I  n 1986, the newly founded ICP held its second joint meeting in conjunction with the EPA in Oxford, United Kingdom. More than 30 years later, we reunited in Amsterdam for the ICP’s 18th biennial meeting and the EPA’s 43rd annual conference.

Between September 4th and 7th, some 900 delegates from 50 countries representing all continents of the planet gathered for an intense program. The day before, the ICP Board had spent the day in their deliberations recommending their work. The so-called “quiet” year between conferences had been far from passive, including a meeting with the Italian Prosthodontic Association and the establishment of new grants and prizes together with the production of standard operating procedures for the Board. Co-Presidents Creugers and Zitzmann paid tribute to the Board’s hard work.

A period of wet Dutch weather could not dampen the warm ambience of the gathering as delegates attended the packed scientific program compiled by Dr Baba from Tokyo and Dr Chvartszaid from Toronto, with additional speakers provided by Dr Phoa representing the EPA. The theme of the conference was “Art and Science in Prosthetic Dentistry,” covering a wide spectrum of topics including digital technology, implant applications and research, and maxillofacial prosthodontics. The needs of the aging population were not ignored. The President of the American College of Prosthodontists, Dr Baba, introduced its Digital Education Program.

There were 11 oral sessions, including 7 keynote lectures, 31 invited speakers, and 62 oral presentations. Of the 147 abstracts that were submitted, 62 were presented. Procter & Gamble sponsored 2 additional speakers on denture-related topics, while there were also 8 case presentations by graduate students.

The Beurs van Berlage is a historic building in central Amsterdam. It provided sufficient accommodation for three concurrent scientific sessions, a record-breaking number of poster presentations (252!), and a huge trade show, of which more than 90% was of ICP origin.

The social activities were all fully subscribed. These included walking tours around the historic city, an enormous banquet with the now familiar Roll Call of Nations, and the almost mandatory canal tour that every visitor to Amsterdam must take.

Worldwide interest in the activities of the ICP continues to expand, and a significant participation from colleagues in mainland China is welcomed. We look forward to our next Biennial Meeting to be held in Shanghai in October 2021 that promises to be yet another landmark occasion.

Our thanks are due to our co-presidents, program chairs, and to RES Seminars for an outstanding meeting that has contributed significantly to the progress of the ICP.

Harold W. Preiskel
Past President, ICP

Note: The second half of the abstracts are presented herein; the first half appeared in issue 6 of 2019.

ADVANCED BIOMATERIALS

Investigating the Effect of Eliminating the Silanization Stage by Inclusion Within Resin Cements When Adhering Ceramics

Muna Al Ameri, Shivana Anand, Richard Foxton

King's College London, London, United Kingdom

Purpose/Aim: To investigate the effect of two pretreatment methods (conventional vs silane-containing) on the bond strength of dual-curing self-adhesive resin cement and durability over time. Materials and Methods: A total of 40 samples were prepared from two ceramics. A total of 8 cylindrical turrets were formed for micro shear bond strength (μSBS) testing, and all were investigated using tandem scanning microscopy (TSM) to assess failure modalities. The ceramic samples included (1) Vitablocs Mark II porcelain and IPS e.max Press lithium disilicate. The cements included (1) RelyX Unicem 2 Self-Adhesive universal resin cement (control group) and (2) SAU-100A (Kuraray Noritake) (experimental group). The samples were divided into four equal groups. Each cement was randomly allocated to a Mark II (n = 20) or lithium disilicate (n = 20) sample. Each ceramic sample received two cylindrical resin turrets. The turret was created per the manufacturer’s instructions. All ceramic samples were pretreated with 5% hydrofluoric acid (20 seconds) before being air sprayed with water and air dried prior to turret creation. RelyX Unicem used a ceramic primer prior to turret formation. SAU-100A turrets were directly bonded to the ceramic surface. One turret was subjected to 24-hour storage in distilled water (37°C), and another was subjected to 4-week storage in distilled water (37°C). After incubation, turrets underwent μSBS testing. All data were statistically analyzed using linear mixed models. Results: Mark II showed statistically significant effects in the interaction of the cement, and no statistical significance was noted during aging. There was no statistically significant effect of the interaction of the cement and aging with e.max. Interestingly, the highest μSBS (mean and SD) was SAU-100A at 24 hours for e.max (16.30 [9.37] MPa), while the lowest μSBS for RelyX doi: 10.11607/ijp.2020.1.icp.epa.2
Cytotoxic Evaluation of Zirconium Oxide Nanoparticles Additive to Acrylic Base Material

Ersu Nur Avukat, Canan Akay, Nuray Tuloğlu, Süle Bayrak, Handan Sevim
Hacettepe University, Ankara, Turkey

Purpose/Aim: The purpose of this in vitro study was to evaluate the cytotoxic effect of different concentrations of zirconium oxide nanoparticles (ZrO2NPs) added to acrylic resins using cell culture method with L929 mouse fibroblasts. Materials and Methods: In total, 36 disk-shaped specimens per group were prepared with dimensions of 5-mm diameter and 2-mm thickness. Mixing proportions were applied according to the manufacturers’ instructions under aseptic conditions. Specimens were prepared from acrylic resin filled with ZrO2NPs. ZrO2NPs were added to the acrylic resin powder 1% and 2% by volume. Control group specimens were prepared from unmodified acrylic resin. The following represents the groups in the study: GI = control group; G1 = acrylic resin and 1% ZrO2NPs; G2 = acrylic resin and 2% ZrO2NPs. Cytotoxicity was evaluated with 3-(4,5-dimethylthiazol-2-yI)-2,5-diphenyl tetrazolium bromide (MTT) assay using L929 cells after 24-, 48-, and 72-hour cell incubation periods. The cytotoxicities were calculated. One-way ANOVA was used to analyze the cytotoxicity of each group (P < .05). Results: According to the results of the 24-hour analysis using MTT test, the control group and the 1% ZrO2NPs group did not statistically differ and were more biocompatible, while the 2% ZrO2NPs group was statistically different. According to the 48-hour analysis results, there was no difference between the groups. According to the 72-hour results, the control group was statistically different and more biocompatible than the groups with 1% and 2% NPs. Conclusions: In this in vitro study, the incorporation of ZrO2NPs into conventional acrylic resin did not impair the biocompatibility of acrylic resin.

Effect of Home Bleaching Treatment on the Translucency of Novel CAD/CAM Ceramic Materials

Burcu Batač, Sema Murat, Deniz Yılmaz
Ankara University, Ankara, Turkey

Purpose/Aim: The purpose of this study was to evaluate the effect of carbamide peroxide home bleaching treatment on the translucency of CAD/CAM ceramic and nanoceramic hybrid materials considering the fact that bleaching therapies are often performed in patients presenting restorations. Materials and Methods: A total of 80 specimens (14 x 12 x 1 mm) were fabricated from 5 different monolithic CAD/CAM block materials as lithium disilicate ceramic (EMg) (Vitablocs Mark II, VITA Zahnfabrik), zirconia-reinforced lithium silicate ceramic (V) (VITA Suprinity, VITA Zahnfabrik), resin nanocomposite (L) (Lava Ultimate, 3M ESPE), and dual-network ceramic (E) (VITA Enamic, VITA Zahnfabrik). All CAD/CAM materials were fabricated in shade A2, high translucency (HT). Polishing (p) and glaze (g) procedures were performed for only one side of the specimens to simulate clinical conditions. The specimens were subject to a thermal aging process using a thermostating device between 5°C and 55°C for 10,000 cycles with a dwell time of 30 seconds. After thermal aging, the carbamide peroxide bleaching agent was applied to the surface of each specimen for 6 hours per day for 8 consecutive days. During the bleaching process, the specimens were kept in an incubator at 37°C. A calibrated spectrophotometer (VITA Easychade Advance) was used to measure CIE LAB values, where a 'b' represented the baseline, after thermal aging, and after bleaching time points. Translucency parameter (TP) was calculated with the TP formula at baseline (TPb), after thermal aging (TPa), and after bleaching (TPc). The data were analyzed using repeated-measures ANOVA and post hoc comparison test with Bonferroni correction at the significance level of 0.05. Results: The interaction among CAD/CAM materials, thermal aging, and bleaching procedures for TP values was found to be statistically significant (P < .05). There were no significant differences for Sp and Ep specimens after thermal aging and bleaching procedures (P > .05). After bleaching treatment for M1M and EM1, the specimen TP values decreased significantly (P < .05). There were statistically significant differences among the groups (P < .05) regarding the respective TP values. Conclusions: Within the limitations of this study, carbamide peroxide home bleaching agents may affect the translucency of different CAD/CAM restorative materials. Clinicians should be careful while applying the home bleaching treatment to patients who have CAD/CAM restorations.

Effect of Bonding and Post Length on the Dislodgment Characteristics of Fiber-Reinforced Composite Post

Anton Elovaa, Valterri Virtanen, Lippa Lassila, Timo Närhi, Pekka Vallittu, Anna-Maria Le Bell Rönning
University of Turku, Turku, Finland

Purpose/Aim: The aim of this in vitro study was to investigate the forces needed to dislodge bonded and mechanically attached individually formed fiber-reinforced composite (FRC) posts from a simulated root canal. Materials and Methods: Two different groups of FRC posts were made. The first group simulated individually bonded and formed FRC posts, and the second group simulated mechanically attached individually formed FRC posts, to a root canal. The fiber post material in both groups (everStick POST, GC) consisted of unidirectional E-glass fiber reinforcement in a semi-interpenetrating polymer network (IPN) polymer matrix. The fiber material was formed into posts (diameter of 1.5 to 1.6 mm) by rolling it between two microscope glasses and light polymerizing it. Different post lengths were made. Artificial root canals were made by drilling holes in PMMA blocks. The final post lengths inside the blocks in both groups were: 2, 3, 4, and 6 mm (n = 6/length). FRC posts in the blocks were tested with a 2-point bending test where the load was applied 0.5 mm from the end of the post. Results: Both length and bonding had a significant effect on the dislodgment force (P < .001). The shortest posts differed statistically significantly from the other post lengths (P < .05). Greater force was needed to dislodge bonded FRC posts compared to not-bonded FRC posts. No statistically significant differences were found among everyStick POST and everStick POST. The minimum post length inside the artificial root canal to achieve adequate mechanical retention (ie, without bonding to simulated root) was 3 mm. Conclusions: This study highlighted the importance of good bonding of FRC posts to a root canal.

A Randomized Controlled Trial of Two Lithium Disilicate Partial Crowns: 3-Year Results

Giulia Gallo, Edoardo Ferrari Cagidiaco, Tim Joda, Marco Ferrari Siena University, Siena, Italy; University of Basel, Basel, Switzerland

Purpose/Aim: The aim of this trial was to evaluate two lithium disilicate systems under clinical conditions for 3 years. Materials and Methods: A total of 60 patients in need of a posterior partial crown were selected for this study. The sample vital teeth were restored and randomly divided into two groups (group 1 = e.max press [Ivoclar Vivadent]; group 2 = LiSi press [GC]) and followed up annually for 3 years. The results show that the two lithium disilicate systems have very good and reliable clinical performances. The two systems were statistically equivalent (success rate of 97.5%). No statistically significant differences were found between the two groups for any clinical parameter. Conclusions: The results show that the two lithium disilicate systems have very good and reliable clinical performances. The two systems were statistically equivalent after 3 years of clinical service.

DNA-Seq Analysis of r8MMSCs on TiO2 Nanotube Arrays
Tianxiao Han, Capital Medical University, Beijing, China

Purpose/Aim: To investigate genomic data of 3D rats’ bone marrow mesenchymal stem cells (MSCs) on TiO2 nanotube arrays. Materials and Methods: TiO2 nanotube arrays with a diameter of 70 mm were fabricated by anodization of titanium sheets at 20 V and 2 h. rBMSCs were seeded on unmodified titanium sheets (control group) and TiO2 nanotube arrays (NT group) for 24 hours. The HiSeq X Ten platform (illumina) was applied to acquire genomic data. The cytoskeleton was recorded via a fluorescent assay. Results: The genetic profiling revealed that NT led to the transcriptional activation of genes encoding cytoskeletal proteins, which was confirmed by a fluorescent assay staining F-actin and α-tubulin proteins. Conclusions: The micromorphologic modification of TiO2 nanotube arrays may enhance MSC stiffness, which in the long term may alter its directional trends and lead to its osteogenic effect.
Purpose/Aim: The aim of this study was to investigate the fitting accuracy of stereolithography (SL) postcuring in different conditions (time and temperature) of photopolymer 3D resins. Materials and Methods: The specimens were linked using CAD software that simulated the shape of the denture flange and the maxillary edentulous alveolar ridge. Specimens were made using an STL file and printed by a 3D printer (Form2, Formlabs) with a thickness of 1.5 mm. A methacrylate-based clear photopolymer resin was used in this study. The specimens were equally divided into 6 groups with 10 specimens in each group. Six conditions were used during the postcuring process: for conditions 1 and 2, the temperature was set to 40°C for different times (15 and 30 minutes, respectively); in conditions 3 and 4, the temperature was set to 60°C for 15 and 30 minutes, respectively; and in conditions 5 and 6, the temperature was set to 80°C for 15 and 30 minutes, respectively. Both precuring and postcuring gap sizes for each specimen were measured in five different locations (right buccal vestibule [V1], the crest of the right alveolar ridge [R1], the palatal midline [P], the crest of the left alveolar ridge [R2], and the left buccal vestibule [V2]) with a stereomicroscope. The Kruskal–Wallis test and Mann-Whitney test were used to calculate the statistical significance of the gap precuring and postcuring with a significance level of .05. Results: Although there was no significant change in gap sizes at V1, R1, and P, considering all reference points, condition 1 had the least average change in gap sizes postcuring, and condition 6 had the highest change in gap sizes. At reference point R2, condition 6 had a significantly higher mean gap size than conditions 1, 2, and 4. At point V2, condition 6 had a significantly higher mean difference in gap size than condition 3. Conclusions: Within the limitations of this in vitro study, the consideration of curing time and temperature of SL dentures should offer the highest accuracy for definitive restorations. The postcuring condition of 15 minutes at 40°C showed the minimum deformation.

Clinical Evaluation of Short Fiber–Reinforced Composite Resin Restorations and Glass-Ceramic Endocrowns in Endodontically TREATED Molars
Ville Karsila, Tiina Myrtyläinen, Jasmine Bijnelic-Donova, Johanna Tanner
University of Turku, Turku, Finland

Purpose/Aim: Advances in adhesive dentistry have brought new treatment approaches for restoring endodontically treated teeth. The aim of this study was to compare the clinical outcomes of short fiber–reinforced composite (SFC) restorations and indirect glass-ceramic endocrowns in endodontically treated molars (ETMs). On average, the follow-up time was 4 years. Materials and Methods: A total of 18 ETMs were randomly divided into two groups: the first group received direct composite resin restorations with an SFC base (VitaX Past, GC); (N = 11), and the second group received indirect glass-ceramic endocrowns (IPS Empress Cadillac Ivo). The statistical analysis was performed using the 95% CI deviation distribution from the Gaussian function subtraction. The statistical outcome for each group was merged, and a 3D color-coded map was created showing the average deviation (α = .05). Results: The heat-pressed post-crown restoration showed 79% ± 6% of the areas within a 50 µm, while the CAD/CAM restoration showed 66% ± 9%. Besides that, the CAD/CAM post-and-core restorations showed 65% of the areas were above the ideal marginal adaptation limit threshold of 200 µm, while only 0.7% ± 0.7% was found for the heat pressed. A qualitative analysis showed that the CAD/CAM post-and-core restoration had a significant positive discrepancy from the original pattern on the buccal part of the post, as well as on the adaptation over the cervical area. The heat-pressed method had a significant negative discrepancy on the apical part of the post. Conclusions: The heat-pressed method to manufacture PEEK-based post-and-core restorations showed higher accuracy than the CAD/CAM method.

3D Accuracy Analysis Between Heat-Pressed and CAD/CAM PEEK Post-and-Core Restorations
Martin Lalama, Mateus Rocha, Edgar O’Neill, Panagiotsi Zoidis
University of Florida, Gainesville, Florida, USA

Purpose/Aim: To evaluate the accuracy of PEEK-based post-and-core restorations fabricated using heat-pressed and CAD/CAM methods. Materials and Methods: Post-and-core patterns (n = 10) were fabricated using an acrylic pattern resin (GC Pattern Resin), and each pattern was scanned using a 3D laboratory scanner (Ceramill Motion 2, Amann Girrbach), and a milling disk made of a modified PEEK-based polymer with 20% ceramic fillers (breCAM.BioHPP, Bredent) was milled into post-and-core restorations. Each of the original post-and-core resin patterns was sprayed, invested, and pressed using pellets made of a modified PEEK-based polymer with 20% ceramic fillers (BioHPP, Bredent) and a PEEK pressing unit (For2Press, Bredent). The resulting post-and-core restorations from the CAD/CAM and heat-pressed methods were scanned using the same 3D scanner, generating the STL-M and STL-P files, respectively. The STL-M and STL-P files were digitally aligned and compared to the STL-R using a 3D analysis software (Geomagic Control X; 3D systems). The 3D spatial distribution deviation was exported, and the statistical analysis was performed using the 95% CI deviation distribution from the Gaussian function subtraction. The statistical outcome for each group was merged, and a 3D color-coded map was created showing the average deviation (α = .05). Results: The heat-pressed post-crown restoration showed 79% ± 6% of the areas within a 50 µm, while the CAD/CAM restoration showed 66% ± 9%. Besides that, the CAD/CAM post-and-core restorations showed 65% of the areas were above the ideal marginal adaptation limit threshold of 200 µm, while only 0.7% ± 0.7% was found for the heat pressed. A qualitative analysis showed that the CAD/CAM post-and-core restoration had a significant positive discrepancy from the original pattern on the buccal part of the post, as well as on the adaptation over the cervical area. The heat-pressed method had a significant negative discrepancy on the apical part of the post. Conclusions: The heat-pressed method to manufacture PEEK-based post-and-core restorations showed higher accuracy than the CAD/CAM method.
Clinical Assessment of Maxillary Sinus Floor Augmentation Using Carbonate Apatite: A 30-Month Follow-up Study
Yoichiro Ogino, Yasuyuki Matsushita, Kiyoshi Koyano
Kyushu University, Fukuoka, Japan

Purpose: Apatite granules (CO3Ap), an inorganic component of human bone, can be fabricated in chemically pure form from calcium carbonate block via a dissolution-precipitation reaction. A first-in-human clinical trial was conducted to evaluate the safety and efficacy of CO3Ap granules in sinus floor augmentation. The aim of the present study was to report the results of this clinical trial and to discuss the effectiveness of CO3Ap granules as a bone substitute in maxillary sinus floor augmentation. Materials and Methods: Ethical permission was given by the Kyushu University Hospital ethics committee, and informed consent was obtained from all participants. Treatment procedure was staged approach in all cases. Prior to maxillary sinus floor augmentation and implant placement, maxillary bone height was measured using CT images. Implants were placed at augmented sites 6 to 10 months after the augmentation procedure. During implant placement, insertion torque value was recorded. To evaluate bone created by CO3Ap granules around implants, the patients were followed 30 months after augmentation for clinical measures (implant survival, stability, and screw loosening) and radiologic measures (peri-implant bone resorption, panoramic radiographic assessment). Results: Six subjects (three men and three women, mean age: 64.8 ± 8.5 years) were selected according to the inclusion and exclusion criteria. The mean values of preoperative and postoperative maxillary bone height were 3.0 ± 1.5 mm and 10.0 ± 1.4 mm, respectively. Although residual CO3Ap granules were found in some cases during implant placement, all implants were placed unevenly. The mean insertion torque value was 24.8 ± 14.0 Ncm. At the 30-month follow-up visit, all implants were in function without any problems, and screw loosening was not observed. Panoramic radiographic assessment showed that no abnormal bone resorption of the augmented areas was observed, and bone height supporting the implants was maintained. Conclusions: Within the limitations of the present small investigation, CT and panoramic radiographic images and clinical findings showed that CO3Ap granules were effective and safe materials for sinus floor augmentation. In addition, they possess the capacity to provide implant stability. More cases with long-term observation are imperative to investigate the influence of CO3Ap granules as bone substitute.

Antibacterial Dental Adhesive Containing Cetylpyridinium Chloride Montmorillonite
Yohei Okazaki, Chenmin Yao, Mohammed Ahmed, Benjamin Merceís, Kumiko Yoshihara, Yashuiko Abe, Bart Van Meerbeeck
National Institute of Advanced Industrial Science and Technology (Aist) Health Research Institute, Kagawa, Japan

Purpose: The class II adhesive system is their primary property, bioactive adhesives may have an additional therapeutic effect. A new antibacterial adhesive was prepared by adding the antibacterial agent cetylpyridinium chloride (CPC) loaded in an inorganic montmorillonite (Mont) carrier (CPC-Mont). CPC is a cationic quaternary ammonium compound with antiseptic properties typically used in mouthrinses or toothpastes. The purpose of this study was to determine the optimal concentration of CPC-Mont when added to a self-etch adhesive. Materials and Methods: Experimental bonds were prepared by adding CPC-Mont in concentrations of 1, 3, and 5 wt% to dental adhesive (Clearfil SE Bond 2 [C-SE2], Kuraray Noritake) as part of a 2-step self-etch adhesive, with C-SE2 without CPC-Mont serving as control. Regarding primers, all experimental formulations and the control used 6 M H3PO4. Conclusions: The null hypothesis was that there would be no differences in terms of microtensile bond strength (µTBS) using the composite Clearfil AP-X (Kuraray Noritake). Antibacterial activity was evaluated by bacterial growth of Streptococcus mutans. Micro Raman spectroscopy was used to measure the degree of conversion upon proper light curing (bluephase Z1; Ivoclar Vivadent: high mode, with an output of 1,200 mW/cm²). All data were analyzed using two-way ANOVA and Tukey post hoc test for multiple comparisons (P < .05). Results: No differences in immediate and aged bond strength were recorded between the experimental adhesive formulations and the control, except for the significantly lower µTBS of C-SE2/5%CPC-Mont. Bacterial growth for 24 hours/7 days was significantly lower for C-SE2/1%CPC-Mont and C-SE2/3%CPC-Mont than for C-SE2/5%CPC-Mont and the C-SE2 control. The 24-hour/7-day degree of conversion of C-SE2/5%CPC-Mont was significantly lower than that of the other experimental formulations and the control. Conclusions: The experimental 2-step self-etch adhesive formulations containing 1 and 3 wt% CPC-Mont were the most promising antibacterial adhesives.

Effect of Nanohydroxyapatite Containing Desensitizing Toothpastes on the Bonding Performance of Two Self-Etch Adhesive Systems
Dandan Pei, Yuchen Meng, Yuchen Zhang, Yi Lu
Xi’an Jiaotong University, Xi’an, Shaanxi, China

Purpose: The desensitizing toothpaste with nanohydroxyapatite (nHAp)-containing toothpastes may modify the surface properties of dentin, which is pivotal as a bonding substrate in resin-dentin bonding. However, whether the modification affects the bonding performance of adhesives remains unknown. The present study aimed to evaluate the dentinal tubular occlusion of nHAp-containing desensitizing toothpastes and their influence on the resin-dentin bonding performance of two mild self-etch adhesives. Materials and Methods: Mid-coronal dentin specimens were prepared from intact human third molars. They were immersed in 1% citric acid for 20 seconds to expose the dentinal tubules to simulate sensitive teeth and then randomly divided into four groups. The control group received no desensitizing treatment. Experimental groups were treated with two commercial nHAp-containing desensitizing toothpastes (Biorepair and Dountodent) and an experimental pure nHAp paste, respectively. Each group was further divided into two subgroups and bonded with either G-Bond or Clearfil S3 Bond. The microtensile bond strength was tested, and failure mode distribution was analyzed. Moreover, the effect of desensitizers on dentinal tubular occlusion was observed using field-emission scanning electron microscopy (FESEM). Resin infiltration of the adhesives labeled by fluorescent Rhodamine B within the dentinal tubules was measured with confocal laser scanning microscopy (CLSM). Results: FESEM revealed that all the desensitizers noticeably occluded the dentinal tubules, and the extents were confirmed after application for 7 days. The majority of the occlusion was still preserved even after acid challenge with cola or adhesive. CLSM demonstrated shorter resin tags produced in the desensitized groups. When bonding with G-Bond, the pure nHAp group showed comparable bond strength to the control group, while Biorepair and Dountodent treatment decreased the bond strength. For groups bonded with Clearfil S3 Bond, all the desensitizers reduced the bond strengths compared to the control, and no significant difference was found among the three groups. Conclusions: nHAp-containing desensitizing toothpastes could occlude dentinal tubules effectively with a certain degree of acid resistance, which contributes to the relief of dentin hypersensitivity. The application of these nHAp desensitizers comprised the resin infiltration of G-Bond and Clearfil S3 Bond, resulting in decreased bond strengths of the resin-dentin bonding.

Strength of a Zirconium Oxide Ceramic Produced with an Alternative Production Process
Jean-Francois Roulet, Mateus Rocha
University of Florida, Gainesville, Florida, USA

Purpose: The class II adhesive system is their primary property, bioactive adhesives may have an additional therapeutic effect. A new antibacterial adhesive was prepared by adding the antibacterial agent cetylpyridinium chloride (CPC) loaded in an inorganic montmorillonite (Mont) carrier (CPC-Mont). CPC is a cationic quaternary ammonium compound with antiseptic properties typically used in mouthrinses or toothpastes. The purpose of this study was to determine the optimal concentration of CPC-Mont when added to a self-etch adhesive. Materials and Methods: Experimental bonds were prepared by adding CPC-Mont in concentrations of 1, 3, and 5 wt% to dental adhesive (Clearfil SE Bond 2 [C-SE2], Kuraray Noritake) as part of a 2-step self-etch adhesive, with C-SE2 without CPC-Mont serving as control. Regarding primers, all experimental formulations and the control used 6 M H3PO4. Conclusions: The null hypothesis was that there would be no differences in terms of microtensile bond strength (µTBS) using the composite Clearfil AP-X (Kuraray Noritake). Antibacterial activity was evaluated by bacterial growth of Streptococcus mutans. Micro Raman spectroscopy was used to measure the degree of conversion upon proper light curing (bluephase Z1; Ivoclar Vivadent: high mode, with an output of 1,200 mW/cm²). All data were analyzed using two-way ANOVA and Tukey post hoc test for multiple comparisons (P < .05). Results: No differences in immediate and aged bond strength were recorded between the experimental adhesive formulations and the control, except for the significantly lower µTBS of C-SE2/5%CPC-Mont. Bacterial growth for 24 hours/7 days was significantly lower for C-SE2/1%CPC-Mont and C-SE2/3%CPC-Mont than for C-SE2/5%CPC-Mont and the C-SE2 control. The 24-hour/7-day degree of conversion of C-SE2/5%CPC-Mont was significantly lower than that of the other experimental formulations and the control. Conclusions: The experimental 2-step self-etch adhesive formulations containing 1 and 3 wt% CPC-Mont were the most promising antibacterial adhesives.
Effect of Cavity Depth on Bond Strength of Different Types of Bulk Fill Composites
Akkazuu Shrya, Akinori Niitsuuma, Sakura Shiratori, Shotaro Katsunuma, Minoru Hatta, Harunori Gomi
University of Turku, Turku, Finland
Purpose/Aim: Bulk fill composites are very useful materials for minimally invasive reconstruction of deep cavities after large caries removal. The material properties of bulk fill composites include good polymerization, low shrinkage, and high fracture toughness under limited light application. Short fiber-reinforced (FRC) bulk fill composite has been developed as a dentin replacement material. This new material shows high polymerization efficiency, higher fracture toughness, and good bonding properties to dentin. The aim of this study was to evaluate the effects of different bulk fill composite materials on push-out bond strength to root canal dentin at 0- to 8-mm light irrigation distance, assumed as a deep cavity. Materials and Methods: A total of 30 bovine mandibular incisors were used for deep cavity specimens. The pulp was removed, and 8-mm-deep cavity space was prepared using a tapered diamond point to obtain consistent thickness of the bulk fill composite from the coronal to the apical. Three different bulk fill composites were used: everX Posterior (EXP), GC as an FRC bulk fill composite; everX Flow Bulk shade (EXF, GC) as an FRC flowable bulk fill composite; and SDR (Dentsply Sirona) as a control. For the bonding procedure, the bonding agent (G-Premio BOND) was applied into the cavity and polymerized for 10 seconds. The cavity space was filled with the wet bulk fill composite and polymerized for 10 seconds on EXP and EXF and for 20 seconds on SDR using an LED light curing unit (G-Light Prima II). After the filling procedure, the specimens were stored in distilled water for 24 hours at 37°C. The specimens were then horizontally sectioned to obtain 1- ± 0.1-mm thickness, and five slices of different depths were obtained for a total of 150 slices. Push-out tests were performed at a crosshead speed of 1.0 mm/minute using a universal testing machine. The maximum failure load was recorded in N, and the push-out bond strength (MPa) was calculated. The results among the groups with different vertical positions from coronal (1) to apical (5) and the total push-out bond strength, which were calculated using the average values of all depths within the same groups, were compared using one-way ANOVA. Results: Among all groups, the highest bond strength was observed in SDR1 (22.8 ± 6.9 MPa), whereas the lowest was observed in EXP3 (10.3 ± 4.5 MPa). EXP showed similar values for bond strength in all positions, and bond strength was not affected by the depth of the cavity. EXP showed a slightly increased and SDR a slightly decreased bond strength in the deeper cavity. Conclusions: Within the limits of the study, it may be concluded that the effect of cavity depth affected the bond strength of EXP (increase) and SDR (decrease). EXP was not affected by the depth of the cavity.

Study on Physical Properties and Effect on Osseointegration of Surface Treatment of Zirconia
Young-Gyun Song, Jong-Hyek Lee, Ye-Ji Kim, Ji-Hun Yim
Dankook University, Cheonan, South Korea
Purpose/Aim: The aim of this study was to investigate the effect of zirconia on osseointegration and its physical properties according to surface treatment using various acid solutions, as well as to suggest the optimum conditions for application in clinical treatment on the basis of the results. Materials and Methods: The prepared zirconia disk specimens were treated with hydrofluoric acid solution and photoassisted etching under various conditions. The surface was analyzed using SEM, and the surface roughness was analyzed using a surface profiler. The osteogenic effect of hFOB cells was assessed via cell counting and reverse transcriptase-polymerase chain reaction (RT-PCR). For analyzing the physical properties of treated zirconia, specimens were used to examine the biaxial flexural strength (ISO 6872). Results: Various roughnesses were obtained according to the surface treatment method. The surface roughness increased in the group treated with hydrofluoric acid solution, but the aspect of roughness increased in nanounits. In the method using photoassisted etching, the surface roughness increased in microunits. Cell reaction showed better results in the photoassisted etching group than in the hydrofluoric acid–treated group (P < .05). There was no statistical difference between groups in the physical experiments. Conclusions: As a result, the photoassisted etching method is more effective than the simple hydrofluoric acid solution treatment for zirconia treatment for osseointegration.

Investigation of Microstructural and Nanomechanical Properties of Monolithic Zirconia Ceramics Before and After In Vitro Aging
Panagiotis Symeonidis, Eleona Kонтonasiki, Nikolaos Kantiranis, Panagiotis Kavouras, Konstantinos Andrikopoulos, Charikleia Prochaska, Lamia Paraskopou, Konstantinos M. Paraskopou
Aristotle University of Thessaloniki, Thessaloniki, Greece
Purpose/Aim: Monolithic zirconia ceramics constitute a class of biomaterials of great interest in dental prosthodontics due to their high strength, hardness, and good optical properties. However, limited scientific information still exists on many aspects of monolithic zirconia performance, especially considering its susceptibility to low thermal degradation (LTD) and its effect on hardness and Young modulus. The aim of the present study was to investigate the nanohardness (H) and Young moduli (E*) of two monolithic zirconia ceramics before and after in vitro aging. Materials and Methods: Twelve specimens (2 x 10 x 10 mm) from two zirconia blocks (group A: BruxZir [BruxZir Solid Zirconia]; group B: Zircon BioStar [Siadent, Dr. Böhme & Schöps]) were milled, fully sintered, and mirror polished through a series of SiC papers and diamond pastes. For in vitro aging, specimens were placed in an autoclave at 121°C at 2-bar pressure for 10 hours. Surface characterization was performed with Fourier Transform Infrared Spectroscopy (FTIR), x-ray diffraction (XRD) analysis, micro-Raman spectroscopy, SEM–energy dispersive spectroscopy (SEM-EDS), and atomic force microscopy (AFM). The mechanical properties (H and E*) were investigated with nanoindentation tests before and after in vitro aging. ANOVA was used to test the statistical significance at P < .05. Results: A statistically significant effect of aging and material on the mechanical properties was recorded, with group A presenting the lowest values. While before aging, both groups presented similar values of H and E* without statistically significant differences, after aging, group B showed a slightly higher mean E* of 25% and the mean H of group B was higher by an average of 39% relative to the corresponding value of group A (P < .001), and the mean H of group B was higher by an average of 76% relative to the corresponding value of group A (P < .001). The transformation zone exceeded 50 μm, and the monoclinic phase volume fraction was significantly higher in group A. On the other hand, the mechanical properties were apparent due to the grinding and polishing procedures, while after aging, an irregular surface with uplifts and uneven rough patterns was observed for both groups (Fig 1). Significantly higher values of surface roughness were recorded after aging for both zirconia ceramics. Although after polishing both groups presented similar monolithic content, they presented quite different behavior regarding their resistance to LTD. According to data provided by the manufacturers, the slightly higher amount of Fe2O3 of group B ceramics may have contributed to the difference in aging sensitivity, as the presence of the trivalent ions Fe³⁺ may have acted as dopants, further stabilizing the tetragonal phase. Conclusions: In vitro aging resulted in a higher percentage of transformation and significantly lower H and E* for group A, suggesting higher susceptibility to LTD.

Mechanical Performance of CAD/CAM Restorative Materials After Erosive Challenge
Azra Tezvergil-Mutluay, M.M. Mutluay, K.N. Jamal
University of Turku, Turku, Finland
Purpose/Aim: CAD/CAM restorative materials are increasingly used in the restoration of worn dentition. The aim of this study was to evaluate the strength and fatigue resistance of CAD/CAM restorative materials submitted to erosive challenge. Materials and Methods: A total of 400 rectangular beams (2 x 2 x 12 mm) were sectioned from the following CAD/CAM blocks: Lava Ultimate (3M ESPE) (LU); Grandio (Voco) (GR); and Cerasmart (GC) (CS). Sectioned and sintered IPS e.max (EM) (Vivadent Vivadent) beams, as well as direct composite resin (FS) (Filtek Supreme XTE, 3M ESPE), were used as controls. The polished beams were tested either after water storage (24 hours, 37°C) or after 15-day erosive challenge in a simulated gastric juice (pH = 1.2, 15 days, 37°C). The beams were subjected to either quasi-static (n = 10/group) or cyclic (n = 40/group) four-point flexure testing using a stress ratio of 0.1 and frequency of 4 Hz to fail in hydrated conditions. The specimens were loaded to 1.2 million cycles. Data were analyzed using one-way ANOVA for quasi-static data and Wilcoxon rank sum test for fatigue data (α = .05). Morphologic analysis was obtained using SEM. Results: The baseline flexural strength of the composite CAD/CAM beams ranged between 239.4 (± 28.8) MPa for EM and 114.7 (± 28.3) MPa for FS. Significant differences were observed among the baseline flexural strength of the beams (P < .05). The four-point flexure strength, fatigue resistance, and endurance limits were significantly affected by the acid challenge (P < .05). The reduction in the flexural strength ranged between 10% (EM) and 20% for CS and FS. Conclusions: The erosive conditions tested in the present study significantly decreased the mechanical performance of the CAD/CAM restorative materials in terms of flexural and endurance limits.

120 The International Journal of Prosthodontics
The Effect on Bond Strength of New Type Tissue Conditioner with Addition of PMMA Resin

Wan-Ting Wang, Tsung-Chieh Yang, Tong-Mei Wang, Li-Deh Lin
National Taiwan University, Taipei City, Taiwan

Purpose/Aim: The in vitro test was made of titaniuum to evaluate the effect of addition of PMMA resin on tensile bond strength between new type tissue conditioner (NTU-TC) and PMMA denture base resin. Materials and Methods: A total of 480 cylinder PMMA resin blocks (Ø30 mm) (Lucitone 199, Dentply Sirona) were prepared and divided into 3 groups (n = 10 each) of NTU-TC according to the weight percentages (wt%) of PMMA resin, and PMMA resin. The study groups were (n = 10) added 2.5, 7.5, 10, 12.5, and 15 wt% PMMA into PEMA powder and mixed it with the liquid of 78.3 wt% acrylate triurate (ATBC), 8.7 wt% hyperbranched polyester (TAH), and 13 wt% alcohol. The control group added 100 wt% PEMA with the same amount of ATBC, TAH, and alcohol for comparison. The tested tissue conditioner (cross-sectional area: 707 mm²; thickness: 3 mm) was positioned between two PMMA resin blocks. After immersion in the distilled water at 37°C at 1°C for 0, 1, 3, 7, 14, and 28 days, these test specimens underwent the tensile test by a universal testing machine at a cross-head speed of 10 mm/minute. The data were analyzed using two-way ANOVA, one-way ANOVA, and Tukey HSD post hoc test (P < .05). The failure mode was observed with visual examination and stereomicroscopy among the test specimens. Results: From day 0 to day 28, an increase in bond strength was found at each test group. The significantly highest values of bond strength were found from 0.42 to 1.45 MPa in the group of 7.5 wt% PMMA resin addition. Most failures were mixed failure (53.3%). Conclusions: Within the limitations of this study, addition of 7.5 wt% PMMA resin to the NTU-TC powder showed the maximal increase on tensile bond strength to PEMA denture base resin within 28 days. Addition of the proper amount and proportion of PMMA resin is an effective method to increase the bond strength of NTU-TC and provides a reliable bonding property.

Enhanced Osseointegration and Biocompatibility of Mg-Al-LDH Nanosheet Patterned Pole-Sealed PEO Bilayer Coating on Magnesium Alloys

Jie Wang, Feng Peng, Xiaolin Wu, Lingyan Cao, Ao Zheng, Xuyang Liu, Xinquan Jiang
Shanghai Jiao Tong University School of Medicine, Shanghai, China

Purpose/Aim: Magnesium (Mg) and its alloys could self-degrade to avoid a second surgery for bone removal, enabling the promotion of bone repair with proper mechanical properties. However, Mg's high rate of degradation leads to an excessive inflammatory response, hindering a good binding with Mg and bone tissue. Endowing Mg with a favorable degradation rate and osteoconductive properties is of great importance in clinical practice. Materials and Methods: A multifunctional bilayer composite coating was designed to improve the bonding interface with bone tissue. Results: The observations carried out under the SEM microscope. Results: The observations carried out under the SEM microscope. Conclusions: The Mg-Al-LDH nanosheet patterned bilayer coating on Mg is expected to provide a new idea and theoretical basis for the clinical application of Mg.

Effect of Er:YAG Laser Decontamination Process on the Surface of Two Titanium Alloys

Kamila Winiowska, Wojciech Zakrzewski, Rafał Wiglus, Zbigniew Rybak, Olga Szczynowska, Patrycja Szymczyk, Kinga Grzech-Lesniak, Krzysztof Dudek, Maria Szymonowicz, Maciej Dobrzenski
Wrocław Medical University, Wrocław, Poland

Purpose/Aim: The in vitro test was made of at least two titanium alloys that are commonly used in implantology were subjected to Er:YAG laser using various exposure parameters and then subjected to observations under SEM to determine the safety of lasers in decontamination of the implant surface in terms of integrity of implant surface structure. Materials and Methods: The cubic model test was made of titanium-vanadium and titanium-niobium alloys. The material was exposed to an Er:YAG laser (LightWalker, Fotona) with a wavelength of 2.940 nm. Individual samples were treated with various laser light parameters to investigate their effect on the surface of the material. Thermacam P640 thermal imager (FLIR) was used with a visible range of 7.5 to 13 μm and a 640 x 480 pixel matrix. In the second stage of the study, the material was subjected to observations under the SEM microscope. Results: The observations carried out under the SEM microscope showed no changes in the surface of the material after the use of the Er:YAG laser with moderate power. However, it has been shown that the use of high power can damage the surface of the alloy, which creates microscopic inequalities susceptible to bacterial colonization. Conclusions: Nowadays, laser devices with the use of moderate power could be applied in the treatment of peri-implantitis thanks to their bactericidal effect. The Er:YAG laser can be a clinically acceptable method of decontamination of titanium alloys, provided that the device is carefully cared for during operation, especially the time and exposure parameters and sufficiently intensive cooling system. Otherwise, it could result in damage to bone and weakening of the implant itself, are a niche for colonization of oral bacteria, which can lead to an increased risk of peri-implantitis.

Biology in Prosthodontics

Effect of Denture Wear on Residual Ridge in Edentulous Patients: Case-Control Study

Arwa Alsagag, Michael Fenlon
Umm Al-Qura University, Mecca, Saudi Arabia; King’s College London, London, United Kingdom.

Purpose/Aim: The aim of this study was to investigate the effect of complete denture wearing on residual ridge resorption in edentulous patients compared to edentulous patients who had never worn dentures. Materials and Methods: As part of this study primarily investigating factors associated with ridge resorption and the influence of denture wear, the denture wear group was defined as patients who had been edentulous for at least 5 years. Patients who had been rendered edentulous in one arch before the other arch were excluded because of the possibility that resorption might be accelerated in the edentulous arch. Patients who were smokers, those taking steroids or bisphosphonates, and those with histories of autoimmune diseases or osteoporosis at any time during their period of edentulousness were excluded. The inclusion and exclusion criteria, patients were chosen from the database. Case and control groups were matched for age, sex, and time since being rendered edentulous. Statistical analyses were undertaken using Pearson’s chi-squared test and Fisher exact test, as the data were categorical and some of the cells in the contingency tables contained small numbers. Results: A total of 30 patients who had not worn dentures for 5 years or more and who met the inclusion criteria were identified. These were matched with 30 controls. All participants were the same age (within 2 years). The study group patients had been edentulous for the same number of years or within 2 years of their respective controls. There was no significant difference between age and time since being rendered edentulous between cases and controls. Conclusions: The authors concluded that wearing complete dentures for more than 5 years has a massive effect on the amount of ridge resorption within a period of 5 years.

Effect of Low-Level Laser on Biologic Behavior of Implant Abutment Materials

Maria Chatziparaskeva, Anna Theocharidou, Athina Bakopoulos, Lamprini Papadopoulou, Petros Koids
Aristotle University of Thessaloniki, Thessaloniki, Greece

Purpose/Aim: Although titanium abutments’ clinical success is well documented, titanium base abutments were introduced in order to combine the benefits of having a titanium-to-titanium connection with high esthetics. Recently, lithium disilicate ceramic (LDS) was investigated as a veneering material for titanium-based abutments due to its high translucency and superior optical properties, along with LDS all-ceramic restorations. In the literature, there are few in vitro studies investigating the mechanical properties of LDS, although potential cytotoxicity for dental all-ceramic systems has already been reported. At the same time, the biostimulatory effect of a low-level laser (LLL) on cell proliferation and soft tissue healing is well documented. The purpose of this in vitro study was to evaluate the effect of LLL on the biologic behavior of implant abutment materials. Materials and Methods: Primary cultures of human gingival fibroblasts (HGFs) were established from the gingival tissues of a healthy donor and developed in DMEM culture medium, supplemented with 10% FBS and antibiotics/antimycotics (approval by the Ethical Committee of the Institutional Review Board).
The International Journal of Prosthodontics

Board. HGFs (3 × 10^4 HGFs/well) were seeded in 24-well plates. Two experimental groups of LDS and Ti (with and without SLLS) and two control groups of Teflon and cells (with and without SLLS) were examined. Twelve samples were prepared for each group, and the experiments were performed in triplicate. After 24-hour incubation with 5% CO₂ at 37°C, Ti was irradiated with a diode laser (Epic Diode Laser, Biolase; 940 nm, 0.2 W) at 15 J/cm² fluence. Cell viability and proliferation were evaluated using MTT assay at 24 hours, 48 hours, and 72 hours after LLLI. SEM (Jeol JSM 840A) and EDX analysis were performed for evaluation of HGF morphology and proliferation of surface composition quantification. Live/dead cells with immunofluorescent labeling was visualized using confocal microscopy (Nikon EZ-C1). Statistical analysis of the data was performed with SPSS (P < .05). Results: Mitochondrial activity of HGFs increased significantly at 24 hours only in the case of the LLLI + Ti group, while the Teflon + SLLS group presented statistically significant increases of HGFs at 48 hours and 72 hours (P < .001). Statistically significant differences presented between cell groups and the LLLS-LDS and Ti groups. SEM and confocal microphotographs confirmed the results of the MTT assay. SEM microphotographs presented well-spread cells with a typical morphology and atrophic shape. Confocal images presented an increase in the number of viable cells both in LDS and Ti after LLLI. Conclusions: Under the limitations of this in vitro study, a positive effect of LLLI at 15 J/cm² on HGF proliferation was reported. This biostimulatory effect could trigger further studies in order to establish a clinical protocol of LLLI for HGFs neighboring implant prosthetic materials.

Apopotic and Autophagic Effects of Dental Alloys Manufactured by Different Methods Based on 3D Oral Mucosa Model

Hui Cheng, Yuan Liu
Fujian Medical University, Fuzhou, Fujian, China

Purpose/Aim: Based on the establishment of a 3D oral mucosa model (3D OMM), the purpose of this study was to study the apoptosis and autophagy levels in human oral mucosa under the influence of dental alloys. This study provides an experimental basis and guidance for the selection in clinical work of dental alloys made by different manufacturing methods. Materials and Methods: Seven groups of dental alloy specimens were fabricated, including cast Au-Pt alloy; cast Co-Cr alloy; CAD/CAM–milled Co-Cr alloy; SLM Co-Cr alloy; cast commercially pure titanium (cp-Ti); CAD/CAM–milled cp-Ti; and SLM cp-Ti. All materials were immersed in cell culture medium for 72 hours for preparation of specimens extracts. These specimens extracts were used to simulate 3D OMM, and the tissues were embedded for immunofluorescence double staining to detect Caspase-3, TUNEL, p62, and LC3B. The results were compared to analyze the effects of different manufacturing methods on apoptosis and autophagy levels. Results: Immunofluorescence double staining showed that Co-Cr can induce early apoptosis and autophagy of oral mucosal cells, while cast Au-Pt alloy had the highest levels of Caspase-3 and TUNEL. At 24 hours, there were twice as many MC3T3 cells adherent on SBAES than on MS; also, a fibronectin coating on the surfaces was capable of reducing this effect dramatically. At 10 minutes, there were twice as many MC3T3 cells adherent on SBAES than on MS. At 1 day, both surfaces sustained cell viability, but SBAES behaved better for cell proliferation. The difference between SBAES and MS was progressively reduced along with osteogenic differentiation. Conclusions: The capability of biomaterials to osseointegrate can be predicted based on in vitro behavior of osteoblasts. The authors characterized one of the most relevant and commercially representative surface configurations attainable subtractively. SBAES promoted higher FN adsorption and more efficient cell adhesion on the SBAES compared to MS. Therefore, the difference was almost absent after a longer period of osteogenic induction.
Digital Fabricated Glass-Ceramic Versus Nanoceramic Veneers: A Split-Mouth Study
Elif Aygun Cimentepe, M. Erhan Comlekoglu, Pinar Ates
Ege University, Izmir, Bornova, Turkey
Objective: To evaluate the clinical performance of laminate veneers fabricated with two different materials. Materials and Methods: Fourteen patients received 28 digitally fabricated veneers (Cerec 3D, Dentply Sirona) (n = 14 leucite [L] glass-ceramic [IPS Empress CAD, Ivoclar Vivadent]; n = 14 resin nanoceramic [R] [Lava Ultimate, 3MESPE]), which were adhesively cemented (Variolink N). All patients were recalled at 6 and 12 months for clinical evaluation according to FDI criteria using IBM SPSS 20.0 software (Friedman test with Bonferroni correction and Dunnnett test; α = .05) and Kaplan-Meier comparison. Results: At the end of 12 months, seven failures (one total debonding in group L, six veneer fractures in group R) occurred. Duration in the mouth was 7.643 months in group L and 11.357 months in group L. Esthetic mean rank scores for group R were 27.5, 59.78, and 66.64 at 0, 6, and 12 months, respectively; while for group L, the scores were 27.5, 35.64, and 37.92 at 0, 6, and 12 months (P = .005). Functional mean rank scores for group R were 30.5, 60.64, and 63.14 at 0, 6, and 12 months, respectively, while for L, the scores were 30.5, 33.85, and 36.35 at 0, 6, and 12 months (P = .001). Clinical evaluation mean rank scores for group R were 26.5, 61.71, and 68.57 at 0, 6, and 12 months, respectively, and for group L, were 26.5, 34.71, and 37.00 at 0, 6, and 12 months (P = .002). Group L showed higher esthetic and functional properties. All conclusions were supported by statistical analysis. Results: The bond strength was not statistically significant in NTP-treated ceramic groups, and the predominant failure type was mixed. SRX showed higher bond strengths than Z in ceramic groups treated with HF + PS (P < .05). VM showed higher bond strengths in Z resin cement groups treated with PS or NTP and P > .05 than EC (P < .05). HF increased the bond strength regardless of ceramic and cement type (P < .05). Conclusions: NTP pretreatment has no significant effect on the bond strength of glass-ceramics to resin cements when the ceramic surfaces are also treated with saline.

Learning Curve of an Intraoral Digital Scanner on Natural Abutments
Luigi Federico D’Arienzo, Marina Pecciarini, Annalisa Biogioni, Nicola Discepoli, Marco Ferrari
University of Siena, Siena, Italy
Purpose/Aim: The aim of this in vivo study was to evaluate the presence of a learning curve in taking intraoral digital impressions of natural abutments. Materials and Methods: A patient who showed an indication for fixed prosthetic rehabilitation in the anterior maxillary sector (1.3–2.3) was selected. Two operators, one with a good level of experience and one without any experience with the intraoral digital scanner, performed 20 intraoral digital scans of the maxillary anterior region using Aada IOS software 3.0 in “prosthodontics” mode and precision modality, strictly following the manufacturer’s instructions. The protocol used for the impressions was divided into three phases: preparation, scanning, and criteria control. The time required for each step and the total amount of time needed were recorded and evaluated statistically using simple and multiple analysis of variance ANOVA and MANOVA tests with Bonferroni multiple comparisons test (P < .05). Results: There were statistically significant differences for the total time recorded only in the first four impressions between the two operators; conversely, there were no statistically significant differences for the operators during the
following scans. The presence of a learning curve was observed in direct digital impressions, but there was no difference between the operators. Both operators showed a progressive reduction of the time needed to scan until they reached a plateau of 2.27" to 2.44" per scan shot. Conclusions: In order to complete the intraoral digital scanner to take impressions of abutments, clinicians should take into account the need to learn how to use the device in that oral environment. Several scans are required to achieve standardized repeatable digital impressions of an acceptable quality. The time needed to take a digital impression in the present study was very reasonable.

Evaluation of the Accuracy of Four Intraoral Digital Scanners When Used by Untrained Dentist
Arturo Dian, Maria Giulia Pulcini, Marta Giovannardi, Carlo Vitelli, Juan Manuel Gone Benites, Matteo Bovio, Clottilde Austoni, Matteo Basso
University of Milan, Milan, Italy
Purpose/Aim: Intraoral scanners are described as precise and easy-to-use tools even for less experienced professionals. However, little data are currently available on the ability of these devices to produce precise and reliable images in real conditions of use, even in inexperienced hands. This study aims to evaluate the precision and accuracy of different intraoral scanners used by a young dentist who had never used digital technologies for in vivo oral impressions. Materials and Methods: Four digital scanner models that were not AADOVA: IOS100 (3shape); and CS3600 (Carestream Health). A single patient was selected as an in vivo scan model. Three reference points were placed on the patient’s teeth in the maxillary left arch. For each device, five scans of the arch were performed by a single operator with poor experience in using digital scanners, according to the manufacturer instructions (scan path and movements). Scan time, number of interruptions, and postprocessing time were recorded. A PVS impression was taken to obtain a gold standard for comparison. The distances between the three reference points presented on each 3D model were measured by three different operators using Intra software (version 6.8.5, Gfai). For continuous variables, the mean, standard deviation, minimum, median, and maximum were calculated. For categorical variables, absolute and relative frequencies are reported. Moreover, for each device, a one-way ANOVA was implemented and Dunnett test applied in order to compare all the mean differences of all the scanners to the gold standard. Results: The mean scan time was 3.57" for IOS 100 (average 3.6 interruptions per scan); 2.01" for CS3600 (0.2 interruptions); 2.23" for Trios (3.0 interruptions); and 2.15" for Emerald (1.6 interruptions). IOS100 proved to be the fastest in preparing the model (postprocessing) with 18.4", followed by Emerald (21.8"), Trios (23.4"), and CS3600 (35.8"). Repeatability of the scans was very high since little standard deviation was reported between each set of five scans. No statistical differences were reported between different devices. Conclusions: All tested devices appeared to be equally accurate and precise for prosthetic procedures, even if used by a less experienced operator. IOS100 seemed to be the slowest in scanning time, but the most manageable, being the smallest device and the most comfortable for the patient. CS3600 had the smallest device and the most comfortable for the patient. CS3600 had the easiest scanning procedure, together with Trios 3, but this last appeared to be the most accurate. Convergent and unpredictable.

Evaluating the Color Stability of Various Denture Liners: Comparison of CIE and CIEDE 2000 Formulas
Fidan Hasanazade, Merve Tanis Çakirbaky, Kürsat Eser
Gazi University, Ankara, Turkey
Purpose/Aim: The purpose of this study was to evaluate the color and form stability of three soft denture liners. Materials and Methods: Three soft liner materials (Trusoft, ViscoGel, and Hydrocast) were used for this study. A total of 40 specimens per each soft liner was used, for a total of 120 specimens prepared in dimensions of 10-mm diameter and 2-mm thickness. Specimens of each denture material were divided into three subgroups (n = 10) and then stored in one of the following solutions for 14 days: distilled water; black tea; rosemint tea; or green tea. Storage solutions were renewed daily. Color coordinates of each specimen were determined before and after storing in solutions using a spectrophotometer. Color differences were calculated according to both CIE and CIEDE 2000 formulas. Two-way ANOVA was performed to analyze the obtained data. Least significant difference test was used to determine the difference of means, and P < .05 was considered to be statistically significant. Correlation between the CIE and CIEDE 2000 formulas was evaluated using Pearson correlation. Results: Statistically significant differences were observed among the solutions (F = 3.49, P = .018) and soft liner materials (F = 50.82, P < .001). The interaction between the solutions and soft liners also revealed a statistically significant difference (F = 4.81, P < .001). Correlation was observed between CIE and CIEDE 2000 formulas (r = .8). Comparing different solutions, IOS100 seemed to be the slowest on sharp cusps.

Evaluation of Strain Distribution Between Milled, 3D-Printed, and Conventional Denture Base
Po-Ju Huang, Tsung-Chieh Yang, Li-Deh Lin, Wang-Tong-Mei
National Taiwan University, Taipei, Taiwan
Purpose/Aim: The purpose of this in vitro study was to evaluate the strain distributions of denture bases fabricated with different materials and methods (conventional, milled, and 3D printing) to evaluate which method was the most accurate. Materials and Methods: A PMMA resin edentulous maxillary model was fabricated with 2 mm of artificial gingiva (Monopren, Kettenbach) to simulate the oral mucosa. The following six different resin materials were used to fabricate the denture bases on the edentulous model: conventionally heat-cured (1) pack (Lucitone 199, Dentaspig Sirona); n = 5; and (2) press (Ivoclar Vivadent; n = 6) PMMA resin; two kinds of CAD/CAM-milled PMMA resin blocks (3/3) Bilkum; n = 5; (4) Yamahachi; n = 5; and 3D printing by digital light processing (5) BV-005, Micraf; n = 6; Base, NextDent; n = 5). Seven strain gauges (KFG series foil gauge, Kyowa) were then attached to the labial notch (Ch1), first premolar (Ch2, Ch4), post- (Ch3), across the denture (Ch5), and the tuberosity (Ch6) on each tested denture base. A static 50-N axial load was applied with each contact on the reference points three times on each specimen. Results: In Ch1 to Ch3, compressive strain was observed in the group of conventional and milled denture bases. The highest strain was shown in Ch3, with decreasing tendency from posterior to anterior. However, both 3D-printed materials presented tensile strains without a significant difference between Ch1 and Ch3. The 3D-printed group presented compressive strain without a significant difference between the six materials. Tensile strain could be observed in Ch7, and the CAD/CAM group showed the lowest strains. Two specimens were fractured in Ch1 when loading on the BV-005 group. When compared to the conventional and milled groups, the performance of strain distribution was divergent in the 3D-printed group. Conclusions: Within the limitations of this study, the conclusions were: (1) CAD/CAM—milled denture base had identical strain distribution to conventional denture base under loading; (2) the strain distribution under loading in 3D-printed denture bases was divergent and unpredictable.

Digital Aesthetic Preview for Edentulous Patients. A Case Report
Marina Imre, Elena Preoteasa, Mihaela Pantea, Ana Maria Tancu
Carol Davila University, Bucharest, Romania
Case Presentation/Background: To evaluate the use of digital dental esthetic design preview software for edentulous patients. Technique/Case Report: A female 57-year-old patient, bimaxillary edentulous and with a satisfactory general health status according to her age, presented because she was unsatisfied with the esthetics of her complete dentures, especially the form and size of the maxillary anterior teeth. The clinical technical steps for the new dentures were strictly followed, introducing the digital aesthetic preview software during the intermaxillary relationship determination.
Are Digital Impressions as Accurate as Traditional Dental Impressions?
Sunyoung Ma, Stephen Atkin, Joanne Choi
University of Otago, Dunedin, New Zealand
Purpose/Aim: The aim of this in vitro study was to investigate the accuracy of complete- and partial-arch impressions when using intraoral scanners compared to traditional impression-making protocols. Materials and Methods: A set of maxillary and mandibular models with 28 permanent teeth (Model 200, Nissin Dental Products) was used as a reference. The reference data were collected using conventional alginate impression material and a high-accuracy noncontact 3D coordinate-measuring machine (Inoxs X5, Dentsply Sirona). Six test groups were included in this study, each with 20 sets of maxillary and mandibular arches: irreversible hydrocolloid or polyvinylsiloxane impressions either poured in type II stone or scanned using a 3D intraoral scanner, and one extraoral scanner (CEREC Omnicam, Dentsply Sirona; and TRIOS 3, 3Shape). The scanning strategy for each intraoral scanner was determined as suggested by the manufacturers. The STL files were then exported into a 3D-modeling software (Geomagic Control X, 3D Systems). Each STL file was compared with the master STL file using a best-fit alignment method after excluding the unnecessary parts of the images, such as the soft tissues. Deviations were viewed by means of a color-coding render. An independent-samples Kruskal-Wallis test was performed to compare the difference between the groups, with the significance set at $P < .05$. Wilcoxon signed-rank tests were performed to assess the precision within each group. Results: The mean trueness of complete maxillary arch scans done using Cerec Omnicam (~25.2 µm ± 17.0) was significantly better than the maxillary alginate impressions scanned using the laboratory scanner (~96.8 µm ± 27.9). The average trueness of the two intraoral scanners (CEREC Omnicam: ~25.2 µm ± 17.0; TRIOS 3: ~26.2 µm ± 6.8) did not differ significantly. For partial scans, significant differences were found compared to the complete-arch scan, but this was not statistically significant. Intraoral scanners had the highest level of precision compared to the other test groups. Conclusions: Within the limitations of this study, intraoral scanners can be recommended as a good alternative for taking impressions, considering their performance in trueness and precision.

Evaluation of Abutment Tooth Color, Cement Color, and Different Thickness of CAD/CAM Blocks
Shoko Miura, Shohei Tsukada, Ryohye Yoshizawa, Masanori Fujisawa
Meikai University, Sakado, Saitama, Japan
Purpose/Aim: Shade selection is an important esthetic factor, and its accurate communication leads to successful esthetic restorations. However, studies on the colors of recently introduced CAD/CAM blocks as functions of abutment tooth color and ceramic thickness are insufficient. The purpose of this study was to examine the effects of abutment tooth color and ceramic thickness on the shade selection of CAD/CAM blocks. Materials and Methods: This study used composite resin blocks (Estelite, A3-3T, Tokuyama Dental) and zirconia-reinforced glass-ceramic blocks (VITA Suprinity FC, A3-HT, VITA Zahnfabrik) of different thicknesses (0.1, 0.2, and 0.3 mm). Each type of specimen was seated on five different colored abutment tooth materials (5.0 × 15.0 × 15.0 mm: IPS Natural Die Material, ND1, ND2, ND3, and ND9, Ivoclar Vivadent). Two try-in pastes with different lightness (H-Value and L-Value) as the cement color (Beautycem Veneer, Shofu Dental) were used. The color of the resulting specimen was evaluated using a noncontact dental spectrophotometric device (CrystaEye Spectrophotometer, Olympus) for the measurement of the color parameters at the center of the specimen. Color data were expressed as CIE L*a*b* system coordinates, and the color difference (∆E) relative to the specimen, before seating with try-in paste was calculated. Statistical analysis was performed using statistical software (JMP Pro 14.3.0, SAS Institute). The mean for each group was analyzed with one-way ANOVA. For post hoc test, Tukey-Kramer HSD test was used to determine the significant differences. Results: The L* value tended to decrease when the H-Value and L-Value of the try-in pastes were compared. As the L* value of the abutment tooth color decreased, the ∆E values tended to increase regardless of the difference in thickness or cement color. The results of the one-way ANOVA indicated that the ∆E values of specimens before seating with try-in paste were significantly different for each abutment tooth color, irrespective of the thickness or cement color. Conclusions: The L* value for ND9, which exhibited a higher ∆E values compared to ND1, ND2, and ND3 for the composite resin specimens. In the zirconia-reinforced glass-ceramic specimens, ND9 had significantly higher ∆E values compared to ND1 and ND2 ($P < .05$). Conclusions: The ∆E values of ND9 were higher relative to the specimens before seating with try-in paste. The color difference of the specimen with the abutment tooth color. The influence of different materials and different cement colors should be further considered in future research.
Fabrication of Removable Partial Dentures by Fully Digitalized Workflow: A Case Report
Hitokota Nishiyama, Asuka Taniyuchi, Minoru Senda, Shinpei Tanaka, Kazuyoshi Baba
Showa University, Tokyo, Japan

Purpose/Background: Over the last decade, the fabrication procedure for RPDs has been changed by a variety of digital technologies. This Case Report introduces a novel developed fully digitalized workflow for RPD fabrication that utilizes IOS, CAD/CAM, and RP technologies. Technique/Case Report: A 62-year-old female patient who had received a fixed partial denture (FPD) for the missing maxillary left first molar (FDI no. 25) 5 years prior was referred to the Department of Prosthodontics, Showa University for prosthodontic treatment because the abutment of the FPD (the maxillary left second premolar, no. 26) suffered from root fracture. A full-arch digital impression of the maxilla and mandible and bite registration were taken by an IOS (TRIOS3, 3Shape) at her first visit. From the STL data of the maxilla, the data of the no. 25 and 26 crowns were removed in order to design the immediate RPD. Using these STL data, the denture base was designed with CAD software and then milled with a 3D printer using PMMA. The clasps and artificial teeth were designed with CAD software. The clasps were milled from PEK blanks, and the artificial teeth from composite resin blanks. Finally, all of these components were assembled by bonding using adhesive material after surface conditioning, and the immediate RPD for the missing teeth was fabricated. This RPD was delivered immediately after extraction of tooth 25. After a 2-month healing period, the mucosa in the edentulous region was exclusively scanned with IOS. These partial STL data replaced the corresponding data of the original full-arch STL data. Each component, including clasps, artificial teeth, and denture base, were fabricated in the same manner as the immediate RPD. The frameworks of the major and minor connectors were designed with CAD software and milled from CeTi2P-A blanks. Finally, all of these components were assembled, and the definitive RPD was constructed and then successfully delivered to the patient. Discussion: The developed fully digitalized workflow for RPD fabrication changes the clinical and laboratory workflow significantly. Replacing conventional complicated laboratory procedures, such as casting into Materialise 3-matic software to compose a virtual solid model, from which a master model was produced using SLA technology to fabricate the prosthesis. SLA 3D-printing technology was used to manufacture the resin positive mold, from which an obturator prosthesis was fabricated with conventional techniques. After processing, adjusting, finishing, and polishing, the definitive obturator prosthesis was placed and adjusted for comfort and function. Conclusion: Digitization of edentulous maxillomaxillary defect models with a chairside intraoral scanner and CBCT was found to be accurate and feasible.

Mechanical Properties and Microstructure of Novel Lithium Disilicate Glass-Ceramic Block for CAD/CAM
Kento Nagaoka, Katsuhito Kato, Shigekori Akiyama, Kenji Kojima, Takahiro Miyake, Toshikiko Azuma, Keita Shiraiku, Koji Yamamoto, Tomohiro Kumagai
GC Corporation, Research & Development Department, Itabashi-Ku, Tokyo, Japan

Purpose/Aim: Lithium disilicate glass-ceramics are known to be clinically useful dental materials from the viewpoints of esthetics and mechanical properties. Initial LiSi Block, a lithium-disilicate glass-ceramic block for CAD/CAM, has been developed with a focus on single-visit treatment (no heat treatment required after milling) in addition to the advantages of lithium disilicate. The objective of this study was to evaluate the mechanical properties and microstructure of this novel lithium disilicate glass-ceramic block.

Materials and Methods: The specimens (diameter: 12 mm, thickness: 1.2 ± 0.2 mm) of Initial LiSi Block (GC), Celtra Duo (Dentsply Sirona), VITA Enamic (VITA), and VITA Mark II (VITA) were prepared and polished with #1,000 SiC paper. The bi-axial flexural strength of the materials was evaluated according to ISO 6872:2015 (n = 10). The results were analyzed with Tukey test after one-way ANOVA. To analyze the microstructure of each material, SEM observation was carried out after 5 min NaOH etching. Results: In the bi-axial flexural strength test, Initial LiSi Block showed significantly higher mechanical property than other products (P < .05). SEM observation confirmed a high density and fine crystal size of < 1 μm precipitated in the Initial LiSi Block class matrix and revealed that lithium disilicate crystals of Initial LiSi Block were smaller than crystals of other products. Conclusions: Initial LiSi Block had the highest mechanical properties. These superior mechanical properties could be achieved via the unique microstructure and fine and high-density crystals. These results suggest that Initial LiSi Block is a useful restorative dental material for single-visit treatment and long-term success.

Effects of Different Types of Intraoral Scanners and Scanning Ranges on Digital Impression Precision
Keita Miyoshi, Shinpei Tanaka, Minoru Senda, Sawako Yokoyama, Hirotaka Nishiyama, Emi Kamimura, Masayuki Takaba, Kazuyoshi Baba
Showa University, Tokyo, Japan

Purpose/Aim: The aim of this study was to evaluate the impact of type of digital scanner and the range of scanning on the precision of digital impressions made for multiple implants. Materials and Methods: A reference model of an edentulous maxilla with six implant analogs was fabricated. Scan bodies were connected to the implant analogs and named A to F in alphabetical order from right to left. They were scanned by five kinds of IOS (3M True Definition Scanner [TDS]; CS 3600 [CCS]; Cercon Omnicam [OMN]; TRIOS Scanner 2 [TR2]; and TRIOS Scanner 3 [TR3]) and a laboratory scanner. These STL files were repeated five times by each scanner, and STL data were captured. In order to evaluate precision, every possible pair out of the 5 STL datasets and each impression method (in total, 10 pairs) were extracted and compared using a best-fit algorithm. Furthermore, in order to evaluate the effects of scanning range on precision of digital impressions, nine different ranges of interest (ROIs) were defined as follows: AB, AC, AD, AE, AF, ABC, ABCD, ABCDE, and ABCDEF. The mean discrepancies in absolute values for each ROI were calculated, and the effects of type of scanner and ROI on precision, as evaluated by the averaged discrepancy, were tested using two-way ANOVA (P < .05). Results: The effect of type of scanner and ROI on precision were statistically significant (P < .05). Precision of the laboratory scanner tended to be better than those of other IOS. This trend was found consistently independent of the ROI (AB: 3.9 ± 0.57 μm, ABCDEF: 3.9 ± 0.18 μm). Precision of the three IOS was comparable with that of the laboratory scanner when the ROI was limited to AB (TDS: 0.6 ± 2.3 μm, OMIN: 0.6 ± 2.3 μm, CC: 21 ± 6.1 mm, OMN: 19 ± 1.4 μm, TR2: 29 ± 10 μm, TR3: 27 ± 8.2 μm). Conclusions: Within the limitations of this in vitro study, it can be concluded that the precision of digital impression impressions by IOS would be reliable provided that the scan range is confined to two neighboring implants, such as in a three-unit suprastructure supported by two implants.

Comparison of Mandibular Movements Between CAD and Conventional Articulator
Miyako Nobita
Morita Dental Office, Kitakyushu City, Japan

Purpose/Aim: It remains unknown whether a conventional articulator or CAD is preferable for fabricating accurate prostheses. The prosthesis fabrication procedure influences the reproduction of mandibular movement. The aim of this study was to compare the accuracy of two kinds of CAD and conventional articulators in reproducing mandibular movements. Materials and Methods: Six participants who did not exhibit TMD were selected for this study. Gypsum models and interocclusal records were collected for each participant. The interocclusal record was considered as the control group. Three types of mandibular movement were performed using two digital articulators (inLab CAD SW, version 1.62, Dentsply Sirona; Ceramill EasyMind, Amann Girrbach) and one conventional articulator (Artex, Amann Girrbach). The subjects were divided into three groups as follows: group 1: anterior guidance; group 2: lateral mandibular movement of the working side; and group 3: nonworking side. This study attempted to measure the distance of the disocclusion as the vertical distance from the mesial cusp of the first molar to the pairing tooth with each of the three articulators. The results were calculated using mean ± SD and median and were analyzed using two-way ANOVA with Tukey HSD, Fisher LSD, Bonferroni, REGWQ, and two-sided Dunnett test (P < .05) (XLSTAT 2019). Results: Mean ± SD anterior guidance showed very similar values in all test and control groups (P > .05). The lateral mandibular movement working side and nonworking side exhibited approximately similar mean ± SD values in all test and control groups. Conclusions: There were no significant differences between the analog and digital articulators and interocclusal record regarding mandibular movements.
of frameworks, arrangement of artificial teeth, or resin polymerization, with digital workflow simplified the manufacturing process significantly. Besides, since all data used throughout the treatment processes were digitized, these data can be stored without spatial limitations and utilized for long-time use after the prosthodontic treatment. Conclusions: Within the limitations of this clinical case report, the reported techniques have a potential to change clinical and laboratory workflow for RPD fabrication from analog to digital.

Multidisciplinary Management of Missing Maxillary Lateral Incisors in Patient with Oblique Occusal Plane: Case Study Mehmet Fatih Özmen, Funda Bayindir Atatürk University, Erzurum, Turkey Case Presentation: Background: The purpose of this case study was to inform about the rehabilitation of the esthetic region with different esthetic problems, such as hypodontia and oblique occlusal plane. Case Report: A 24-year-old female patient presented to our clinic with esthetic complaints. The patient did not have maxillary lateral incisors congenitally and was oblique in the occlusal plane. The patient also had an unsuitable implant-supported fixed restoration in the anterior region that made the rehabilitation harder. It was decided to replace the restoration with esthetic material, and periodic help was received from Periodontology to revise the soft tissue arch. The smile arc was remanaged with esthetic material e-max Press in golden ratio and restoration of maxillary canines and premolars, as well as maxillary lateral incisors in molar and premolar areas, with laminate restorations and full crowns in a full-ceramic restoration. Discussion: Orthognathic and orthodontic rehabilitation were needed in this case; however, the patient had neither the time nor the economic and psychological conditions to meet these requirements. Conclusion: Suitable and esthetic smile designs should be offered by the interdisciplinary team in order to satisfy the patients with different dental problems. Clinical Implications: Prosthodontics always provides patients with rapid and acceptable solutions with the use of esthetic materials and esthetic indications.

Digital Smile Design in the Interdisciplinary Management of an Attrition Patient: Four-Year Follow-up Carlos Parra Andrés Bello National University, Santiago, Chile Case Presentation: Communication within the different parts of the interdisciplinary team is of utmost importance in order to deliver good results in a functionally/esthetically challenging case. Digital Smile Design as a communication instrument allows better understanding and more accurate information transmission within the team. The following clinical case used digital smile design as a means of evaluation and communication in the treatment planning and execution of an extensive fixed prosthodontics case by means of extensive reconstruction with a fixed lithium disilicate tooth-borne construction. A 43-year-old male patient presented to the prosthodontic clinic in Santiago, Chile, with a chief complaint of unesthetic anterior tooth wear, describing difficulty in cutting thin articles with the anterior teeth. Upon clinical examination, severe tooth wear in the anterior plane was observed. An altered plane of occlusion was noticed. Full photo/video evaluation and digital smile design protocol were applied. This protocol improves communication within the interdisciplinary team and allows the prosthodontist to provide the information required by the lab technician in order to provide an esthetic wax-up. This esthetic wax-up, tried in as a mockup, is followed by the functional wax-up, which will then be used as a template for esthetic crown lengthening, as well as crown prep, provisional, and final restorations. Full-crown monolithic lithium disilicate restorations were used for reconstruction of a severely worn dentition, altered occlusal plane, and functional alterations; loss of anterior guidance reconstruction; and establishment of an adequate occlusal plane and anterior esthetics. The digital smile design protocol provides an excellent way to communicate within the interdisciplinary team and allows interaction among all members of the team in order to provide the best standard of care in restoring an esthetically challenging restorative case. Up to 4 years of case follow-up is presented.

Study on the Clinical Effects of Difference Between Digital and Traditional Impressions for Fixed Restoration Wu Qianju, Xinquan Jiang, Zhisheng Zhang, Di Jin, Yi Zhang, Zhiming Liu, et al. Peking University 1st Shanghai Jiaotong University, Shanghai, China; Xiamen Medical College; Xiamen, Xiamen, China Purpose/Aim: To compare the clinical effects using digital and traditional methods of impression techniques and stored in different groups: PMF restoration (A) or ceramic crown (B). In group A, two approaches (A1: digital impression; A2: traditional impression) were conducted with Cerec Omnicon scanning and traditional silicone rubber impression, respectively, and the same procedures were performed in group B (B1: digital impression; B2: traditional impression). Intraoperative emotional tension was evaluated, and clinical efficacy—i.e., marginal adaptation and periodontal index—was also investigated statistically. Results: Statistical significance could not be found between the two manufacturing methods for the ceramic crown group on clinical effect (P > .05), while there was a statistical significance in the PMF crown group (P < .05). Moreover, it was demonstrated that emotional tension could be reduced remarkably by digital impression. Conclusions: Full-crown restorations created with a digital system could achieve good clinical results compared to those created with a traditional impression. Rehabilitation based on the digital technique showed an advantage over the traditional from the aspect of clinical experience with more comfort, which could take the place of traditional impressions and provide new guidelines for future clinical practice.

Physical Properties of New Hybrid Resin Block for CAD/CAM Takumi Shoji, Takayuki Ueno, Tomohiro Kumagai GC Corporation Research & Development Department, Tokyo, Japan Purpose/Aim: Hybrid resin blocks for CAD/CAM are known to be a useful material for clinical use. In recent years, hybrid resin crowns for CAD/CAM have been approved by the Food and Drug Administration. Recently, the next generation, CERASMART300, was launched only in Japan. CERASMART300 has superior mechanical properties because it utilizes a new silane coupling agent and improves the interface between the inorganic filler and the resin matrix. The purpose of this study was to evaluate the physical properties of the new material and other products in the marketplace. Materials and Methods: Five products were selected for analysis: (1) CERASMART300 (GC); (2) Tetric CAD (Ivoclar Vivadent); (3) Grandio Blox (VOCO); (4) multiColor (VITA Enamic); and (5) LAVA Ultimate (3M ESPE). These blocks were evaluated with the 3-point bending test and the 3-body wearing test. The specimens of the 3-point bending test were prepared in accordance with ISO6842, and the test was conducted using Autograph (AG-iS, Shimadzu) with a crosshead speed of 1 mm/minute. The specimens of the 3-body wearing test were prepared by milling and conducted with an original wear test machine for 200,000 cycles (load 0.84 MPa). The antagonist was a PMMA disc, and a slurry mixture of PMMA and glycerin was applied to the contact area during the test. The wear value of specimens was calculated from the difference of specimen height before and after the wear test. All results were analyzed using one-way ANOVA (P < .05). Results: According to the results of the 3-point bending test, CERASMART300 showed the highest flexural strength of 3-body wear test. The CERASMART300 showed the lowest value, but there were no significant differences among the products except for Enamic Multicolor. Conclusions: From all results, CERASMART300 exhibited the highest flexural strength and lowest wear value. Therefore, it is expected that CERASMART300 is a durable material and may have clinical advantages.

Shear Bond Strength of Resin Cement to Zirconia Ceramic After Aluminum Oxide Sandblasting Nevin Tas, Sebnem Yılmaz, Isil Cekic-Nagas, Ferhan Eglmez Gaziantep University, Ankara, Turkey Purpose/Aim: Various surface treatment methods have been suggested for zirconia to obtain high bond strength to resin cements. The aim of this study was to evaluate the effect of aluminum oxide sandblasting with various propulsion pressures on the shear bond strength of Y-TPZ to resin cement. Materials and Methods: A total of 84 bar-shaped specimens (6 × 10 × 1.5 mm3) were equally divided into four groups (n = 21 each) according to test protocol. The specimens in the control group received no surface treatment. The other groups received airborne-particle abrasion with 110-μm Al2O3 particles at 200 kPa, 400 kPa, or 600 kPa (2-bar, 4-bar, and 6-bar pressure, respectively). Then, zirconia specimens embedded in plastic rings with autopolymerizing acrylic resin as the abraded surfaces were on top and stored in distilled water at 37°C. A total of 84 disk-shaped composite specimens were fabricated (φ = 6 mm, h = 2 mm). Control and sandblasted zirconia groups were then divided into three subgroups. Composite disks were prepared onto the abraded surface specimens with a double-cure resin cement (Panavia V5) with different film thicknesses (100 μ, 150 μ, and 300 μ). After they were stored in distilled water at 37°C for 24 hours, the shear bond strength test was performed at a crosshead speed of 1 mm/minute. Data were analyzed using two-way ANOVA and Tukey HSD test for multiple comparisons (P < .05). Results: Shear bond strength showed a significant difference between the control and sandblasted groups (P < .05; F = 11.625) and cement treatment modes. More comfortable, which could take the place of traditional impressions and provide new guidelines for future clinical practice.
film thickness \( (P < .05, F = 34.59) \). All sandblasted groups (2MPa, 4MPa, and 6 MPa) exhibited significantly higher bond strengths than the control group \( (P < .05) \); however, no difference was observed among sandblasting with different pressures \( (P > .852) \). On the other hand, the ranking among the groups follows: 300 µm > 100 µm > 500 µm. In addition, the highest SBS was recorded in the 2 MPa–100 µm group, followed by the 4 MPa–100 µm group. Conclusions: Cement film thickness should be as thin as possible. Sandblasting increased the bond strength of zirconia compared to control. For bonding zirconia to resin cement, 2 and 4 MPa seem to be suitable when the cement film thickness is 100 µ.

### Clinical Dilemmas in Restoring Teeth in the Anterior Esthetic Region: Case Report and Literature Review

Melania Toska, Dimitra Vasilaki, Maria Bei, Konstantinos Michalakis

Aristotle University of Thessaloniki, Thessaloniki, Greece

Case Presentation: Restoration of a single tooth or of a limited number of teeth in the anterior esthetic region is always a big challenge, as the restorative dentist must not only match the shape, color, and texture of the restorations to those of the adjacent natural teeth, but must also handle the surrounding soft tissues very carefully. The problem becomes even bigger when a full implant prosthesis presents a high smile line. In these cases, even minor soft tissue defects (ie, recession) may compromise the final esthetic result. Soft tissue grafting has been advocated as a possible solution for this problem. Use of pink ceramics can offer an alternative solution if the patient refuses to undergo additional treatment procedures due to time or financial restrictions. The present study provides a systematic review, through a case report and review of the literature, critical points for the fabrication of restorations in the anterior esthetic zone, including proper material selection, margin design, and placement, impression procedures, and mode of fabrication (analog vs digital). Furthermore, it rationalizes the restorative dentist's decision on which approach to follow (soft tissue grafting vs pink ceramics) when a patient presents with previous restorations not satisfying their aesthetic expectations. The Pink Esthetic Score (PES) and the White Esthetic Score (WES), which were introduced for the evaluation of implant-retained anterior restorations and the adjacent peri-implant tissues, and their application on restorations retained by natural teeth is also examined.

### Comparison of Accuracy of Complete Dentures Fabricated with CAD/CAM Technology

Fu-Chuan Tsai, Tsung-Chieh Yang, Tong-Mei Wang, Li-Deh Lin

National Taiwan University, Taipei, Taiwan

Purpose/Aim: The study aimed to compare the reproducibility of the occlusal surface and dimensional accuracy of complete dentures fabricated with digital technologies (CNC milling vs rapid prototyping). Materials and Methods: Two maxillary and mandibular edentulous models (EDE1001-UL-UP-FEM, Nissin) were mounted on a semi-adjustable articulator (Articulator Vivadent). Then, the models were scanned with an optical scanner (3Shape Trios) and the data were processed with the Dental System. The models were printed with two different digital materials using a 3D printer (WES). Then, the printed models were surveyed with a tactile scanner (3Shape TRIOS) and the measurements were made at the occlusal surface. Results: The results showed that the dimensional accuracy of the CNC-milled dentures was better than that of the rapid prototyped dentures. Conclusions: The study results indicate that CNC-milling technology is a reliable and accurate method for fabricating complete dentures with high dimensional accuracy.

### The Peel Bond Strength Between 3D-Printed Custom Tray Materials and Elastomeric Impression/Adhesive Systems

Yichen Xu, Fabian Hüttig, Christine Schille, Ernst Schweizer, Jürgen Geis-Gerstorfer, Sebastian Spintzyk

Tübingen University, Tübingen, Germany

Purpose/Aim: The digital workflow of CAD and additive manufacturing has gained popularity in prosthodontic dentistry and shown promise in facilitating the fabrication of custom trays. The present study aimed to evaluate the bonding of three 3D-printing custom tray materials with three elastomeric impression/adhesive systems. Materials and Methods: Custom trays were fabricated using a digital denture mold, the final impression material, and the resin cement. The bond strength between each tray material and impression/adhesive system was measured using the three-point bending test. Results: The peel bond strength of the 3D-printed custom tray materials was compared with that of a conventional light-curing resin. Materials and Methods: CAD-designed test blocks were printed using AM technologies, including stereolithography (SLA), digital light processing (DLP), and fused filament fabrication (FFF). The test blocks were then scanned by the 3Shape TRIOS and different adhesive systems were applied to the printed trays. The strength measurements were carried out using a three-point bending test. The data were analyzed using statistical tests. Results: The peel bond strength of the 3D-printed custom tray materials was significantly higher than that of the conventional light-curing resin. Conclusions: The use of 3D-printed custom trays can improve the accuracy and efficiency of the dental impression process. The selection of the appropriate adhesive system is crucial for achieving optimal bond strength.

### Prosthetic Options and Considerations for the Missing Tooth in the Anterior Esthetic Region

Dimitra Vasilaki, Maria Bei, Melanie Toska, Konstantinos Michalakis

Aristotle University of Thessaloniki, Thessaloniki, Greece

Case Presentation: Anterior tooth loss presents a significant esthetic challenge for restorative dentists. Many treatment modalities have been described in the literature as available options for replacing a single missing tooth in the anterior zone. These include: restorative retained by a dental implant, FDP, resin-bonded FDP, and orthodontic space closure. The present study evaluated the systematic review in order to identify the preferences and efficacies of different treatment options for the single missing anterior tooth. Materials and Methods: An electronic MEDLINE search was conducted by three independent reviewers to identify English-language articles published in dental journals between January 1990 and December 2018 reporting on the treatment of a single anterior maxillary tooth. The search terms were categorized into the four groups comprising the PICO question. Supplementary manual searches of published full-text articles and reviews were also performed. Results: The initial database search did not identify any RCTs; furthermore, no study directly comparing the different treatment approaches was found. The follow-up period of the treatments performed was not stated in most of the articles. Conventional FPDs have been used to allow the replacement of missing teeth for many years, providing both strength and esthetics. Resin-bonded FDPs can be seen as long-term provisional restorations, with the survival rate being higher in anterior locations compared to posterior ones. Furthermore, when a crown or bridge is applied, the cantilever design is applied. Dental implants in the esthetic zone are well-documented in the literature, showing high survival and success rates. Tooth structure, periodontal tissues, available bone, financial restrictions, and patient age are some of the factors that must be considered when choosing among the previous options. Conclusions: Definitive treatment options for anterior tooth loss cannot be drawn from the clinical trials and are dependent on the different treatment approaches. All included studies reported separately on the examined treatment options and used different protocols. According to the literature reviewed, it seems that all treatment modalities are effective, and the clinicians' preferences and experience is important when choosing the treatment approach.
The color evaluation of six maxillary anterior teeth was carried out using a rinse with coffee or tea for 30 seconds four times daily for 4 weeks. Materials and Methods: no beverage (control group); coffee; or tea. All participants received staining beverage consumed during and after the in-office bleaching treatment. This RCT was registered in the Clinical Trials Registry (NCT NCT03933527).

Tooth Bleaching: A Randomized Controlled Trial

Tissue Surface Adaptation of Complete Denture Base: Using Three Different Manufacturing Techniques

Digital design and fabrication will be widely applied in fixed denture fabrication. Therefore, the digital die-fabricating technology of the distinctive design for artificial gingiva should be improved. In some cases, the die and artificial gingiva need to be carefully designed to accurately simulate the position and elasticity of the gingiva after crown-lengthening surgery and papilla reconstruction. In the described technique, the artificial gingiva is changeable as the patient’s intraoral condition and/or the doctor's decision change. The accurate fabrication of the full prosthesis was achieved based on the more stable and precise digital design of the die.

MANAGEMENT / COMPLICATIONS

Developing a Metatheory of How People Manage Tooth Loss

Conservative Management of Discolored Anterior Teeth: A Case Report

Shaoqing Zhang, Hao Yu, Hui Cheng

School and Hospital of Stomatology, Fujian Medical University, Fujian, China

Purpose/Aim: To evaluate the effects of bleaching procedures (coffee and tea) on the effectiveness of in-office bleaching. Materials and Methods: This RCT was registered in the Clinical Trials Registry (NCT NCT03933527). The participants were randomly divided into three groups according to the bleaching procedure consumed during and after the in-office bleaching treatment: no beverage (control group); coffee; or tea. All participants received two sessions of the in-office bleaching treatment with 40% hydrogen peroxide gel. For the coffee and tea groups, the participants were asked to rinse with coffee or tea for 30 seconds four times daily for 4 weeks. The color evaluation of six maxillary anterior teeth was carried out using a spectrophotometer (Easyshade, Vita ZahnFabrik) employing the CIE L*a*b* system at baseline (T0), immediately after the first bleaching session (T1), immediately after the second bleaching session (T2) 1 week after the end of the bleaching procedure (T3), and 3 weeks after the end of the bleaching procedure (T4). Data were analyzed using two-way ANOVA and Tukey tests (α = 0.05). Results: Sixty participants completed the study (n = 20 per group). Compared to the baseline assessment, no significant differences were observed in the E value among the three groups at any time interval; however, the L* value in the control group was significantly higher than the coffee and tea groups at T3 (P = 0.038 and P = 0.012) and T4 (P = 0.002 and P < 0.001). Conclusions: Exposure to coffee or tea during the bleaching treatment does not affect the effectiveness of in-office bleaching treatment. However, after tooth bleaching, brighter tooth color was observed in the participants who did not consume the staining beverages.

Conservative Management of Discolored Anterior Teeth: A Case Report

Shaoping Zhang, Hao Yu, Hui Cheng

Fujian Medical University, Fujian, China

Case Presentation: Discoloration of anterior teeth is one of the most frequent reasons a patient seeks dental care. In the management of discolored teeth, multiple treatments are available to enhance the esthetic outcome, from surface treatments in occlusal/interproximal areas to more complex prosthetic solutions such as veneers or crowns. Moreover, the knowledge of the mechanisms behind tooth discoloration can influence the treatment plan. Innovative digital technology—including CAD/CAM chairside technologies, digital scanner/articulator, and the introduction of novel high-translucency zirconia—coupled with modern adhesive strategies have reduced both biologic and financial costs compared to the conventional analog approach. The aim of this case report was to show how these new materials and technologies can be used in association with noninvasive/minimally invasive approaches to restore discolored, previously restored anterior teeth. This case report presents a combination of novel digital technologies—such as CAD/CAM, digital articulator, and virtual wax-up—and their applications in the high-quality restoration of discolored anterior teeth.
of how people respond comprehensively to loss of teeth. This metatheory provides a reasonable educational and clinical foundation for preparing patients and their dentists for managing extensive tooth loss.

**Predictive Factors of Outer Cortex Loss in Advanced Jaw Reconstruction**

Richelle Chuka, Afnan Al-Fouzana, Jana Rieger, Suresh Nayar, Martin Oswald, Daniel O’Connell, Jeffrey Harris, Hadi Seikaly, Hadi Institute for Restorative Sciences In Medicine, Edmonton, Alberta, Canada

Purpose/Aim: Head and neck tumor (HNT) patients are being treated with complex jaw reconstruction rehabilitation (JRR) procedures. Complex JRR involves a preoperative surgical design and simulation (SDS) using 3D digital technology for microvascular fibular free-flap reconstruction involving the posterior maxillary area. Prior osseointegrated dental implants supporting complex JRR, adjuvant treatment may be delivered if required. Surgically driven design principles and protocols have evolved in the planning and delivery of the complex jaw reconstruction to support the completion of oral rehabilitation in the JRR pathway. This study investigated factors that may influence outer cortex loss (OCL) in complex jaw reconstructions. Materials and Methods: Ethics approval was obtained for this retrospective chart review of adult HNT patients. Patients were included if they underwent primary osseointegrated dental implant placement at the time of jaw reconstruction for an HNT between January 2011 and March 2018 at the JRM. Treatment variables were analyzed to determine factors associated with OCL (TG, n = 167%). Which was measured by OCL was reported as incidence of osteoradionecrosis, osteomyelitis, or a nonhealing bone exposure. Results: A total of 62 patients fulfilled the inclusion criteria. Of these 62 patients, 29 (47%) underwent RT. RT was associated with OCL (Fisher exact test, p < .001). There was no OCL observed in the nonirradiated patients or in patients who received the modified protocol. The authors concluded that the main risk factor for OCL seems to be mitigated by changes in protocol to include HBO therapy, narrow-platform implants, and BIF. The delivery of HBO before implant exposure surgery in the irradiated jaws may decrease the incidence of OCL.

**Repeated Fractures of the Fixed Implant-Supported Metal-Acrylic Prostheses: A Case Report**

Bo Huang, Shaya Sadeghi, David Chvartszaid

University of Toronto, Toronto, Ontario, Canada

Case Presentation: Background: Dental implants are a predictable treatment option for patients with complete or partial edentulism. The implant success rate is high; however, prosthetic complications are frequent. One of the most common prosthetic complications with fixed full-arch implant-supported prostheses is fracture of the veneering material, including acrylic. Objectives: The current paper aimed to describe a significant fracture of a patient with a history of repeated fractures of fixed implant-supported metal-acrylic prostheses and to review the benefits and limitations of different restorative materials. Clinical Scenario: A 60-year-old ASA II male patient presented seeking a solution for repeated fractures of his fixed implant-supported metal-acrylic prostheses. The patient’s definitive treatment plan involved a transition to a zirconia-based prosthesis design with the optimized metal-acrylic prosthesis design as the prototype. Discussion: The risk factors causing the resin-related complications were extensively discussed in the 5-year report; briefly, mechanical factors such as occlusal load, force direction, and option of the restorative materials played a major role. In this case, the etiologies for repeated fractures of the acrylic portion of the prosthesis were identified as extensive occlusal force, suboptimal occlusal scheme of the restorations, and inadequate material strength. Management of a patient with repeated fractures has to focus on eliminating or controlling the etiologies, addressing the patient’s chief complaint, and preventing further complications.

**Posterior Maxillary Osteonecrosis of Jaw-Related Dental Implants: A Retrospective Study**

Sun Jinho Kim, Junghyun Park, Angene Alfafara

Ewha Woman’s University, Seoul Hospital, Seoul, South Korea

Purpose/Aim: It has been established that there is a direct relationship between conditions such as odontogenic apical infection and degenerative changes in the antral mucosa, leading to sinusitis. Medication-related osteonecrosis of the jaw (MRONJ), a side effect of long-term bisphosphonates and antiresorptive drug administration, has been reported to be one of the predisposing factors for sinusitis. This study aims to investigate the treatment and progression of MRONJ in patients with maxillary sinusitis. Materials and Methods: IRB-approved patients with MRONJ and with or without concomitant maxillary sinusitis in the Ewha Woman’s University Mokdong Hospital from January 2006 to July 2017 were included in the study. Patients were randomly assigned to a control group (CG: sequestrectomy alone) or a test group (TG: sequestrectomy and regeneration using PRF + rhBMP2). CT scans and panoramic radiographs were performed as diagnostic tools. Age, sex, primary diagnosis, type, duration, and route of medication; MRONJ stage; presence of maxillary sinusitis; oroantral fistula closure; management protocols; resolution; and recurrence were evaluated. The influence of different local factors on the observed outcomes was analyzed. Results: Out of 144 patients diagnosed with MRONJ, 31 (22%) presented involvement of the maxilla, wherein the severity was classified as stage 2 or 3. Of these patients, 31 (15 in CG and 16 in TG) completed the study. Chronic maxillary sinusitis was seen in 18 (58%) patients, and an oroantral fistula was detected in 16 (52%) patients. The mean length of drug exposure was 64 months, with alendronate as the most frequently associated with the disease progression, followed by ibandronate. Treatment protocols included sequestrectomy and debridement followed by leucocyte-rich PRF and rhBMP2. The mean healing time was 24 weeks. No there was no significant difference observed in the patients of the treatment groups; however, resolution outcomes for MRONJ over sequestrectomy alone (CG, n = 15, 86%). Oroantral fistula was managed surgically with palatal rotational flap, buccal releasing flap, and membrane insertion. Twelve out of 18 (66%) patients with concomitant chronic maxillary sinusitis underwent successful endoscopic sinus surgery. Conclusions: MRONJ in posterior maxillary bone has a more severe impact compared to those who did not (n = 6, 67%). Conclusions: This study demonstrated that PRF and rhBMP2 combined treatment protocols provided a promising treatment outcome for bone regeneration and fast soft tissue healing.

**Inhibitory Effects of Vibratory Stimulus Via an Occlusal Splint on Sleep Bruxism**

Hirotaka Ohara Nakamura, Masayuki Takaba, Yuka Abe, Takeshi Suganuma, Kazuyoshi Baba

Showa University, Tokyo, Japan

Purpose/Aim: Although sleep bruxism (SB) is one of the most important clinical problems in dental practice, there is no definitive method for controlling it. The authors previously investigated the immediate effects of vibratory stimulation via occlusal splint (OS) on SB and sleep structure, which were evaluated using a portable PSG recording device and revealed a significant reduction in SB duration without controlling it. The authors hypothesized that the inhibitory effects of the OS may have confounded the found association. Therefore, this study aimed to elucidate the effects of vibratory stimulation on SB when the inhibitory effects of the OS diminished after having the subjects use the OS for 14 nights for adaptation. Methods: Fifteen healthy young adults participated in the final study, and subjects were asked daily to wear the OS for 14 nights and the number of SB episodes per hour and the total SB duration per hour were compared among the nights using Friedman test. The effects of vibratory stimulation on SB were examined in the OS group and in the control group (CG). SB and sleep variables on the two SB variables were tested using Wilcoxon signed-rank test. Results: No significant differences were found in the sleep variables throughout the experiment. The two SB variables were statistically different depending on the experimental night (P < .05). For changes over time using the OS, both SB variables decreased significantly on the first night of OS usage (P = .009 and P = .002, respectively) and then significantly increased to a level comparable to baseline on the 15th night. Regarding the effect of the vibratory stimuli applied on the 17th to 20th nights, both SB number and total duration of SB episodes per hour were significantly decreased by vibratory stimuli (without stimuli: median = 5.2, with stimuli: median = 3.9, P = .001; without: median = 35.3, with: median = 15.1, P = .002, respectively). Conclusions: These results indicate that the SB inhibition system might suppress the number and duration of SB episodes without substantial sleep disturbance even after adaptation to the OS and might be an effective tool for the management of SB.
MULTIDISCIPLINARY / MAXILLOFACIAL

Factors Affecting Mouth Opening in Head and Neck Cancer Patients: Preliminary Data in 322 Patients
Sudhir Bhandari, Sushmita Ghosal, Amit Bahl
Postgraduate Institute of Medical Education and Research, Chandigarh, India

Purpose/Aim: (1) To present preliminary data on the various factors influencing mouth opening in head and neck cancer survivors over a period of 12 months. (2) To find a possible correlation between these factors and trismus. Materials and Methods: Interincisal maximum mouth opening was measured in 322 head and neck cancer patients before the beginning of oncology treatment and then at 3, 6, and 12 months after completion of the treatment. The 1-year data obtained on mouth opening were correlated with variables such as pretreatment mouth opening; stage of the cancer (ie, extent of the pathology); site of the pathology; and type of treatment (rendered in various combinations [RT and/or surgery and/or chemotherapy]). Change in mouth opening with regard to various parameters individually and their combinations were explored and will be presented. Results: Out of 322 patients recruited, 178 completed their 3-month follow-up, and 85 completed their 6-month follow-up. A total of 108 patients were currently undergoing radiotherapy, and 36 patients were considered dropouts due to various reasons. A significant decrease in mouth opening was found at 3 and 6 months after completion of treatment in relation to pretreatment mouth opening and stage of the disease. Data obtained at 1 year show a gradual improvement in mouth opening, signifying improvement in mouth opening with period of time. In comparison to the various treatment modalities, it was found that those patients who underwent surgery and then radiotherapy had minimal mouth opening at baseline, and their mouth opening did not improve over a period of 1 year. Considering the evidence presented in the mouth opening, it was found that patients diagnosed with carcinoma of the hypopharynx, nasopharynx, and larynx did not develop trismus at any point in time, while patients diagnosed with carcinoma of the oral cavity, oropharynx, and salivary glands were more prone to develop trismus. Conclusions: All 322 patients underwent radical radiotherapy and underwent mouth opening exercises, as prescribed. Variables analyzed were: presence and severity of mucositis according to the WHO Oral Toxicity Scale and presence of xerostomia and mouth opening at any point in time, while patients diagnosed with carcinoma of the oral cavity, oropharynx, and salivary glands were more prone to develop trismus. At 1 year, mouth opening showed improvement, which may be related to natural healing and mouth opening exercises, as prescribed.

Retaining Interim Obturator in Completely Edentulous Patients with Bilateral Maxillomaxillary
Sudhir Bhandari, Mohit Dhiman, Tejomary Shastri
Postgraduate Institute of Medical Education and Research, Chandigarh, India

Case Presentation: Background: An obturator addresses the most imminent issues of nutritional insufficiency and impaired speech in patients with intraoral maxillary defects in the interim period. It is a considerable challenge for the maxillofacial surgeon to rehabilitate and retain prosthesis in edentulous patients with bilateral maxillomaxillary defects. Since such a scenario, one has to look beyond the oral cavity for sustaining the prosthesis intraorally and fulfilling the functional needs of the patient. Case Report: Four male patients were referred for prosthodontic treatment to meet their present and impending nutritional and speech issues after surgical resection of the maxilla. Three patients would also require adjuvant radiotherapy, and it was anticipated that their nutritional status would get further complicated with time. There was no plan to reconstruct the defect surgically in any of these patients. As anticipated, the conventional obturator failed to provide adequate retention in all four patients. Patients were then kept on a feeding tube and underwent a miserable period concerning their food intake and speech. An interim obturator in four edentulous male patients with bilateral maxillomaxillary defects was retained by utilizing a custom-fabricated headgear facebow assembly. Discussion: Compelling evidence is lacking with respect to treatment outcome when the defects are closed surgically in comparison to prosthetic rehabilitation. Customized headgear-retained obturators were adequately retentive and served their purpose well in all four patients. This treatment also gave the liberty to alter and refine the prosthesis at will, provided access to the operative site for a quick evaluation of disease recurrence, and was economical for the patients. Conclusion: A customized and accurately adapted headgear facebow assembly has an immense potential to function as a valuable, prudent, and extremely useful tool for a non-immediate, customized obturator in patients with extensive maxillary defects. Clinical Implications: In addition to fulfilling functional and nutritional needs, providing a prosthesis in the interim period in edentulous patients with extensive maxillary defects has an immense positive psychologic effect for future treatment.

Differences Between a Traditional and an Innovative Method of Impression to Restore a Maxillofacial Defect
Norma Bocca, Gianfranco Gassino, Massimo Carossa, Paola Ceruti, Francesco Bassi
University of Turin, Torino, Italy

Case Presentation: Facial defects result from trauma, neoplasms, or congenital malformations. Facial prostheses replace missing parts by means of adhesives or, when possible, through implants. Processing an epithe

© 2019 BY QUINTESSENCE PUBLISHING CO, INC. PRINTING OF THIS DOCUMENT IS RESTRICTED TO PERSONAL USE ONLY. NO PART MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM WITHOUT WRITTEN PERMISSION FROM THE PUBLISHER.
incidence of mucositis and xerostomia is probably due to exclusion from radiation in the maxilla and parotid glands obtained by the new mandibular position due to the stent. Limitations of this study include small sample size and sample selection bias (there were not enough patients to exclude small sample size bias), so it is unknown whether protective factors besides the oral stent that caused these improvements. Intraoral custom stents were introduced to keep the mouth open during treatment. They reduced the extent of healthy tissue exposed and kept the mandible and tongue in the same position during all sessions. Evidence on their effectiveness in reducing the frequency of mucositis is low. In accordance with several previous studies, it was found that the stent was not able to effectively reduce mucositis prevalence, but was able to reduce the severity of mucositis. Therefore, according to these results, it is presumed that an intraoral stent reduces the incidence of postradiotherapy sequelae and their severity of radiotreated patients for cervicofacial neoplasia.

Speech Improvement Using Palatal Lift Prostheses in Myopathy Patients

Gaejin Jung, Seong-Kyun Kim, Seong-Joo Heo, Jae-Young Koak Seoul National University, Seoul, South Korea

Case Presentation: Background: The palatal lift prosthesis was first proposed by Gibbons and Bloomer in 1958. This device is used to improve the pronunciation of patients with velopharyngeal incompetence. Velopharyngeal incompetence is an anatomic problem in which the nasal cavity is not separated from the oral cavity due to nerve and muscle function and the soft palate and pharynx. It is distinguished from the velopharyngeal insufficiency caused by anatomical problems. If velopharyngeal closure fails when speaking, the sound exits simultaneously through the nose and mouth, making a nasal sound. Palatal lift prostheses lift the soft palate of patients with velopharyngeal incompetence to help the velopharyngeal closure, improving pronunciation by reducing nasalance in patients with hypernasality. Technique/Case Report: Case 1: A 47-year-old man with myopathy and bulbar palsy diagnosed in 2012 was referred from the Department of Rehabilitation Medicine. At the first visit, the drooping of the lip and overall muscle tension drop was visible. Intraoral examination, the soft palate had a downward position due to insufficient muscle tension. A provisional prosthesis was fabricated with posterior wire insertion to control soft palate elevation. After nasometry check, a definitive prosthesis was fabricated and delivered. Nasopharyngeal endoscopic examination revealed improvement in velopharyngeal incompetence. Case II: A 36-year-old man with myopathy diagnosed in 2014 visited because of drooping of eye lids, and overall muscle tension drop was visible. With intraoral examination, the soft palate had been seen in a downward position due to insufficient muscle tension. The palatal lift device was fabricated and delivered to the patient. This device design was based on Greene et al, proposed a model for the nasopharynx. The type of devices designed was a prosthesis using a hard and soft polymer. Results: Intraoral examination revealed that the second patient had a significant reduction in function of surrounding muscles of the palate. In order for the device to be effective, help from the surrounding muscles is essential. Surgery is not indicated because the patient’s muscular disease is a progressive one. Prosthetic devices had good retention, so it was decided to check the current devices regularly through periodic visits. Conclusion: Palatal lift prostheses were delivered to two myopathy patients with velopharyngeal incompetence. Nasometry was used to confirm the reduction of nasal sound and improvement of pronunciation. In addition, nasal endoscopy confirmed the improvement of velopharyngeal closure. Clinical Implications: Palatal lift prostheses can help patients who have velopharyngeal incompetence improve pronunciation.

Impact of Oral Hygiene Instructions on Maxillofacial Prosthetic Patients

Sayuri Koga, Yoichiro Fujikawa Ogino, Kiyoshi Natsue Koyano Kyushu University, Fukuoka City, Japan

Purpose/Aim: The purpose of this study was to improve oral appliances (OA) to achieve high-level compliance in patients with OSA. Materials and Methods: Five female patients who had been referred by sleep physicians to Kyushu Dental University Hospital for OSA therapy with an OA were enrolled in this study. Inclusion criteria were the diagnosis of OSA with out other sleep disorders based on overnight PSG lasting at least 5 hours. Any patient exhibiting signs and symptoms of TMD and/or a history of psychologic problems and/or occlusal dysfunction was excluded from this study. All patients answered the Epworth Sleepiness Scale questionnaire ESS before OA therapy. This study was approved by the ethics committee at Kyushu Dental University Hospital (No. 12-18). All patients read and signed an informed consent. Two types of OAs were fabricated based on the same therapeutic jaw position of patients. Patient responses regarding sensation and sleeping conditions when each appliance was fitted were compared. Results: Complications with soft-type appliance were greater than with hard-type appliance in the following patient-assessed variables: ill-fitting, difficulty closing lips, excessive salivation, pain in the oral tissue, and difficulty sleeping. On the contrary, complications with hard-type appliance were greater than with soft-type appliance in the following variables: dry mouth, discomfort, difficulty wearing, occlusal change, increase in bruxism, discomfort in the TMJ area, and continuous TMJ area pain; and pain in the teeth. Sleep data from one patient were not recorded completely. Two patients exhibited a complete match between results of sleep data and continuous maintenance, and group 3 included 35 nonmaxillofacial defects patients with continuous oral hygiene instruction. The gender, age, number of residual teeth and occlusal supports, and occlusal units (OUs) of each patient were abstracted from medical records. Oral hygiene condition scores were measured by O’Leary’s plaque control record (PCR). The PCR scores were calculated by O’Leary’s plaque control record (PCR). The PCR scores were performed using Kruskal-Wallis test and Spearman rank correlation coefficient, and significance level was set at .05. Results: Statistical analyses of patients’ factors showed that there was no significant difference in age among all groups. However, patients in group 3 had significantly more residual teeth, occlusal supports, and OUs compared to groups 1 and 2, implying that group 3 patients had better oral conditions than maxillofacial prosthetic patients. There were significant differences in PCR scores among all groups; group 3 showed the lowest PCR scores, and group 1 showed significantly lower PCR scores than group 2. In group 1, significant correlations were found between PCR scores and residual teeth and between PCR scores and occlusal supports, while there were no significant correlations between PCR scores and the factors in groups 2 and 3. This suggests that, in maxillofacial prosthetic patients with oral hygiene instruction, PCR scores might be influenced by the number of residual teeth and occlusal supports, which imply better conditions. Conclusions: Interventions such as oral hygiene instruction and oral care could improve maxillofacial prosthetic patients’ oral hygiene conditions. However, it seems to be hard to reach the level of nonmaxillofacial defects in patients.


Jae-Hyun Lee, Jung-Suk Han, In-Sung Luke Yeo, Hyung-In Yoon, Seong-Joo Heo, Jae-Young Koak, Seong-Kyun Kim, Young-Jun Lim, Myung-Joo Kim, Ho-Beom Kwon Seoul National University, Seoul, South Korea

Purpose/Aim: The purpose of this study was to improve oral appliances (OA) to achieve high-level compliance in patients with OSA. Materials and Methods: Five female patients who had been referred by sleep physicians to Kyushu Dental University Hospital for OSA therapy with an OA were enrolled in this study. Inclusion criteria were the diagnosis of OSA without other sleep disorders based on overnight PSG lasting at least 5 hours. Any patient exhibiting signs and symptoms of TMD and/or a history of psychologic problems and/or occlusal dysfunction was excluded from this study. All patients answered the Epworth Sleepiness Scale questionnaire ESS before OA therapy. This study was approved by the ethics committee at Kyushu Dental University Hospital (No. 12-18). All patients read and signed an informed consent. Two types of OAs were fabricated based on the same therapeutic jaw position of patients. Patient responses regarding sensation and sleeping conditions when each appliance was fitted were compared. Results: Complications with soft-type appliance were greater than with hard-type appliance in the following patient-assessed variables: ill-fitting, difficulty closing lips, excessive salivation, pain in the oral tissue, and difficulty sleeping. On the contrary, complications with hard-type appliance were greater than with soft-type appliance in the following variables: dry mouth, discomfort, difficulty wearing, occlusal change, increase in bruxism, discomfort in the TMJ area, and continuous TMJ area pain; and pain in the teeth. Sleep data from one patient were not recorded completely. Two patients exhibited a complete match between results of sleep data and
the type of OA that the patient wanted to continue using. Conclusions: This study was conducted in a small population of five patients, so future research needs to target more patients and to collect sleep data prior to fitting the OA in order to clarify the properties of each of these two types of experimental OAs.

Comparison of Different Methods for Rehabilitation of Maxillary Defects

Michael Michael

Johannesburg, Gauteng, South Africa

Case Presentation: Background: Patients with maxillary tumors may be exposed to postsurgical defects that have a profound impact on speech, mastication, deglutition, esthetics, and psychosocial functioning. This effect on patients’ quality of life may not only influence their nutrition (and therefore their health) but may also affect their integration in society. Due to the unique nature of each patient, the presenting pathology, and the subsequent defect, an “Appropriateach” approach for management is required for each patient. Multiple options for dental rehabilitation and obturation of maxillary defects have been described without any solution having definitively better outcomes in varying presenting scenarios. Case Report: This case series explores the different techniques in palatal obturation, including removable obturators, implant-retained removable obturators, implant-retained fixed dental prosthetics with removable obturators, implant-retained fixed dental prosthetics with soft tissue flaps, and free fibular flap. Case Discussion: Discussion and Conclusion: Multiple factors require consideration before a patient-specific approach can be formulated. The extent and position of the maxillary defect has an impact on the outcomes of each treatment modality. This is specifically noticeable when comparing prosthetic obturation with surgical obturation. Clinical Implications: An insight into various options may help in determining appropriate patient management.

3D Printing Offers New Impression Procedures to Overcome Severely Limited Mouth Opening: About Two Cases

Adrien Naveau, Raven Smirani, Raphael Devillard, Christophe Bou, Valérie Plaire

Bordeaux University Hospital, Bordeaux, France

Case Presentation: Background: Some patients with limited mouth opening do not respond to common treatments, such as exercise and stretching movements of the facial muscles. For the prosthodontist, this restriction leads to ill-fitting prostheses, as the loaded tray is not properly inserted and aligned during the dental impression. This poster presents two customized impression procedures using 3D printing for overcoming severely reduced mouth opening. First Case: Surgery and radiation for head and neck cancer therapy left the patient with a palatal defect and a reduced mouth opening. Oral prosthesis could not be anatomically considered, but a palatal obturator could still improve the patient’s quality of life. The soft tissues of the maxillary defect were segmented from the CBCT data and 3D printed with resin. A palatal obturator prototype was made in silicone for try-in and converted into resin after adjustments for insertion and retention during the surgical procedure. The patient suffered from a severe post-traumatic oral neuromas of the superior alveolar nerve, resulting in a facial soft tissue fibrosis and limited mouth opening. For rehabilitation with immediate complete dentures, the maxillary custom tray was sagittally split into two pieces. Two small hinges were 3D printed and bonded to each side of the tray. This procedure allowed the insertion of loaded half-frames successively into the mouth and their assembly once inside. Discussion: Standard 3D-printing procedures can be helpful to accomplish the fundamental impression step and participate in the fabrication of a successful prosthesis. Conclusion: Advances in 3D printing have resulted in new customized tools available for the treatment of challenging oral and maxillofacial disorders at an affordable cost. Clinical Implications: Enhanced accuracy and accessibility of 3D printing technology offers new tools for impression procedures to overcome severely limited mouth opening.

Design and Fabrication of a Facial Prosthesis with Immediate Loading Following Rhinectomy

Portia Tshimangadzo Nethononda, Jacobus Hercules van den Heever, Karmisha Naidu, Variza Daya-Roopa

University of Pretoria, Pretoria, South Africa; Central University of Technology, Free State, Montsheuin, South Africa

Congenital or acquired facial defects can have functional and esthetic effects that impact the patients’ quality of life. Malignancies of the nasal vestibule are rare, accounting for 9% of all cancers of the nasal cavity and < 1% of all malignant tumors of the upper aerodigestive tract. Patients are usually men between 60 and 65 years old. Primary nasal vestibule tumors usually occur in posterior, paramedian, and commissural regions of the nasal cavity, invasion, whereas tumors > 4 cm in diameter are associated with invasion of the pre-maxilla and usually require extensive surgical resection. The resulting maxillofacial defects are difficult to treat with conventional prosthetics. Osseointegrated implants have provided significant adjuncts to improving prosthesis retention and function. Clinical Report: A 43-year-old female patient diagnosed with squamous cell carcinoma of the nasal septum was referred to the prosthodontic clinic at the University of Pretoria. CT nasal axial scans showed nasal septum destruction and bone obliteration of the nasal floor. Treatment Planning Phase: The surgical treatment plan called for a total rhinectomy and partial maxillectomy. Pre-prosthetic planning aimed for immediate placement of bilateral zygomatic implants. Impressions of the dentition and facial defect were taken and used in the fabrication of a wax pattern of the nose and upper lip. Color matching was done using a spectrophotometer (Spectromatch, UK), and a silicone nasal prosthesis was fabricated before surgery. A central magnet was attached on the fitting surface to assist the patient in orientating and seating the prosthesis. Implant Placement: A total rhinectomy and partial maxillectomy were performed, and frozen sections were taken in the theatre. Two 30-mm zygomatic implants with 4.0-mm-wide restorative platforms were placed bilaterally (Zygyn, Southern Implants). Restorative Phase: The interim denture was inserted and retained with trauma screws. Titanium temporary abutment cylinders were fitted on the implants and their screw holes plugged with bone wax. These cylinders were picked up using a fast-setting cold-curing acrylic resin, and a framework was then made with the same materials. Discussion: Case Discussion: Most nasal vestibule tumors are squamous cell carcinomas and are often fatal if not treated early. Patients who have undergone mid-facial resection suffer psychologic trauma. This case illustrated how we can design, fabricate, and load a facial prosthesis immediately following surgery, and, in so doing, maintain the patient’s dignity.

Combined Prosthodontic and Surgical Management of Patients with Amelogenesis Imperfecta: Case Series of Three Patients

Ben Omondi, Rael Akiemba, Fane Nyata, Symon Guthua, Godfrey Barasa, Wyne Manana, Dennis Kota, Elizabeth Dimba, David Avangue

University of Nairobi, Nairobi, Kenya

Case Presentation: Background: Amelogenesis imperfecta (AI) is an inherited condition that affects the structure of enamel of both sets of dentition. Hypoplastic, hypocalcified, hypomaturation, and hypomaturation-hypoplastic phenotypes have been described. Five genes have been implicated: AMELX, ENAM, MMP-20, KLK4, and FAM83H. The concerns for the prosthodontist are sensitivity, occlusal adaptation of the maxillary prosthesis to the opposing dentition, and the need to fabricate a removable obturator and a retruded intercuspation. Purpose: To demonstrate the benefit of multidisciplinary collaboration in the management of adult patients presenting with AI but lacking restorative space. Methods: Impressions were taken using irreversible hydrocolloid (BluePrintR) and poured in type III gypsum to generate study casts. Using a fausseboeuf record, these were mounted in a semi-adjustable articulator (Dentatus ARH). Reference points were made on the casts after careful evaluation by the prosthodontic and surgical teams. Mock “cast surgery” was rehearsed on one half of the casts, but sparing the palatal/lingual. Base-plate wax was adapted on the reduced casts to assess for adequate room for denture teeth, but maintaining the occlusal vertical dimensions. New sets of impressions were taken using irreversible hydrocolloid in custom trays and poured in type III gypsum to generate working casts. The aforementioned procedure was repeated, and the selected complete denture teeth angled. The patients approved of the setup before processing and finishing. The surgical phase was undertaken under general anesthesia, and the dentures fitted intraoperatively. Tissue conditioner (Coe Comfort) was applied to the dentures on the third day postoperatively and changed every week for a month, with monthly follow-ups for 6 months thereafter. Results: The patients reported satisfaction with the outcomes as far as their appearance, ability to masticate, and enhanced self-esteem. Conclusion: Despite providing a removable option, a satisfactory outcome can be possible with a combined prosthodontic and surgical approach for adult patients with AI but no prosthetic space. Clinical Implications: Improvement of the concerns of the affected persons, including their oral health-related quality of life, was achieved with a removable option.
Hybrid Digital-Analog Workflow in Fabricating Orbital Prosthesis: A Case Report
Phang Zi Ying, Toh See, Liang Xiong
National University of Singapore
Case Presentation: Introduction: To restore extraoral facial defects, a tradi-
tional moulage technique is often employed. This is often uncomfortable
for patients, and there is potential for distortion due to patient position
and weight of the material, which may result in more clinical time spent and
more patient visits to compensate for said distortions. This case presenta-
tion describes the use of CBCT to acquire data on the defect morphology
in the fabrication of an orbital prosthesis. Case Presentation: A 55-year-old
Chinese man was diagnosed with melanoma of his right eyelid. He under-
went right orbit exenteration and subsequently presented at the National
Dental Centre Singapore for fabrication of an orbital prosthesis. In lieu of
a traditional facial moulage, a limited field-of-view CBCT was taken. CAD
was used to design the orbital prosthesis, which was then 3D printed with
biocompatible resin and tried in on the patient to ensure fit and determine
optimal extensions for the final orbital prosthesis. A custom-made ocular
prosthesis was also fabricated at the same time. The 3D-printed prosthesis
was then converted to wax, and the position of the iris was determined
clinically. A negative model of the defect site was created using dental
plaster. The silicone orbital prosthesis was then fabricated using conven-
tional laboratory procedures. Discussion: The use of digital technologies in
the fabrication of maxillofacial prosthetics has become increasingly wide-
spread. In this case report, only visualization and design of the prosthesis
were achieved using digital technologies, as rapid prototyping of silicone
materials and wax were not readily available. Conclusion: Numerous chal-
enges remain in the fabrication of maxillofacial prosthetics using digital
technology but the digital workflow allows for less patient time spent in
the chair. Discussion: Digitalization only offers advantages over conventional
workflows. Further studies are required to continue developing and refine-
digital workflows in maxillofacial prosthetics.

An Evaluation of the Efficacy of Two Prostheses in Palatopharyngeal Incompetency Patients
King George Medical University, Lucknow, India
Purpose/Aim: To evaluate palatal lift prosthesis and nasal speaking valve in terms of changes in speech intelligibility of monosyllabic and conversation-
al speech and hypernasality. Materials and Methods: This study was con-
ducted in the Department of Prosthodontics, Crown and Bridge, Faculty of
Dental Sciences, K.G.M.U. UP, Lucknow. Patients were considered eligible
according to the inclusion criteria: Patients with palatopharyngeal incompete-
ncy. Written informed consent was taken from each patient. A total of 90 patients were random-
ized into the palatal lift prosthesis (group 1), nasal speaking valve (group 2), or speech therapy (group 3) groups by a nurse, with 30 patients in each
group. Results: Patients who received nasal speaking valve had less than
25% hypernasality, while patients receiving palatal lift prosthesis had greater than 30% nasalance score. Patients with nasal speaking valve had
better speech intelligibility compared to palatal lift prosthesis conclusions. Conclusions: Nasal speaking valve provided better speech intelligibility and hypernasality than palatal lift prosthesis.

A Novel Surgical Guide for Large Mandibular Dentoalveolar
Defects: An Appropriatce Method
Schalk Van Der Linde, Johann Schoeman
University of the Witwatersrand, Johannesburg, South Africa
Case Presentation: Background: Ameloblastomas are benign but locally
aggressive tumors of odontogenic epithelium origin. Reported prevalence
rates are 1% of all oral tumors and cysts of the jaw, increasing to 10%
to 12% if all odontogenic tumors are considered. The mandible is more
commonly affected than the maxilla. Three variants are recognized: con-
vencional unicystic; and multicystic; and a peripheral or extraosseous
variant. Various treatment modalities exist, ranging from conservative enu-
cleation or marsupialization with peripheral ostectomy to en bloc segmen-
tal resection. Technique/Case Report: In the present clinical setting (Chris
Hani Baragwanath Academic hospital and Charlotte Maxeke Johannesburg
Academic Hospital) the surgical treatment modality of choice is an en bloc segmen-
tal mandibular resection with reconstruction plate and spacer placement,
followed by particulate graft from the iliac crest and graft consolidation.
Dental rehabilitation involves implant placement with acrylic dentoalveolar
prostheses. Discussion: The large extent of hard and soft tissue volume loss
seen in these dentoalveolar defects following reconstructive procedures
and the use of current intraoral scanning and design technology to fabricate
milled surgical guides for implant placement. In a resource-constrained
setting, an Appropriatce surgical guide has been developed to ensure that
implant placement meets both surgical and prosthodontic demands, with
implants ultimately placed within the planned prosthetic envelope for suc-
cessful dental rehabilitation. The outcome of implant placement with the
use of a novel surgical guide is discussed. Conclusion: The use of a novel surgical guide facilitated the placement of implants within
prosthetic parameters in cases of large mandibular dentoalveolar defects.
Clinical Implications: This novel Appropriatce surgical guide can readily be
fabricated in a resource-constrained setting to aid with implant placement
for large dentoalveolar defects.

SPECIAL NEEDS / GERIATRICS

The Oral Health Status of Attendees and Residents in United Arab Emirates Care Homes
Bananch Almazrooei, Fatemeh Amir Rad, Alexander Milosevic
Hamdan Bin Mohammed College of Dental Medicine, Dubai, United Arab Emirates
Purpose/Aim: The oral health status of day-stay attendees and residents in
care homes in the United Arab Emirates (UAE) has not been previously
investigated. This cross-sectional study aimed to determine the oral health
status of care-home attendees and residents in the UAE. Materials and
Methods: All care homes identified from the UAE Ministry of Health web-
database were approached, and all employees and residents were invited
to participate, forming a convenience sample. The WHO classification was
used for medical conditions. Oral and dental status were recorded on the
WHO Oral Health Assessment form for adults (2013), and other demographic
details were recorded separately. The three examiners had training and cali-
bation exercises prior to conducting the dental examinations. Results: A total
of 107 participants with a mean age of 67.5 years (SD 15.65 years) were examined. Nineteen subjects had significant cognitive impairment and
could not cooperate, and only partial examination were possible. Men (n = 57) had a mean age of 69.2 years (SD 16.3), which was not significantly
different from the mean age of women (65.5 years, SD 14.8). Most of the
participants (n = 70) had an ASA classification of mild systemic disease,
while 25 were classified with severe systemic disease. Periodontal problems
were present in 58 (72%) of 81 dentate participants (26 participants were edentulous). Overall mean DMFT was 23.2 (SD 9.0), but the mean DMFT in
men was significantly greater (26.5) compared to women (19.8, P < .001). Of 88 participants, 18 (20.5%) complained of pain or soreness at the time
of examination. The frequency of tooth brushing/cleaning the mouth was
not correlated with participants’ immunity. Educational attainment pre-
dicted 25% of the variance of the DMFT, and 40% was accounted for when
predefined inclusion and exclusion criteria. Written informed

Dry Mouth Syndrome and Oral Health in Nursing Home Residents
Madeline Bicheru, Elena Preoteasa, Carmen Chifirucu, Marina Imre, Cristinia Preoteasa
Carol Davila University of Medicine and Pharmacy, Bucharest, Romania
Purpose/Aim: Dry mouth syndrome (DMS) is frequently present in old-age
dividuals and is often associated with denture stomatitis. The purpose
of this study was to investigate the correlation of DMS with the aerobic oral
microflora of the dependent elderly wearing complete dentures. Materials
and Methods: This study was conducted in a group of 30 patients (20 pa-
tients with DMS, 10 without) wearing complete acrylic dentures who were
recruited from a nursing home. DMS was diagnosed subjectively with a
questionnaire and objectively by measuring stimulated salivary flow. Saliva samples were collected with a swab from three different locations (ma-
xiary denture mucosal surface, middle hard palate mucosa, and floor of the
mouth) and inoculated in different media (blood agar, Chapman agar, bile
esculin agar, CHROMagar ECC, Sabouraud agar, chromID OXA-48, CHRO-
MID ESBL). MALDI-TOF mass spectrometry was used for the identification
of recovered bacterial and fungal strains. Additional parameters, such as
the level of oral hygiene, fitting of the denture, and health of the oral mu-
cosa, were taken into consideration. Results: A total of 50% of the subjects
were aged 80 to 90 years, and 52% were women. A total of 44 bacterial
strains were identified. All the patients in the DMS group presented poor
oral hygiene and denture plaque, 95% of the dentures had low retention
and stability, and 75% of patients had oral lesions caused by the den-
ture. Multivariate analysis of the 44 different bacterial strains, 84% were found on
the mucosal surface of the maxillary denture in patients with DMS. The aerobic
microflora was very diverse, with the most prevalent bacteria
mucosal surface of the maxillary denture in patients with DMS. The aerobic
microflora of the dependent elderly wearing complete dentures. Materials
and Methods: This study was conducted in a group of 30 patients (20 pa-
tients with DMS, 10 without) wearing complete acrylic dentures who were
recruited from a nursing home. DMS was diagnosed subjectively with a
questionnaire and objectively by measuring stimulated salivary flow. Saliva samples were collected with a swab from three different locations (ma-
xiary denture mucosal surface, middle hard palate mucosa, and floor of the
mouth) and inoculated in different media (blood agar, Chapman agar, bile
esculin agar, CHROMagar ECC, Sabouraud agar, chromID OXA-48, CHRO-
MID ESBL). MALDI-TOF mass spectrometry was used for the identification
of recovered bacterial and fungal strains. Additional parameters, such as
the level of oral hygiene, fitting of the denture, and health of the oral mu-
cosa, were taken into consideration. Results: A total of 50% of the subjects
were aged 80 to 90 years, and 52% were women. A total of 44 bacterial
strains were identified. All the patients in the DMS group presented poor
oral hygiene and denture plaque, 95% of the dentures had low retention
and stability, and 75% of patients had oral lesions caused by the den-
ture. Multivariate analysis of the 44 different bacterial strains, 84% were found on
the mucosal surface of the maxillary denture in patients with DMS. The aerobic
microflora was very diverse, with the most prevalent bacteria
genera being Staphylococcus, Streptococcus, Neisseria, Lactobacillus, Klebsiella, Actinobacter, Enterobacter, and Pseudomonas spp., while Candida spp strains were isolated from 90% of the investigated patients. Staphylococcus spp were the most frequent isolated bacteria after Candida spp in both groups. The mucosal surface of the maxillary denture presented the highest variety of microorganisms. While the diversity of oral microorganisms was present in both groups, DMS was significantly associated with poor oral hygiene, lack of stability and retention of the denture, and oral ulcers. Better understanding of oral microflora and the impact that dental hygiene and dental treatment have on bacterial colonies is essential in modern dentistry.

Knowledge and Practice About Oral Hygiene by Tribal Women of Uttar Pradesh—A Community-Based Study

Pranjal Dutt, Pooran Chand, Balendra Singh, Sunit Jurel, Raghuwar Singh

King George’s Medical University, Lucknow, Uttar Pradesh, India

Purpose/Aim: Oral health is an inherent part of the general health and wellness of an individual. Dental caries, gum disease, and oral mucosal lesions constitute the major oral health stigma in developing countries and among deprived populations. To practice healthy oral habits, it is quintessential to have good oral health knowledge and attitude. Good oral hygiene practice and knowledge about oral health-related issues among tribal populations is considered to be an essential prerequisite for ameliorating oral health and oral hygiene. The purpose of this study was to assess the oral health knowledge and oral hygiene practices among tribal women of Uttar Pradesh. Materials and Methods: A cross-sectional study was conducted among 200 tribal women of Uttar Pradesh. Data were collected using semi-structured questionnaires and interview method and were analyzed with descriptive statistics. Results: The majority of tribal women did not know the association between tobacco consumption and oral cancer. They had poor knowledge about oral health issues. When tribal women were asked about rinsing oral cavities with plain water after every meal, most of them were found to not be following this practice. It was found that most respondents (90%) brushed their teeth regularly; more than half brushed their teeth once; and most respondents brushed their teeth in the morning. Conclusions: In the present study, there is a gap in the oral health knowledge and oral hygiene practice among tribal women, which needs to be filled by regular oral health education programs.

Occlusal Force Predicts Decline in Cognitive Function Over 3 Years

Kodai Hatta, Motoyoshi Fukutake, Hitomi Sato, Yusuke Miha, Hiromasa Hagino, Kaori Enoki, Yuki Muratani, Ken-Ichi Matsuda, Yoshinobu Maeda, Kazunori Ikebe

Osaka University, Osaka, Japan

Purpose/Aim: Japan is a growing health problem for countries with aging populations. Few effective treatments are available for dementia, and there is increasing interest in oral function as a modifiable risk factor in interventions to prevent cognitive decline. However, most of those studies were done by cross-sectional design. Therefore, this study aimed to investigate the impact of occlusal force on the decline of cognitive function over a 3-year period among Japanese people aged 70 and 80 years. Materials and Methods: Participants were community-dwelling older adults who participated in baseline and follow-up surveys (n = 1,204; at baseline, n = 634; 79–81 years, n = 570). Dental examinations assessing number of teeth, number of teeth with a periodontal pocket depth of 4 mm or more, and occlusal force were conducted by registered dentists. Cognitive function was assessed using the Japanese version of the Montreal Cognitive Assessment (MoCA-J). Socioeconomic factors, medical history, drinking and smoking habits, physical performance, genetic factors, and C-reactive protein concentrations in blood were examined. A generalized estimating equation (GEE) was used to examine how occlusal force at baseline influenced cognitive decline over 3 years. Missing values of factors were supplemented with the multiple substitution method. P values < .05 were considered statistically significant. Results: The median of the MoCA-J score and occlusal force at baseline were 23.0 points and 383 N. The GEE showed that occlusal force was associated with better cognitive function (nonstandardized coefficient: B = 0.088, P = .019); participants who had 100 N more occlusal force than other participants had a MoCA-J score that was higher by 0.884 points at follow-up. The interaction of occlusal force and elapsed years was significant (B = 0.058, P = .031); for participants who had 100 N less occlusal force, the MoCA-J score decreased by 0.058 points in 3 years. Conclusions: Occlusal force had a protective impact on the incidence of cognitive decline over the subsequent 3 years in Japanese older adults aged 70 and 80 years, after adjusting for possible risk factors.

The Impact of General Bone Mineral Density on the Edentulous Mandible

Anda Slaidina, Baiba Springe, Evija Nikitina, Una Soboleva, Aivars Lejiniks

Riga Stradins University, Riga, Latvia

Purpose/Aim: To detect the impact of general bone mineral density (BMD) on jawbone structure in elderly edentulous women. Materials and Methods: In the present study, 62 edentulous women aged 65 to 91 years (mean age 74.00 ± 6.6 years) and who underwent CBCT (Next generation i-CAT, KaVo eXam vision) examinations due to implant planning were included. Bone mineral density measurements (BMD) of the lumbar spine and both femoral necks were made using dual energy x-ray absorptiometry (DXA) (Lunar Dexa DPX-NT, GE Medical Systems). The worst T-score readings from both were taken into account. Based on DXA results, patients were divided into two groups: normal BMD (T-score ≥ –1.0) and reduced BMD (T-score < –1.1). CBCT images were analyzed with OnDemand3D Dental software. A cross-section area of the whole mandible and the area of the trabecular and cortical bone were measured in the region of the mandibular right lateral incisor. Total bone area, cortical and trabecular bone area, and proportion of cortical/trabecular bone area were calculated. Measurements were made by one experienced observer with two attempts. Differences between groups were evaluated using t test. Measurement error was determined using Dahlberg method. Results: All women were divided into two groups according to DXA results: normal BMD (n = 19; mean age 70.27 ± 5.2 years) and reduced BMD (n = 46; mean age 74.15 ± 6.8 years). The difference between groups was not statistically significant (P = .71). There was a larger area of total mandible area and cortical bone area in the normal BMD group than in the reduced BMD group; respectively, total bone area: 169.05 ± 29.9 and 149.79 ± 38.4 mm² (P = .05); cortical bone area: 94.0 ± 21.9 and 78.1 ± 21.2 mm² (P = .008). There was no statistically significant difference between the groups according to area of trabecular bone (P = .69). Conclusions: Reduced BMD had a negative effect on elderly women regarding the amount on the edentulous mandible and amount of cortical bone. Acknowledgments: This project was supported by a postdoctoral research aid (1.1.1.2/VIAA/11/16I139).

Correlations Between General Health Status and Materials Used for the Subtotal Edentulous Patient Treatment

Ana Maria Cristina Tancu, Alice Aura Rusu, Daniela Istrati, Mihaela Pantea, Elena Preoteasa, Marina Meleascu-Imre

Carol Davila University of Medicine and Pharmacy Carol Davila, Bucharest, Romania

Case Presentation: Background. This case report highlights aspects related to general health status and modern materials used for removable dentures in the context of a growing number of patients presenting complex pathologies that require personalized treatment. Techniques: The patient, a 59-year-old man who was bimaxillary and subtotally edentulous, with the presence of 1.7 in the maxilla and 3.2, 3.3, and 4.3 in the mandible and with incorrect RPDs, presented to the clinic asking for dental-maxillary rehabilitation. His general status was severely altered: physical handicap with left hemiparesis, speech alteration, attention deficiency, epilepsy after a car accident, surgery on the cervical vertebral column and inferior members, arterial hypertension, and treated hepatitis C. The severity of his condition led to the treatment plan. The patient was under neurologic and cardiologic treatment and also physiotherapy. Due to these general conditions, two RPDs were chosen, preparing the patient for the complete denture that he would wear after the loss of his last teeth, and with no proprosthetic treatment that could eventually interfere with his health status. Discussions: In order to enhance the mechanical resistance of the denture bases, a modern injected thermopolymerizable PMMA resin (Vitaplex/Roko) was used, as the necessity of using resistant materials for patients with epilepsy is well known to avoid fracture and the possibility of swallowing parts. This material is twice as resistant as acrylic resin and also has other advantages (less polymerization contraction, less residual monomer, etc). At the same time, dentures made of this material are light and delicate, providing better comfort for the patient. Conclusions: Patients with epilepsy need to be carefully evaluated by the dentist and supervised by the neurologist, and special measures need to be taken for prosthetic treatment (ie, the use of modern and improved materials). Clinical Implications: This case confirms the necessity of the individualized approach in particular cases of subtotal edentulous conditions, offering stable and durable therapeutic results.