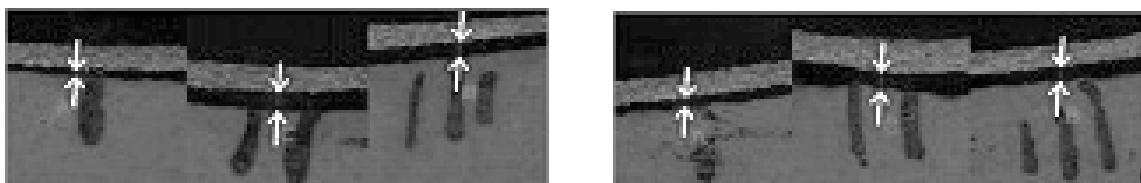
**Keywords:** maxillary denture base plates, three-dimensional printing technique, dental wax patterns

**Purpose/Aim:** The purpose of this in vitro study was to evaluate the adaptation of maxillary denture base plates produced using a three-dimensional printing (3DP) technique.

**Materials and Methods:** Thirty standardized edentulous maxillary stone casts were prepared and were randomly divided into three groups according to the use of three different metal fabrication methods. Five wax patterns were fabricated using the 3DP technique, while the remaining patterns were fabricated using the conventional method. After casting, all of the denture base plates were attached to the corresponding master casts, and three transverse cuts were made through each stone cast-metal base set. The gaps between the inner sides of the base plates and the surface of the casts were measured at 9 points using a stereomicroscope. The data were analyzed using t-tests.

**Results:** Mean adaptation values were obtained for denture bases fabricated using the 3DP and conventional methods. There was no statistically significant difference ( $p>0.05$ ) in the gap width values between the 3DP technique and the conventional method. The adaptation values for the denture base plates were  $199.72\pm97.66 \mu\text{m}$  (using the 3DP technique) and  $143.64\pm86.96 \mu\text{m}$  (using the conventional method). The two methods did not differ significantly ( $p>0.05$ ) with respect to the gap width values at each examined region for each method.

**Conclusions:** Clinically acceptable adaptation can be achieved with denture bases manufactured using the 3DP technique.



## **11** *cancellation*

### ► **Esthetics and Ceramics**

## **12**

### **INFLUENCE OF DIFFERENT LIGHT SOURCES ON TOOTH SHADE SELECTION FOR INDIRECT RESTORATIONS**

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**Purpose/Aim:** Color selection is an essential ingredient for a successful indirect restoration as it is necessary to provide the patient with acceptable aesthetic. Inconsistencies among different light conditions can make matching the shade of a single porcelain tooth to the natural teeth around it very challenging. The aim of the study was to examine visual shade selection in three different light sources: natural daylight, operating light and corrected light. VITA Easyshade spectrophotometer (Vita-Zahnfabrik, Germany) was used to evaluate the reliability of the visual shade method.

**Materials and Methods:** The visual assessment was based on a comparison between a shade guide and the target tooth. One observer with normal color vision was asked to visually match the color of the maxillary central right incisor and the right canine in a group of 100 subjects, aged 22 to 40 years, mean age 25. Two shade guides were used: VITA Vitapan Classical and VITA 3D-MASTER (Vita-Zahnfabrik, Germany) in natural light, operating light and handheld light designed especially for color matching in dentistry Demetron Shade Light (Kerr, USA) and then re-evaluate with the use of Vita EasyShade spectrophotometer (Vita-Zahnfabrik, Germany).

**Results:** Significant interactions were found between the effects of shade guide system ( $p < 0,05$ ) and light sources ( $p < 0,05$ ). When using corrected light source and VITA Vitapan Classical shade guide the spectrometer and the human eye selected the same shade in 69 patients for the central incisor and 73 patients for the canine. Overall, the use of the VITA Vitapan Classical shade guide significantly improved the agreement between visual and the spectrophotometer.

**Conclusions:** Within the limitations of this study, the VITA Vitapan Classical demonstrated superior agreement in shade selection, than VITA 3D-Master. Visual tooth color matching is a subjective method and it is dependant on light conditions. The Demetron Shade Light has been proven to be a useful device for color matching of artificial teeth in prosthodontic treatment.

## 13

### QUERCETIN/ETHANOL AS A SIMPLE BUT VERSATILE PRIMER IN DENTIN BONDING

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**Keywords:** quercetin, cross-linking, bond strength

**Purpose/Aim:** Poor bonding stability remains the “Achilles' heel” in dentin bonding, a simple, safe and effective approach to inhibit the activities of both exogenous collagenases and endogenous MMPs, and to prevent the growth of bacterial biofilm is therefore highly demanded.

**Materials and Methods:** In the present study, quercetin/ethanol solution was developed as a multifunctional primer to pretreat dentin surface during adhesive restoration.

**Results:** Results showed that pretreatment with quercetin/ethanol solutions (0.5 and 1.0 wt%) on dentin surface effectively preserved bonding strength after one-month collagenase aging ( $p < 0.05$ ). Irrespective of aging, lower nanoleakage expression and less cohesive failure in dentin were observed in quercetin-treated groups ( $p < 0.05$ ). Compared with the control group, the in situ zymography test revealed that the 0.5 and 1.0 wt% quercetin-treated dentin effectively inhibited MMP activity, while their contact angles significantly increased. Live/dead bacterial staining and MTT assay proved that the 0.5 and 1.0 wt% quercetin groups exerted a significant bactericidal effect while inhibiting the biofilm growth of *Streptococcus mutans* (*S. mutans*) ( $p < 0.05$ ).

**Conclusions:** We believe that quercetin/ethanol solution may serve as a simple but versatile primer to provide dentists a promising approach to obtain desirable bonding stability and prevent secondary caries, thereby prevent the frequent replacement of resin-based restorations.

## 14

### THE EFFECT OF CERAMIC LIGHT SCATTERING AND BEAM PROFILE ON THE IRRADIANCE OF LUTING CEMENTS

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**Keywords:** light curing, beam profile, ceramics

**Purpose/Aim:** To measure the light scattering of a light curing unit as influenced by the ceramic thickness and the offset of the specimen from the location of the maximum light irradiance of the curing light unit.

**Materials and Methods:** A ASCENT OL5 broad spectrum LED (CAO Group) light curing unit (LCU) was mounted above the MARC

Resin Calibrator unit (Blue light Analytics, Halifax, Canada) with the handle towards the right side with the light emitting head set at 1.0, 1.5 or 2.5 mm vertical distance above the light sensor. Using the 3D table the position of the center of the head was first aligned with that of the light sensor and then moved in 1 mm increments in the x-y plane. At every position the irradiance was measured. The process was repeated with ceramic slabs of the thickness same as that of pre-set vertical distance. Ceramic slabs were Empress-CAD and e.max-CAD (Ivoclar Vivadent) of various translucencies and shades. The % irradiation was calculated with respect to the center value. Linear regression of the % irradiance against offset distance were calculated for each material, shade, thickness and direction. The effect of position, material, thickness and shade on the values of the slope were analyzed using multiple ANOVAs.

**Results:** The regressions showed a good fit greater than 90% and were most of the time in the 99% range. Moving away from the center showed decreased irradiation and can be explained as the dispersion of the light (Fig 1). All ANOVAs showed significant effects for all parameters, but significant interactions as well. The direction of the movement had a highly significant effect, indicating that the beam profile of the LCU is asymmetric having the steeper slope in the +X (East) direction. The values of slope were used to evaluate the scattering effect of light by the ceramic. Effects of shades and material were significant but minimal. However, pooling shade and translucency, the material's thickness shows significant differences. The slope of thicker samples was less steep.

**Conclusions:** The Ascent OL5 LCU has an inhomogeneous beam profile, being the most intensive in the center and diminishing substantially towards the periphery. This was most pronounced by moving the light emitting head in direction of the handle of the LCU (+X or East direction). The thicker the ceramic the less irradiation changes were found as a function of the position indicating that the ceramics were scattering the light and thus slightly alleviating the effect of the inhomogeneous beam profile. It would be interesting to repeat the experiment with a much smaller sensor to enhance the resolution of the results. The authors thank Ivoclar Vivadent for donating the ceramics.

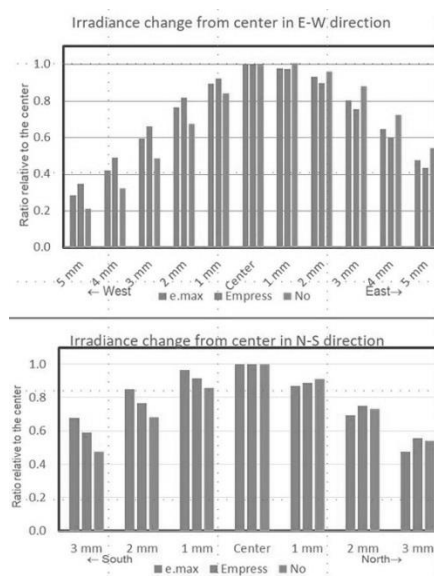


Fig 1: Irradiation as a function of the position in % of the center value (100%). N= North = +Y; S= South = -Y; E = East = +X, W = West = -X

## 15

### FIT OF Y-TZP COPINGS IN FUNCTION OF THE DIMENSIONAL CHANGES FROM THE SINTERING PROCESS

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**Keywords:** dental marginal adaptation, ceramics. zirconia

**Purpose/Aim:** To evaluate the fit of Y-TZP copings and relate them to the dimensional changes from the sintering process

**Materials and Methods:** Twenty-four Y-TZP copings were equally divided into two groups (n=12): ZMX - IPS e.max ZirCAD (Ivoclar Vivadent, Liechtenstein) and ZKL - Zirklein (Zirklein, Brazil). The copings were scanned in micro-CT before and after sintering so that SSR was obtained from the measurement of the distance between the coping's walls. The SSR obtained was compared to those the manufacturers reported (ANOVA-2 and Tukey, p<.05). The copings were settled on an abutment and taken to the micro-CT to evaluate

their marginal and internal fit. The data enabled the statistical comparison (ANOVA-2 and Tukey,  $p \leq 0.05$ ) between groups and measurement sites and between the fit obtained with that stipulated by the CAD/CAM software ( $80 \mu\text{m}$ ) (Dunnnett test,  $p \leq 0.05$ ).

**Results:** Both groups showed statistical differences between the SSR the manufacturer reported and those obtained experimentally. There was no statistical difference among the groups for marginal fit, with differences only for internal fit and between the different regions measured. The fit obtained experimentally differed from the internal space determined in the CAD/CAM software.

**Conclusions:** The sintering shrinkage of Y-TZP copings must be better understood, once it might be a factor of influence on the copings fit, leading to a non-uniform internal fit.

## 16

### AESTHETICS, NOT JUST A SMILE

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**Introduction:** “Esthetics have become centrally important in our highly developed, technologically advanced society, and youth-oriented culture” (Berry 2008). One's outward appearance and how pleasing it is determines the attention and value one is granted. Facial esthetics have a definitive and important influence on our everyday life and impacts on social behaviour and perception by society (Faure et al, 2002). Individuals with esthetically pleasing features are perceived to possess positive personality traits and seem to benefit from preferential treatment. The importance placed on facial esthetics has resulted in the development of various aesthetics enhancing products, creating a perception that beauty can be bought. The process of seeking out and purchasing these products or services to enhance one's esthetic traits is referred to as esthetic labor (Anderson et al, 2010), which suggests that there are esthetic laborers. Prosthodontists' primary objective is to rehabilitate the head and neck, with the aim improve function, esthetics, and quality of life for the patient. What then is our role in esthetic labour, or have we become laborers working to feed this new culture of eternal youth?

**Materials and Methods:** A literature search was carried out to identify all aesthetically-driven procedures and software programmes that claim to improve the dental, facial, or dentofacial aesthetics. These will be presented, together with the claims for their outcomes, and the presence or absence of any scientific evidence for those claims.

**Results:** The results will be presented with the poster.

**Conclusions:** Conclusions will be presented with the poster.

## 17

### INFLUENCE OF THICKNESS AND LOW-TEMPERATURE DEGRADATION ON PROPERTIES OF DENTAL ZIRCONIA

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**Keywords:** thickness, low-temperature degradation, zirconia

**Purpose/Aim:** To evaluate the influence of thickness and degradation on the mechanical properties of different zirconia.

**Materials and Methods:** 4 different zirconia ceramics (Lava Frame, In-ceram, Zenostar, Upcera), were fully sintered and cut into the size of 23mm (Length) x 4mm (Width) x 0.8mm and 1.5mm (Thickness). Specimens were artificially aged in distilled water by heat-treatment under 134°C/0.2 MPa for 10 hours and 20 hours. All specimens were divided into 24 groups, each group included 6 specimens classified by different thickness (0.8mm/1.5mm) and aging time (0hours as control /10hours and 20hours). SEM and X-ray diffraction were used to estimate the monoclinic phase of one specimen in each group. Three-point flexure and Vickers hardness tests were used to test the mechanical properties of the specimens.

**Results:** (1) The SEM results suggested with the aging time extending, the surface defects and micro-cracks of specimen became more obvious, particularly in the 20h group. Compared with 1.5mm group, 0.8mm group showed more significant defects and micro-cracks. (2) The XRD results revealed an increase in the monoclinic phase fraction in specimens aging with 20 hours compared with 10 hours



(Table 1). (3) The hardness and strength decreased more significantly in specimens aging with 20 hours. The hardness and strength slightly reduced in specimens of 1.5 thickness compared to which in 0.8mm (Table 2).

**Conclusions:** (1) With the aging time, the micro-cracks on the surface of specimen were more obvious and same to the monoclinic phase. (2) With the aging time, the mechanic-strength and Vickers-hardness of zirconia were reduced. (3) Compared with 1.5mm group, 0.8mm group showed more significant defects, micro-cracks, monoclinic phrase and lower mechanic strength in spite of the aging time.

## ► Fixed and Removable / Occlusion

### 18 *cancellation*

## 19

### EVALUATION OF MASTICATORY PERFORMANCES OF PATIENTS WITH SHORTENED DENTAL ARCHES

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**Keywords:** shortend dental arch, mastication, oral quality of life

**Purpose/Aim:** Kayser (1981) was the first to demonstrate that shortened dental arches without molar support can provide sufficient oral

function. Nevertheless, majority of publications deal with the subjective experience of mastication. The aim of this study was to characterize the masticatory efficiency in subjects with shortened dental arches.

**Materials and Methods:** Seven patients aged from 54 to 78 years (mean age  $\pm$  standard deviation:  $70 \pm 13$  yr) with a shortened dental arch were selected at the dental Department Garancière - Rothschild Hospital (Paris, France). Chewing parameters were measured during chewing sequences using samples of peanuts and carrots. Chewing time, number of chewing cycles and chewing frequency were video recorded during the mastication of the test foods. Masticatory performances were characterized by the 50th percentile (D50) particle size of the expectorated bolus. The Global Oral Health Assessment Index (GOHAI) was used to assess oral health related quality of life. The patients were asked to answer 12 questions relating to oral function, pain, and psychosocial discomfort.

**Results:** Patients with shortened dental arches showed less particle size reduction than patients with complete dental arches. Chewing duration, and number of chewing strokes appeared similar with control group, but with masticatory frequency was lower. The GOHAI score varied from 56 to 41 (mean  $\pm$  sd:  $47.1 \pm 5.2$ ), this assessed a poor oral quality of life.

**Conclusions:** The tested group of patients showed impaired masticatory function. Characterization of chewing efficiency and oral health related quality of life seem to reverse the lack of patients' complaints. A new prospective study should be proposed with varied dental functional status of patients with shortened dental arches.

## 20

### OCCLUSAL VERTICAL DIMENSION BY ANTHROPOMETRY OF HAND'S FINGERS

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**Keywords:** Fingers, Thumb, Vertical Dimension of Occlusion

**Purpose/Aim:** The purpose of this study was to validate in Chilean population, the anthropometric method by Ladda which found a significant correlation between the length of the fingers and the vertical dimension of occlusion.

**Materials and Methods:** A cross-sectional study, with 151 Chileans: 76 males and 75 females. Anthropometric measurements of vertical dimension occlusion, length of index finger, length of little finger, and distance from tip of thumb to tip of index finger of right hand were recorded clinically using digital Vernier caliper. Correlation was studied using Pearson's coefficient.

**Results:** Vertical dimension occlusion was significantly correlated with all the parameters analyzed. In males, correlation of vertical dimension occlusion was stronger with the length of index finger ( $r=0.908$ ) whereas in females, it was stronger with the length of little finger ( $r=0.827$ ).

**Conclusions:** Since the variations between vertical dimension occlusion and finger lengths are within the range of 3-4 mm, as with other anthropometric methods published, VDO prediction through this method is reliable, and reproducible. This method is simple, economic, and non-invasive; hence, it could be recommended for everyday clinical practice.

## 21

### NEUTRAL ZONE OR CONVENTIONAL MANDIBULAR DENTURES: A CROSS-OVER TRIAL COMPARING ORAL-HEALTH RELATED QUALITY OF LIFE

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**Purpose/Aim:** There is widespread consensus that the neutral zone (NZ) concept improves stability for mandibular complete dentures (CDs). However, little is known about its impact on oral health-related quality of life (OHRQoL) of edentulous patients compared to conventional (CV) dentures.

**Materials and Methods:** In this prospective cross-over trial, edentulous patients received both CV and NZ mandibular dentures. Each type of CD-set was worn for at least 8 weeks after the last recall visit. Upon delivery of the second set, the first set was withheld from the patient. A power analysis was done after completion of the first 4 patients using one sample t-tests and a clinically meaningful mean difference of OHIP-20 scores (CV-NZ) estimated to be between 5 and 10. Required sample size was 34. Patients were assigned to a sequence group by means of random draw from a container holding 40 tickets coded with equal numbers of "NZ" and "CV" tickets. To determine carry-over and treatment effect between sequence groups, a two-sample t-test was done. Twenty-item oral health impact profiles (OHIP-20) were completed by patients after each wearing period. Scores were compared with pre-treatment scores using paired t-tests and correlation statistics. Treatment effect size (ES) was established. Associations of OHIP-20 scores and patient factors (age, gender, period of edentulousness, prosthodontic diagnostic index (PDI), denture dimensions and preference) were performed using the generalised linear model. Significance for all tests was set at  $p=0.05$ .

**Results:** Thirty-five patients completed the trial. Mean age was 62.3 years (range 47-85 years). Fourteen patients were male. Mean period of edentulousness was 30.9 years (range 1-60 years). Majority of patients had class III and IV PDI (most challenging). No significant carry-over ( $t=1.000$ ;  $p=0.324$ ) or treatment effect ( $t=1.533$ ;  $p=0.134$ ) was found between the two sequence groups. Differences ( $p<0.001$ ) between pre-treatment and both post-treatment OHIP-20 scores were highly significant ( $t=6.470$  for CV;  $t=6.713$  for NZ). A significant positive correlation was found between CV and NZ OHIP-20 scores before and after adjusting for pre-treatment OHIP scores ( $r=0.733$ ,  $p<0.001$ ;  $r=0.8752$ ,  $p<0.001$  respectively). Treatment ES was high for both denture types ( $>0.8$ ). Difference of ES between NZ and CV dentures was small ( $ES<0.2$ ). None of the patient variables showed significant associations with OHIP-20 scores of the two types of dentures, except for preference and OHIP-20 scores of NZ dentures.

**Conclusions:** For the patients in this trial, both treatment methods improved OHRQoL significantly and patient-related factors did not influence impact on OHRQoL differently for both interventions.

## 22

### **THREE DIMENSIONAL FINITE ELEMENT STUDY ON THE RESTORATION OF ANTERIOR TEETH WITH ABNORMAL ANTERIOR TEETH**

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**Keywords:** combined crown with all-ceramic, occlusal relationship, three-dimensional finite element

**Purpose/Aim:** Three dimensional finite element method was used to analyze the stress distribution of porcelain fused to metal crown under different occlusal relationship.

**Materials and Methods:** Three dimensional finite element of combined crown with all-ceramic for maxillary anterior teeth under alveolar bone resorption were established. We simulated different occlusal patterns by controlling direction and position of loading force in those models under alveolar bone resorption. Then we analyzed the stress distribution characteristics of static and constant in intercuspal position.

**Results:** With the decreasing of the height of alveolar bone and the area of parodontium, the peak values of stress of the combined crown with all-ceramic and abutment teeth decreased obviously. While the stress peak values of the support tissues of alveolar bone and parodontium increased sharply. The stress states are different under different occlusion status with the identical external force. The peak values are higher under normal overbite and overjet, while there are no distinguished differences under other three occlusal conditions. In conclusion, deep overjet is more favorable to protecting periodontal support tissues for its stress values are the lowest.

**Conclusions:** With the decreasing of the height of alveolar bone and the area of parodontium, supporting ability of periodontal tissue decreased. there is no general rule about the stress state of each part with different occlusal patterns. And further studies are needed on this issue.

## 23

### EFFECT OF BRUXISM FOR BRAIN STRUCTURE

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**Keywords:** bruxism, brain, neuroimaging

**Purpose/Aim:** The aim of this study was to investigate the effect of bruxism for brain structure using magnetic resonance imaging (MRI) by voxel-based morphometry (VBM).

**Materials and Methods:** Sixty female participants with no pain and normal jaw function participated. All participants classified bruxer group and non-bruxer group according to questionnaire of oral behaviors checklist. MRI examinations were performed using a Philips 1.5 T Achieva system (Philips Medical Systems, Best, The Netherlands). MRI examinations (T1-weighted images) were acquired using a gradient first field echo sequence with the following parameters: TR 20 ms, TE 4.6 ms, flip angle 20°, FOV 24 × 24 cm, pixel matrix 288×288, and slice thickness 1 mm. MRI examination analysis was performed using VBM analysis to calculate the brain volume of grey matter and white matter by statistical parametric mapping (SPM12 software from The Wellcome Trust Centre for Neuroimaging, Institute of Neurology, University College London, UK). The brain volume of grey matter and white matter compared between bruxer group and non-bruxer group. Statistical comparisons were used to identify brain regions with significant brain structure. Locations of brain region of significant brain structure between both groups were transformed into Talairach standard coordinates. The Spearman's rho test was used to analyze the association between the brain volume at sensorimotor cortex and premotor cortex and oral behaviors checklist score calculated from the questionnaire.

**Results:** The brain volume of grey matter and white matter at whole brain were no significantly different between both groups ( $P > 0.05$ ). Brain volume at sensorimotor cortex and premotor cortex in grey matter and white matter were significantly different between both groups ( $P < 0.001$ ). Negative correlation between the brain volume at sensorimotor cortex and premotor cortex and oral behaviors checklist score were found.

**Conclusions:** Based on the present MRI findings, we therefore suggest that bruxism leads to change the brain structure of grey matter and white matter at the sensorimotor cortex and prefrontal cortex.

## 24

### REMOVABLE PARTIAL DENTURE REPAIR USING DMLS TECHNIQUE: CASE REPORT

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**Keywords:** denture repair, DMLS technique, digital dentistry

**Case Presentation:** Fracture of retentive arm, reciprocal arm or occlusal rest is a common problem in long term maintenance of the removable partial denture (RPD). When denture components were fractured previously, a pick-up impression was taken to fabricate a plaster model. In the dental laboratory, the fractured components were reproduced using a pattern resin or wax. After the investment and casting process, components finally soldered to the dentures. Such a procedure had the inconvenience that the patient had to stay for a certain period of time without denture. Relatively the clasp can often be repaired quickly using wrought wire, but if casting process is required, such as an occlusal rest, the denture must be sent to the dental laboratory. In addition, errors in repair process occur during various steps which greatly depend on the technical sensitivity of the operator. In recent years, digital technology has developed in dentistry, so denture frameworks can be manufactured using direct metal laser sintering (DMLS) technique. Pick-up impressions can be replaced with oral scans, wax pattern can be designed on CAD programs, and the designed STL files can be sent to DMLS devices to fabricate final components. In the process of pick-up impression, the denture is often displaced by the pressure applied during impression taking. However, when the oral scan is used, it is possible to make the digital impression as accurately as possible without the pressure applied. It is also possible to design uniform and appropriate thickness with CAD program. Above all things, the patient has the advantage of continuing to use the denture during the procedure.

As the average life expectancy is prolonged, patients with RPD restoration have a longer period of long-term denture maintenance. The possibility of fracture of the partial denture component may increase during the maintenance period. When reconstruction of denture is impossible, it is significant that digital technology can be used to repair the denture conveniently. In this case of fracture of the occlusal rest for support and indirect retention, DMLS technique was used to repair the partial dentures. Fitness and functional results of dentures were satisfactory.

## 25

### THE EFFECT OF OCCLUSAL SUPPORT LOSS ON COGNITIVE IMPAIRMENT IN RATS WITH CHRONIC CEREBRAL ISCHEMIA

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**Keywords:** occlusal support loss, chronic cerebral ischemia, learning and memory

**Purpose/Aim:** More studies showed that as a common disorder in senior population, loss of teeth could adversely affect human cognitive function. However, the underlying mechanism has not yet been well-established. We've found that nitric oxide (NO) might play an important role in the cognitive function caused by loss of teeth, which also mediates the signaling pathways in the chronic cerebral ischemia. Therefore, we explored the effects of occlusal support loss on chronic cerebral ischemia and the role of NO and its synthases.

**Materials and Methods:** Three-month-old male Wistar rats with 2-VO (2-vesselocclusion) or molars removed or both treatments were housed in a standard environment for 8 weeks. The spatial learning and memory ability of rats in each group were detected by Morris water maze test. The changes of NO and iNOS (inducible nitric oxide synthase) in rat hippocampus, the expressions and activities of acetylcholine, Choline acetyl transferase (ChAT) and Acetylcholinesterase (AChE) were analyzed. Western blotting was used to test the expression of iNOS. The activation of astrocytes and microglia were measured by immunohistochemical staining.

**Results:** Rats with both chronic cerebral ischemia and loss of occlusal supports exhibited hippocampus-dependent learning deficits in the Morris water maze, a significant increase of NO and iNOS in hippocampus, a decline of neurotransmitters (ChAT and AChE) and an increased expressions of astrocytes and microglial cell.

**Conclusions:** This study confirms that the loss of occlusal support with chronic cerebral ischemia can lead to further impairments of learning and memory ability, which NO and iNOS in the hippocampus are involved.

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### GOLD COPING-SUPPORTED OVERDENTURE TREATMENT IN A PATIENT WITH SEVERELY WORN DENTITION: A CASE REPORT

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**Case Presentation:** In a patient with a few sound teeth, tooth-supported overdenture can be considered a treatment option. Tooth-supported overdenture allows preservation of underlying alveolar bone and proprioception. Moreover, it provides a rigid support, diffuses the stress that is given to an abutment and supporting tissue, and shows long-term stability. An abutment tooth can be prepared using one of the following methods: (1) Attachment installation to provide it with an additional support. (2) Placing a coping to preserve residual ridge. (3) Conventional filling. A 60-year-old female patient had lowered vertical dimension and unstable occlusion due to the severe wear of a dentition. Teeth thought to show bad prognosis were extracted. #13,23,33,35,43,45 were kept to be used as the abutments. For the underlying alveolar ridge was thought to provide enough support, the teeth were restored with gold copings. Horizontal jaw relation was taken upon a centric relation induced using gothic arch. Proper vertical dimension was set at a point where the patient became comfortable in physiologic rest position, pronouncing, and swallowing. The taken impression was used in fabricating a temporary denture. The patient wore the temporary denture for 3 months and did not show any clinical symptoms. The definitive denture was fabricated afterwards. 6 months has passed since the delivery and the results are functionally and esthetically satisfactory.

## COMPLETE SUCTION DENTURE FOR EDENTULOUS PATIENT WITH EXCESSIVE FLABBY TISSUE AND SEVERE ALVEOLAR BONE RESORPTION

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**Keywords:** complete denture, closed mouth technique

**Case Presentation:** The introduction of implants resolved a number of obstacles in treatment of edentulous patients with traditional methods of prosthodontics. However, the use of complete dentures remains the only way to treat those edentulous patients with general health restrictions, financial difficulties, improper alveolar bone and condition of soft tissues for implants. The purpose of existing conventional impression method for dentures is to broaden the internal pressure surface so that the internal surface of denture adhere to alveolar bone for great maintenance and stability, and better masticatory functions. On the other hand, having too broad surface adhere to the alveolar bone causes the lower denture to mobilize during mouth opening and tongue movements. Especially, flabby tissues restrict dentures from seating properly, and there are limitations, such as over-extension of denture border causing the restriction of muscle movements, for patients with severe residual ridge resorption to make complete dentures using conventional method. A complete suction denture requires reproduction of mandibular movement, pronunciation, mastication, and daily muscle movements during the course of denture fabrication. The denture is fully surrounded by the oral mucosa that mobilizes the tissues surrounding the denture. When patient swallow or upper and lower dentures contact to each other, the internal surface of the denture adhere to the residual ridge by the creation of negative pressure, and this prevents rattling of denture when talking, and enhances the maintenance and stability of the denture during meal. Moreover, since impression was taken while patient was guided to close mouth in patient's own way, a static border molding method was used, which is differ from the conventional method. This case, an 86-year old female patient, is a patient of completely edentulous both maxilla and mandible, with an excessive flabby tissues on maxilla and severe alveolar bone resorption on mandible. Even with the surgical approach, because the complete excision of movable tissues was impossible, non-pressure impression technique using a window tray and impression material with great flowability was used to gain great fitness due to the failure of the flabby tissue displacement. For mandible, an overdenture using implants seem to be favorable in terms of maintenance and stability, but in this case, implantation was impossible due to severe alveolar bone resorption. Therefore, the mandibular suction denture was applied to enhance denture maintenance and stability. I report this case because the patient was satisfied with sufficient denture stability.

## COMPARISON EDENTULOUS IMPRESSION SURFACES BETWEEN OPEN AND CLOSED MOUTH TECHNIQUE THROUGH THREE-DIMENSIONAL ANALYSIS

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**Keywords:** edentulous, impression, three dimension

**Purpose/Aim:** Impression for complete denture can be taken by either open mouth technique or closed mouth technique. Those techniques have respective clinical features and their results differ from each other. Currently no data comparing impression surfaces of open and closed mouth techniques three dimensionally has been reported. The purpose of this study is to analyze the difference between impression surfaces of the two techniques when they are clinically taken

**Materials and Methods:** Diagnostic casts of 10 edentulous patients were fabricated and scanned. Two identical trays were made for each cast. Trays were 3mm thick and no space for impression material was given. Handles were attached to only trays for open mouth technique.

On the next visit, after border molding with VPS heavy body, final impression was taken with both trays. Each definitive model was fabricated and scanned. Their surfaces were compared and analyzed three dimensionally. The discrepancies were designated with color map. For the statistical analysis, the measurement of edentulous impression surface was performed according to several divided areas as follows: (Maxilla) 1) Mid palatal suture, 2) Palatal area, 3) Ant. crestal 4) Post. crestal 5) Labial area, 6) Buccal area, 7) Posterior palatal seal area, (Mandible) 1) Crestal area, 2) Ant. Lingual, 3) Post. Lingual 4) Retromolar pad, 5) Buccal area, 6) Labial area

**Results:** The border of closed mouth technique showed shorter than open mouth technique on labial and buccal area. The posterior palatal area was not pressed under closed mouth technique as much as open. For the mandible, closed mouth technique showed 0.2mm longer anterior lingual border, 0.2-0.3mm shorter labial, buccal border. Mean value discrepancy of posterior lingual area was low but the

deviation was rather high. Borders around masseteric muscle area and insertion of labial mental muscle area was formed shorter with close mouth technique than with the other.

**Conclusions:** Closed mouth technique was affected from the individual status of attachment and activation of muscles on border area compared with open mouth technique. They showed tendency of shorter borders on the muscle attached areas. However, close mouth technique showed deficient pressure on posterior palatal area. An extra effort should be given to make suitable sealing of posterior palatal area for the closed mouth technique

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### **DISTRIBUTION AND INTENSITY OF OCLUSAL CONTACTS BETWEEN COMMON AND NON-COMMON SIDE OF BITE**

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**Purpose/Aim:** Chewing can be bilateral or unilateral, the last so called the "preferred or usual bite side". To compare the amount and intensity of occlusal contacts, relative to the common side of bite, and to relate it to the muscular force applied on both sides.

**Materials and Methods:** A convenience sample of 21 healthy students was taken, with ages between 19 and 22 years old. The chewing force was measured with a dynamometer in each hemiarcate, after which a computerized occlusal analysis was performed using the T-Scan III Evolution®, which obtained the intensity, number and location of the contacts in maximal intercuspitation (MIC). The usual side of bite was determined using chewing gum. The analysis and comparison of the data was done with t test of student or wilcoxon.

**Results:** The number of occlusal contacts of the usual side versus the non-habitual side, from the first premolar to the second molar, showed an average of 16.10 points and 15.62 respectively. Of the total teeth observed the first molar presents a greater number of contacts, both on the usual side and on the non-habitual side, mean of 2.48 contact points, on both sides; with no statistically significant differences. Regarding muscle strength, the usual bite side presents 292.6 N, and the non-preferential side 273.6 N, presenting statistically significant values  $p = 0.02$ . Finally, the right side was the one with the highest prevalence with 66.7%; the left side was preferential, only reaching 33.3%.

**Conclusions:** The number of occlusal contacts on the usual side tends to be higher than the non-habitual side of bite. The tooth with the highest number of occlusal contacts was the first molar. There is a greater tendency of the intensity of occlusal contacts on the preferential side than on the non-preferential side of bite. The usual side has a clear tendency to exert more muscle strength than on the non-habitual side of the bite.

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### **ECCENTRIC OCLUSAL CONTACT ANALYSIS OF BRUXISM PATIENTS**

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**Keywords:** bruxism, T-scan, occlusal interference

**Purpose/Aim:** The purpose of present study is to evaluate occlusal contact pattern of bruxism patient and correlation between bruxism and balancing occlusal interference.

**Materials and Methods:** 100 patients with no missing tooth except 3rd molars were investigated in this study. They were separated into 2 groups. Group A(39 patients) was bruxism and group B(61 patients) was no bruxism. We used T-scan system to record MICP, left / right eccentric movement and diagnosed balancing side interference. We also recorded eccentric occlusal patterns (canine guidance/group function). Examined teeth were checked again with articulation paper after T-scan taking.

**Results:** Results of Group A in eccentric relation was 12.8% canine guidance, 61.5% group function guidance, 25.7% others and group B was 40.9% canine guidance, 47.5% group function guidance, 11.6% others. Balancing side occlusal interference was 51.2%(group A), 45.9%(group B).

**Conclusions:** There was no significant difference concerning balancing side occlusal interference between group A(bruxism, 51.2%) and group B(no bruxism, 45.9%). The results of this study were different from previous studies. Further study is needed to investigate more patients about correlation between eccentric occlusal guidance and balancing side occlusal interference.

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### EFFECT OF RELIEF SPACE FOR IMPRESSION PRESSURE IN EDENTULOUS MODEL

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**Keywords:** impression pressure, edentulous model, relief space

**Purpose/Aim:** The aim of this study was to investigate the effect for impression pressure in the edentulous model.

**Materials and Methods:** For lower and upper jaw edentulous model, we used plaster model (MAP-34, NISSIN, Kyoto). Polyvinylsiloxane elastomer, Polyether elastomer, and alginate impression material were used in this study. Two tray types applied to no relief spaces and 1.4 mm of relief spaces. Pressure sensors were embedded at three locations in the median alveolar crest (L1), right side of alveolar crests corresponding to the molars (L2), and right side of buccal shelves (L3) at lower jaw edentulous model, and three locations in the incisive papilla (U1), deepest point of the mid-palatal suture (U2), and right side of alveolar crests corresponding to the right first molar (U3) at upper jaw edentulous model. For each impression material, the measurement was performed five times for each of the two types of trays, and the mean values were determined as impression pressure. The impression pressure values at each pressure sensor on each impression materials were measured at 180 s after the start of the measurement. Maximum impression pressure value during 180 s defined as impression pressure value.

**Results:** Impression pressures values at lower jaw edentulous model were significantly higher than at upper jaw edentulous model in each impression material using each tray ( $P < 0.05$ ). Highest Impression pressure value at lower and upper jaw edentulous were L1 and U1 respectively in each impression material using each tray. Impression pressure value at L1 and U1 used by tray with 1.4 mm of relief spaces tend to decrease compared to used by tray with no relief spaces in each impression material. However, impression pressure values at L2, L3, U2, and U3 used by tray with 1.4 mm of relief spaces tend to increase compared to used by tray with no relief spaces in each impression material.

**Conclusions:** Our results suggest that impression pressure value at lower jaw edentulous model were significantly higher than at upper jaw edentulous model, and relief spaces in tray play an important role to control impression pressure value during edentulous impression.

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### THE PENETRATION AND DISINFECTION OF CANDIDA ALBICANS IN DENTURE BASE RESIN

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**Purpose/Aim:** The fitting surface of a denture provides an ideal environment for the growth of Candida, which adheres to, contaminates and penetrates porosities in the resin base. The purpose of this study was to determine the extent of penetration into the resin, and whether it is possible to eradicate it by the use of disinfection.

**Materials and Methods:** Heat-polymerising polymethylmethacrylate test plates ( $n=23$ ) were processed according to the manufacturer's instructions. Twenty-two were inoculated in a laboratory culture of Candida. One plate was excluded as a control. Three plates each were removed on days 7, 14 and 21. The rest were removed on day 21; 3 were placed in distilled water, 3 in a denture cleanser (Steradent), 3 placed in a 20ppm solution of chlorine dioxide for 8 hours, and 3 were left dry. One plate maintained the live culture count. The plates were then fractured into three pieces, and the penetration depth of Candida was measured at 10 uniform intervals over 4 fractured surfaces under SEM. For viability, surfaces of the plates were decontaminated by placing them into 0.2% chlorhexidine for 15 minutes and rinsed with sterile distilled water. The fractured plates were placed in Sabouraud broth, incubated for 5 days, then subcultured onto Sabouraud agar for 48 hours. Results were recorded as presence or absence of growth of Candida.

**Results:** A statistically significant increase in penetration depth (to max.  $631\mu\text{m}$ ) of Candida occurred on days 14 and 21, compared with day 7. All plates including the control, displayed evidence of Candida. Viable Candida were not present on the surface or internal fractured surfaces after decontamination with chlorhexidine. However, after 5 days in liquid media, there was growth in all the plates including those treated with chemical disinfection.

**Conclusions:** Candida albicans penetrates into denture base resin over a period of time, significantly within the first 14 days. None of the disinfection methods eradicated all Candida that penetrated into resin as they migrated to the surface after recognizing nutrients. This implies that infected denture fitting surfaces should always be replaced by removing at least a 1mm layer of contaminated resin.



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### SUCCESS AND SURVIVAL OF POST-RETAINED FIXED DENTAL PROSTHESES IN PREMOLARS

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**Keywords:** survival, post-core, complications

**Purpose/Aim:** To evaluate the survival and complication-free (success) rates of post-core restorations supporting fixed dental prostheses done at the National Dental Centre Singapore (NDCS) after a mean time in function of 7 years and to assess the incidences of biological and technical complications. Possible differences in the survival of restorations based on different post and core systems will also be assessed.

**Materials and Methods:** Patients with endodontically treated premolars restored with post-retained fixed dental prostheses from the years 2007 to 2009 were recruited from the Endodontic Registry of National Dental Centre, Singapore and evaluated by three clinicians. 265 patients, with 329 treated premolars, were examined clinically. A range of clinical parameters was assessed. Complications were classified to be tooth and prosthesis-related. Digital radiographs were also obtained. Failure and complication rates were calculated based on person-time at risk.

**Results:** The mean time in function was 7.1 years. 25 teeth were lost, resulting in a 7-year survival rate of 92.7% (95% CI: 89.5, 95.0). The corresponding success (complication-free) rate was 75.1% (95% CI: 70.5, 79.1). 40 prostheses failed, resulting in a 7-year prosthetic survival of 88.6% (95% CI: 84.8, 91.5). Common complications observed were periodontal disease (3.9%), periapical pathology (7.3%), caries (3.9%), porcelain chipping (9.9%) and tooth fractures (5.0%). For tooth fractures, a risk analysis yielded significant associations between the number of occluding teeth (OR: 5.47, 95% CI: 1.37, 21.90) and the number of adjacent teeth (OR: 3.96, 95% CI: 1.47, 10.65).

**Conclusions:** Within the limits of the study, restoration of premolar teeth requiring root canal treatment with a post core and crown is a viable treatment option when the premolar teeth have adjacent teeth and is within a relatively intact dentition.

## 34 *cancellation*

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### DENTURE STATUS IN ELDERLY IN JAPAN AS THE TOP RUNNER IN ULTRA-AGED SOCIETY

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**Keywords:** ultra-aged society, denture, patients' number

**Purpose/Aim:** Missing teeth number of the elderly has been decreasing dramatically, and percentage of denture patients is decreasing in Japan as the top runner in ultra-aged society. On the other hand, social aging has increased the number of the elderly, which may cause increase in absolute denture patients' number. Therefore, denture status in elderly from Survey of Dental Diseases and Vital Statistics was examined.

**Materials and Methods:** The results (ratio of person with several prostheses) in the Survey of Dental Diseases in 2005, and 2011 and absolute numbers of partial denture patients and complete denture patients were estimated. Also in a private dental clinic, the change in the number of dental prostheses was examined in the corresponding year.

**Results:** Although the ratio of denture patients decreased, the ratio of the removable partial denture increased in elderly. In absolute number of patients, removable partial denture patients decreased a little, but aged. On the other hand, full denture patients decrease in 18%. However, aged 85 and over increased. Even at the private dental clinics located in suburbs of regional cities with a population of 100,000, partial denture patients increased by 19%, and full denture partial increased by 11%. Increase of denture patients aged 85 and over might increase the difficulty of denture treatment.

**Conclusions:** Denture patients did not decrease in number compared with the increase in remaining teeth, therefore the necessity for the suitable denture treatment for the oldest old was suggested.

## 36 *cancellation*

## FRACTURE STRENGTH AND FATIGUE RESISTANCE OF FIBER-REINFORCED CANTILEVER RESTORATIONS

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**Keywords:** fiber-reinforced, adhesive, cantilever bridges

**Purpose/Aim:** In the last decade fiber-reinforced direct chairside restorations were introduced to the clinical practice. The aim of this study was to evaluate effect of retention design on fatigue resistance of two-unit chair-side cantilever bridges reinforced with unidirectional fiber-reinforcement.

**Materials and Methods:** One hundred and twenty extracted upper canines were used (n=20 per group). The retentions designs were: lingual and buccal supporting wing (F1), 2 mm approximal box with lingual wing (F2), 2 mm approximal box only (F3), 1 mm incisal overlap labial laminates with (F4) and without (F5) lingual wing and 3 mm overlap (F6) laminate. EverStick C&B E-glass fibre reinforcement with G-aenial Posterior restorative composite and G-Premio BOND adhesive was used for all the restorations. After 12 weeks water storage (37°C), the teeth were potted in poly(methylmethacrylate) 1 mm below cement-enamel junction. Five specimens of each group were tested monotonically at 30° angle with 4 mm diameter stainless steel sphere to estimate the maximum fracture load. Fatigue testing at 5 Hz was initiated at approximately 85% of the maximum load (R= 0.1) using an Instron ElectroPuls E1000 dynamic testing machine. For successive specimens the cyclic load was decreased in increments of approximately 50 N. The process continued until reaching the load at which specimens did not fracture within  $1.2 \times 10^6$  cycles. The fatigue life distribution was evaluated in terms of the cyclic force and number of cycles to failure. The groups were compared using Wilcoxon Sum Rank Test ( $\alpha=0.05$ ).

**Results:** The maximum static fracture load ranged between 70 and 460 N and the highest resistance to fracture was with F1, followed by F6 and F4. The ranking of the groups and statistically significant ( $p<0.05$ ) groups (superscript letters indicate similar groups) from higher to lower was as follows: F1a,F6ab,F4b,F2c,F5c,F3d. The primary fracture patterns were pontic fracture (F1,F6, F4) or debonding (F2,F3,F5).

**Conclusions:** The design of the fiber-reinforced cantilever restorations are important for their longevity. Addition of reinforcing wings reinforced with unidirectional fibers should be considered for better performance of cantilever bridges.

► **Implants / Materials**

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**PROSPECTIVE RANDOMIZED CONTROLLED CLINICAL TRIAL  
COMPARING ENCODE PROTOCOL AGAINST CONVENTIONAL  
PROTOCOL FOR RESTORING SINGLE IMPLANTS**

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**Keywords:** Encode, abutment, impression

**Purpose/Aim:** The aim of this prospective randomized controlled clinical trial is to compare the 1-year clinical outcome of the Encode protocol to the conventional protocol for restoring single implants. The comparison involved biological, prosthetic and aesthetic variables.

**Materials and Methods:** A total of 45 implants (OSSEOTITE Implant, Biomet 3i, Palm Beach Gardens, Fla, USA) were inserted in 42 patients. After randomization of the implants, 23 implants were restored according to Encode protocol and 22 were restored following conventional protocol. As part of the Encode protocol, all the implants were restored by CAD/CAM abutment and metal-ceramic crown retained by cross-pin (lateral prosthetic screw). The conventional group implants were restored by prefabricated titanium abutment and metal-ceramic crown retained by cross-pin. All the clinical steps were provided at the Royal Dental Hospital of Melbourne. At baseline,

the following variables were evaluated: proximal contacts quality, occlusal contacts quality, marginal bone level (MBL), aesthetics, patient satisfaction and probing pocket depth (PPD). After 1 year, changes in aesthetics, patient satisfaction, proximal contacts quality, occlusal contacts quality, MBL, and PPD were evaluated. In addition, the prosthesis cleansability, mucosal health, bleeding on probing (BoP), metallic discoloration and all forms complications were recorded.

**Results:** At the 1-year review visit, 40 patients with 41 implants attended (95.2% recall rate) the recall visit (22 Encode and 19 conventional). No implant or abutment failure occurred. The Encode crowns had 100% survival and one conventional crown failed due to excessive looseness (94.7% survival). Aesthetics and patient satisfaction were favourable for the two protocols. The crowns of the two protocols were cleansable. One Encode crown (4.5%) and 6 conventional crowns (33.3%) had slight mucosal redness. Eight Encode crowns (36.4%) and 8 conventional crowns (45.4%) had BoP. Only 2 conventional crowns showed metallic discoloration of the mucosa. The 1-year alteration in PPD was similar for the 2 protocols (Encode = 0.04 mm, conventional = 0.13 mm). In addition, the MBL loss was similar for the 2 protocols (Encode = 0.71 mm, conventional = 0.78 mm). The 2 protocols had similar proximal contacts and occlusal contacts patterns. Screw loosening occurred for 1 Encode crown (4.5%) and 2 conventional crowns (10.5%). Ceramic chipping occurred for 2 conventional crowns (11.1%). No significant statistical difference was observed for any of the evaluated variables.

**Conclusions:** After 1-year clinical service, the Encode and conventional protocols were comparable from the biological, prosthetic and aesthetic perspectives. Implant restorations produced by the Encode protocol showed some advantages that can be attributed to CAD/CAM processing of titanium abutments.

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### ASSESSMENT OF OHRQOL IN PATIENTS TREATED WITH IMPLANT ASSISTED REMOVABLE DENTURES

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**Purpose/Aim:** It has been well documented that conventional implant supported fixed prostheses (ISFP) provide excellent treatment outcomes; however, patients with multiple missing teeth, such as those who lost occlusal support, generally require a large number of implant placements. In such cases, the application of removable prostheses with a minimum number of implant placements, such as implant overdenture (IOD) or implant assisted removable partial denture (IARPD), allows to reduce surgical invasion and expenditures. The aim of this study was to assess the prosthetic treatment outcome as evaluated by oral health related quality of life (OHRQoL) of implant assisted removable dentures (IARDs) in comparison with those of ISFPs.

**Materials and Methods:** This study was conducted at the department of Prosthodontics and Implant Center at Showa University Dental Hospital. Patients, who were classified as Eichner Index B3, B4, C1, C2 and C3, were recruited. In total, 37 patients (65.4±10.6 y, female 70.3%) agreed to participate in this study after giving informed consent. Patients received the prosthodontic treatment either of ISFP (n=16), IARPD (n=9), or IOD (n=12) during the study period. OHRQoL was evaluated by using the Japanese version of Oral Health Impact Profile (OHIP-J), which was administered before and one month after delivering the prostheses. The OHIP summary score as well as four dimensional scores, which represented “oral function”, “orofacial pain”, “orofacial appearance”, and “psychosocial impact”, were analyzed to determine the effect of the types of treatments on these OHIP scores (t-test, p<0.05). The study protocol was approved by the ethics committee of Showa University (#2007-29).

**Results:** The average number of missing teeth for the ISFP and IARD group was 17.1±4.7 and 21.6±5.3, while that of the embedded implants for the ISFP and IARD group was 7.7±2.4 and 2.7±1.6, respectively. The average baseline OHIP summary score and “oral function”, “orofacial pain”, “orofacial appearance”, and “psychosocial impact” dimensional scores for the ISFP group (78.8±30.3, 18.3±9.6, 13.9±5.2, 8.1±4.4, and 20.8±11.7) were comparable with those for the IARD group (75.5±40.4, 18.5±10.6, 11.4±6.2, 9.1±6.4, and 19.3±14.9). All of these scores significantly improved (decreased) by both types of the treatments (p<0.05), while no significant group difference was found for the magnitudes of the change in any of the OHIP scores. There were no significant group differences in any of these post treatment scores.

**Conclusions:** Within the limitation of this study, these results indicated that treatment outcomes of IARDs are comparable with those of ISFPs. These results suggest that implant assisted removable dentures may allow noticeable treatment outcomes with less invasiveness and expenditures and therefore should be regarded as an effective treatment option.

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### DESIGNING MANDIBULAR CENTRAL INCISORS ON ONE, SINGLE PIECE IMPLANTS: 4 YEARS OUTCOME

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**Keywords:** mandibular central incisors, single piece implants, zirconia

**Case Presentation:** Lack of bone quantity, anatomical limitations, available mesio-distal space, adjacent teeth angulations, and surgical errors create a scenario where functional and esthetic restoration of missing mandibular central incisors becomes challenging. Three such patients are described where one, single piece implant was placed in the mandibular central incisor region. These implants were in inconsistent positions which made the prosthesis designing testing. Immediate full contoured temporary prosthesis was delivered to meet the esthetic desires of the patients. The provisional prostheses were used as an aid to compensate for the lacunae while designing of the definitive prosthesis. Complete zirconia based restorations, innovative CAD-CAM designing, ovate pontics, and philosophy of telescopic prosthesis were utilized to attain an optimal outcome in each of these patients. Barring minor complaints like saliva seepage while speaking in one patient no active complaints have been reported till their last follow up.

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### CONSERVATIVE REHABILITATION OF THE COMPLETELY EDENTULOUS PATIENT

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**Keywords:** fully edentulous, overdenture

**Introduction:** The treatment of a totally edentulous patient, for years has consisted of applying a total superior and inferior prosthesis which retains and supports the mucous membrane. However, a high percentage of the inferior prostheses, present problems of retention (Goiato et al., 2009), that can be improved with the insertion of 2 endo-osseous implants where the spherical pillars are attached to the dental prosthesis (Cvetko et al., 2012; Yang et al., 2011). Next, a case is presented in which conservative criteria is applied in the management of the dental substrate under the superior prosthesis.

**Clinical Case:** A 83-year-old female patient, with no history of systemic diseases, partially edentulous upper and lower gums, with upper and lower acrylic removable partial dentures with support, retention, stability and aesthetics problems. Endodontics of upper canines left with a protector and a conventional total prosthesis. A total denture was made in the mandible, doubled in transparent acrylic, which served as surgical radiographic guide for the insertion of 2 implants brand Neodent model Titamax CM 3.5 x 9 mm. Those that were left under the gingiva, at 4 months were connected first with healing abutments and posterior to the suture, which were passed with inferior prosthesis with the acrylic of thermocure and posterior connection of prosthesis to implants with GC Reline. The controls were performed until the use of both prostheses was comfortable which was valued with the Geriatric Oral Health Assessment Index (GOHAI).

**Discussion:** The retention of the lower total denture is greatly improved by being connected to 2 implant pillars; in this case the conservative management of the superior canines allows to reduce the bone loss.

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### FEA OF OCCLUSION ON PROSTHESES FOR COMPLETELY EDENTULOUS MANDIBLES WITH ALL-ON-4 CONCEPT

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**Keywords:** 3-Dimensional finite element, all-on-4, occlusion

**Purpose/Aim:** To provide biomechanical reference for occlusal design and clinical occlusal adjustment on oral implants supported cross-arch fixed prostheses for completely edentulous mandibles with All-on-4 Concept.

**Materials and Methods:** The 3-Dimensional Finite Element (FEM) Model of oral implants supported cross-arch fixed prostheses for completely edentulous mandibles with All-on-4 Concept was built by SolidWorks software, in which two parallel Nobel-Active 3.5\*13mm implants were placed anteriorly, and two tilted Nobel-Active 4.3\*15mm implants were placed posteriorly in 30 degree; multi-unit abutments were used to rectify the insertion guide for prostheses; the implants supported cross-arch fixed bridge was designed as posterior cantilevers with bilayer supra-structure which had titanium alloy framework covered by resin composite. The FEM stress analysis was applied by Ansys15.0 software to simulate different occlusal contact types with the combination of centric/lateral/protrusive occlusion and inclusive/exclusive cantilever contact, and to analyses the Von Mises stress of mandibular bone/implants/supra-structure prostheses materials.

**Results:** In centric occlusion status, occlusal contacts range from canine to first molar cantilever shows the most balanced stress distribution on all parallel and titled implants whereas all teeth but cantilever have occlusal contacts shows highest stress on anterior parallel implants. In lateral occlusion status, group function pattern excluded cantilever contact shows the most balanced stress distribution on all parallel and titled implants. In protrusive occlusion status, the combination of incisal and non-cantilever posterior contacts shows most balanced stress distribution.

**Conclusions:** In case of the implants supporting fixed prostheses for completely edentulous mandibles with All-on-4 Concept, cantilever occlusal contacts should be carefully treated in order to obtain more stress balance on parallel and titled implants.

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### IMMEDIATE VS. EARLY LOADING OF SINGLE DENTAL IMPLANTS: A SYSTEMATIC REVIEW AND META-ANALYSIS

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**Keywords:** fixed dental prosthesis, immediate dental implant loading, early dental implant loading

**Purpose/Aim:** The aim of this systematic review and meta-analysis was to evaluate the survival rate and marginal bone loss of single implant crowns loaded immediately or early.

**Materials and Methods:** Two reviewers made an electronic database search in the advanced mode, with no language or date restriction, in Medline/PubMed, Embase and Cochrane Central Register of Controlled Trials, up to May 2016. Studies were selected by title and abstract for screening according to inclusions criterias: A- studies about dental implants; B- human cohort studies (prospective and retrospective) and RCTs; C- sample involving partial edentulous patients; D- immediate loading implants; E- early loading implants; F- n ?10.

**Results:** Five studies from 5710 initially identified met the inclusion criteria. A meta-analysis yielded risk difference (RD) and standard mean difference (SMD) together with the corresponding 95% confidence intervals (95% CI) was performed. In this systematic review the included trials did not reveal significant differences between immediate and early loading protocols in single implant crowns regards survival rate at 1 and 3 years (RD -0.00, 95% CI -0.04 to 0.04; P = 0.98), even the marginal bone loss for 1 (MD 0.01, 95% CI -0.04 to 0.02; P= 0.36) and 3 years (MD -0.04, 95% CI -0.27 to 0.19; P= 0.72)

**Conclusions:** The immediate or early loading of the implants should be considered, however if it have to be choose, it might be better to opt for an immediate loading protocol, since there are no advantages or benefits with early loading.

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### IN VITRO STUDY OF SCREW LOOSENING OF ABUTMENTS WITH INTERNAL CONNECTION DEPENDING ON THE ANGULATION

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**Keywords:** screw loosening, angulated abutments, cyclic loading

**Purpose/Aim:** The aim of this preliminary in vitro study was to analyze the screw loosening of two types of machined prefabricated abutments for internal Morse taper connection implant system when a cyclic loading was applied. Screw loosening has been reported as one of the most frequent complications in implant supported single crowns. Nevertheless, the factors that influence in this mechanism have not been clearly established. Rigorous efforts to reduce the recurrence of abutment screw loosening in single-tooth implant restorations have been developed including changes in implant design, screws and abutments.

**Materials and Methods:** 12 Mozo Grau Internal Implant Connection System® (3, 75 x 11, 5 mm) implants were divided into groups A and B. Group A consisted of six abutments with 0° angulation and group B consisted of six abutments with 15° angulation. Each implant was assembled to the abutment with an implant motor with torque control (IChiroPro Bien Air®) to 20 Ncm, and placed on a custom-made implant fixing jig. Cyclic loading was applied simulating masticatory movement (300, 000 cycles / 200N / 2Hz) (equivalent to 1 year of simulated function). Reverse torque values (RTV) were recorded before and after loading. The reverse torque value (RTV) data were analyzed using Wilcoxon signed-rank test ( $p < .05$ ).

**Results:** Reverse torque values were lost in each implant assembly when applied a cyclic load. The average RTV before loading for group A was ( $12,14 \pm 1,289$  Ncm) and after loading the RTV were ( $6,30 \pm 1,34$  Ncm). For group B the average RTV before loading were ( $10,80 \pm 1,26$  Ncm) and after loading the RTV were ( $6,71 \pm 0,72$ ). Statistically significant differences were obtained when group A ( $p < .046$ ) and group B ( $p < .028$ ) was exposed to a cyclic load.

**Conclusions:** Within the limitations of this preliminary in vitro study, it was concluded that (1) every group showed decreased RTV after cyclic loading of 1-year simulated function. (2) Although statistically significance was found, differences when comparing RTV of group A to group B after cyclic loading were minimal. Further research will be required to confirm these preliminary conclusions.

## 46

### MARGINAL BONE LOSS IN IMPLANTS PLACED IN THE MAXILLARY SINUS GRAFTED WITH ANORGANIC BOVINE BONE

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**Keywords:** sinus floor augmentation, alveolar bone loss

**Purpose/Aim:** Sinus elevation is a reliable and often used technique. The success of implants placed in such situations, even with bone substitutes alone, led us to strive for bone loss close to zero and to seek out variables that cause higher or lower rates of resorption. The objective of this study was twofold: to evaluate the survival rates and marginal bone loss (MBL) around implants installed in maxillary sinus augmentation using anorganic bovine bone, and to identify surgical and prosthetic prognostic variables.

**Materials and Methods:** A total of 55 implants were placed in 30 grafted maxillary sinuses in 24 patients. Periapical radiographs were evaluated immediately after implant placement (at baseline), at 6 months, and at the most recent follow-up. MBL was calculated, taking into account the distortion rate for each radiograph as compared to the original implant measurements, from the difference between the initial and final measurements.

**Results:** The survival rate was 98.2%, with only one implant lost (100% survival rate after loading) over a mean follow-up time of  $2 \pm 0.9$  years. The MBL ranged from 0 to 2.85 mm: 75.9% of mesial sites and 83.4% of distal sites showed  $<1$ mm of MBL, while 35.2% of



mesial sites and 37% of distal sites exhibited no bone loss. The MBL was significantly ( $p < 0.05$ ) greater in open flap as compared to flapless surgery.

**Conclusions:** Within the limitations of this study, we concluded that maxillary sinus elevation with 100% anorganic bovine bone presents predictable results, and that flapless surgery results in less MBL as compared to traditional open flap surgery.

Table 1. Comparison of mesial versus distal marginal bone loss among different variables

Independent Variables	MBL (mm)	MBL (mm)	P Value	
			Mann-Whitney U test	Student t test (two-tailed)
Mesial versus distal	0.6 (± 0.7) n = 54	0.4 (± 0.5) n = 54	NS	NA
Flapless versus flap surgery				
Mesial	0.2 (± 0.3) n = 22	0.8 (± 0.8) n = 32	NA	<0.001
Distal	0.2 (± 0.4) n = 22	0.5 (± 0.6) n = 32	<0.05	NA
One-stage versus two-stage surgery				
Mesial	0.5 (± 0.5) n = 13	0.6 (± 0.7) n = 41	NA	NS
Distal	0.3 (± 0.4) n = 13	0.4 (± 0.6) n = 41	NS	NA
Multiple versus single abutment				
Mesial	0.5 (± 0.7) n = 42	0.8 (± 0.7) n = 12	NS	NA
Distal	0.4 (± 0.5) n = 42	0.4 (± 0.7) n = 12	NS	NA
Women versus men				
Mesial	0.6 (± 0.7) n = 31	0.5 (± 0.7) n = 23	NA	NS
Distal	0.3 (± 0.5) n = 31	0.4 (± 0.6) n = 23	NS	NA

MBL values are shown as mean (±SD).  
NS = not significant; NA = not applicable.

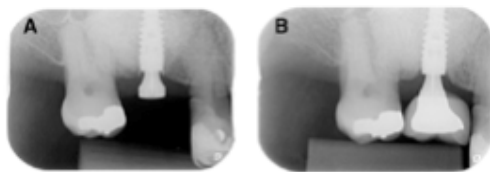


Figure 1. Radiographic measurements at Baseline (A) and 2 years after implant placement (B).

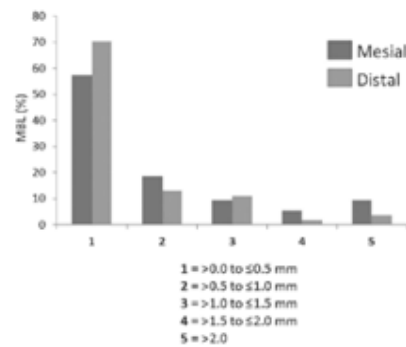


Figure 2. Frequency of bone loss as a function of interproximal site (mesial or distal)

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### DIAGNOSIS AND MANAGEMENT OF BIOLOGICAL IMPLANT COMPLICATIONS: A CASE REPORT

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**Case Presentation:** Implant-based care is a popular and generally effective treatment modality for replacement of missing teeth. However, biological complications associated with implants and implant-supported restorations can occur and may manifest as infection, significant bone loss and implant failure. Given the controversial nature and wide variability in the existing scientific literature pertaining to biological complications around implants, it is important for clinicians to be well-informed of the uncertainty in the existing limited scientific evidence related to this condition and to exercise sound clinical judgement in its management. This case report will describe the diagnosis and management of a 75-year-old patient with severe bone loss and infection at multiple abutment sites supporting fixed prosthodontic restorations on teeth and implants. The patient's dental history is significant for comprehensive fixed prosthodontic care on natural teeth and implants that was completed in 2009. Nine internal connection implants were originally placed and restored in 2009 with implant-supported crowns and implant-supported fixed dental prostheses. The patient's medical history was significant for hypertension, osteoarthritis and osteoporosis. The patient had a prior history of oral bisphosphonate medication use for nine years for treatment of osteoporosis. The patient's clinical presentation may have been complicated by poor compliance, infrequent dental care, implant malposition, suboptimal implant diameter, use of cement-retained restorations, and history of periodontitis. The patient's care involved removal of severely compromised teeth and implants, provision of transitional removable prostheses, and insertion of definitive removable partial implant-supported overdentures utilizing remaining implants. This case emphasizes the possibility of biologic complications in a dentition that underwent comprehensive prosthodontic treatment and the need for multi-disciplinary approaches to their management.

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**DEGRADATION OF RESIN-DENTIN INTERFACE IN VITRO IS  
DEPENDENT ON RESTORATIVE MATERIALS AND MMP INHIBITION**

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**Keywords:** restoration-tooth interface, biodegradation, restoration failure

**Purpose/Aim:** Restoration longevity is one of the prime goal of any Prosthodontic treatment. One major factor influencing the long-term clinical outcome of the prosthesis is the quality of interface between the restoration and abutment. Resin-based materials are widely utilized as restorations, adhesives and cements in both direct and indirect applications. Resin-based materials play a critical role in the creation and long-term maintenance of the restoration-tooth interfaces. However, enzyme-mediated hydrolysis of resin components and tooth structure decreases interfacial bonding strength, potentially contributing to bacterial penetration, decay, retention loss, and, ultimately, restoration failure. This study aims to explore the factors determining the integrity of resin-dentin (restoration-tooth) interface in a direct restoration model to evaluate the effect of different composite resins, adhesive systems, enzymes (salivary esterases and dentinal matrix-metalloproteinases (MMPs)) and an MMP inhibitor on the biostability of the resin-dentin interfaces.

**Materials and Methods:** Standardized resin-dentin specimens, made from traditional composite (Z250) or antimicrobial resin material (Dyract-eXtra), were bonded to human dentin using total-etch (Scotchbond) (TE) or self-etch (Easybond) (SE) adhesives. TE was prepared with or without an MMP-inhibitor (galardin) at the dentinal interface. Specimens (N=3/group) were incubated in phosphate-buffer or simulated human salivary esterases (SHSE) media (37°C/pH=7.0) for up to 180 days, then suspended in continuous media biofilm fermenter cultivating biofilms of *Streptococcus mutans* UA159 for 3 days (1/4-THYE+10mM sucrose, 37°C/pH=7.0, D=0.6). Bacterial penetration and biofilm formation along the interfaces were used as indicators of interfacial integrity which were assessed by confocal laser scanning microscopy with biomarkers (Live/Dead).

**Results:** Bacterial penetration and biofilm formation increased with time ( $p<0.05$ ). SHSE accelerated bacterial penetration and biofilm formation ( $p<0.05$ ). SE interfaces showed more interfacial bacteria vs. TE interfaces ( $p<0.05$ ). Galardin-treated TE specimens showed reduced interfacial bacterial ingress and biofilm formation vs. non-galardin-treated TE specimens at different time points ( $p<0.05$ ). Dyract-eXtra specimens showed lower bacterial cell viability within the interface vs. the traditional composite ( $p<0.05$ ).

**Conclusions:** Although the degradation process of resin-created interfaces is inevitable, differently fabricated interfaces showed various degradation rates confirming the fact that this process can be manipulated by material chemistry, mode of adhesion, enzyme inhibition (MMP inhibition) and oral conditions (salivary esterases). This finding applies not only to the resin-dentin interfaces in direct restorations but also to other interfaces associated with resin-created bonding such as the adhesion of tooth structure to a fiber post and metal-ceramic fixed prosthesis. Overall, the understanding of interfacial degradation process and its determinants can lead to improvements in material composition and modification of clinical protocols (such as application of enzyme inhibitors or improved material selection algorithms). The potential positive impact of these in vitro findings on enhanced in vivo longevity of restorations needs to be confirmed in well-designed clinical trials.

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### **SURVIVAL RATE OF TITANIUM-ZIRCONIUM NARROW DIAMETER DENTAL IMPLANTS: A SYSTEMATIC REVIEW**

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**Keywords:** dental implants, survival rate, root cause analysis

**Purpose/Aim:** Despite the existence of several studies validating the use of narrow diameter implants, most of them are based on pure Ti alloys. There is few clinical evidences of the success of TiZr narrow diameter implants (TiZr NDIs) regarding survival rate (SR) and marginal bone loss (MLB). The aim of this review was to systematically assess SR, as well as MBL of TiZr NDIs compared to commercially pure titanium narrow diameter implants (cpTi NDIs).

**Materials and Methods:** The search was conducted in Medline/PubMed, Cochrane, Scopus and Embase databases (year 2000 to November 2016). Cohort studies and randomized trials were included with the following outcome measures: survival rate and peri-implant marginal bone loss. Quality assessment of the studies and meta-analysis were performed. Results were reported according to the PRISMA Statement.

**Results:** Six clinical studies from the 3453 articles initially identified met the inclusion criteria. There were no statistically significant differences in SR when TiZr NDIs and cpTi NDIs were compared in the 1-year follow up ( $p=0.5$ ), or when comparing TiZr NDIs placed in posterior and anterior regions. There was no difference between groups regarding 1-year SR: -0.01 (95% CI, -0.05 to 0.03) and MLB: -0.01 mm (95% CI: -0.14 to 0.12).

**Conclusions:** It can be concluded that TiZr NDIs present similar success rates and peri-implant bone resorption to cpTi NDIs.

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### IMMEDIATE LOADING OF TWO-IMPLANT MANDIBULAR OVERDENTURES: 5-YEAR PROSPECTIVE STUDY

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**Keywords:** implant overdenture, immediate loading, mandibular

**Purpose/Aim:** The aim of this 5-year pilot prospective study was to evaluate the implant survival rate, marginal bone loss, and patient reported outcomes before and after the immediate loading of two-implant mandibular overdentures with ball attachments.

**Materials and Methods:** Nineteen patients who had edentulous mandible with a mean age of 69.8 years (range, 60 to 85 years) at Dental Hospital, Tokyo Medical and Dental University enrolled in this study. A newly fabricated complete denture was used for radiographic guides. The computer planning followed the design procedure (Procera, Nobel Biocare), and the surgical guides (Nobel Guide, Nobel Biocare) were fabricated for each patient. Flapless surgery was performed with this surgical guide, and two implants (Speedy Groovy, Nobel Biocare) (n=38 implants) were placed in canine positions. At the operation day, removable overdenture supported with two ball attachments (Ball abutment and Gold cap, Nobel Biocare) was delivered. The survival of each implant was evaluated clinically and radiographically. The panoramic radiographs were taken immediately after surgery and at 1, 2, 3, 4 and 5 years after placement for the record of the marginal bone loss. All participants answered questionnaires for the patient reported outcomes, the Japanese version of the Oral Health Impact Profile for edentulous (OHIP-EDENT-J), the Patients' Denture Assessment (PDA), and a general satisfaction before implant placement, 1, 6, 12, 24, 36, 48 and 60 months after surgery. The cumulative survival rate was calculated. The Tukey HSD post-hoc test was used to evaluate changes in the marginal bone loss and the patient reported outcomes.

**Results:** Two patients, with one failed implant, dropped out prior to completion of the study. The failed implants were included in the evaluation of cumulative implant survival. The cumulative implant survival rate at 5 years was 94.7% (36/38). There is no significant difference in the OHIP-EDENT-J during observation period. The general satisfaction increased from 1 month after surgery increased from 1 month after surgery to 48 months. PDA increased from 1 month after surgery to 60 months. The mesial bone loss is significantly higher than distal bone loss in 5 years follow-up.

**Conclusions:** In this 5-year pilot prospective study, the immediate loading of two-implants mandibular overdentures with ball attachments resulted in favorable implant survival and patient reported outcomes.

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### MAXILLARY IMPLANT-SUPPORTED TELESCOPIC OVERDENTURES WITH CAD/CAM CUSTOMIZED ABUTMENT AND ARCH-FRICTION-SOFT SYSTEM

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**Keywords:** Overdenture, Implant supported, Arch-Friction-Soft System

**Case Presentation:** Implant-supported fixed dental prosthesis and implant-supported overdenture are treatment options for patients with edentulous maxilla. Implant-supported FDP has the advantages of providing high masticatory function and comfort to the patient. However, it has esthetic limitation due to insufficient soft tissue support in patients with severe alveolar bone resorption. Also, it is expensive, needs frequent maintenance. Implant-supported overdenture, on the other hand, not only provides similar retention and function but also facilitates esthetics, phonetics, and hygiene control. Despite these benefits, implant overdenture treatment of the edentulous maxilla is challenging compared to that of the mandible due to inherent anatomic and biomechanical problems; reduced bone quality and quantity, unfavorable biomechanical force, and thin buccal bone due to the resorption pattern of the maxillary alveolar bone. Moreover, controversy persists as to factors critical for implant and prosthetic success. Therefore, it is critical to select the right patient, to plan whether palatal coverage is necessary, and to consider the number, distribution and angle of the implants while treatment planning. Various attachment systems have been used for the maxillary implant-supported overdenture, but still have problems such as complicated manufacturing processes, expensive materials, and decreased retention over time. To overcome these limitations, the Arch-Friction-Soft

System can be used. It has an elastic nylon component which provides the system adequate retention without much frictional force, giving the prosthesis longer life. Also, it is easier to repair than conventional attachments. The case report presents three elderly patients (1 male and 2 female) who had severe alveolar bone loss in the edentulous maxilla. The patients previously had conventional dentures, which they could not adapt to, and had a strong desire for fixed prostheses. They were successfully treated with maxillary implant-supported overdentures using the Arch-Friction-Soft System in terms of retention, function, and esthetics. CAD/CAM technology was utilized to allow for an easier and more precise fabrication of titanium customized abutments, overcoming the limitations of unfavorable implant placement

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### DEVELOPING A TYPE 2 DIABETIC RODENT MODEL TO STUDY THE EFFECT OF DIABETES ON OSSEOINTEGRATION

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**Keywords:** osseointegration, diabetes, bone

**Purpose/Aim:** The aims of this study were to develop a high fat, high sugar diet-induced rodent model of type 2 Diabetes Mellitus (T2DM) to analyse the effects of diet induced T2DM on the osseointegration of titanium implants.

**Materials and Methods:** Four female Sprague Dawley rats were randomly assigned to two groups: 1) Normal diet (ND), and 2) High fat high sugar (HFHS) diet. Titanium implants 4.1mm length x 1mm diameter with a sandblasted and acid etched surface (Institut Straumann AG, Switzerland) were placed in the right tibia at week 1 in the ND group and observed for a 4-week period. The HFHS group were placed on a special diet (high fat chow – 60% fat and fructose enriched water – 25%w/v) at week 1 and the implant placed in the right tibia at week 3 and observed for a 4-week period. Two-dimensional changes to bone quality were determined using dual energy X-ray absorptiometry (DEXA) scans to analyse bone mineral density (BMD), Bone mineral composition (BMC), lean weight (LW) and fat percent. Metabolic changes were measured by insulin tolerance and oral glucose tolerance tests. Three dimensional bone morphological structures, relative bone volume (BV/TV), relative bone surface (BS/TV), trabecular thickness (Tb.Th), trabecular separation (Tb.Sp), trabecular number (Tb.N) and bone-to-implant contact (BIC) were analysed using microCT analysis.

**Results:** Whole body DEXA scans at week 5 following implant placements demonstrated reduced BMD ( $178.95 \pm 19.86$  Vs  $181.63 \pm 11.43$ ), reduced BMC ( $6113.67 \pm 94.00$  Vs  $6816.08 \pm 94.34$ ), reduced LW ( $108.08 \pm 27.05$  Vs  $157.88 \pm 3.72$ ) and increased fat percent ( $40.18 \pm 11.56$  Vs  $22.51 \pm 1.14$ ) in the HFHS group compared to the ND group. Insulin tolerance tests at week 3 and week 4 demonstrated reduced sensitivity to insulin in the HFHS diet group compared to the ND group. Analysis of the trabecular bone in a 0.5mm radius around the implant demonstrated reduced BV/TV ( $21.3 \pm 6.47$  Vs  $25.57 \pm 3.29$ ), reduced BS/TV ( $5.37 \pm 0.85$  Vs  $6.28 \pm 0.22$ ), reduced Tb.Th ( $0.15 \pm 0.03$  Vs  $0.16 \pm 0.03$ ), reduced Tb.N ( $1.38 \pm 0.17$  Vs  $1.63 \pm 0.09$ ), and increased Tb.Sp ( $0.32 \pm 0.03$  Vs  $0.29 \pm 0.03$ ) in the HFHS group compared to the ND group. Finally, the BIC in the HFHS group was reduced compared to the ND group ( $54.8 \pm 9.7$  Vs  $62.3 \pm 19.8$ ).

**Conclusions:** This model demonstrates a high fat, high sugar diet reduces insulin sensitivity in rodents, mimicking changes observed in diet-induced T2DM in humans. Although frank diabetes was not induced in this short study period, these early metabolic changes were shown to alter bone structure and morphology, and, importantly, negatively affect osseointegration.

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### COMPARISON OF PATIENT-REPORTED OUTCOMES BETWEEN IMMEDIATELY AND CONVENTIONALLY LOADED MANDIBULAR TWO-IMPLANT OVERDENTURES

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**Keywords:** implant overdenture, immediate loading, magnetic attachment

**Purpose/Aim:** The aim of this 3-year randomized controlled trial is to compare patient-reported outcomes between immediately and conventionally loaded mandibular two-implant overdentures retained by magnetic attachments.

**Materials and Methods:** Nineteen participants with edentulous mandibles at Dental Hospital, Tokyo Medical and Dental University were randomly assigned into either an immediate loading group (immediate group) or a conventional loading group (conventional group). A newly fabricated complete denture was used for radiographic guides. The computer planning followed the design procedure (Procera, Nobel Biocare), and the surgical guides (Nobel Guide, Nobel Biocare) were fabricated for each patient. Each participant received 2 implants (Speedy Groovy, Nobel Biocare) in the inter-foraminal region by means of flapless surgery. Prostheses in the immediate and conventional groups were loaded using magnetic attachments (Magfit IP, Aichi steel, Japan) on the same day as implant placement or 3 months after surgery, respectively. All participants completed questionnaires (the Japanese version of the Oral Health Impact Profile for edentulous [OHIP-EDENT-J], the patient's denture assessment [PDA], and general satisfaction) before implant placement (baseline) and 1, 3, 6, 12, 24 and 36 months after surgery. The median differences between baseline and each monthly score were compared using the Mann-Whitney U test. The differences in median and 95% confidence interval between two groups were analyzed.

**Results:** One patient, with two failed implant, in the conventional group dropped one month after implant surgery. After three years, one patients in the immediate group died because of disease. In the lower denture domain of PDA, the immediate group showed a statistically higher score at 3 months assessment ( $P=0.04$ ). There was no statistically significant difference in oral health-related quality of life and general satisfaction between the two groups from baseline to 3-year follow-up.

**Conclusions:** Based on this 3-year randomized controlled trial, immediate loading of mandibular two-implant overdentures with magnetic attachments tends to improve patient self-assessment for lower denture earlier than observed with a conventional loading protocol.

## 55

### **THE EFFECT OF CYCLIC LOADING ON THE RETENTIVE FORCE OF THE CEMENTLESS FIXATION (CL.F) SYSTEM: A NOVEL RETRIEVABLE TYPE OF IMPLANT PROSTHESIS**

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**Keywords:** Cementless Fixation system, crown, abutment

**Purpose/Aim:** The Cementless Fixation (CL.F) System is a novel retrievable type of implant prosthesis. It does not require any cement and screw hole. Retention of this system is obtained from friction between inner surface of crown and outer surface of abutment. The inner surface of crown is relined with a thin-film composite resin after surface treatment and Titanium abutment is fabricated with 2 degree tapered axial wall using CAD/CAM. The purpose of this study was designed to find out the effect of cyclic loading on retentive force of the CL.F system.

**Materials and Methods:** 1. Preparation of specimens. Twelve set of CL.F system (CAD/CAM abutment & crown) were prepared. Analogs (GSTLA400, Osstem, Seoul, Korea) were embedded perpendicularly into auto-polymerizing resin. Titanium abutments were fabricated with 2 degree tapered axial wall using CAD/CAM (Exocad DentalCAD, Exocad, Darmstadt, Germany) system. Then, zirconia crowns were designed, milled using laboratory milling machine (Rainbow mill, Dentium, Seoul, South Korea) then sintered. Inner surface of zirconia crowns was 50  $\mu$  Al<sub>2</sub>O<sub>3</sub> sandblasted, etched (Freedent etching, LaboTech, Seoul, Korea) and a zirconia primer (MKZ Primer, bredent GmbH & Co. Senden, Germany) was applied. After that, a composite flowable resin (Crea.lign, bredent GmbH & Co. Senden, Germany) was relined between inner surface of zirconia crown and the abutments and light curing was done after removing excessive resin.

2. Application of cyclic loading and measurement of retentive force. Fifty vertical compressive load cycles from 5N to 50N was applied on flat top surface of the crown along the long axis of 12-specimens using a cyclic loading instrument (MTS-810, MTS Corporation, USA). After that, the retentive force was measured by universal test machine (Instron 3367, Instron Co., USA). The custom-made zig and screw were utilized in order to apply the vertical tensile force between the abutment and the crown perpendicularly with the long axis. Additional retention force was estimated after 100, 200, 600, and 10,000 load cycles are applied to the specimens with same procedure and each group is named G50, G100, G200, G600, and G10,000 according to number of load cycles

**Results:** The retentive forces after 50, 100, 200, 600 and 10,000 cyclic loading were  $20.47 \pm 5.78$  N,  $19.79 \pm 6.61$  N,  $18.46 \pm 5.23$  N,  $19.60 \pm 6.93$  N and  $20.32 \pm 5.54$  N. All groups show no statistical significance.

**Conclusions:** The retentive force of the CL.F system was maintained under various load cycles. The maximum retentive force of the CL.F system could be acquired within short period in oral condition under normal masticatory force.

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### CORRELATION BETWEEN IMPLANT STABILITY PARAMETERS IN ILIAC BONE BLOCKS OF SWINE

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**Keywords:** implant stability, insertion torque

**Purpose/Aim:** This study's aim was to investigate, in the swine iliac bone blocks, the correlation between implant stability parameters: insertion torque (IT), resonance frequency (ISQ), periosteal value (PTV), and micromotion (MM)

**Materials and Methods:** Ten self-tapping Nobelbiocare MKIV (4.0mm x 10mm) implants were placed in the swine iliac bone blocks according to manufacturer's protocol of soft-bone with thin cortical layer. Ten implants were tested; IT, ISQ, PTV, and MM were recorded for each implant. IT was recorded during implant placement, and ISQ was measured after an implant was inserted. Then, a 5-mm healing abutment was connected to the implant for measuring PTV and MM. MM was measured (1 mm above implant platform) with micro-miniature LVDT when a lateral force was applied to the top of healing abutment by a Dynamic Loading Machine. Spearman rank-order correlation was performed for statistical analysis.

**Results:** The correlation coefficients between the primary stability parameters were: IT and MM, 0.35; ISQ and MM, 0.58; PTV and MM, 0.83; IT and ISQ, 0.64; IT and PTV, 0.34; PTV and ISQ, 0.66.

**Conclusions:** For the primary stability parameters which can be tested clinically (IT, ISQ and PTV), correlations were noted between IT and ISQ and between PTV and ISQ while only a weak correlation was noted between IT and PTV. If MM, which can only be tested in the laboratory environment, was used as a gold standard, MM showed the strongest correlation with PTV and the weakest with IT. Further investigation is needed to confirm which parameter can represent the primary stability best.

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### EFFECT OF NANO-HYDROXYAPATITE DESENSITIZING PASTE ON DENTIN TUBULAR OCCLUSION AND BOND STRENGTH OF SELF-ETCH ADHESIVE

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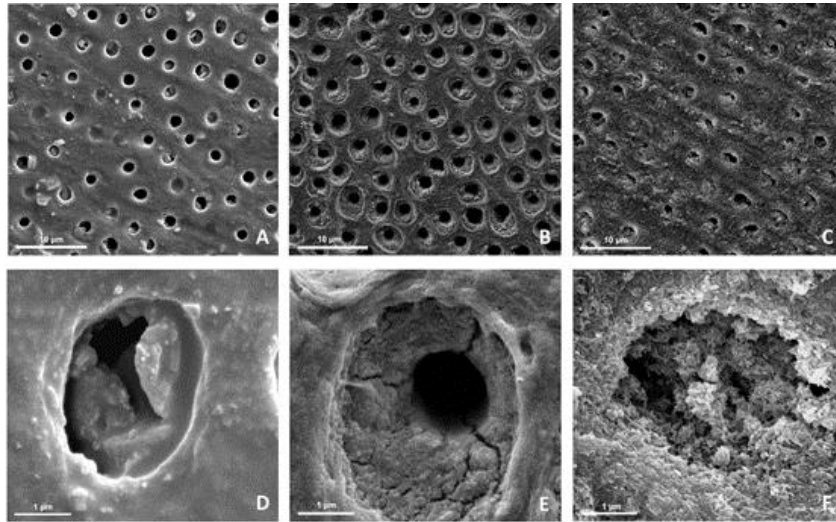
**Keywords:** hydroxyapatite, dentin hypersensitivity, bond strength

**Purpose/Aim:** To evaluate a nano-hydroxyapatite (nano-HA) desensitizing paste application on dentin tubular occlusion and the bond strength of three self-etch adhesives.

**Materials and Methods:** Thirty-six intact third molars were cut with isomet to remove the occlusal enamel. They were etched with 1% citric acid for 20 s to simulate the sensitive dentin and then divided into two groups randomly (n=18): the control group (no treatment) and the experimental group (with nano-HA paste treatment). After that, Each group was divided into three subgroups randomly (n=6), and then they were bonded with G-Bond, Clearfil S3 Bond or FL-Bond ? according to the manufacture's instruction separately. The microtensile bond strength was tested and failure mode was analyzed immediately and after water storage for 6 months. Scanning electrical microscope (SEM) was used to evaluate the sealing ability of nano-HA in dentin tubules.

**Results:** The dentin tubules were mostly occluded with abundant needle-like nano-HA particles. For G-Bond, nano-HA application increased the bond strength comparing to the control group at 24 h (P<0.05); after 6 month water ageing, the bond strength of the control group and the HA treated group have no significant difference (P>0.05). For Clearfil S3 Bond, nano-HA application decreased the bond strength comparing to the control group both at 24 h and after 6-month water ageing (P?0.05). For FL-Bond ?, the bond strength of the control group and the HA treated group have no significant difference either before or after 6 month water ageing (P>0.05). Failure mode analysis showed that half of the samples in all groups were adhesive failure.

**Conclusions:** Nano-HA treatment decreased the bond strength of Clearfil S3 Bond, while had no adverse effect on G-Bond and FL-Bond?. Choosing a compatible adhesive system after nano-HA desensitizing treatment can be used in clinical practice when endeavoring to control hypersensitivity without adverse interference in bonding of self-etch adhesive.



A & D: untreated dentin; B & E: etched by 1% citric acid for 20 s; C & F: treated by nano-HA desensitizing paste treatment after 1% citric acid etching for 20 s

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## OSSEOINTEGRATED IMPLANTS AS AUXILIARY PILLARS IN REMOVABLE PARTIAL DENTURES. CASE REPORT

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**Keywords:** dental implant, RPD

**Case Presentation:** A mayor shortcoming in Removable Partial Protheses (PRDs) is the lack of patient retention and/or stability, which negatively affects patient satisfaction. Multiple oral characteristics may compromise prosthetic prognosis: tooth-tissue support, broad areas of edentulism, unfavorable distribution of remaining teeth and few remaining teeth to provide retention and/or support. A solution to this, is the use of a limited numbers of strategically placed dental implants to help improve the position of the fulcrum line, eliminating the need of large areas for tissue support. These implants are attached to the PPR through a non-rigid junction.

**Objective:** To present a clinical case rehabilitated by RPD and dental implants as auxiliary pillars.

**Case Report:** A male patient, 61 years old, goes to the Faculty of Dentistry of the University of Chile to recover his smile. The clinical examination shows partial upper edentulism and lower edentulism (tooth permanence: 3.4, 3.5 y 3.7). Use of upper and lower PPR, patient reports discomfort due to poor retention of his lower PPR.

**Diagnosis:** 61 years old healthy male patient. Partial Upper edentulism (Kennedy class II sub 2) and lower (Kennedy class IV sub 1). Severe Generalized Chronic Periodontitis. In caries activity.

**Treatment:** Periodontal Treatment, restorative dentistry. In the jaw ferulized PFU was performed on teeth 3.4 and 3.5 with lingual milling, surgical installation of TIXOS internal hex implants in teeth zone 4.1 and 4.3. RPD retained by means of sphere attachments to the implants, conventional clasps and supported on the dental implant and lingual milling of the teeth PF 3.4 and 3.5.

**Discussion:** The unfavorable distribution of mandible teeth gave us a linear anchorage. It has been suggested in the literature that the use of dental implants allows the transformation of unfavorable anchoring situations into pseudo-class III of Kennedy, modifying PPR anchor and improving retention and stability.

**Conclusions:** The use of dental implants allowed to improve the retention of the PRP and stability against the horizontal movements, improving patient satisfaction.



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### THE STRATEGIC USE OF THE NASOPALATINE CANAL FOR FULL ARCH IMPLANT REHABILITATION

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**Keywords:** incisive canal, full arch, strategy

**Introduction:** The nasopalatine canal (NPC) is oftentimes considered an anatomical limitation for a maxillary implant placement. However, in patients with severe maxillary atrophy, anchorage of implants in the remaining bone around the nasopalatine canal may be considered as an option to provide sufficient anterior support to enhance the biomechanics of implant supported prosthesis. The purpose of this retrospective clinical study is to demonstrate and evaluate the clinical performance of implants placed into the nasopalatine canal.

**Method:** Ten patients with a mean age of 54.4 years that had received nasopalatine canal implants were restored utilizing implant supported restorations.

**Result:** A total of 10 subjects that had received nasopalatine canal implants and were restored utilizing implant supported restorations were included in this case series.

**Conclusion:** The successful rehabilitation of patients with severely atrophic maxillae that had nasopalatine canal implants placed to support full-arch fixed restorations, show that this procedure provided predictable and esthetic outcomes.

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### EFFECTS OF CERAMIC DENSITY AND SINTERING TEMPERATURE ON MECHANICAL PROPERTIES OF POLYMER INFILTRATED CERAMIC

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**Keywords:** mechanical properties, polymer infiltrated ceramic

**Purpose/Aim:** To evaluate the effects of ceramic network density and sintering temperature on mechanical properties of a polymer infiltrated zirconia ceramic network (PICN) dental material.

**Materials and Methods:** A dense zirconia ceramic and four zirconia ceramic networks with varying porosities were sintered at three different temperatures and twelve PICNs based on the porous ceramics mentioned above were manufactured. Additionally, pure polymer were prepared. After specimen preparation, flexural strength and elastic modulus were measured via the three-point bending test. Fracture toughness was determined by a single edge notch beam (SENB) method. Vickers hardness was tested by the indentation-strength system. Scanning electron microscope (SEM) was employed to observe the microstructure and the fractured surface.

**Results:** The mechanical properties (flexural strength, elastic modulus, fracture toughness and hardness) of PICN were better than traditional dental ceramic restorative materials. Different density and sintering temperatures greatly affect the mechanical properties of PICN materials. Depending on the density of the porous ceramic and sintered temperature all the mechanical properties were presented in detail subsequently. SEM observations indicated that the porous ceramic network was successfully infiltrated and crack growth in PICN was hindered by the polymer network.

**Conclusions:** This polymer infiltrated ceramic material is a successful step toward the goal to develop a material with similar mechanical behavior to that of natural human enamel and dentin.

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### EFFECT OF DIFFERENT SURFACE TREATMENTS ON SHEAR BOND STRENGTH OF ZIRCONIA CEMENTED TO VENEERING CERAMIC

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**Keywords:** zirconia, shear bond strength, nano silica sol

**Purpose/Aim:** Zirconia-based ceramics are preferred by dentists for many applications including single crown and fixed partial dentures. While for yttria-stabilized tetragonal zirconia polycrystalline (Y-TZP) restorations, clinical success and reliability depend upon the mechanical integrity and shear bond strength (SBS) between zirconia and veneering ceramic, which could be influenced by various variables such as surface treatments. Thus, the purpose of this study was to evaluate SBS through different surface treatments on zirconia by nano silicon dioxide sol-gel methods, meanwhile the flexural strength of zirconia was also detected.

**Materials and Methods:** Forty rectangular Y-TZP blocks were randomly divided into four groups: the blocks were not received any surface treatment (control group, group A); the blocks were immersed into 30% nano silica sol for 2 min (group B); the blocks were crystallized at 1450°C, then immersed into nano silica sol for 2 min (group C); the blocks were superficial spread with nano silica sol (group D). The blocks of group A-D were all finally sintered at 1450°C. Flexural strength was determined by three-point bending method and fracture morphologies were observed using scanning electron microscopy (SEM). Then additionally forty Y-TZP blocks for group A-D were prepared and Ni-Cr alloy group with ten blocks was the other control group (group E). All the blocks of group A-E were veneered with dentine porcelain and the SBS test was performed. Data were analysed using one-way ANOVA with a post hoc Tukey HSD test.

**Results:** The SBS value of group C was the lowest ( $P < 0.05$ ) and there was no significant difference between group A and group E ( $P > 0.05$ ). Groups B and D had the higher SBS than the other groups ( $P < 0.05$ ). Glass-like appearance, a thin surface layer, and a glass phase less than 10  $\mu\text{m}$  were observed by SEM in group B, C, and D respectively. The flexural strength of group B and C were significantly lower and higher than other groups respectively ( $P < 0.05$ ), and there was no significant difference between group A and D ( $P > 0.05$ ).

**Conclusions:** 1. Immersion with nano silica sol on crystallized blocks exhibited the higher flexural strength but the lower SBS. 2. Immersion and superficial spreading with nano silica sol on pre-sintered blocks could effectively increase the SBS although the former method decrease the flexural strength of final crystallized Y-TZP, while the value of flexural strength was still high enough for clinical applications.

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### THE EFFECT OF ELF PULSED MAGNETIC FIELDS ON OSTEOBLAST DIFFERENTIATION VIA MAP KINASE PATHWAYS

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**Purpose/Aim:** Severe bone defect makes dental treatment plans more difficult and complicated, and smooth bone remodeling, and fast and fine osseointegration are crucial for the success of implant treatment. It is reported that the pulsed alternative magnetic field can accelerate the healing process of bone fracture. The extremely low frequency (ELF) pulsed magnetic fields has been discussed with their possibility to cause biological effects on bone formation. However, the mechanism of the osteogenic effect has still many unknown points. In this study, we focused on osteoblastic cells in the exposure of ELF pulsed magnetic fields in vitro and investigated the effect of magnetic fields on cell differentiation via MAP kinase signaling pathways.

**Materials and Methods:** MC3T3-E1 osteoblastic cells were cultured in 7000 mG (0.7 mT) and 6 Hz ELF pulsed magnetic field. Following 24 hours of culture within the magnet field, cells were stained with Alexa fluor 488 phalloidin (Molecular Probes, CA, USA) to observe morphology by Confocal Laser Microscan (LSM 5 PASCAL, Carl Zeiss. Inc). mRNAs and proteins were obtained from cells at every time points to determine osteoblast differentiation with or without magnetic stimulation. Quantitative real time PCR and western blot were performed to assess small G-proteins and MAP kinase activities. Same series of experiment were performed for osteoblastic cells cultured on the titanium plates. Results were compared using the Student's t-test. P values less than 0.05 were considered statistically significant.

**Results:** No significant changes in cell morphology were detected with the ELF pulsed magnetic field stimulation. Expressions of alkaline phosphatase, osterix, and osteocalcin which were concerned with bone differentiation were increased in 5 days after the stimulation. 30 minutes after the stimulation, the activity of RhoA was decreased and 1 hour after, activity of ERK was increased.

**Conclusions:** The ELF pulsed magnetic field accelerated cell differentiation in particular the late differentiation in MC3T3-E1 osteoblastic cells in vitro. In current research, it is reported that osteoclasts reduce the bone formation by osteoblasts via semaphorin 4D-plexin B1 interaction and its downstream signaling, ERK and small G-proteins. The results of our study that the ELF pulsed magnetic field accelerated osteoblastic cell differentiation by reducing activity of RhoA and enhancing activity of ERK corresponded with these previous reports. This magnetic system could have a possibility of clinical implications by supporting earlier osseointegration around a dental implant by inducing early maturation of osteoblast.

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### **THREE-DIMENSIONAL DEFORMATION OF INTERNAL IMPLANT-ABUTMENT CONNECTION: A BIOMECHANICAL COMPARISON BETWEEN TITANIUM AND ZIRCONIA**

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**Keywords:** implant-abutment connection, deformation, zirconia

**Purpose/Aim:** The aim of this study was to investigate the influence of the abutment material and the connection geometry on deformation and wear at the implant – abutment connection area (IAC), using an optical scanner.

**Materials and Methods:** Thirty-two internal conical titanium implants, and two types of prefabricated abutments (zirconia or titanium), each (n=8) with different connection geometries (hexagon or non-hexagon) were prepared. The inner surfaces of the implants were optically scanned before and after loading for 105 cycles in a simulated wet environment. The scanned data were superimposed to calculate potential three-dimensional (3D) deviations. Surfaces of the two respective implants in each group were examined using scanning electron microscopy to observe fretting wear patterns. A two-way ANOVA was used for the statistical analysis.

**Results:** The 3D deviation (deformation) was detected at the IAC in relation to the loading direction. The average 3D positive deviation, maximum positive and negative deviations at the IAC were significantly higher with zirconia abutments than with titanium abutments, regardless of connection geometries (all  $p < 0.05$ ). However, the average 3D negative deviation was similar between the two materials ( $p > 0.05$ ). The effect of connection geometry was not significant ( $p > 0.05$ ). After cyclic loading, an irregular wave-pattern furrow was observed on the connection area of the implant with titanium abutment, whereas a long and straight groove was detected on that with zirconia abutment.

**Conclusions:** Within the limitations of this study, plastic deformation and fretting wear were evident at the internal implant-abutment connection area after cyclic loading. Zirconia prefabricated abutments showed statistically higher deformation and fretting wear at the internal connection area of the loaded titanium implant than titanium alloy abutments. Proper selection of abutment material may be important for the structural integrity of the implant-abutment connection area.

## ► Maxillofacial Rehabilitation

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### PROSTHETIC REHABILITATION IN A PATIENT WITH OSTEOGENESIS IMPERFECTA

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**Keywords:** osteogenesis imperfecta, overdenture

**Case Presentation:** Osteogenesis imperfecta is a disease, mostly congenital, that occurs with bone weakness and pathological fractures due to a type I collagen deficit. For this reason, the rehabilitation of these patients is a real challenge. Male patient of 23 years, with osteogenesis and dentinogenesis imperfecta. It is decided to perform an overdenture on teeth, with two forged ball retainers on the tissue side of the superior prosthesis. Bilateral balanced occlusion is chosen and the case is developed in centric relation. It was verified after the revisions (3 and 10 months) the recovery of the masticatory, aesthetic and phonatory functions, in addition to an increase of self-esteem. The use of overdentures on remnant teeth may be a useful therapeutic alternative in the rehabilitation of patients with a high degree of bone atrophy, without the need to carve the teeth, and to allow their correct hygiene, as well as that of the prosthesis.

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### METAMERISM OF THREE DIFFERENT PIGMENTS FOR FACIAL PROSTHESES AND A METHOD TO IMPROVE SHADE EVALUATION

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**Purpose/Aim:** A maxillofacial prosthesis of acceptable dimension, surface and shade can improve the quality of life of a patient. When judging shade, observer and illuminant metamerism may result in colour differences. The aim of this study was to visually assess the illuminant metamerism under three standard illuminations of a single silicone material using three different pigmentation techniques, to use these data to determine if it is possible to construct a useful shade guide, and to devise and assess a shade matching protocol for silicone elastomer maxillofacial prostheses.

**Materials and Methods:** Nine silicone shade tabs were constructed for three volunteers representing light, medium and dark skin tones. The shade tabs were intrinsically pigmented using make-up, oil paint or silicone pigments. The shade matching and mixing was completed under colour corrected light. The recipe for the construction of each shade tab was recorded for the first three shade tabs. This was used for construction of the remaining six shade tabs at two separate sessions. Six examiners scored the match of each shade tab to the volunteer's malar region on a visual analogue scale under three standard light sources: colour corrected light, incandescent light, and fluorescent light. The examiners were required to follow an observation protocol to score each shade tab under all three light sources.

**Results:** The intra- and inter-rater reliability was assessed using the Intra-class Correlation Coefficient and revealed acceptable reliability ( $>0.6$ ). A three-way ANOVA was used to assess the effect of rater on the scores. Two outliers were excluded and the remaining raters' scores averaged. The two-way ANOVA revealed significant differences ( $p < 0.05$ ) for pigments and illuminant, and the interaction of pigments with illuminant on the raters' scores.

**Conclusions:** Illuminant metamerism can affect the appearance of silicone prostheses. Oil paint as a pigment under fluorescent illumination had the worst effect. It proved possible to construct a shade guide using the methods described and the shade matching protocol was shown to be reliable.

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## OSSEOINTEGRATION AND RADIATION IN HEAD AND NECK MALIGNANCY

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**Purpose/Aim:** Head and neck cancer patients are often left debilitated from the side effects of cancer treatment. Tumour ablation and radiation may result in insufficient hard and soft tissues, impaired speech and deglutition, and sacrifice of important neuromuscular structures. The use of intraosseous dental implants is an effective way to rehabilitate these patients. The purpose of this review is to highlight the management objectives and challenges clinicians face when using implant therapy to rehabilitate these patients.

**Materials and Methods:** Selected literature, from 2006 to 2017 was reviewed highlighting the use of implant therapy in the prosthodontic rehabilitation of irradiated cancer patients.

**Results:** The first treatment objective is to restore function. Half a million people are diagnosed with oral and oropharyngeal cancer annually two thirds of which are diagnosed at advanced stages leaving them severely disfigured and with extensive loss of hard and soft tissues. The other objective is to reduce morbidity brought upon by the side effects of cancer treatment modalities. One hundred and fifty thousand patients die each year from head and neck cancers with many more suffering from the complications of treatment. Early involvement of the prosthodontist, before commencing with cancer treatment, cannot be emphasised enough, highlighting the importance of the multidisciplinary approach in achieving these objectives. This will enable early interventions such as pre-radiation dental assessments, proper planning and sequencing of treatment so as to minimise adverse effects of radiation such as osteoradionecrosis. Factors to consider is site and timing of implant placement and whether grafting will be required to replace the missing tissues. Prosthodontic considerations include loading times and prosthetic design. Achieving these objectives will also result in a much better prosthodontic outcome affording the patient a better quality of life.

**Conclusions:** This poster presentation will make recommendations in the form of a flow diagram to assist the clinician in treatment decision making. Different strategies will be assessed taking into consideration the different clinical scenarios and prosthodontic considerations.

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## PRELIMINARY STUDY ON THE USEFULNESS OF PLASMA RICH FIBRIN (PRF-I) IN TMD INTRA-ARTICULAR PAINFUL CONDITIONS

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**Keywords:** PRF-i, Temporomandibular joint, chronic intra-articular diagnoses

**Purpose/Aim:** Biological therapy for knee osteoarthritis, such as platelet-rich plasma (PRP) or fibrin (PRF) has been proposed to improve clinical and structural outcomes by delivering a high concentration of growth factors (GF) that mediate healing and remodeling with excellent short-term effects, improvement of a quality of life and with favourable results on degenerative cartilage lesions. Intra-articular disc derangements, arthritis and arthrosis can be sometimes resistant to conventional treatments (occlusal splint, exercise, pharmacotherapy). However, injection of a PRF rich in GF could be useful in healing of degenerative intra-articular processes and pain reduction. Aims of the study were to assess the impact of intraarticular PRF injections on painful symptoms and mandibular range of motion in patients with chronic TMD diagnoses and to evaluate possible adverse effects of the protocol,

**Materials and Methods:** A total of 10 patients with repeating pain in preauricular region and limited range of motion, mostly due to intraarticular chronic diagnoses, participated. The diagnoses were established according to the DC/TMD protocol. A 0,3-0.5 ml of PRF-I were injected in the affected TMJ on three occasions at 2-week intervals. No other treatment was provided during the observation. Patients first assessed a short-term post injection pain and/or swelling. Afterwards they assessed preauricular pain on the 1st, 3rd, 7th and the 14th day after each injection using the 0-10 VAS scale. The range of mandible motion was also measured at each visit. All patients also filled in Chronic Pain Grade questionnaire and Jaw function limitation scale (JFLS, 20 questions).

**Results:** The VAS showed significant pain reduction. The majority of patients expressed a favorable outcome from the 1st day to 1 month after treatment. No severe adverse events were observed during the treatment or the follow-up period. The range of jaw motion improvement varied between different patients, although all of them perceived improvement, as measured on the JFLS.

**Conclusions:** Preliminary short-term clinical results are encouraging and indicate that treatment with PRF injection has a positive impact mostly on the reduction of the intensity of pain. The increase of the range of jaw motion is variable, although self-perceived function improved significantly (JFLS). However, MRI imaging will be utilized in our further research in order to confirm the clinical diagnosis and evaluate the potential of PRF-i in regenerative processes in intraarticular tissues, especially in cartilage healing.

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### PROSTHETIC REHABILITATION OF A FULLY EDENTULOUS PATIENT AFTER MAXILLECTOMY

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**Keywords:** obturator, maxillofacial rehabilitation, edentulous patient

**Case Presentation:** The purpose of an obturator is to restore function and appearance of patients who have maxillary defects. The number and location of remained tooth, the sizes of defects, and the shapes of defect margins are important factors that affect the prognosis of prosthetic rehabilitation. Especially, careful consideration is needed for an edentulous patient because it is very difficult to obtain retention and stability of an obturator. Two cases of prosthetic rehabilitation for edentulous patients who had surgical operations to remove oral cancers are presented here. Both patients had squamous cell carcinoma in the right maxillary sinus and surgical defects were created on the right side of palates as a result of surgery. A conventional surgical obturator is in the form of a recording base of full denture. However, in these cases, a rim made by clear acrylic resin was added to the base of the obturator to obtain further stability during swallowing. To make this altered form of surgical obturator, a recording base and wax rim was fabricated and centric relation bite was registered before surgery. The height of the rim was determined in order that anterior and posterior mandibular teeth contacted with the rim during swallowing movement. And then, the wax of rim was changed to clear acrylic resin in the laboratory. The surgical obturator was delivered to the patient after surgery. When surgical wound was fairly healed, an interim obturator was fabricated from the surgical obturator. The surgical obturator was relined with tissue conditioner and anterior artificial teeth were added for esthetics. There were no signs of recurrence several months after maxillectomy and definitive obturators were fabricated. An individual tray was extended into the maxillary defect and the margin of the defect was recorded more precisely with modeling plastic impression compound at rest position. And then, a little amount of regular-body vinyl polysiloxane impression material was used to make wash impression of the defect area. Retention in the classic sense is not possible for an edentulous patient with a maxillary defect. Fortunately, in these two cases, retentive deficiency was not severe due to the preserved premaxillae and well-defined static defects. An acceptable level of retention was obtained from engagement of the undercut in the defect and aid of the adhesive applied to the prosthesis on the unresected side. Two patients were satisfied with the result of the treatment in the aspect of function and esthetics.

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### IMPLANT REHABILITATION USING ORTHODONTIC TREATMENT FOR AN OLIGODONTIA PATIENT WITH LOSS OF VERTICAL DIMENSION

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**Case Presentation:** Oligodontia is a hereditary disorder characterized by agenesis of more than 6 primary/permanent teeth, excluding the wisdom teeth. This case report describes a patient with non-syndromic oligodontia, with the absence of 12 permanent teeth. Functional and aesthetic problems were caused by the malformed teeth, interdental space, unacceptable occlusal plane, and insufficient posterior bone. And during growth, loss of the vertical dimension occurred because of missing teeth and mesial drifting. Considering the young age of the patient, removable partial denture was excluded for the option and implants are one of the best alternative treatment options for patients with oligodontia. To move teeth to a favorable position and to increase the vertical dimension, preresorative orthodontic intervention was required. The implants were used as anchorage, and provisional prosthodontic restoration was performed along with orthodontic treatment to increase vertical dimension. Aesthetic and functional evaluation was performed through temporary state including orthodontic treatment period. And the final prostheses were made because the provisional prostheses showed the satisfactory results. Despite the time and cost problems, implant rehabilitation with orthodontic treatment in younger patients with oligodontia seems to have good prognosis in long term because it recovers not only masticatory function but also vertical dimension.

## EFFECT OF EMG BIOFEEDBACK TRAINING FOR DAYTIME CLENCHING ON REGULATION OF GRINDING DURING SLEEP

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**Keywords:** sleep bruxism, biofeedback, EMG-BF training

**Purpose/Aim:** Since bruxism is well known not only as one of the contributing factors to temporomandibular disorders but also as a risk factors for periodontal disease aggravation, tooth fracture and prosthesis destruction, bruxism regulation is a critical issue in dental practice. However, no strategy has been confirmed to have definite effect on bruxism regulation. Our previous study has revealed that the tonic components of electromyography (EMG) decreased after daytime EMG biofeedback (BF). Accordingly, the present study aimed to determine the effect of daytime EMG-BF training on the phasic components of EMG during sleep.

**Materials and Methods:** In total, 18 participants (mean age,  $24.5 \pm 3.1$  years) with subjective symptoms of daytime clenching or a diagnosis of nocturnal bruxism were divided into BF ( $n = 10$ ) and control (CO,  $n = 8$ ) groups and underwent a 5-h EMG recording during the daytime and nighttime for consecutive 3 consecutive weeks. The BF group underwent BF training in week 2, during which a signal was delivered in the event of clenching to enhance their awareness. The CO group underwent EMG recording without any BF signal. The EMG recording was conducted using a one-channel, portable EMG-BF apparatus. This apparatus was placed behind the participants' ear and designed to be less conspicuous while recording during activities of daily living. The participants were instructed to eat lunch during the recording and were allowed to behave normally, except for washing their faces and touching the electrode, which might have created undesirable noise in EMG signals. To normalize EMG levels, maximum voluntary contraction (MVC) effort was repeated thrice to determine 100% MVC. The number of EMG events exceeding 20% MVC, with durations between 0.25 and 2 s, were counted as phasic burst events. After completing of the EMG recording, all data stored in the device were analyzed on a computer using our exclusive software program, which enabled us to detect EMG signals exceeding an assigned threshold and to count the number of such EMG events.

**Results:** Although no significant differences was noted in baseline recordings (week 1) between the two groups, a significant decrease was observed in the number of EMG events in the BF group ( $37.2 \pm 21.2$  in week 2 and  $32.4 \pm 19.6$  in week 3) compared with that in the CO group ( $75.0 \pm 36.2$  in week 2 and  $82.5 \pm 29.3$  in week 3;  $P < 0.05$ ; Tukey's honestly significant difference test).

**Conclusions:** These results suggested that using EMG-BF training for daytime bruxism can be an effective approach for regulate nocturnal bruxism in terms of the phasic and tonic components. Given the limitation of our research design, the results of this study implied that daytime EMG-BF is a potential therapeutic strategy for regulate sleep bruxism.

## PREFABRICATED RADIAL BONY FOREARM FREE FLAP FOR SECONDARY RECONSTRUCTION IN CLEFT LIP AND PALATE

Zavada, Richard \*

Mayo Clinic

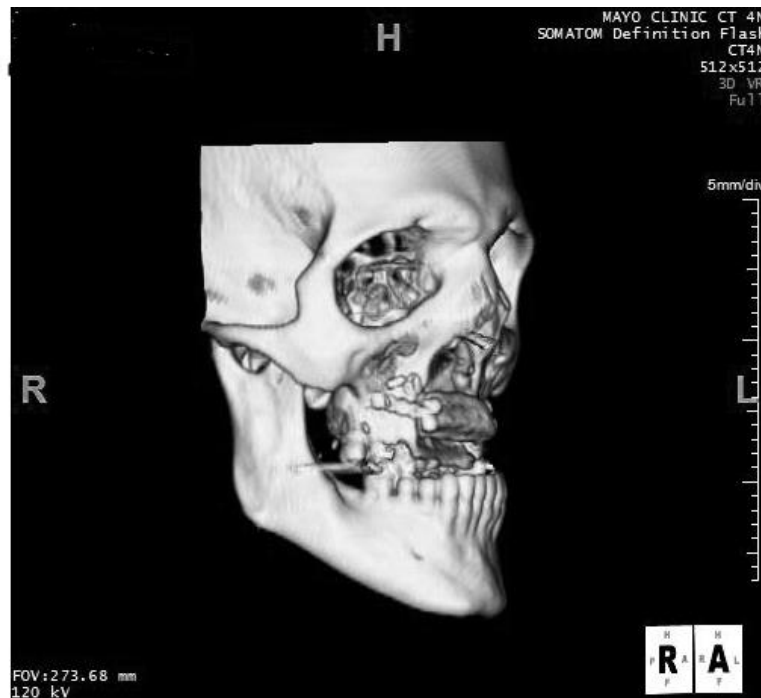
Dental Specialties

Rochester, Minnesota, USA

**Keywords:** cleft-lip, pre-fabricated flap, maxillary reconstruction

**Case Presentation:** A 45-year old male patient with a history of cleft lip and palate, multiple failed grafting procedures, and an oro-nasal fistula presented to Mayo Clinic dental specialties for consultation on his reconstructive options. In conjunction with our surgical team, we highlighted all treatment options based on his presentation and medical history as well as the benefits and limitations of each. The patient elected to have a two-staged, pre-lamination osseocutaneous free flap procedure. In the initial surgery, Right iliac crest bone graft was harvested and translocated to the left radial forearm to allow for vascularization for approximately six weeks. The next surgery was harvesting the osseocutaneous free graft and vessels, anastomosing them with neck vessels, and in setting of the composite graft into the defect. After adequate healing, a debulking and dental implant placement procedure was completed. Two endosseous implants placed into the locations of teeth #4 and #13 and three implants in the composite graft at sites #6, 8, and 11. At uncover procedure, the patient's

current removable prosthesis was retrofitted to be a fixed restoration on implants #4, 6, 8, and 13. Implant #11 had been deemed failed for unknown reasons at uncover. The metal-acrylic fixed dental prosthesis was fabricated for the patient. The final prosthesis was designed to be screw-retained and direct to the fixture level of the Branemark implants. The prosthetic was designed to allow for proper esthetics and phonetics as well as cleansability.



## ► Special Needs / Geriatrics

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### **SINGLE-IMPLANT OVERDENTURES RETAINED BY THE NOVALOC ATTACHMENT SYSTEM: PROTOCOL FOR A MIXED-METHODS RANDOMIZED TRIAL**

**Freitas De Souza, Raphael \* Bedos, Christophe; Esfandiari, Shahrokh; Makhoul, Nicholas M; Dagdeviren, Didem; Abi Nader, Samer; Feine, Jocelyne S  
Montreal, QC, Canada**

**Purpose/Aim:** Overdentures retained by a single implant in the midline have arisen as a minimal implant treatment for edentulous mandibles. Its success depends on the performance of a single stud attachment, which are susceptible to wear-related retention loss. Recently developed biomaterials used in attachments may result in better performance of the overdentures, offering minimal retention loss and greater patient satisfaction. These biomaterials include resistant polymeric matrixes and amorphous diamond-like carbon applied on metallic components. The objective of this explanatory mixed methods study is to compare Novaloc, a novel attachment system with such characteristics, to a traditional alternative for single implants in the mandible of edentate elderly patients.

**Materials and Methods:** We will carry out a randomized cross-over clinical trial comparing Novaloc attachments to Locators for single-implant mandibular overdentures in edentate elderly patients. Participants will be followed for three months with each attachment type; patient-based, clinical and economic outcomes will be gathered. A sample of 26 participants is estimated to be required to detect clinically relevant differences in terms of the primary outcome (patient ratings of general satisfaction). Participants will choose which attachment they wish to keep, then be interviewed about their experiences and preferences with a single implant prosthesis and with the 2 attachments. Data from the quantitative and qualitative assessments will be integrated through a mixed-methods explanatory strategy. A last quantitative assessment will take place after 12 months with preferred attachment; this latter assessment will enable the observation of attachments' long-term wear and maintenance events.



**Results:** The research protocol received the operating funds needed for its conduction, as well as ethical approval by the institutional IRB. It is currently at the beginning of the recruitment stage. A version was registered in the clinicaltrials.gov database (available at <https://clinicaltrials.gov/ct2/show/NCT03126942>).

**Conclusions:** Our results will lead to evidence-based recommendations regarding these systems, guiding providers and patients when making decisions on which attachment systems and implant numbers will be most appropriate for individual cases. The recommendation of a specific attachment for elderly edentulous patients may combine positive outcomes from patient perspectives with low cost, good maintenance and minimal invasiveness.

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### **DIFFERENCES IN PREFRONTAL ACTIVITIES UNDER SENSORY INTEGRATION TASK: COMPARISON BETWEEN INCISOR AND MOLAR TEETH**

**Kishimoto, Takahiro \* Takaharu, Goto; Tetsuo, Ichikawa**  
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**Department of Oral & Maxillofacial Prosthodontics**  
**Tokushima, Japan**

**Keywords:** prefrontal cortex, sensory integration, occlusal force

**Purpose/Aim:** The prefrontal cortex (PFC), which is located in the anterior region of the cerebral cortex, plays an important role in complex cognitive behavioral planning, decision-making, and sensory integration of intra-extraoral sensory information. We have been reported that periodontal tactile input influences cerebral blood flow in the prefrontal cortex. The purpose of this study was to investigate the differences of the effect in incisor and molar teeth regarding the PFC activity and modulation ability of occlusal force under sensory integration tasks.

**Materials and Methods:** We enrolled 10 healthy young subjects without missing teeth. The tested teeth were central incisor and first molar in left side. The experimental task was to keep the occlusal force between 25 and 30 N for 30 seconds through a load cell transducer (Unipulse, Tokyo, Japan) with/without external information. Cerebral blood flows in the PFC/prefrontal cortex were measured using a wearable near infrared spectroscopy (HITACHI, Tokyo, Japan). When the occlusal force value was within or outside of the directed range, green LED and red LED lights were illuminated as visual information and a buzzer also turned off and on as auditory information. The measurements were repeated four times for each condition.

**Results:** An increase in the cerebral blood flow in the PFC was observed through the sensory integration tasks involving both incisor and molar teeth. The cerebral blood flows in the PFC in biting with first molars with external information were significantly higher than those with central incisors. As for the modulation ability of occlusal force, the mean occlusal forces in the task without information were significantly lower than those of external information in the tasks both anterior and posterior teeth.

**Conclusions:** Occlusal force modulation with molar teeth affected the PFC activity more than that with incisor teeth under the sensory integration task.

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### **SJÖGREN'S SYNDROME AND EDIBLE OILS: MORE THAN WHISTLE-WHETTING AGENTS**

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**Prosthodontics**  
**Toronto, ON, Canada**

**Keywords:** Sjögren's Syndrome, edible oils, demineralization

**Purpose/Aim:** Sjögren's Syndrome (SS) is an auto-immune disorder with a plethora of oral manifestations including dry mouth, rampant dental decay, gingivitis, candidiasis, and hypogeusia/dysgeusia, and subsequently wreaking havoc on quality of life. It is of vital importance that agents be identified that might protect the tooth surface from demineralization since the natural oral buffer capacity of saliva is reduced. Lipids may play a role through the inhibition of carious demineralization by providing a diffusion barrier within the organic protein-lipid-water matrix of enamel which may decelerate caries demineralization (Featherstone and Rosenberg, 1984). During a literature search to find agents that could either rehydrate or at least prevent further oral dehydration of xerostomic patients, a description of the ancient Ayurvedic oil-pulling technique was discovered claiming several benefits to oral health. **PURPOSE:** To determine 1) the

in vivo effects of oil-pulling in patients with xerostomia due to SS or medication usage and 2) the in vitro effects of the edible oils in protection against erosion.

**Materials and Methods:** 1) in vivo: participants previously diagnosed with primary SS (pSS) i.e., no other connective tissue disorder}, taking medications with a xerostomia side effect (Med), or otherwise healthy salivators (HS) were recruited into the study. Saliva, plaque and tongue scraping samples were collected pre- and post-testing and analyzed for levels of Strep. mutans, Lactobacilli sp., and Candida sp. Participants were randomly assigned to a rinsing agent and followed the traditional oil-pulling technique of 15 min/day for 3 weeks using virgin coconut oil (VCO), olive oil (OO), sesame oil (SEO), sunflower (SUO), chlorhexidine (CHX, 1 min/day, 2 weeks only), or water. 2) in vitro: Human extracted teeth were subjected to 10 cycles of 5 min pre-treatment with the above products, 30 min artificial saliva, 3 min 1% citric acid (pH 2.3), 60 min artificial saliva then subjected to optical profilometer analysis.

**Results:** In SS participants, levels of Strep. mutans were reduced 10-fold by OO and SEO, 100-fold by VCO and completely by CHX; of Lactobacilli sp. 1000-fold by CHX, otherwise not at all; and of Candida sp. up to 100-fold by VCO, 10-fold by SUO and CHX. Each product was slightly less effective in the Med group. After usage of VCO, SS and Med participants stated, “my gums don’t bleed after flossing”, “my teeth look brighter”, “I can taste again”, and “I don’t have that sour dough smell”. Protection against enamel and dentin loss was greater with VCO than SEO or SUO and not all with OO.

**Conclusions:** Oil-pulling with VCO offers the xerostomic patient a more pleasant oral condition and a somewhat protective effect against xerostomia-related demineralization.

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### POST - GRADUATE SPECIALIST PROSTHODONTIC TRAINING IN SOUTH AFRICA – WHERE IS IT GOING?

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**Keywords:** prosthodontic training, post-graduate training, national professional examination

**Purpose/Aim:** A comprehensive review of current training leading to certification as a specialist prosthodontist in South Africa was done, to enable a discerned response to the mandate from the Health Professions Council of South Africa (HPCSA) around the development of a unitary exit examination, latterly referred to as the National Professional Evaluation (NPE).

**Materials and Methods:**

A qualitative review of the training programmes at all the academic oral health centres in South Africa by way of:

- a) literature review of global training in postgraduate prosthodontics
- b) collaborative consultation and discussion with the respective teaching teams at a platform facilitated by the national specialist group
- c) review of institutional prospectuses, was done.

**Results:**

Fundamental differences in the educational transformative processes between entry and exit levels were evident. These related to:

1. Institutional variations: differentials pertaining to resources, transformative processes; candidates; institutional culture and perceptions.
2. Faculty constraints: recruitment, retention and development; dual appointment by the provincial department of health and seconded to the academic institutions under the auspices of the DoHET.
3. Curriculum: non – standardised interdisciplinary liaisons and transformative processes; quality assurance processes.
4. Assessment: the utilisation of different tools; inconsistent objectives regarding outcomes; lack of standardisation; examiner bias; dogmatism<sup>9-11</sup>.
5. The impact of stakeholder demands.
6. Patient Dynamic: cost-intensive nature of prosthodontic treatment; diversity of the patient pool; cultural variations.
7. Role of the proposed examining body<sup>1</sup>: responsible for assessing and conferring specialist fellowships in Medicine and Dentistry without the responsibility of training candidates<sup>12</sup>.

**Conclusions:** The intention of the NPE is to ensure a common outcome<sup>1</sup>, however, it cannot be achieved without consideration of the institutional differences. Further in-depth exploration of these is necessary for strategic address aimed at both unitary transformative processes and outcomes.

## NOVEL SPHEROID CULTURE OF MESENCHYMAL STEM CELLS FOR REGENERATIVE PROSTHODONTICS

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**Keywords:** mesenchymal stem cell, regenerative prosthodontics, spheroid culture

**Purpose/Aim:** Progress in stem cell-based regenerative medicine has introduced the concept of “regenerative prosthodontics,” particularly for missing teeth with severe alveolar bone resorption (Niibe et al., J Prosthodont Res, 2017). Recently, mesenchymal stem cells (MSCs) have been used to improve bone augmentation for dental implants. Conventionally, MSCs are expanded as adherent monolayers; however, these cells eventually lose their proliferation and multilineage potential after repeated passages. Three-dimensional (3D) culture systems can generate MSC spheroids, which are expected to solve the limitations associated with conventional adherent culture and to facilitate scaffold-free cell transplantation. In this study, we established a novel MSC spheroid culture system to achieve long-term maintenance of their multilineage potential in sufficient numbers to support transplantation therapies.

**Materials and Methods:** OriCell<sup>TM</sup> mouse MSCs (Cyagen) and human MSCs (FACS-sorted CD271+/CD90+) were cultured for 2 months at 37°C, 5% CO<sub>2</sub> in floating 3-D culture in a glass flask with shaking (85-95 rpm: Bio-shaker BR-40LF, Taitec) or in conventional adherent culture. MSCs at low (<15) and high (?15) passage numbers were used. During the culture period, expression of cell surface markers indicative of good MSC quality (PDGFR $\beta$ /Sca-1 and CD90/CD106 for mouse and human MSCs, respectively) was examined by flow cytometry. In vitro differentiation of MSCs to osteoblast, chondrocyte and adipocyte lineages was investigated by cytochemical staining (alkaline phosphatase, toluidine blue, and oil red O, respectively) and RT-PCR.

**Results:** In 3-D culture, mouse and human MSCs at both low and high passage numbers formed spheroids within one month. The size of the spheroids increased during the culture period. The spheroid MSCs highly expressed genes indicative of multilineage potential (PDGFR $\beta$ , vimentin, CD106 and Oct3/4). MSC at high passage numbers under adherent conditions did not show adipogenic differentiation capacity, while the 3-D-cultured cells maintained both osteogenic and adipogenic differentiation capacity. Under the adherent condition, MSCs progressively lost expression of PDGFR $\beta$  and CD106 by repeated passaging up to 20 times. The decreased expression of these markers under adherent culture was significantly reversed by changing to 3-D culture for 2 months. In addition, the lost adipogenic differentiation capacity of adherent-cultured MSCs was remarkably restored by the 3-D culture. Furthermore, the spheroids showed a renewable “stem cell pool” property, where undifferentiated MSCs grew out from spheroids seeded on a culture dish, and each attached spheroid could then be removed and re-seeded again several times to provide additional cultures of outgrown MSCs.

**Conclusions:** These data suggest that the shaking 3-D culture could maintain the multilineage potential of MSCs and even restore the multipotency lost after monolayer expansion. This novel spheroid culture method could provide a promising strategy for regeneration of alveolar bone and teeth in future prosthodontics. [This investigation was supported by JSPS KAKENHI Grant for Young Scientists (B: 16K20480)]

## INFLUENCE OF SOLITARY EATING IN THE ELDERLY ON SYMPTOMS ON “ORAL FRAILITY” AND “PHYSICAL FRAILITY”

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**Keywords:** frailty, oral frailty, solitary eating

**Purpose/Aim:** In Japan, the elderly population is rapidly increasing unprecedented in the world. Prevention of long-term care is an important issue in connection with an increase in medical and nursing care costs accompanying the increase in the elderly population, and the concept of “frailty”, which is defined as “losses of physiologic reserve that increase the risk of disability” has attracted a steeply increasing interest among researchers and clinicians. In Japan, the concept of “oral frailty”, associated with the decline of oral function, has been proposed. On the other hands, the meaning of solitary eating has been noticed as social problem associated with the increase in the elderly population or changes in dietary habits. In this study, a questionnaire survey was performed to investigate subjective symptoms of the tendency of solitary eating, and to examine the relationship with the “physical frailty” and “oral frailty”.

**Materials and Methods:** A total of 1214 subjects were enrolled with prior consent. This study was conducted with the approval of the Ethics Committee of the Tokushima University Hospital (No. 2404). The questionnaire of “Have you eaten alone by yourself?” was raised to assess the tendency of solitary eating. 5 items questionnaire, comprising of weight loss, exhaustion, physical activity, walking speed and grip strength, for physical frailty were raised for the assessments of “physical frailty”. 7 items questionnaire, comprising of symptoms on mastication, swallowing, remaining teeth, saliva and tongue, were raised for the assessments of “oral frailty”. All questionnaire items were evaluated on a scale of 1 to 4, and each score was set to a higher value as the tendency of functional decline was higher.

**Results:** In female subjects, the score of “solitary eating” was gradually increased with age, however decrease tendency of that score was found in male subject. The score of “solitary eating” has significant effect to every subjective symptoms of “physical frailty” (odds ratio: 1.18-1.52,  $p < 0.05$ ) and “oral frailty” (odds ratio: 1.20-1.28,  $p < 0.05$ ).

**Conclusions:** To prevent the “physical frailty” and “oral frailty”, the beneficial evaluation of symptom in “solitary eating” was suggested.

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### USE OF GERANYLGERANIOL (GGOH) TO RESCUE BONE REGENERATION IMPAIRED BY BISPHOSPHONATE- AN IN VIVO STUDY

Wang, Huey-Jen \* Han-Wei Wang <sup>1</sup>; Chia-Yuan Hu <sup>1</sup>; Tsung-Chieh Yang <sup>1</sup>; Alex Yunn-Jy Chen <sup>1</sup>; Tong-Mei Wang <sup>1</sup>; Li-Deh Lin <sup>1</sup>; Juo-Song Wang <sup>1</sup>; Bei-En Chang <sup>2</sup>

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Hsinchu City, Taiwan, China

**Keywords:** bisphosphonate, BRONJ, GGOH

**Purpose/Aim:** Bisphosphonate-related osteonecrosis of the jaw (BRONJ) is one of the main side effects of bisphosphonate therapy (BPT). To date, there is no effective therapy of the BRONJ. Nitrogen-containing bisphosphonates (N-BPs) target to the inhibition of pyrophosphate synthase (FPPS) in the mevalonate pathway. Consequently, decreased synthesis of the downstream metabolites, Geranylgeraniol (GGOH) and Farnesol (FOH), is believed to largely account for the development of BRONJ. Previous in vitro studies have shown the negative effects of N-BPs on decreased viability and migration capacity of different cell types. The aim of our study was to demonstrate that the application of downstream metabolites may reverse the negative biological effects of N-BPs.

**Materials and Methods:** Amputation-regeneration model of zebrafish caudal fin was employed to analyze the effects of drug administration. Alendronate (N-BP), farnesol, and geranylgeraniol at  $7.5 \times 10^{-5} M$  were used to treat the fish by incubation. The regenerated bone in the fin were documented by calcein staining. The dynamic appearance of osteoclasts during the process were observed by TRAP staining.

**Results:** The bone regeneration impaired by alendronate was reversed to normal in the presence of GGOH and FOH. In addition, the morphological restoration was delineated by TRAP staining to reveal the distribution of osteoclasts. The results showed that the number and distribution of osteoclasts was restored to normal likewise. Hence, systemic application of GGOH and FOH may reduce the side effects of bisphosphonate therapy.

**Conclusions:** In this study, we demonstrate that the impairing effects of alendronate on bone regeneration and osteoclast activities may be reversed by application of GGOH and FOH. Our study in zebrafish provides a vivid animal model to investigate the BRONJ in vivo. And the results may further extend to the clinical applications in treating BRONJ.

## EFFECT OF SUBPRESSURE TECHNIQUE ON THE PENETRATION ABILITY OF PIT AND FISSURE SEALANT IN VITRO

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Prosthodontics  
Beijing, China

**Keywords:** penetration, sealants, subpressure

**Purpose/Aim:** The aim of this in vitro study was to improve the penetration of sealants following the use of subpressure technique.

**Materials and Methods:** 27 human maxillary premolars extracted for orthodontic reasons were stored in normal saline for a maximum of 1 month. All the teeth were cleaned and etched according to manufacturer's instructions. Sealants were applied to the surface of sound teeth in 3 experimental groups: conventional sealing application (C), -0.4 bar subpressure sealing application (S4), and -0.8 bar subpressure sealing application (S8). Bucco-lingual slices of samples were observed under SEM. Fissure types was classified and compared among the groups. The entrance of the pits and fissures, defined by the distance between the two enamel surfaces, was approximately 200  $\mu$ m measured perpendicular to the fissure axis. The filled area (area of fissure filled by sealant) was marked in each SEM photograph using Photoshop CC. Penetration was presented by the ratio of sealed area pixels to fissure pixels in Photoshop. The data were analyzed by Kappa test and One-way ANOVA at  $\alpha = 0.05$ .

**Results:** There was no significant difference in the fissure types among these groups, and Y2-type was the main fissure type. Group C had the lowest percentage of filled area ( $78.43\% \pm 13.63\%$ ). The filled area proportion in experimental group is statistically significant higher than that of control group ( $p < 0.05$ ). Group S8 had the highest filled area proportion ( $97.48\% \pm 1.78\%$ ), with a slight increase than that of group S4 ( $96.30\% \pm 3.42\%$ ) ( $P > 0.05$ ).

**Conclusions:** Subpressure technique could improve the penetration of sealant effectively. It is believed that subpressure technique would have potentially important implications

## Notes

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## Notes

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## Notes

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## Notes

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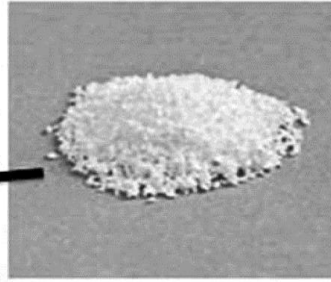
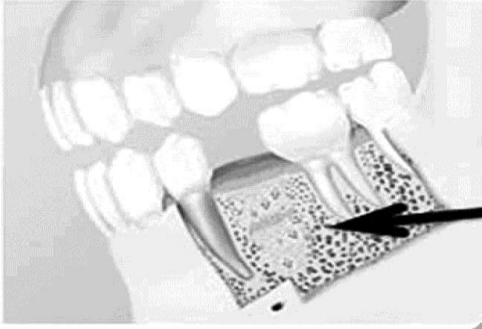
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**Patent No.: US 7,947,821 B2**

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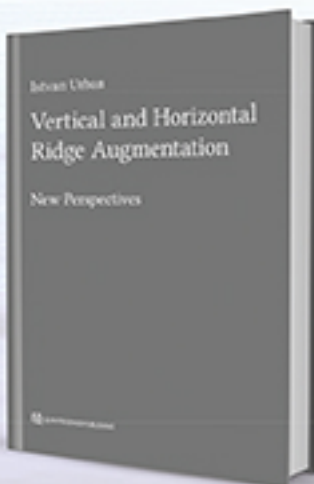
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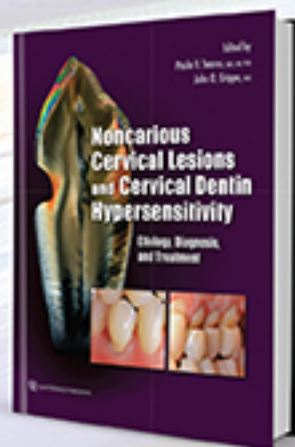
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