Clinical Oral Investigations
https://doi.org/10.1007/s00784-021-03940-6

ABSTRACTS

Abstracts of the 10th Virtual Conseuro 2021 Congress

EP – 001

Nicotine Addiction and Tooth Loss

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Aim: The aim of the study is to reveal the relationship between smoking status and nicotine addiction and tooth loss in patients.
Materials and Methods: Approval was obtained from the OMU Clinical Research Ethics Committee for the study. A questionnaire including Fagerström nicotine dependence test and DMFT index was created to evaluate the patients' condition. Radiographic examination and clinical examination were performed. The analysis and evaluation of the data was done with SPSS 25.0, statistical significance level was accepted as $p < 0.05$.
Results: 124 patients who applied to OMU Faculty of Dentistry were included in the study. The average age was 38.42 ± 14.46 years (min:18-max:72). 65 (52.4%) of the patients included in the study were nonsmokers, 55 (44.4%) were currently smoking and 4 (3.2%) had quit smoking. The mean number of missing teeth was 3.57 ± 3.9 (min:1-max:19). The mean DMFT index was 9.58 ± 6.08 (min:1-max:28). Those who currently smoke and quit smoking were separated as the case and the control group. The mean number of missing teeth in the case group ($\overline{X}$= 4.14) was significantly higher than the control group ($\overline{X}$= 3.06). There was a significant positive correlation between the number of teeth lost and the number of cigarettes used per day (pack), duration of smoking (years) and the amount of smoking (pack years) of patients who smoked in a period of their life. As a result of linear regression analysis, the change in the number of missing teeth can be explained by 4 independent variables (age, amount of smoking (pack year) FNTD score, tooth brushing frequency) with a rate of 34.1%.
Conclusion: In the study, a significant relationship was found between smoking and the number of missing teeth. Due to the increase in nicotine addiction, an increase in the number of missing teeth was found.
Keywords: prefabricated veneers, resin composite, transparent templates, veneers, CAD/CAM blocks

EP – 002

Dental Pain Perception in Sleep Bruxism Subjects – A Blind, Controlled Clinical Trial

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Aim: The aim of the present study is to compare the dental pain perception of sleep bruxism (SB) subjects with that of a non-SB control group. The hypothesis used in this investigation was that SB subjects are more sensitive to electrical as well as to thermal pulp testing.
Materials and Methods: The present pilot study was conducted as a blind, controlled clinical trial and included 104 participants. The experimental procedure comprised two measurement dates. At the first appointment, following a thorough dental examination by one trained dentist, 53 participants were assigned to the SB group and 51 to the non-SB control group. The diagnosis of SB was verified according to the clinical criteria of the American Academy of Sleep Medicine. At the second appointment, electrical pulp testing (EPT units, vitality scanner, SybronEndo) and thermal pulp testing (CO_2-application) were performed by another trained dentist who was blinded regarding the SB diagnosis. During the measurement, the subjective overall tooth sensitivity (numeric analogue scale), the EPT units, CO_2-application time (sec.), CO_2-pain duration (sec.), and CO_2-pain intensity (visual analogue scale) were recorded. The tooth to be tested was selected in the following priority: first premolars, second premolars, first molars, preferably in the maxilla. The alpha error probability was set to $p=0.05$.
Results: Regarding the EPT units, CO_2-application time, and CO_2-pain duration no significant group differences were observed. Interestingly, the SB subjects rated their CO_2-pain intensity more severe ($p=0.025$) as well as their subjective general teeth sensitivity ($p=0.004$).
Conclusion: Although SB subjects and non-SB controls do not differ with respect to the objective parameters of electrical and thermal pulp testing, the subjective evaluation of their general teeth sensitivity as well as their pain intensity following CO_2-application was perceived more intense. These findings might be interpreted as an indication of a somatosensory amplification in SB subjects.
Keywords: pain perception, sleep bruxism, somatosensory amplification, thermal pulp testing, electrical pulp testing

EP – 003

Evaluation of Discolorations and Surface Properties of Indirect, Direct and Prefabricated Veneer Materials

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Aim: The purpose of this study is to determine the color changes of ceramic and hybrid blocks, prefabricated and direct resin composites after long-term immersion in coffee and to what degree these discolorations could be removed by paste-polishing procedures.
Materials and Methods: One direct resin composite (Harmonize-Kerr), two prefabricated resin composites (Brillant Componeer-Coltène and Edelweiss-Edelweiss Dentistry), one hybrid ceramic block (Cerasmart270- GC) and one zirconia reinforced lithium silicate block (CeltraDuo-DentsplySirona) were used. A total of 200 samples (25/group) shaped as upper right central incisor were used. CAD/CAM blocks were mechanically polished or glazed while the direct specimens were prepared with transparent templates (U-veneer-Ultradent) or Smile-Line silicone mold (Style-Italiano). The prefabricated veneers were used as they were manufactured without further polishing. Baseline color-measurements were performed with a spectrophotometer and specimens were immersed in coffee solution for two months, then they were

Published online: 22 April 2021

polished with a diamond paste. Color measurements were undertaken at each sequence. All data were statistically analyzed by multivariate ANOVA, posthoc Tamhane and t- test ($p<0.05$).
Results: The color change (ΔE) of all samples kept in coffee for 2 months was found to be significant ($p<0.05$). The groups with the least color changes were Cerasmart270 and Cerasmart270-Glaze groups however, the difference between them and with all other groups were found statistically significant ($p<0.05$). Harmonize and CeltraDuo-Glaze groups showed equal color change. The most discolored groups were the prefabricated veneers and the transparent template group (Edelweiss ≥ Brillant Componeer ≥ Harmonize U-veneer). The color restitution after polishing was found to be different for all the groups but close to 3rd and 2nd week values.
Conclusion: For avoiding long-term discolorations: hybrid Cerasmant270 blocks need to be mechanically polished; Harmonize resin composite need to be properly polished; CeltraDuo blocks need to be glazed and prefabricated veneers and templated resin composites need to be mechanically polished.
Keywords: prefabricated veneers, resin composite, transparent templates, veneers, CAD/CAM blocks

EP – 004

Cost-Effectiveness of Glass Hybrid Versus Composite in a Multi-Country Randomized Trial

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Aim: We assessed the cost-effectiveness of two amalgam alternatives, glass hybrid (GH) and composite (CO) in a multi-country randomized controlled split-mouth trial.
Materials and Methods: University clinics in Croatia, Serbia, Italy and Turkey participated. Pairs of GH (EQUIA Forte, GC) and a nano-hybrid CO (TetricEvoCeram, IvoclarVivadent) were randomly placed in occlusal-proximal two-surfaced cavities in permanent molars of adults (n=180/360 patients/molars). We used 3-years interim data for this evaluation. FDI-2 criteria were applied and teeth requiring repair, re-restoration, endodontic treatment or extraction recorded. Our outcome was the time until any or major complications (requiring endodontic treatment or extraction) occurred. Costs were calculated in US Dollar (USD) 2018, with the local currencies being converted using Purchasing Power Parities. To estimate initial and re-treatment costs, a payers' perspective was taken, and direct medical costs estimated from fee item catalogues. Incremental-cost-effectiveness ratios (ICER) were used to express the cost difference per gained or lost effectiveness.
Results: Overall costs were lower for GH than CO in Croatia, Turkey and Serbia, while this difference was minimal in Italy. GH tended to survive longer than CO in Croatia and Italy, and shorter in Serbia and Turkey; overall survival time was not significantly different (p=0.67/log-rank). The cost-effectiveness differences indicated CO to be more expensive at limited (ICER: 268.5 USD/month without any complications) or no benefit at all (-186.2 USD/month without major complications).
Conclusion: GH was less costly than CO both initially and long-term. Efficacy differences were extremely limited.
Keywords: dental materials, economic evaluation, health services research, caries; clinical studies

EP – 005

Clinical Comparison of Prefabricated and Direct Resin Composite Veneers Formed with Transparent Templates

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Aim: The aim of this blinded clinical trial is to compare the clinical performances of prefabricated resin composite veneers and direct resin composite veneers formed with transparent templates for a period of 18 months.
Materials and Methods: 21 volunteer patients who applied to Ege University Faculty of Dentistry for anterior esthetic rehabilitations were selected according to our inclusion and exclusion criteria. 74 veneers were randomly performed with prefabricated resin composite veneers (Edelweiss, Edelweiss Dentistry, Austria) or resin composite veneers (Ceram-X Duo SphereTec, Dentsply Sirona, Germany) using transparent templates (U-Veneer, Ultradent, USA). These restorations were all placed according to manufacturer's recommendations by a single operator and no mechanical polishing was applied on their buccal surfaces after placement. The veneers were clinically evaluated at baseline, 6, 12 and 18 months by two experienced and blind clinicians according to the modified Ryge criteria (USPHS criteria). For that purpose, color match, marginal discoloration, marginal adaptation, anatomic form, secondary caries, retention loss, surface roughness, gloss retention and postoperative sensitivity were scored. Statistical analysis was performed with McNemar and Kolmogorov-Smirnov Z tests ($p<0.05$).
Results: There were no statistically significant differences in all evaluated criteria, except gloss retention, between the groups. There was a significant difference between time periods in the polishing retention criteria for both groups ($p<0.05$). Beside minor problems, direct resin composite veneers and prefabricated resin composite veneers were both found clinically successful, and all the patients were satisfied after 18 months of evaluation.
Conclusion: Young clinicians without experience of anterior esthetic restorations can easily use both methods in a relatively short application time. However, for a long-term clinical gloss retention, we advise to perform a fine polishing on both veneer surfaces especially for smoking and heavy coffee/tea drinker patients.
Keywords: esthetic, prefabricated resin composite veneer, transparent templates, veneer, clinical success

EP – 006

Comparative Analysis of Stress Distribution of Experimentally Designed Endodontic Rotary Files

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Aim: To compare the distribution of stress across experimentally designed endodontic rotary files with different cross-sections, pitch, and helix angles under conditions of bending and torsion force.
Materials and Methods: Three-dimensional simulations were created using Matlab software for finite element analysis of eight endodontic rotary files with the following parameters: 25 mm in total length, 6% taper, 0.25 mm diameter at the tip, 1.20 mm diameter at 16 mm from the tip, triangular and squared cross-section designs, and a pitch of 2, 4, 8 and 16 mm in length. Bending and torsional stress distribution was analyzed by applying an encastre of 3 mm at the tip of the file, a transverse load of 0.1 N, and a torsional movement of 0.3 Ncm, respectively, using ABAQUS. Maximum von Mises stress values were recorded in MPa and descriptive analytics was performed.

Results: The maximum bending stress value was observed in the endodontic rotary file with a triangular cross-section and a pitch of 4 mm (1250.4 MPa), followed by 2 mm pitch (1237.7 MPa), 16 mm pitch (1230.5 MPa), and 8 mm pitch (1192.5 MPa). The maximum torsional stress value was observed in the endodontic rotary file with a triangular cross-section and a pitch of 4 mm (2054.4 MPa), followed by 8 mm pitch (2032.3 MPa), 2 mm pitch (1999.9 MPa), and 16 mm pitch (1749.6 MPa).
Conclusion: The squared cross-section design with a pitch of 16 mm showed the lowest bending stress values, and the squared cross-section design with a pitch of 16 mm showed the lowest torsional stress values.
Keywords: endodontic file, finite element analysis, stress distribution, torsion, bending

EP – 007

Microleakage of Different Restorative Materials in Class V Restorations: *In-Vitro* Study

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Aim: Microleakage is a major factor contributing to the occurrence of secondary carious lesions around restorations. This study aimed to evaluate the microleakage around class V restorations using different restorative materials.
Materials and Methods: In this *in vitro* study, 32 standardized class V cavities were prepared on buccal and lingual surfaces of 16 human teeth (extracted within a period of 6 months) using beveled conventional preparation, where occlusal margin was located at the enamel and cervical margin at the cementum/dentin level. Specimens were randomly divided into 4 groups (n= 8) for restoration with (A) GC Fuji II LC (Resin modified glass ionomer) (B) Prime&Bond universal + SDR plus (Smart dentin replacement) (C) FuturaU Bond + Admira Fusion Flow (Ormocer-based nanohybrid flowable composite) (D) Palfique universal bond + Palfique universal flow. After being stored in distilled water and finished, teeth were immersed for 24 hours in 2% methylene blue dye. Teeth were sectioned bucco-lingually and dye penetration on occlusal and cervical margins was scored using a stereomicroscope. The results were analyzed using Chi-square and Kruskal-Wallis tests ($\alpha = 0.05$).
Results: There was statistically significant difference between microleakage at occlusal margin and at the cervical margin ($p < 0.001$). None of the four different groups of restorative materials completely sealed the tooth/restoration interface at the cervical margin showing no statistically significant difference in microleakage ($p = 0.054$), while there was a statistically significant difference between the different materials at the occlusal margin ($p = 0.024$).
Conclusion: When comparing different restorative materials in Class V cavities, the cervical margins, where adhesion is between restorative material and dentin/cementum, showed the greatest scores in microleakage.
Keywords: flowable composite, microleakage, resin modified glass ionomer, class V restorations

EP – 008

Digital Method to Quantify Cement Remnants and Enamel Loss after Debonding Lingual Brackets

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Aim: The aim of the present study is to present a repeatable, reproductible, and accurate morphometric measurement method for measuring and quantifying the area and volume of cement that remains after fixed lingual multibracket appliance debonding, enamel loss after fixed lingual multibracket appliance debonding, and the volume of cement used to adhere fixed lingual multibracket appliances.
Materials and Methods: Ten conventional lingual brackets were cemented in 10 extracted teeth embedded into an epoxy resin model simulating a dental arch. This model was scanned before and after bonding the lingual brackets, after debonding, and after polishing the surfaces. We also performed a Micro-Computed Tomography scan of the lingual brackets used. Afterward, the standard tessellation language (STL) digital file was aligned, each tooth was segmented individually, and the file was re-aligned using engineer morphometry software. Inter-operator and intra-operator comparative analyses were performed using the ANOVA test, and the repeatability and reproducibility of the morphometric measurement technique were analyzed using Gage R&R statistical analysis.
Results: Repeatability showed 0.07% and 0.16% variability associated with the area and volume measures, respectively, while reproducibility showed 0.00% variability associated with the area and volume measures, respectively.
Conclusion: This morphometric measurement technique is a repeatable, reproductible, and accurate morphometric measurement method for quantifying the area and volume of cement that remains after fixed lingual multibracket appliance debonding, enamel loss after fixed-lingual multibracket appliance debonding, and the volume of cement used to adhere fixed-lingual multibracket appliances.
Keywords: debonding, enamel loss, lingual orthodontics, morphometry, cement remnants

EP – 009

Long Term Color Evaluation of Different Fluoride Releasing Restoratives: An *In-Vitro* Study

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Aim: The aim of this *in vitro* study was to compare color change of different fluoride releasing restoratives at long term.
Materials and Methods: Four different fluoride releasing restoratives including a giomer (Beautifil II), a high strength posterior glass ionomer (Amalgomer), a glass hybrid restorative (EQUIA Forte Fil) and a glass carbomer (Glass Fill) were tested. A hundred and ninety-two specimens were fabricated (n=48, per group). Each group was further divided into four subgroups and subjected to thermocycling as follows; Group-1: no thermocycling (24 h water storage), Group-2: 10.000, Group-3: 30.000, Group-4: 50.000. The color of the specimens was determined by a spectrophotometer after specimen preparation, 24 hour, 10.000, 30.000 and 50.000 cycles. ΔE values were calculated using CIELab parameters. Data were analyzed by two-way mixed ANOVA and LSD tests($p<0.05$).

Results: Significant differences were observed among the groups after 24h water storage, 10.000, 30.000 and 50.000 thermocycling. Color chance and material interaction ($p<0.001$) was also found significant ($p<0.001$). After 24h, Beautifil II showed the lowest color change, while Amalgomer, EQUIA Forte Fil and Glass Fill were similar ($p<0.001$). After 10.000 cycles, the highest color change was seen in EQUIA Forte Fil and Glass Fill, the lowest was seen in Amalgomer and Beautifil II. After 30.000 cycles, the highest color change was seen in Amalgomer and the lowest was seen in Beautifil II. After 50.000 cycles, the highest color change was seen in Glass carbomer, while Amalgomer, Beautifil II and EQUIA Forte Fil were similar.
Conclusion: Although glass carbomer showed significantly higher color change, none of the tested fluoride releasing materials maintained their color stability in long term.
Keywords: color stability, giomer, glass carbomer, glass hybrid, amalgomer

EP – 010

New Digital Technique to Quantify Enamel Removed after Stripping

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Aim: The aim of this study was establishing a new protocol to measure digitally the area and volume of enamel removed on the dental surface after interproximal enamel reduction.

Materials and Methods: An experimental model was made by embedding 14 lower teeth, from all dental sectors, into epoxy resin. Teeth were distributed as lower dental arch, keeping the contact point. An intraoral digital scanning was performed before and after air-rotor stripping and then re-contouring and polishing of interproximal enamel surfaces. The procedure was carried out by a single operator. Standard Tessellation Language (STL) digital files were obtained. An engineering morphometry software was used to segment and align full-arch STL digital files in order to analyze individually the area and the volume of the interproximal tooth enamel surface reduction. STL files were superimposed by using the non-varied surfaces of teeth as a reference with the best fit-align algorithm. The area of enamel removed was measured comparing preoperative boundaries and postoperative interproximal enamel reduction STL digital files. The volume of enamel removed was measured selecting and isolating preoperative and postoperative interproximal enamel reduction digital files via reverse selection. Descriptive analysis was performed using Student t-test and Shapiro-Wilk test was used to analyze the normality of the variables.

Results: Morphometric measurement digital protocol showed higher enamel reduction area (3.53 ± 3.08 mm^2) and volume (0.32 ± 0.22 mm^3) values on distal surface compared with the area (2.97 ± 3.05 mm^2) and the volume (0.22 ± 0.16 mm^3) of the enamel reduction on mesial surface. The pair *t*-test did not show statistically significant differences between the mesial and distal areas (p=0.529) and volumes (p=0.430) of the enamel removed.

Conclusion: The new morphometric measurement protocol is found appropriate to analyze the area and volume of interproximal enamel surface reduction.

Keywords: interproximal reduction, morphometry, orthodontics, stripping, digital impression

EP – 011

Twelve-Month Clinical Comparison of Two Different Composite Resins in Class III and IV Cavities

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Aim: The aim of this study was to evaluate and compare the clinical performance of a nanohybrid composite and a microhybrid composite resin applied in Class III, IV cavities for a period of 12 months.

Materials and Methods: A total of 64 patients without any systemic diseases applied to Ordu University, Faculty of Dentistry for aesthetic restoration of their anterior cavities. Inclusion and exclusion criteria were used for the selection of the patients. The 159 teeth cavities of Class III and Class IV were randomly restored with nanohybrid composite resin (Clearfil Majesty ES 2) or microhybrid composite resin (Gradia Direct Anterior) according to manufacturers' recommendations. Aesthetic, functional, and biological properties of the restorations were evaluated by two independent examiners at baseline, 6 and 12 months using Modified USPHS/FDI criteria. The variation of the properties according to restoration materials was compared with the Chi-square test. The cumulative implant survival rate in the restoration materials were determined and compared by using Kaplan-Meier analysis and the Log-Rank (Mantel–Cox) test.

Results: At 12 months, 159 restorations were evaluated in 64 patients with a recall rate of 100%. For the nanohybrid group, 2 restorations of one patient were lost at 6 months and were not evaluated further. Two restorations in the nanohybrid group were repaired due to partial fracture (Score 4) at 12- month recalls. Survival rates of the Nanohybrid Group and the microhybrid Group were 94.9 and 100.0 respectively (Kaplan–Meier) ($p<0.05$). Statistical analysis revealed no significant differences between the two composite resin groups except for surface luster, surface staining, post-operative hypersensitivity and periodontal response when the three time periods were compared.

Conclusion: The main cause of restoration failure was restoration fracture. The microhybrid composite resin tested showed better clinical performance in terms of surface luster, surface staining, post-operative hypersensitivity and periodontal response.

Keywords: clinical performance, composite resin restoration, follow-up, survival, Class III and IV cavities

EP – 012

Effects of Different Bleaching Application Time on Tooth Color and Mineral Alteration

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Aim: The purpose of this study was to evaluate the color and mineral changes caused by the bleaching agent applications at different durations on the enamel surface.

Materials and Methods: 60 caries-free lower central incisors extracted for periodontal reasons were standardized for enamel and dentin thickness after cone-beam computed tomography measurements in terms of mineral (n=24) and color change (n=36). All teeth were divided into 3 groups according to different bleaching durations for color (n=12) and mineral change (n=8) measurements. The specimens were stored in artificial saliva at 37°C. The samples for mineral change were examined with the energy scattering X-ray device before and 2 weeks after the application. For a color change, the measurement of the samples was performed with a spectrophotometer. Opalescence Boost PF 40% was applied for 20 min in Group 1, 40 min in Group 2, and 60 min in Group 3. In order to determine the efficacy of bleaching, color measurements were repeated 24 h, 7, and 14 days after the application.

Results: In the study, a statistically significant difference was observed between all groups in terms of color change at different measurement times ($p<0.05$). The highest ΔE00 values were observed in Group 3 (ΔE003 = 8.37±2.15); the lowest value was observed in Group 1 (ΔE001 = 4.74±1.26). Ca values were similar increase among all groups ($p>0.05$). The highest Ca values were observed in Group 3 (69.91±5.34); the lowest value was observed in Group 2 (66.08±1.50). P values were similar increase among all groups ($p>0.05$). The lowest p values were observed in Group 3 (26.54±5.92); the highest value was observed in Group 2 (29.86±2.26).

Conclusion: Effective whitening was achieved in all study groups. When the results are evaluated as versatile in terms of bleaching effectiveness

and mineral change, the most ideal bleaching duration was determined as 40 min (Group 2).
Keywords: office type bleaching, energy scattering, X-ray color change, mineral content, spectrophotometer

EP – 013

How Do Background and Cement Shade Affect Resin Matrix Ceramic CAD/CAM Blocks' Color

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Aim: The purpose of this study was to find out the effect of different shades of background and cement on the obtained color of A2 shaded CAD/CAM blocks.
Materials and Methods: Ten specimens [6×7×1mm] were obtained for each A2 shaded CAD/CAM blocks (Lava Ultimate [LU]; Vita Enamic [VE]). A specimen [6×7×4mm] was prepared for each determined A2 and A3,5 shaded backgrounds (A2B; A3,5B) by a composite resin. All the specimens were polished with 600-, 800-, 1200- and 2000-grit silicon carbide papers. 10 resin cement samples (6×7×0,1mm) were prepared for each A2 and opaque shades of G-CEM Link Force (A2C; OC). Each CAD/CAM sample is matched randomly with a cement sample and a background and optically connected by Cargille. L,a,b color parameters measured by a spectrophotometer and recorded to calculate color differences (ΔE_{00}) between the matched and connected samples and the reference point (5 mm CAD/CAM sample for LU and VE) by CIEDE2000 (1:1:1) formula. Three-way ANOVA and post hoc Tukey tests were performed for the statistical analysis.
Results: Regardless from the other parameters higher ΔE_{00} were observed; at VE for material type, at A2 shade for cement and at A3,5 shade for background ($p<0,05$). Perceptible ΔE_{00}(0,63±0,20; ΔE_{00} <0,8) was observed only for LU with OC and A3,5B. Clinically unacceptable and significantly higher ΔE_{00} (2,15±0,26; 1,8<ΔE_{00}) was observed for LU with A2C and A3,5B ($p<0,05$). For VE, samples with OC and A2B showed clinically acceptable ΔE_{00} (1,56±0,35;0,8<E_{00}<1,8) while the highest ΔE_{00} (2,98±0,41;1,8<ΔE_{00}) was observed at samples with A2C and A3,5B. Both groups showed significant differences with the other VE groups ($p<0,05$). For intergroup comparisons of VE and LU, only samples with OC and A2B showed no significancy ($p>0,05$).
Conclusion: The compositions of resin matrix ceramics and the shade of cements will change interactions with light and the obtained color so should be in mind while planning a restoration especially with needed masking for darker backgrounds.
Keywords: CIEDE2000, color, CAD/CAM

EP – 014

A 3-year Multicentre Clinical Trial in Split-mouth: Glass Hybrid System vs. Resin Composite

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Aim: The objective of this study was to compare the clinical performance of a glass hybrid restorative system, EQUIA Forte, with a nano-hybrid resin composite, Tetric EvoCeram, in moderate to large class II cavities after 3-year follow up.
Materials and Methods: A total of 360 two-surface restorations were placed in four dental schools: Zagreb, Croatia; Milan, Italy; Izmir, Turkey, and Belgrade, Serbia. Patients (n=180) in need of 2 restorations in the molar region of the same jaw received one glass hybrid restoration (EQUIA Forte, GC) and one resin composite restoration (Tetric EvoCeram, Ivoclar Vivadent). After the cavity preparation, restorations were placed in bulk for the glass hybrid material and in 2-mm incremental layers for the resin composite with a two-step self-adhesive system. Clinical performances were assessed by two independent evaluators in each center according to the FDI-2 criteria for aesthetic, functional and biological properties at the baseline, after one, two and three years. To test the performance of the restorative materials, equality of survival curves was tested using a stratified test for matched pairs and the FDI-2 criteria were compared using a sign test.
Results: No significant differences in survival rates between EQUIA Forte (90.8%) and Tetric EvoCeram (93.1%) were observed at the 3-year recall ($p>0.05$). No statistical differences could be detected between the properties of glass hybrid restorative system and the nano-hybrid resin composite except for one of the functional properties- fracture of the material and retention, with resin composite showing slightly better clinical scores ($p<0.05$).
Conclusion: After 3-year clinical evaluation, both the glass hybrid restorative system and the nano-hybrid resin composite showed good clinical performance in moderate to large two-surface restorations in the molar region.
Keywords: glass hybrid system, multicenter, resin composite, split mouth, clinical trial

EP – 015

Er,Cr:YSGG Laser Effects on the Dentin Morphology and Microleakage: A SEM Study

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Aim: The evaluation of the enamel and dentin cavity surface morphologies by Scanning Electron Microscopy (SEM) in Class II occlusogingival slot cavities which were prepared and etched by Er, Cr: YSGG (Erbium, Chromium: Yttrium, Scandium, Gallium, Garnet) laser and assessing their effects on the microleakage at composite resin restorations, and also comparing them with those of traditional methods.
Materials and Methods: Fifty-five non-carious, sound extracted human molar teeth were divided into five groups: bur preparation + acid etching (Group I), bur preparation + laser etching (Group II), laser preparation + laser etching (Group III), laser preparation (Group IV), laser preparation + acid etching (Group V). Acid applications were performed by the total-etch (Gluma Acid Gel) method. Adhesive (Gluma Comfort Bond) and resin composite (SOLITAIRE 2) was applied to every sample. The resin-tooth interface was evaluated on the basis of microleakage. Statistical analysis of the results was performed and compared using the Chi-Square test and Fisher's Exact test. SEM examinations of laser irradiated samples (Groups II, III, IV, V) revealed a lack of smear layer, irregular and crater-like surface in enamel. Also, these examinations revealed opened dentinal tubules orifice, step like flattered surface and lack of smear layer in dentin.
Results: Statistically significant differences were found among the occlusal ($p=0.003$) and gingival regions microleakage ($p=0.001$) in groups and between occlusal and gingival microleakage ($p=0.000$). In Group V at the gingival, microleakage was found significantly greater than the other groups ($p<0.05$). In Group II, the microleakage at the occlusal was found significantly greater than Groups I, IV and V. When the microleakage at occlusal and gingival were compared among each group, only group V showed statistically significant difference ($p<0.05$).

Conclusion: According to the results of this study, it was determined that there is no need for the etching process after laser preparation
Keywords : erbium laser, etching, marginal leakage, SEM, cavity preparation

EP – 016

Clinical Evaluation of Porcelain Laminate Veneers with FDI Criteria for 2-year

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Aim: Porcelain laminate veneers (PLVs) are minimally invasive options which are often preferred in restorative dentistry for esthetic rehabilitations. The aim of this study was to evaluate clinically PVLs according to the FDI criteria for a period of 24-month.
Materials and Methods:
Eleven patients (7 female, 4 male) applied to our clinic with esthetic complaints. Following intra-oral examination, veneer restorations were planned for the anterior maxillary teeth with minimal tooth preparations. A total of 30 PLVs were fabricated by using leucite-reinforced feldspathic ceramic (IPS-Empress, Ivoclar Vivadent, Liechtenstein). Following glazing procedure, all the restorations were luted with a dual-cure resin cement (Variolink DC, Ivoclar Vivadent, Liechtenstein). Patients were recalled after the 24-month and PLVs were evaluated with the FDI criteria by two independent and blind observers (GP and BY). Descriptive statistics were used, and percentage values were calculated.
Results: Fractures or cracks were not observed in any restoration during the 24-month follow-up. 73% (n=22) of the PLVs had perfect marginal adaptation only 27% (n=8) had small marginal discrepancies that can be removed by polishing. 57% (n=17) of PLVs were evaluated as having good color match, no difference in shade and/or translucency, and 33% (n=13) of PLVs had minor deviations in shade and/or translucency. In periodontal examination, 23% (n=7) of the PLVs had no plaque, no inflammation and no pockets and 77% (n=23) of the PLVs had some plaque formations, minor inflammations however no pocket development was observed in any of those cases.
Conclusion: The data were obtained from a 24-month follow-up period; however, long-term follow-ups are necessary to evaluate the clinical performance of PLVs. Since there was no fracture, failure or need for removal of the restorations after 24-month, the survival rate was evaluated as 100%.
Keywords: FDI criteria, laminate veneers, porcelain, dental esthetics

EP – 017

Effect of Povidone-Iodine and Hydrogen-Peroxide Mouthwashes on Shear Bond Strenth to Enamel

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Aim: During COVID-19 pandemic, use of different mouthwashes have been recomended to reduce the viral load. Aim of this study is to compare the effect of different mouthwashes on shear bond strength of a universal adhesive in regard to self-etch (SE) and etch and rinse (ER) application modes.
Materials and Methods: 100 sound human maxillary central incisors were selected. Flat enamel surfaces were obtained. Specimens were randomly assigned to 5 groups (n=20) [Control, 1.5% hydrogen-peroxide(H_2O_2), 0.2% povidone-iodine (PVP-I), Listerine, Chlorhexidine (CHX)]. Then, each group was divided into two subgroups according the application mode of the used universal adhesive (Single Bond Universal) (n =10). After adhesive procedures, resin composite was applied by a Teflon mold (2mm height, 2.4mm diameter) and light polymerized. Shear bond strength was tested with a Universal testing machine after water storage for 24 h. The debonded areas were examined for failure mode analysis with a stereomicroscope at 25×magnifications. The data were statistically analyzed by two-way ANOVA and Bonferroni test ($p<0.05$).
Results: Etch and rinse application mode of the adhesive system led to higher shear bond strengths than self-etch application mode, regardless of the preoperational antiseptic mouthwashes used ($p<0.001$). The lowest shear bond strength values among all the tested groups were measured for H_2O_2/SE group (3.77±1.37MPa). The control group (where no mouthwash was used) exhibited the highest SBS values (26.43 ±4.35MPa) in SE mode (PVP-I/SE=8.70±1.92, Listerine/SE=9.99 ±2.90; CHX/SE=17.67±4.37MPa) ($p<0.05$). PVP-I/ER group (24.04 ±5.01MPa) showed no significant difference with H_2O_2, CHX, Listerine and control groups in ER mode (21.40±3.67, 28.30±6.03, 29.61±4.78, 31.48±7.45) ($p>0.05$). H_20_2 presented lower shear bond strength (21.40±3.67MPa) than other mouthwashes in ER mode ($p<0.05$). The adhesive failure mode was predominant for all groups.
Conclusion: The antiseptic mouthwashes decreased the enamel bond strength of the universal adhesive used in self-etch application mode, however only H_2O_2 reduced the enamel bond strength in both application modes.
Keywords: hydrogen peroxide, mouthwash, povidone iodine, shear bond strength, chlorhexidine

EP – 018

Homogeneity of Curing Unit Beam Profile and Microhardness of Composites with Different Thicknesses

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Aim: To analyze factors affecting inhomogeneity of dental curing units and to evaluate its effects on microhardness of dental composites with different thicknesses.
Materials and Methods: Spectrum and radiant emittance of 8 dental curing units (DCUs) were examined. Curing modes with radiant emittance about 1000mW/cm^2 were selected for each DCUs. Changes in spectrum of each DCUs by neutral-density (ND) filters were evaluated. DCUs were tested with ND filters with different optical density (OD) values (0.1,0.2,0.5,1.0,2.0).
Beam profiles of each DCUs were analyzed with holographic diffuser and CCD camera. Images of light were projected from holographic diffuser and photographed with CCD camera. CCD camera was placed at 20cm and in line with center of the image. Iris of camera lens was set at value 16. Changes in beam profile by ND filters with higher OD values were investigated. OD values were recorded when the inhomogeneity was observed.
Two dental composites were packed into 1cm x1cm Teflon mold with different thicknesses (1,2,3,4mm). The mold was put between slide glasses and cured with multi-peak DCU (Bluephase Style 20i) for 20 seconds. Vickers microhardness test was conducted at center, 2mm and 4mm points of 4 directions (Up, Down, Right, Left) on top and bottom surfaces. One week later, microhardness test was performed again. Each test was repeated 5 times. One-way ANOVA and paired t-test was carried out to analyze the results of microhardness test.
Results: From 8 DCUs, 3 had multi-peak and 5 had single-peak spectrum. Spectral distribution of each DCUs were uniformly decreased after attenuated by ND filters. Inhomogeneity of beam profile was observed after attenuated with ND filters with different OD values (Mean:2.74,2.68,2.62,2.54,2.52,2.52,2.46,2.42/ SD:0.05,0.08,0.08,0.09,0.04,0.04,0.05,0.08). Microhardness value was lower at 4mm points of each specimen than other points, and lower at the points near violet LED (Right-2mm) compared to center on bottom

surface with 4mm specimen of packable composite ($p<0.05$, Immediate:11.77vs19.64/1week:12.45vs22.16).
Conclusion: Inhomogeneity of DCUs should be taken into account when the light is heavily attenuated.
Keywords: dental curing unit, dental materials, dental curing light

EP – 019

The Effect of World Coffee Types on Discoloration of a Resin Composite
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Aim: To evaluate the effect of world coffee types with different pH values on color change of a resin composite that does not contain color pigment produced by smart chromatic technology. The hypothesis tested was coffees with different pH values would reveal a significant difference on discoloration of the resin composite.
Materials and Methods: Eighty-four disk-shaped specimens (diameter:8mm thickness:2mm) were prepared from Omnichroma (Tokuyama Dental, Japan). A standard polishing procedure was applied, and specimens were randomly divided into 7 groups (n=12). Six different coffee (Colombia, Santos, Costa Rica, Guatemala, Kenya, Ethiopia) solutions and distilled water (control) were used. Specimens were immersed in daily refreshed coffee solutions at 37°C for 7 days. pH values of immersion solutions were also measured with a pH meter (Knmaster, Turkey) before every immersion. Baseline and final color measurement of the specimens was made with a spectrophotometer device (Spectroshade Micro, MHT, Italy). The CIEDE2000 color formulation was used to calculate the discoloration (ΔE_{00}). Statistical analyzes were performed using the one-way variance (ANOVA) analysis with a significance level of 0.05.
Results: According to the results of the analysis, no significant difference was found between different coffee groups in terms of ΔE_{00} values ($p = 0.182$). Discoloration of specimens kept in coffee solutions was found to be higher than clinically acceptable value ($E_{00}>1.8$) (Control Group: $E_{00}=1.69$). Control group showed the least discoloration which was statistically different from all coffee groups ($p<0,001$).
Conclusion: The hypothesis was rejected. It was concluded that the pH value alone did not affect the discoloration of the resin composite. It is thought that other properties of coffee (consistency, density, aroma, growing region etc.) may also be effective on discoloration. Future research is needed.
Keywords: discoloration, smart chromatic technology, composite

EP – 020

Effect of Light Inhomogeneity on Microhardness of Resin Cements Under CAD/CAM Blocks
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Aim: Because the distribution of irradiance and spectral emission of many dental light beams is different, the light energy passing through the restoration shows inhomogeneous distribution. Differences in irradiance and light wavelengths of different regions within the same restoration can lead to differences in the degree of polymerization and reaction rate of resin cement. Therefore, we tried to find out how the inhomogeneity of light emitted from the light curing unit has a specific effect on the polymerization of resin cement under the CAD/CAM block of various types and thicknesses.
Materials and Methods: High translucency and Low translucency of IPS e.max CAD (Ivoclar Vivadent), Celtra Duo (Dentsply), LAVA Ultimate (3M ESPE) and Vita Enamic (VITA Zahnfabrik) were used. Thickness of each block was 1.0, 1.5, 2.0 and 4.0mm and total of 100 specimens were produced. Transparency and optical transmittance of each block were measured using VITA Easy Shade, Fiberoptic Spectrometer (USB2000; Ocean Optics) and Laser Beam profiler (Ophir spiricon). Variolink N and Rely-X U200 were used as resin cements. Five points (-4,-2,0,+2,+4mm) were marked according to the distance of the light tip. At each point, Microhardness was measured immediately, a day and a week after polymerization.
Results: (1) As the thickness of the CAD/CAM block increased, the translucency and light transmission decreased ($p<0.05$).
(2) The beam profile of the light curing unit that passed through the CAD/CAM block did not show uniform.
(3) The resin cement microhardness decreased in the order of E.max HT ≥ Lava Ultimate ≥ Celtra Duo ≥ E.max LT ≥ Vita Enamic ($p<0.05$).
(4) More than 2mm thickness showed relatively inhomogeneous microhardness ($p<0.05$).
Conclusion: Translucency and light transmission differ and show inhomogeneous depending on the thickness and types of the CAD/CAM blocks. And It affects the degree of conversion of resin cements.
"This study was supported by Yonsei University College of Dentistry Research Fund 6-2019-0015"
Keywords: inhomogeneous, microhardness, resin cements, CAD/CAM blocks

EP – 021

Cleanliness of Canal Walls after Retreatment of Maxillary First Molar: *In-Vitro* Analysis
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Aim: The aim of this study is to evaluate the amount of residual gutta percha after retreatment with rotary files (Reciproc Blue®) from each canal of maxillary first molar using cone beam computed tomography (CBCT), and time required to accomplish it.
Materials and Methods: Nine extracted first maxillary molars, which include 27 canals, were used. Root canal treatment was conducted. Preoperative CBCT were taken, and retreatment done using Reciproc Blue®. CBCT were taken post retreatment and percentage of residual volume gutta percha from each canal was calculated. The total retreatment time was recorded. SPSS version 24 for Windows (SPSS, Chicago, IL, USA) was used as the statistical evaluation of the results. One-way ANOVA was conducted in comparing the residual root canal filling material and retreatment time between the canals. The significant value was set at a level of less than 0.05.
Results: The mean percentage volume of residual filling material in mesiobuccal, distobuccal and palatal canals were 15.06%, 1.77% and 1.89% respectively. Despite the highest percentage of residual filling material scored by mesiobuccal canal, there was no significant difference between the three types of canals (p=0.083). No canals are exempted from showing completely clean from filling material.
The mean time required to retreat mesiopalatal canal was 271.89 seconds, 246.11 seconds for distobuccal canal and 414.89 seconds for palatal canal. However, no significant difference was found between the canal retreatment time (p=0.088).
Conclusion: There was no statistically significant difference in terms of amount of residual filling material in mesiobuccal, distobuccal and palatal canal for maxillary first molar as well as total time used for retreatment with Reciproc Blue® system.
Keywords: reciproc blue, retreatment, canal walls

EP – 022

The Effect of Different Modeling Resins on Discoloration of Omnichroma Composite
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Aim: To investigate the effect of different modeling resins on discoloration of single shade universal composite, Omnichroma, and multishade nanofilled composite resin.
Materials and Methods: Two different restorative materials G'ænial Anterior composite resin (GC, USA) shade A1 and Omnichroma composite resin (Tokuyama Dental, Tokyo, Japan) were used without modeling agents (control) and with two different modeling agents (Bisco Modeling Resin (Bisco, USA), GC Modeling Resin (GC, USA). A total of 90 disc-shaped samples (8 mm diameter, 2 mm thickness) were prepared (n=15). The specimens were fabricated by condensing the material into a silicone mold. Composite resin was pressed by a glass plate and mylar strip to flatten and smooth the surface, so that no air bubbles were left. Modeling agents were then applied according to the manufacturer's recommendations. Restorative materials are polymerized by LED (Elipar S10, 3M ESPE) for 20 sec. Standard surfaces were prepared using aluminum oxide discs (Sof-Lex; 3M ESPE, USA). The specimens were immersed in coffee solution (Nescafe Classic, Nestle, Switzerland) at 37°C for 6 days, solution was refreshed daily. Samples underwent a color determination procedure by using a spectrophotometer (Spectroshade Micro, MHT, Italy) at baseline and at the end of test period. The amount of discoloration was calculated with CIEDE2000 color formulation (ΔE_{00}). Statistical analyzes were performed using the one-way variance (ANOVA) analysis with a significance level of 0.05.
Results: Regardless of groups all specimens showed discoloration higher than clinically acceptable value (ΔE_{00}>1.8). In all groups tested Omnichroma showed more discoloration than G'ænial, and the difference was statistically significant. Different modeling agents did not affect the amount of staining of both composite resins.
Conclusion: Multishade composite presented lower discoloration than the single shade universal composite. Modeling resin usage did not influence the discoloration.
Keywords: nanofilled composite resin, omnichroma, tooth discoloration, modeling agent

EP – 023

Evaluation of the Acid-Formation Potential of the Saliva for Individual Caries Risk Assessment

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Aim: To determine the acid-formation potential of the saliva and evaluate whether this is a valid method to detect the individual caries risk in patients with and without caries experience.
Materials and Methods: A clinical controlled cross-sectional study was carried out by means of two groups: (1) naturally healthy subjects without caries-experience (n=25; DMFT=0) and (2) subjects with at least one active carious lesion (n=25; DMFT>0). A detailed intraoral examination, bleeding (BI) and plaque (PI) indices were obtained. The acid -formation potential was measured according to the pH-difference after 1 hour. Number of *Streptococcus mutans, Lactobacilli* and the buffering capacity were assessed. Intergroup comparisons were performed by Mann-Whitney-U-Test. The diagnostic value of acid-formation potential was evaluated by "Receiver-Operating-Characteristic"-method and calculation of the "Area Under the Curve" (AUC-value). The saliva microbiome was analyzed by 16S rDNA next generation sequencing.
Results: A significant difference was found between the groups for pH-difference, while the caries group showed a higher mean value after 1 hour (Healthy=1.07, Caries=1.42; p=0.035). The AUC-value was in a desirable range (0.67; 1=ideal). Furthermore, a significantly increased occurrence of *Streptococcus mutans* (p<0.001; AUC=0.83) and *Lactobacilli* (p<0.001; AUC=0.83) was found in the caries group. The oral hygiene indices showed a significantly higher BI (p=0.006) and PI (p=0.001) in the caries group. With regard to the buffering capacity no difference was shown between the two groups. The composition of the saliva microbiome of subjects with active caries indicates a higher α-diversity and richness. A significant increase was seen for *Alloprevotella*, *Prevotella*, *Campylobacter* and *Veillonella*, in the naturally healthy group. The genera *Fretibacterium, Lactobacillus, Spirochaetes, Synergistetes* and *Leptotrichia* were significantly increased in the caries group.
Conclusion: The acid-formation potential of the saliva seems to be a valid method to assess the individual caries risk and corresponds well to the number of mutans streptococci/lactobacilli and the saliva microbiome.
Keywords: caries risk assessment, dental caries, dental health, saliva microbiom, acid-formation potential

EP – 024

Morphological Changes in Bleached Enamel after Treatment with Three Remineralizing Agents

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Aim: To investigate the effect of 35% Hydrogen Peroxide (HP) bleaching gel on the morphology of enamel and to analyze the effect of four remineralizing agents on it.
Materials and Methods: One hundred blocks (3x3x3mm) were prepared from the buccal and palatal surfaces of 50 human teeth. The enamel surfaces were bleached in one session with 4 applications of 8 minutes each one with 35% HP. The samples were divided into four remineralization treatment groups (n = 25). Group 1: GC Tooth Mousse®, Group 2: Remin Pro®, Group 3: Colgate Sensitive PRO-Relif®, Group 4: Mirafluor®. SEM observation was performed at baseline, after bleaching and remineralizing treatment in all groups.
Results: After bleaching, SEM shows an increase of superficial irregularities on enamel. After remineralization treatment, different degrees of deposit of amorphous mineral on the enamel surface were observed in all groups. All samples treated with GC Tooth Mousse® and Remin Pro® showed clear signs of remineralization. On the samples treated with Colgate Sensitive PRO-Relif® and Mirafluor®, the enamel defects caused by bleaching remained visible and a few mineral deposits were noticeable.
Conclusion: CPP-ACP and hydroxyapatite-based products showed more surface deposits than 8% arginine or fluoride based. For this reason, it could be more interesting to recommend the first group after bleaching.
Keywords: CPP-ACP, fluoride, hydroxyapatite, remineralization, bleaching

EP – 025

Does Gender Effect the Attitudes, Preferences and Behavior of Dentists Regarding Restoration Repair?

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Aim: This study aimed to compare attitudes, preferences, and clinical behavior of male and female dentists regarding the repair of amalgam or composite resin restorations.
Materials and Methods: A 6-item questionnaire comprised of multiple-choice questions was sent by e-mails to the dentists in Turkey via Turkish Dental Association (TDA). The data obtained after responding the questionnaire were analyzed using the Chi square test to compare answers of

two genders (p=0.05). Categorical variables were presented numerically and as percentages.
Results: Questionnaire was answered by 816 dentists (401 male [49.1%]; 415 females [50.9%]). There was significant difference between two genders regarding the factors effecting preferences of restoration repair ($p<0.05$). The male practitioners more often preferred repairing to preserve remaining tooth structure than female ones (p=0.018). However, the female practitioners more often preferred repairing to achieve longer survival and to avoid repetitive restorations (p=0.000), and to preserve the pulp vitality (p=0.029). Another statistical difference was between the genders regarding indications and contraindications for restoration repair. The male practitioners more often gave priority to restoration repair in case of secondary caries (p=0.002) while the female ones more often gave priority to restoration repair in case of tooth wall fracture (p=0.038). The female practitioners more often avoided repairing in patients who do not obey the appointments (p=0.042), and when the remaining tooth structure was not able to resist mastication forces (p=0.045). Also, the statistically significant differences were found between the genders regarding preferred techniques, attitudes and clinical behavior ($p<0.05$).
Conclusion: It could be concluded that; the gender effect attitudes, preferences and clinical behavior of dentists regarding restoration repair.
Keywords: web survey, restoration repair

EP – 026

Evaluation of Color Stability of Experimental Dental Composite Resins Prepared from Bis-EFMA
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Aim: This study aimed to compare the color stabilities of experimental resin-based composites (RBCs) prepared from a novel monomer system derived from 9,9-Bis[4-(2-hydroxyethoxy) phenyl] fluorene) (Bis-EFMA), bisphenol A-glycidyl methacrylate (Bis-GMA), and urethane dimethacrylate (UDMA) with each other, also with a commercial RBC, 3M ESPE FiltekTM Z250 (FZ).
Materials and Methods:
Experimental Bis-EFMA, Bis-GMA, and UMDA based composites were prepared (20% Bis-EFMA or 20% Bis-GMA or 20% UDMA, and 20% triethylene glycol dimethacrylate (TEGDMA) and 60% glass filler). Eighty RBCs were produced with a diameter of 8 mm and 2 mm thickness (n=5). The initial color values of RBCs on the first day, first week, and the first month after immersion into black tea, coffee, cola, and water solutions were measured using a spectrophotometer (VITA Easyshade® V; Zahnfabrik, Bad Säckingen, Germany) against a white background. The normality of data distribution was checked using the Shapiro–Wilk test. Due to normal distribution, an analysis of covariance (ANCOVA) was conducted. Significant differences were analyzed with Tukey's post hoc test ($p = 0.05$).
Results: Bis-EFMA and UDMA based composite resins exhibited significantly less ΔE and ΔL compared to Bis-GMA based composite resins ($p < 0.05$), but no significant difference was found with FZ ($p > 0.05$). Tea and coffee caused significantly higher changes in total color (ΔE), light value (ΔL), red-green (Δa), and blue-green (Δb) coordinate values compared to water and cola ($p < 0.05$). At one month compared to one week and one day, significantly higher values were obtained in terms of ΔE, ΔL, Δa, and Δb ($p < 0.05$).
Conclusion: Bis-EFMA, a novel bisphenol A-free monomer system, has the potential to be used in commercial RBCs as a substitute for Bis-GMA in terms of better color stability.
Keywords: color stability, dental composite material, resin matrix, bisphenol A

EP – 027

Effect of Air Blow Pressure at Multi-step Adhesive Application on Bond Strength
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Aim: In general, the dental adhesive instructs air blow to make thinner adhesive layer and have different recommended air pressures. In clinical situation, actual air blow pressure may differ depending on the dentist which make technical sensitivity. Especially, multi-step adhesive has 2nd or 3rd bonding-step which function same of the products and intended to make thicker layer and might be more sensitive to air blow pressure. In this study, the bond strength of multi-step adhesives with several air blow pressure at bonding-step application was evaluated to find impact of air blow pressure.
Materials and Methods: The materials used were G2-BOND Universal (GC, G2B), SE BOND2 (Kuraray, SE2) and OptiBond FL (Kerr, OFL). Bovine dentin was ground with 320-grit SiC paper. Adhesives were applied to the dentin surface according to manufactures' instructions except air blow pressure at bonding-step application. It was air-blowed at each of the following air blow pressures; 0.05 and 0.15 MPa. The mold was place on adhesive area to isolate bonding area, 2.38mm diameter. Adhesives were light cured via the mold, and composite-resin was filled into the mold and light cured. The specimens were immersed in water at 37º C for 24 hours and then subjected to shear bond strength (SBS) test (n=5). Data were analyzed by T-test ($p<0.05$).
Results: Mean(±SD) SBS values at 0.05MPa were 34.0(±3.6), 31.0(±4.6) and 28.3(±4.7) MPa for G2B, SE2 and OFL respectively. SBS values at 0.15MPa were $34.4(\pm6.5)^{n.s.}$, $12.9(\pm3.5)^{*}$ and $22.7(\pm3.6)^{n.s.}$ MPa. G2B and OFL has no significant difference on SBS in between air blow pressures. Even when the air blow pressure was 0.15 MPa, G2B maintained high bond strength.
Conclusion: SBS of G2B was not affected by air blow pressure at bonding-step application and had high bond strength which means G2B may have low technique sensitivity, and high usability in clinical practice. The authors belong to GC Corporation.
Keywords: bond strength, bonding agent, multi-step adhesive, air blow pressure

EP – 028

Effect of Thicknesses on Translucency of Resin-Based Composites and Glass Ceramics.
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Aim: The aim of this study was to evaluate the effect of the thicknesses (1, 2, 3 and 4 mm) on the translucency of the resin-based composites (RBCs) and glass ceramics using a colorimeter, and to compare the influence of the thickness of those materials on the translucency parameter (TP) value.
Materials and Methods: Forty specimens were prepared for each of the A3 shade RBCs and glass ceramics ((Beautifil II, Estelite Sigma Quick, Filtek Z250, Filtek Z350 XT, Gradia Direct, Herculite Precis, Lava Ultimate, Tetric N-Ceram, Celtra® Duo, heat-cured CD, IPS e.max CAD HT, IPS e.max CAD LT, rainbow™ LS). The TP was compared among the different thicknesses within the materials using one-way analysis of variance. The materials divided into two groups, such as eight in Group 1 and five glass ceramics in Group 2. Mann-Whitney test was used to compare TP, ΔL^*, Δa^* and Δb^* between Group 1 and Group 2.
Results: The TP values of the RBCs and glass ceramics significantly decreased as the thickness of the materials increased. There was statistically significant difference between the two groups for TP in 2, 3 and 4 mm. For ΔL^*, there were statistically significant differences in 2 and 4 mm between two groups. For Δa^* and Δb^*, significant differences

were present in all thicknesses between the two groups, and Δb* absolute values were greater than those of Δa* in all thicknesses.
Conclusion: The TP of RBCs and glass ceramics decreased as the thickness increased, especially from 1 mm to 2 mm. The TP value of RBCs was significantly decreased as the thickness of the material increased from 2 mm to 4 mm more than those of glass ceramics.
Acknowledgements: This study was supported by Yonsei University College of Dentistry Research Fund 6-2019-0015.
Keywords: bond strength, bonding agent, multi-step adhesive, air blow pressure

EP – 029

Bond Strength of Active Adhesive Application to Cervical Enamel and Dentin

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Aim: The aim of this study was to evaluate the effect of active application of a universal adhesive resin in different modes on shear bond strength to cervical enamel and dentin.
Materials and Methods: Sixty extracted non-carious human anterior teeth were used. The buccal/lingual surfaces of the teeth were ground to obtain a flat enamel/dentin and all teeth were embedded in self-curing acrylic resins. All specimens were divided into 4 groups according to adhesive resin application procedures (n=15) of Gluma Bond Universal (Kulzer, Hanau, Germany). Group I: Passive Application/Etch&Rinse Mode (PER) Group II: Active Application/Etch&Rinse Mode (AER) Group III: Passive Application/Self-etch Mode (PSE) Group IV: Active Application/Self-etch Mode (ASE). After the adhesive application, a tigon tube (inner diameter of 2 mm, height of 2 mm) was positioned to buccal cervical enamel and lingual cervical dentin surfaces and filled with a nanofill resin composite. Then, after storage in distilled water at 37^0C for 24 hours, the specimens were thermocycled for 1000 cycles between 5 and 55 °C with a dwell time of 5 s each. Bond strength test performed with a universal testing machine at a cross head speed 0.5 mm/min and bond strength values were calculated (MPa). The data were statistically analyzed using two-way ANOVA ($p<0.05$).
Results: There were statistically significant differences between cervical enamel and dentin groups' bond strength values in all application modes ($p<0.05$). The active application of the universal adhesive system to enamel in Etch&Rinse mode showed the highest bond strength values in all groups and showed statistically significant difference ($p<0.05$). However, in cervical dentin, Etch&Rinse mode/passive application group showed the lowest bond strength value compared to other test groups and the difference was statistically significant ($p<0.05$).
Conclusion: Within the limitations of this study, the universal bond applied actively in Etch&Rinse mode improved the bond strength to cervical enamel.
Keywords: adhesive resin, etching modes, shear bond strength, universal adhesive, active application

EP – 030

Effect of Different Mouthrinses on Color Stability of Supra-Nano Filled Composite Resin

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Aim: Recently, a novel supra-nano filled resin composite, Omnichroma (Tokuyama Dental, Tokyo, Japan), claiming to rely mainly on structural color technology for shade matching, is gaining attention from the clinicians. This study aimed to evaluate the effect of different mouthrinses (with alcohol or alcohol free) on the color stability of Omnichroma composite resin.
Materials and Methods: Sixty-disc shaped specimens (8 mm diameter, 2 mm thickness) were prepared with Omnichroma composite resin and polished with Sof-Lex aluminum oxide polishing disks (3M ESPE, Dental Products, Seefeld, Germany), starting with coarse and ending with extra fine. Specimens were divided into five groups (n=12) according to the immersion media; distilled water (control), Listerine Cool Mint (Johnson & Johnson, New Jersey, USA) (with alcohol), Klorhex (Drogsan Turkey) (with alcohol), Meridol (GABA GmbH, Lorrach, Germany) (alcohol free) and Denta Save (Drogsan,Turkey) (alcohol free). The samples were immersed in 20mL of solutions for 2 minutes twice a day for 7 days (with a 12-hour interval between exposures), and then stored in 20 mL of distilled water at 37°C. Measurements were carried out at two different times: after sample preparation and at the end of 7 days by a single operator previously calibrated, with a digital spectrophotometer (SpectroShade; Medical High Technologies, Italy). Welch ANOVA test was used to evaluate the differences in ΔE_{00} measurements among groups, multiple comparisons were evaluated with Games Howell test.
Results: Except control group all samples showed clinically unacceptable discoloration ($\Delta E_{00}>1.8$). Statistical analysis showed that, the specimens exposed to Meridol and Denta Save showed significantly higher discoloration than the control group ($p<0.05$). However, no statistically significant differences were observed among other groups.
Conclusion: Immersion in alcohol-free mouthrinses caused higher discoloration. Clinicians must consider the staining ability of daily used mouthrinses on restorative materials.
Keywords: mouthrinses, supra-nano filled resin composite, discoloration

EP – 031

***In-Vitro* Evaluation of the Microleakage of Preheated Bulk Fill Composites**

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Aim: The aim of this study is to *in vitro* evaluate microleakage of bulk fill composite restorations preheated in class II cavities.
Materials and Methods: 80 extracted human molar teeth were used in the study. 160 slot cavities were prepared in the mesial and distal of the teeth. In the gingival of the cavities, Estelite Bulk Fill Flow (Tokuyama, Tokyo, JAPAN) in the mesial and SDR Posterior Bulk Fill Flowoble Base (Dentsply, DeTrey, GERMANY) in distal are used and the remaining occlusal parts are restorated by Filtek^{TM} One Bulk Fill Restorative (3M, St Paul, MN, USA). The composites used were applied at 4 different temperatures (4ºC, room temperature, 39ºC and 55ºC). After finishing and polishing, all specimens were thermocycled and then placed in 0.5% methylene blue for 24 hours at room temperature. Specimens were sectioned into 2 parts in mesio-distal direction and examined using a stereomicroscope (X40) and microleakage values were determined.
Results: In the statistical evaluation of the microleakage values of FiltekTM One Bulk Fill Restorative applied at 4 different temperatures on the occlusal surface with One-way ANOVA, it was observed that there was a significant difference between the groups ($p=0.02$). In the comparison of the microleakage values of Estelite Bulk Fill Flow applied in the gingival region with the One-way ANOVA test at 4 different temperatures, there was no statistically significant difference between the groups ($p> 0.05$), while there was a significant difference between the groups using SDR Posterior Bulk Fill Flowoble Base ($p= 0.002$). The highest microleakage values were observed at 4°C in all groups.
Conclusion: The results obtained within the limits of the study show that preheating bulk fill composite resins before application can be used as a useful method in reducing microleakage. However, *in vivo* studies are needed to support the results.
Keywords: microleakage, preheating, stereomicroscope, bulk fill composite

EP – 032

Effects of Acidic Beverages on Optical and Physical Properties of Flowable Composite Resins

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Aim: The aim of this *in vitro* study was to investigate and compare color change and surface roughness values of three flowable composite materials with different viscosity after short-term storage in various beverages with acidic pH.

Materials and Methods: Two flowable composite materials (FCM) with medium viscosity (Es Flow, Spident, Korea and Ruby Flow, Inci Dental, Turkey) and one FCM with low viscosity (Estelite Flow Quick, Tokuyama, Japan) were used. Sixty-three sample were prepared in stainless steel molds and polymerized with a LED light curing unit (Valo Cordless, Ultradent, USA) then stored in distilled water (37°C, 24 hours) (n=21). Initial surface roughness (SR) (MarSurf M 300C; Mahr GmbH, Göttingen, Germany) and color change measurements (CC) (Vita EasyShade Advance 4.0, Vita Zahnfabric, Germany) were performed. Then, samples were divided into 3 subgroups: Distilled water (control)/ orange juice/soda with pomegranate (n=7). Specimens were stored in the related liquids for 4 days (37ºC). Liquids were freshly prepared daily during experiment. At the end of 4th day SR and CC measurements were repeated. Data were analyzed by ANOVA, Post hoc Tukey and Paired-T tests (p<0.05).

Results: When flowable composites were compared according to acidic beverages in terms of SR, statistically significant differences were found for Ruby Flow kept in soda with pomegranate (Ra=0.1), Estelite Flow Quick (Ra=0.09) and Es Flow (Ra=0.18) stored in orange juice (p<0.05). When CC values were compared, no statistically significant differences were observed among all groups (p>0.05).

Conclusion: While both medium and low viscosity flowable composite materials performed an increase in surface roughness values after stored in beverages with similar acidic pH, these materials showed color changes below clinically acceptable values.

Keywords: color stability, flowable composite, surface roughness, acidic beverage

EP – 033

Effects of High Concentration Waiting Room Whitener on Surface Properties of Bulk-Fill Composites

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Aim: To evaluate surface microhardness (MH) and roughness (SR) of two bulk-fill composite materials with different viscosity subjected to thermal aging in artificial saliva (AS) then exposed to a high concentration of waiting room whitener gel.

Materials and Methods: High viscosity (Estelite Bulk-Fill Flow,Tokuyama,Japan) (EBF), low viscosity (Filtek Bulk-Fill Posterior, 3MESPE,Germany) (FB) bulk-fill composite materials, bleaching agent containing 45% Carbamide Peroxide (Opalescence Quick PF 45%,Ultradent,USA) were used. A total of twenty samples were prepared in 4x10 mm Teflon molds and polymerized with LED light curing unit (n=10). Initial MH and SR measurements were performed after samples were exposed to thermal aging procedure (10,000 cycles).Then 45% Opalescence Quick PF was applied to samples for 30 minutes during 14 days. Samples were kept in AS for the remaining 23.5 hours. Final MH and SR measurements were repeated at the end of 14 days. Wilcoxon Signed Ranks, Kruskal-Wallis and Bonferroni tests were used in the analysis of the MH while One-way ANOVA and Post-Hoc Tukey tests for SR (p<0.05).

Results: Regardless of bleaching agent, there was a significant difference in MH values between two bulk-fill materials *($p<0.05$).*MH value of FB was found higher than EBF. According to bleaching agent, a significant decrease was found in MH values for both of the bulk-fill composite materials *($p<0.05$).* Regardless of bleaching agent, there was a significant difference in SR values between two bulk-fill materials *($p<0.001$).* SR value of FB was calculated higher than EBF. When the effect of bleaching agent on SR was examined, no statistically significant difference was observed in EBF *($p>0.05$).* SR value of FB was found higher after bleaching application and the difference was statistically significant *($p<0.05$)*.

Conclusion: Although MH value of high viscosity bulk-fill material decreased after bleaching agent, SR value did not change. Instead of low-viscosity, high-viscosity bulk-fill material can be safely used in the restoration of teeth with high concentration waiting room whitener gel.

Keywords: microhardness, surface roughness, waiting room whitener, bulk fill composite resins

EP – 034

Awareness on Replacement of Missing Teeth: An Institutional Analysis

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Aim: Tooth loss is still a major oral health problem in developing countries. Missing teeth significantly impairs oral function but not all patients were aware of the consequences of tooth loss and not many seek treatment to replace the missing teeth. This study aims to assess the awareness and factors that prevent patients from seeking treatment for the replacement of missing teeth and also to identify the relationship between self-perceived oral health with the experience of missing teeth.

Materials and Methods: Validated self-administered questionnaires were distributed using convenience sampling method from September to October 2019. The questionnaires consisted of four parts: sociodemographic, assessment of knowledge and awareness towards the replacement of missing teeth and self-perceived oral health. Data were analyzed using descriptive statistics correlation tests.

Results: A total of 203 adults responded to the survey, aged 18 to 79 years old (mean: 42.46, ±15.521). Most of the respondents (83%, n=167) had experience missing teeth, with 74% (n=123) did not receive any treatment for replacement of the missing teeth. The main reason was the low felt need for any treatment due to lack of awareness and knowledge. Knowledge on replacement of missing teeth was associated with their level of education (p<0.05). Self-perceived oral health was related to the experience of missing teeth and level of education (p<0.05).

Conclusion: Strategies should be planned to increase the awareness on the consequences of missing teeth among the public. Dentists' involvement in educating patients need to be improved to change the patients' perception and attitude in replacement of missing teeth.

Keywords: missing teeth, replacement of missing teeth, awareness

EP – 035

Shear Bond Strength of Indirect Pulp Capping Materials to Caries-Affected Dentin

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Aim: To evaluate the shear bond strength (SBS) of indirect pulp capping materials to caries affected dentin (CAD) with/without chlorhexidine (CHX) pretreatment.

Materials and Methods: Coronal dentin surfaces of 150 extracted sound human molar teeth were ground flat. Artificial CAD were obtained. Half of the specimens were pretreated with 2%CHX and half of them received no-pretreatment before the application of indirect pulp capping materials (n=15). Five materials were assessed: 1-Conventional glass ionomer cement (Fuji IX, GC, Japan) (CGIC) 2-Resin modified glass ionomer cement (Fuji II GC, Japan) (RMGIC), 3-Resin modified glass ionomer bioactive cement (Activa Bioactive, Pulpdent, USA) (ACT) 4-Resin modified tricalcium silicate (Theracal, Bisco, USA) (RMCS), 5-Water-based tricalcium silicate, (Biodentine, Septodont, France) (WBCS). To evaluate the SBS, the Universal Test machine was used (1mm/min).
Data were evaluated by Student's t-test and one-way ANOVA. The differences between groups were analyzed by Mann-Whitney U and Kruskal-Wallis test. Pairwise comparisons were determined with the post-hoc Tukey HSD or Dunn-Bonferroni test. Unless otherwise stated, results for $p<0.05$ were considered statistically significant. Bonferroni Correction was made to control Type I error in multiple comparisons.
Results: Among the groups without pretreatment; SBS of RMCS [0.72(0.59-1.09) MPa] and WBCS [0.89 (0.31-1.05) MPa] were found to be significantly lower compared to ACT [4.37(3.34-6.45) MPa], CGIC [2.52(1.88-6.36) MPa] and RMGIC [5.24(3.23-8.27) MPa] ($p<0.01$). There were no significant differences between Group ACT, CGIC and RMGIC and between Group RMCS and WBCS($p>0.05$).
Among the CHX pretreated samples, SBS of Group RMCS [0.43(0.14-0.86) MPa] and WBCS [0.21(0.16-0.35) MPa] were found to be significantly lower than Group ACT [4.33(2.68-7.06) MPa], CGIC [4.36(3.61-7.44) MPa] and RMGIC [7.56(6.38-10.29) MPa] ($p<0.01$). There were no significant differences between Group ACT, CGIC and RMGIC and between Group RMCS and WBCS ($p>0.05$).
There was no statistically significant difference between the groups with and without CHX pretreatment in all materials ($p>0.010$) except for WBCS. CHX pretreated WBCS group showed lower SBS than the WBCS/without CHX ($p=0.007$).
Conclusion: Tricalcium silicate-based materials had lower shear bond strength than glass ionomer-based materials, both with and without pretreatment of CHX.
*This study was funded by Scientific and Technological Research Council of Turkey (TUBITAK)(ProjectNo:119S048)
Keywords: indirect pulp capping material, shear bond strength, caries affected dentin

EP – 036

Gingival Color and Pink Dental Materials: A Systematic Review
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Aim: A systematic review was performed to: (1) analyze and synthesize available scientific evidence on the color space of human gingiva and (2) evaluate the compatibility of gingival color guides and gingival ceramics and composites with this color space.
Materials and Methods: A systematic review was performed in Scopus and MEDLINE/PubMed. The terms: "gingiva shade ", "gingiva-colored", "pink composite", "pink ceramics", "pink porcelain", "gingiva-colored materials", "gingiva-colored ceramics", "gingiva-colored porcelain", "gingiva-colored composite" and "shade matching", were combined in different equations with the term "AND color". The risk-of-bias tool of the Cochrane Collaboration was used for quality assessment.
Results: A total of 3304 articles were recovered. After applying the inclusion and exclusion criteria, 26 articles were selected for review and analysis. From them, 18 (69%) studied the color of the human gingiva and 8 (31%) the gingiva-colored materials: 4 of pink ceramic and 4 of pink composites. All articles that had been published as of 2004 and 2016-2018 accumulated the highest number of publications (54%).
Analyzing the color of the gingival tissues is the basis for the development of pink clinical guides and restorative materials that cover the color spectrum of the tissues surrounding the tooth. Several authors have determined mucogingival color based on age, sex or race, with inconsistent results. The color space of the gingival tissues is wider than the dental color space. Commercial gingival color guides have a high coverage error. Limited scientific information about pink ceramics and composites shows color differences between materials and natural gum that overcome threshold values of clinical acceptability (AE_{CIELAB}:3.7; $AE_{CIEDE2000}$: 2.8).
Conclusion: (1) The gingival color space is wider than the dental color space. (2) The gingival color guides should be improved to cover this color space. (3) The adjustment and color stability of gingival dental materials require further investigation.
Keywords: gingiva, gingival material, gum, shade, color

EP – 037

Adhesion to Deproteinized Caries Affected Dentin: 3D Gap Formation Analysis by Microcomputed Tomography
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Aim: Pretreatment with a deproteinizing agent like NaOCl is reported to dissolve the organic compounds of the smear layer leaving the inorganic crystals to act as a filler with the hybrid layer. It is also reported to be a strong non-specific proteolytic response, and it has been reported to affect the "intact" sound collagen adversely. Thus, the aim was to evaluate the effect of NaOCl deproteinization of the caries affected dentine on the gap formation at the adhesive interface treated with different adhesive systems with micro-CT.
Materials and Methods: 96 human carious molars were used. Carious dentine was removed until caries affected dentin was reached. Samples were randomly divided into two main groups with respect to the presence of deproteinization (Group A; n=48; control group and Group B; n=48; deproteinized group). These groups are divided into 4 subgroups (n=12) according to the adhesive systems tested: 1. Adper™ Single Bond 2 (two-step etch&rinse); 2. Clearfil SE (two-step; self-etch); 3. Clearfil Universal Bond Quick (etch&rinse mode); 4.Clearfil Universal Bond Quick (self-etch mode). In Group B, the samples were deproteinized by application of 6% NaOCl for 15s and rinsed. The teeth were restored with a bulk-fill composite (Tetric N-Ceram, Ivoclar, Vivadent, Liechtenstein) with molds (4x4 mm dimensions). Samples were stored in distilled water at 37ºC for 7 days. Microgap formation was evaluated in mm^3 with the microtomography Skyscan 1174® device. Statistical analysis was performed with Kruskal Wallis and Mann Whitney U tests.
Results: It was found that there was no significant difference between the non-deproteinized and deproteinized groups with respect to the adhesive systems used. The only statistically significant difference was found in Adper Single Bond 2 samples with respect to deproteinization ($p=0,043$).
Conclusion: Deproteinization process has statistically increased the microgap formation using etch&rinse adhesive system on caries affected dentin when Adper Single Bond 2 was used, so the hypothesis that would not be a significant difference between deproteinized and non-deproteinized groups was partially rejected.
Keywords: bulk-fill composite resin, caries affected dentin, microcomputed tomography, sodium hypochlorite, adhesive

EP – 038

Effects of Different Surface Pretreatments on Fiber Post-Resin Cement Interface Shear Bond Strength
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Aim: The aim of this study was to evaluate and compare the effects of different surface pretreatments on shear bond strength (SBS) between the horizontal surface of prepared glass fiber post and resin cement. The hypothesis of this study was that surface pretreatments of glass fiber posts by using different concentrations of various chemical solutions can increase adhesion especially on the post-resin cement interface.

Materials and Methods: A total of twenty-five glass fiber posts (Cyctec Blanco, Hahnenkratt, Germany) (n=10) were used. Before starting experiment, tapered part of post was cut off. Two equal-length samples were obtained from remaining post. Polishing discs (OptiDisc, Kerr, USA) were used to achieve a flat post surface horizontally. Remaining post thickness (0.8mm) and width (1.6mm) were measured with digital caliper and get standardized. Before surface pretreatments posts were cleaned (96% ethyl alcohol, 3min). Two solutions [hydrofluoric acid(HF)and hydrogen peroxide(HP)] were used for surface pretreatments. Four experimental groups were carried out using two different concentrations of solutions. Group 1: No surface pretreatment (Control). Group 2: 4%HF (Bisco, USA)(1min),Group 3:20%HP (20min),Group 4: 35%HP(Whiteness HP,FGM,USA)(1min),Group 5: 9.6%HF (Pulpdent, USA)(15sec).Silane coupling agent (Monobond S, Ivoclar Vivadent AG, Liechtenstein) and primer (Multilink Primer, Ivoclar Vivadent AG, Liechtenstein) were performed to post surfaces respectively. Dual-cure resin cement (Multilink N, Ivoclar Vivadent AG, Liechtenstein) was applied to post surface by a plastic round mold (1.5mm in diameter) and polymerized with LED light-curing unit. Specimens were stored in distilled water (37°C, 48 hours). Samples were embedded in acrylic resin blocks. SBS values (MPa) were measured using universal testing device (Instron 3345, Instron Corp.,USA)(1.0 mm/min) [DIN 13990 (2017)]. Statistical analyses were performed using one-way ANOVA and the *post hoc* Tukey tests*($p<0.05$)*.

Results: There were no significant differences between SBS values when pairwise comparisons of all groups were performed among themselves ($p>0.05$). Group 4 (35%HP)(22,73±6,36 MPa) and Group 5 (9.6%HF)(21,28±6,42 MPa) showed higher values than Group 3 (20%HP (19,01±3.66 MPa),Group 2 (4%HF)(17,98±2,84 MPa), and Group 1 (Control)(16,83±3,55 MPa).

Conclusion: Shear bond strength between post and resin cement was not affected at the expected level by surface pretreatments (20%HP and 4%HF) applied to post surfaces. On the other hand, clinically acceptable strength values were obtained by applying higher concentrations (35%HP and 9.6%HF).

Keywords: hydrofluoric acid, hydrogen peroxide, shear bond strength, glass fiber post

EP – 039

Real-Time Temperature Changes on Gold Restored Teeth

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Aim: Human teeth are constantly subjected to temperature changes during daily function. This study aimed to measure in *in vivo* real-time temperature changes on gold restored teeth comparing with intact teeth during the intake of hot and cold water. The null hypothesis is that there is no difference in real-time temperature change between gold restored teeth and intact teeth when intaking hot and cold water.

Materials and Methods: A total of 16 first molars, 8 natural intact teeth (Group NT) and 8 restored teeth with gold inlays (Group GR), were selected from the participants. A custom-made thermocouple sensor (0.5 mm in diameter) was attached to the coronal third of the buccal surface of teeth in the NT group and the most buccal part of gold inlays in the GR group with a flowable resin composite. The participants consecutively consumed hot water at 60 °C twice and cold water at 4 °C twice according to a standardized regimen. Resting temperature, maximum and minimum temperatures, time for reaching peak temperatures, and heating and cooling velocities were obtained from real-time records. Statistical analysis was performed by using independent two-sample t-test ($\alpha = 0.05$)

Results: The GR showed significantly higher mean maximum temperature (44.7 ± 2.9 °C) than the NT (40.5 ± 1.2 °C) during drinking hot water. In contrast, the GR showed lower mean minimum temperature (25.0 ± 4.9 °C) than the NT (31.5 ± 3.1 °C) during drinking cold water. The heating and cooling rates for the GR were 0.7 ± 0.3 °C/s and 1.5 ± 1.0 °C/s, which were two and three times higher than those of the NT, respectively.

Conclusion: The gold restored teeth showed greater temperature change than the intact teeth in terms of magnitude and velocity in response to the temperature changes induced by hot and cold water.

Keywords: hot/cold water, intraoral temperature, real-time, thermocouples, gold inlay

EP – 040

Dentist's Behavior in the Diagnosis and Management of Proximal Caries Lesions

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Aim: Classically, caries lesions have been treated invasively by cavity preparation; however, research on cariology recommend treating many early caries lesions by non-invasive or microinvasive treatments. The objective is to evaluate the behavior of a group of odontostomatologists to a clinical case, evaluating whether their criteria and behavior in diagnosis and management depend on their academic level, years of professional practice, the application of minimal intervention dentistry criteria and the usual practice in conservative restorative treatments.

Materials and Methods: The study has the approval of the Ethics Committee of the Balearic Islands, with research project nº. IB4142/20PI. An online survey was replied by dentists registered at the Illustrious Official College of Dentists of the Balearic Islands (628 members). The questionnaire was developed by the researchers from a real clinical case. A descriptive statistical analysis was performed, to evaluate the association between the survey responses and the variables of interest, the χ^2 of independence test was performed. In addition, tests comparing the corresponding proportions were conducted using Fisher's exact test.

Results: The survey was answered by 134 dentists (21% of the registered dentist). 99.2% of respondents recognize caries lesions in the proximal faces. 99.0% indicate invasive class II filling treatments, only 4.0% indicate radiographic control, 3.0% conservative remineralization treatments and 3.0% minimal intervention treatments with resin infiltrations. The 82.5% of those surveyed stated that they applied concepts of minimal intervention. Most of the respondents have been practicing for 5-15 years

45.2%. The 92.8% practice conservative dentistry on a daily basis. 34.1% have a master's degree, 26.9% have a postgraduate degree, only 4.7% are doctors. No significant differences were found in any of the variables analyzed.
Conclusion: Results show that there are no significative differences in the professional behavior towards the diagnosis and management of caries lesions in this group of professionals, having very interventionist criteria and attitudes.
Keywords: caries detection, demineralization, non-cavitated caries lesions, radiography, atraumatic restorative treatment

EP – 041

Effects of Desensitizers and a Self-Etch Adhesive in Treatment of Dentin Hypersensitivity
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Aim: The aim of this *in-vivo* study was to evaluate the effects of a self-etch adhesive resin and two desensitizing agents (Calcium phosphate, 5% glutaraldehyde) in the treatment of dentin hypersensitivity in 6 months clinical follow-up.
Materials and Methods: The study protocol was approved by the Ethic Committee of Kırıkkale University (12.12.2019/ 28/02) and Turkey Ministry of Health, Pharmaceuticals and Medical Devices Agency (11.03.2020/68869993-511.06-E.64768). 69 participants (54 female,15 male) with at least one sensitive tooth (Schiff Sensitivity Score >1) were included in this study and randomly divided to three treatment groups (n=23):

I. Tetracalcium phosphate and dicalcium phosphate containing desensitizer (Teethmate)
II. 35% hydroxyethyl methacrylate and 5% glutaraldehyde containing desensitizer (Gluma Desensitizer)
III. Self-etch adhesive resin (Hybrid Bond)

The products were applied according to manufacturer's advises. The hypersensitivity score of each participant was evaluated with a visual analog scale (VAS) and Schiff cold air test at baseline, immediately after treatment and after 1 week, 1, 3 and 6 months. The data were evaluated with repeated measures ANOVA and Kruskal Wallis, Wilcoxon and Friedman tests at significance level of 0.05.
Results: There was no significant difference between the treatment procedures at any evaluation period ($p>0.05$). Intragroup comparisons revealed that the differences between baseline and immediately after treatment scores and after 1 week, 1, 3 and 6 months were statistically significant in Teethmate and Gluma Desensitizer groups ($p<0.05$). However, in Hybrid Bond group, there was a regain in VAS and Schiff Cold Air test scores between baseline and 6 months however, the difference was not statistically significant difference ($p>0.05$).
Conclusion: Within the results of this clinical study, it was concluded that the effectiveness of calcium phosphate and 5% glutaraldehyde-based desensitizers continued to be effective for 6 months after the treatment of dentin hypersensitivity.
Keywords: desensitizing agent, self-etch adhesive resin, dentin hypersensitivity

EP – 042

Evaluation of the Stability of Different Desensitizing Agents Against Demineralization Using Micro-CT
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Aim: The aim of this study is to examine the effectiveness of desensitizing agents with different remineralizing mechanisms in occluding dentinal tubules and their stability against acid exposure using micro-CT and SEM. The null hypothesis was that none of the desensitizers could prevent dentin demineralization when subjected to acidic challenge.
Materials and Methods: In this study, 40 permanent human molar teeth were used. Forty dentin blocks (3×3×5mm) were obtained from the dentino-enamel junction area, including crown and root dentin with a precision cutting device. The discs were randomly divided into 4 groups as Enamelast (5% Sodium Fluoride Varnish; Ultradent; Utah, USA), Nupro Sensodyne Paste (Dentsply; NY; PA; USA), Tooth Mousse (GC; Tokyo; Japan), and Colgate Sensitive Pro-Relief Desensitizing Paste (Colgate; NY; USA). Enamelast was applied with its own brush and the other 3 agents were applied with a rubber-bur according to manufacturer's advises. Each group was scanned 3 times by using micro-CT (BrukerSkyScan1172, Belgium); before/after the application of desensitizing agent, and after immersing the demineralizing solution, respectively. Kruskal Wallis, One-way ANOVA and post-hoc tests were performed for statistical analysis.
Results: The values are given as mean and standard deviation. Statistically significant difference was found between the groups in terms of 3rd scan mineral density (g/dl) and mineral volume (g/cm^3) values ($p<0.001$; $p<0.001$). When we look at the average of 3rd scan mineral density values among the groups, it was determined that the highest value was at Colgate Sensitive ProRelief (1.49±0.11)and the lowest average value was at Enamelast (1.34±0.05). In terms of mineral volume values, it was determined that the highest value was in Nupro (1.58±0.17) and the lowest mean value was in Colgate Sensitive ProRelief group (1.29±0.12).
Conclusion: The use of new formulation toothpastes can prevent enamel demineralization. Colgate Sensitive Pro Relief exhibited significant resistance to acid challenge compared to others. These results may be related to the presence of arginine in this product. Therefore, this toothpaste can be an alternative to prevent and treat patients with dentin hypersensitivity.
Acknowledgements This project was supported by Inonu University/ Turkey, Scientific Research Projects Unit (TDK-2019-1935).
Keywords: dentin hypersensitivity, desensitizing agent, Micro-CT, demineralization

EP – 043

Effect of Polymerization Modes and Acidic Cycle on Surface Hardness of Composite Resins
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Aim: The aim of this study is to compare the effect of different polymerization modes and acidic cycle on the surface hardness of composite resins.
Materials and Methods: A total of 208 disk specimens of 8 mm in diameter and 2 mm in thickness were prepared using a nanofill (Filtek Ultimate Flow), a nanohybrid (G-aenial Universal Flow) and two microhybrid composite resins (Gradia Direct Anterior, Filtek Z250). Composite resins were polymerized with a third-generation light-curing unit (LCU) (VALO) at two different modes (20 seconds standard, 6 seconds extra power) and two subgroups were formed (n=26). These subgroups were then divided into two groups again (n=13) in which samples were stored in acidic beverage (Coca Cola Company) and distilled water for 28 days. Microhardness (VHN) was measured using a Vickers Hardness tester. Data were analyzed by Shapiro-Wilk normality, multiple ANOVA, Tukey multiple comparison test, Kruskal Wallis and Mann Whitney U test ($p<0.05$).

Results: VHN values of Filtek Z250 group were statistically significantly higher than Filtek Ultimate Flow, G-aenial Universal Flow and Gradia Direct Anterior groups (p = 0.0001). The percentage of surface hardness change (SMHC) was found to be the highest in the samples of Gradia Direct Anterior composite resin (12.56 ± 2.75 N/mm^2) which were polymerized with extra power light mode and then stored in cola. VHN mean values of the cola group were statistically significantly lower than those of the distilled water group (p=0.0001). VHN values of the extra power mode group were statistically significantly lower than those of the standard power mode group (p=0.0001).
Conclusion: Composite resins were affected by liquids at different rates depending on their compositions. Compared with the standard mode, the extra power mode of VALO LCU caused the restorative materials to be more affected by acidic beverage with the exception of Filtek Z250 and G-aenial Universal Flow.
Keywords: composite resin, surface hardness, Valo led, Vickers hardness, beverage

EP – 044

Comparative Analysis of TEGDMA Release Levels of Resin Containing Dental Materials
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Aim: The aim of our study is the comparative examination of TEGDMA release amount in different times from a resin infiltrant used commonly in minimal invasive dentistry, two different flowable composites and two different fissure sealants. Our null hypothesis is that the restorative materials used will not cause difference between the TEGDMA release amounts in different times.
Materials and Methods: In our study, samples with a height of 1 mm and a diameter of 6 mm were prepared by using a resin infiltrant; ICON (DMG Chemisch-Pharmazeutische Fabrik GmbH, Hamburg, Germany), two flowable composites; GrandioSo Heavy (Voco, Cuxhaven, Germany), Filtek Ultimate (3M ESPE, St Paul, MN, USA) and two fissure sealants; Clinpro Fissure Sealant (3M ESPE, St Paul, MN, USA), Grandio Seal (Voco, Cuxhaven, Germany). The samples were polymerized with Elipar S10 (3M ESPE, St Paul, MN, USA). The samples prepared were kept in 75-25% ethanol water solution in an oven at 37 °C and the samples were collected at minute 10, first hour, 24 hours and on day 7 and TEGDMA release amount was measured with Agilent 1100 HPLC (Agilent Technologies, Santa Clara, CA, ABD). All statistical calculations were made with SPSS 20.0V statistical program. Repeated measurements (one way) variance analysis was applied to the data obtained.
Results: In all time periods, ICON showed the highest release amount, while Filtek Ultimate showed the lowest amount. TEGDMA amount released from ICON was found to be significantly higher than the amount released from all other groups (p<0.05). No significant differences were found between the other groups.
Conclusion: According to the results of our study, the highest TEGDMA release occurred in ICON. Since there are not enough studies in literature conducted with this material, further studies should be conducted.
This study was supported by the Scientific Research Project Commission of Ondokuz Mayıs University with the Project number PYO.DIS.1901.17.001
Keywords: residual monomer, resin infiltration, TEGDMA, HPLC

EP – 045

The Effect of Prophylactic Polishing Protocols on Surface Roughness of Different Resin Composites
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Aim: The aim of this study was to evaluate the effect of prophylactic polishing paste and air-polishing on the surface roughness of different resin composites.
Materials and Methods: In this study, three different resin composites were used: nanohybrid (Charisma Topaz, Kulzer GmbH), low-viscosity bulk-fill (Metafil Bulk Fill, Sun Medical) and high-viscosity bulk-fill (Filtek Bulk Fill, 3M ESPE) resin composites (n=40). Totally 120 disc-shaped specimens (diameter: 4mm, thickness: 2 mm) were fabricated using Teflon molds. All specimens were polymerized with LED light-curing device (1000 mW/cm^2) according to the manufacturers' instructions. All specimens were polished with a series of aluminum oxide polishing discs (OptiDisc, Kerr) and subdivided into four groups according to the different prophylactic polishing protocols (n=10): 1) no prophylactic polishing protocol (control), 2) polishing paste, 3) air-polishing, 4) air-polishing+polishing paste. Then, the surface roughness (Ra,mm) were measured at 4 different points of the top surfaces by a contact profilometry (Marsurf M 300 C). Data were statistically analyzed with two-way ANOVA and Bonferroni tests (p<0.05).
Results: Regarding the polishing protocols, for Metafil Bulk Fill and Charisma Topaz, control (0,550±0,170), (0,365±0,090) and polishing paste (0,615±0,083), (0,424±0,065) groups showed significantly lower surface roughness than air-polishing (0,748±0,181), (0,603±0,069) and air-polishing + polishing paste (0,899±0,110), (0,577±0,087) groups, respectively. However, no significant differences were observed between control and polishing paste groups. For Filtek Bulk Fill, air-polishing group (0,657±0,059) showed significantly higher surface roughness than polishing paste group (0,531±0,093). Regarding the resin composites, for control group, Charisma Topaz (0,365±0,090) showed significantly lower surface roughness than Metafil Bulk Fill (0,550±0,170) and Filtek Bulk Fill (0,632±0,109). For air-polishing and polishing paste groups, Metafil Bulk Fill showed significantly higher surface roughness than Charisma Topaz. For air-polishing + polishing paste groups, Metafill Bulk Fill (0,899±0,110) showed significantly higher surface roughness than Charisma Topaz (0,577±0,087) and Filtek Bulk Fill (0,596±0,089).
Conclusion: Air-polishing caused higher surface roughness than polishing paste for all tested composites. Besides, low-viscosity bulk-fill showed higher surface roughness than nanohybrid composite for all polishing protocols.
Keywords: bulk-fill, prophylactic-polishing paste, resin composite, surface roughness, air-polishing

EP – 046

Cavity Preparation Skill Assessment of Dental Students During the Covid-19 Pandemic
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Aim: Virtual Reality (VR) tools in dental training has increased due to the constraints associated to the COVID-19 pandemic. In dental curricula, VR is a viable alternative for training activities that are specifically designed to avoid the risk of contagion present in clinics. The objective of the present study is to assess the cavity preparation skills of undergraduate students in the third year of the degree of Dentistry, using VR simulators.
Materials and Methods: 34 dental students had individual training with the 3D haptic simulators (Universal Simulation, London, UK) consisting of making a Class 1 cavity (C1C) on a first mandibular molar with a preform, 5 times. After this, the students performed the same C1C on the mandibular molar without a preform. The parameters and control values (CV) were established as: Surgery time (ST): 10 minutes,

Drilling time (DT): 8 minutes, Progress: 70%, Precision: 60%. The results of the C1C without the preform were evaluated and compared with the CV.

Results: According to the evaluated parameters the results showed: **ST** average 8:48min, Median 8:30min, Minimum and Maximum values (MinMax) 4:34-16:30min, Standard Deviation (SD) 4:10min; **DT** average 4:17min, Median 3:22min, MinMax 1:38-9:27min and SD 1:55min; **Progress** average 89.6%, Median 97.8%, MinMax 34.6-99.8%, SD 17.7. **Precision** average 71.3%, Median 75.9%, MinMax 47.2-87.5%, SD 10.9. From the participating students 75% and 96.43% performed the treatment in the established ST and DT, respectively; 85.8% reached the established progress and 89.3% exceeded the established precision.

Conclusion: Since most of the students have reached the established CV, it is possible to conclude that VR training in Dentistry is a useful and appropriate method of skills acquisition in dental surgery avoiding aerosols and close contact between the student and the patient.

Keywords: class 1 cavity, COVID-19 pandemic, dental training, virtual reality, cavity preparation skills

EP – 047

Fracture Strength of CAD/CAM Endocrowns after Thermo-Mechanical Loading

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Aim: The purpose of this *in-vitro* study was to determine the fracture strength (FS; N) of endodontically treated molar teeth restored with different CAD/CAM endocrowns after thermo-mechanical loading. The null hypothesis is that the type of CAD/CAM material would not affect the fracture resistance.

Materials and Methods: 40 non-carious human mandibular third molars with similar crown size and shape were used. Ten intact teeth served as the control group and received no treatment, while 30 teeth were endodontically treated using ProTaper Next rotary instruments. For standardized endocrown cavities, butt-joint preparation with 2mm wall thickness, 2mm cusp reduction and 2mm intracoronal extension into the pulp chamber were prepared. Then, teeth (n:30) were randomly divided into three groups and endocrowns were manufactured with zirconia reinforced lithium silicate (Celtra Duo; Dentsply), leucite-reinforced feldspar ceramic (Initial LRF; GC) and hybrid ceramic (Cerasmart 270; GC) CAD/CAM materials (n=10). Endocrowns were adhesively luted using a universal adhesive (Futurabond U; VoCo) and a dual-cure resin cement (Bifix QM; VoCo) and polymerized (Demi Ultra; Kerr). Following thermocycling for 20.000 cycles (5°C-55°C) (SD Mechatronik Thermocycler, Germany) and 480000 load cycles at a load of 50 N in a chewing simulator (CS-4.2, SD Mechatronik, Germany), fracture strength was performed with a universal testing machine (Instron). Data was analyzed with one-way ANOVA and post hoc Tukey tests ($p<0.05$).

Results: FS was significantly affected by the type of CAD/CAM material ($p=0.00$) thus, the null hypothesis was rejected. Cerasmart 270 (3312.13 ±164.30 N) exhibited the highest FS, while there were no significant differences between the control (3018.76±131.56 N), Celtra Duo (3053.29±246.98 N) and LRF (2838.81±254.05 N) groups ($p<0.05$), which exhibited significantly lower FS than Cerasmart 270.

Conclusion: Zirconia reinforced lithium silicate and leucite-reinforced feldspar ceramic produced endocrowns exhibited similar fracture resistance as the intact teeth, while hybrid ceramic CAD/CAM material Cerasmart 270 showed higher fracture resistance with more repairable failures.

Keywords: endocrown, fracture strength, thermo-mechanical loading, CAD/CAM

EP – 048

Efficacy of XP-Endo Retreatment System In Removing Thermafil and Guttacore Using Micro-CT

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Aim: The present study aims to evaluate the effectiveness of an XP-endo non-surgical root canal re-treatment system in removing both Guttacore and Thermafil gutta-percha carrier-based root canal filling materials from straight root canal systems using micro-computed tomography (micro-CT) analysis. The null hypothesis holds that there is no difference between the gutta-percha carrier-based root canal filling materials during removal from straight root canal systems.

Materials and Methods: The study was performed on 24 single-rooted upper teeth, which were randomly allocated into the following study groups: Group A, Thermafil and AH-plus sealer ($n = 12$); and Group B, Guttacore and AH-plus sealer ($n = 12$). Before and after the non-surgical root canal re-treatment procedure, the samples were submitted for a micro-CT analysis. The volume of the root canal filling material (mm^3), volume of the remaining root canal filling material (mm^3), and the time (minutes) needed to remove the root canal filling material were also recorded. Student's t-test was used to analyze the results.

Results: No statistically significant differences were found between the volume of the remaining root canal filling material in the GutaCore and Thermafil root canal filling systems at the coronal third ($p = 0.782$), middle third ($p = 0.838$) or apical third ($p = 0.882$) of straight root canal systems; however, the GuttaCore required a statistically significant ($p = 0.037$) shorter amount of time (4.72 ± 0.76 min) to be removed than the Thermafil carrier-based root canal filling material (5.92 ± 1.42 min).

Conclusion: The XP-endo non-surgical endodontic re-treatment system removes both GuttaCore and Thermafil gutta-percha carrier-based root canal filling materials from straight root canal systems, although removal of the GuttaCore gutta-percha carrier-based root canal filling material required less time.

Keywords: endodontic, micro-computed tomography, root canal filling material, root canal re-treatment, carrier-based root canal system

EP – 049

Microleakage and Marginal Integrity of Bulk-Fill Composite Resin Restorations in MOD Cavities

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Aim: The aim of this *in-vitro* study is to compare the microleakage and marginal integrity of 6 different bulk-fill composites (BFC) (Admira Fusion x-tra (AFX), Admira Fusion x-base (AFB) x-tra fill (XF), x-tra base (XB) and Tetric N-Ceram Bulk Fill (TNB) Tetric N-Flow Bulk Fill (TFB)) applied at 2 different thicknesses in MOD cavities.

Materials and Methods: Standardized 60 MOD cavities were performed on the 60 sound molars. On proximal surfaces, mesial margins were located 1mm below the cement-enamel junction (CEJ) and distal margins were located 1mm above the CEJ. Prepared teeth were randomly divided into 6 groups (n=10): Group 1 (G1)–FuturabondU+XB-2mm+XF-4mm-(VOCO), Group 2 (G2)–FuturabondU+XB-4mm+XF-

2mm-(VOCO), Group 3 (G3)–TetricNbond+TNB-2mm+TFB-4mm-(Ivoclar), Group 4 (G4)–TetricNbond+TNB-4mm+TFB-2mm-(Ivoclar), Group 5 (G5)–FuturabondU+AFX-2mm+AFB-4mm-(VOCO), Group 6 (G6)–FuturabondU+AFX-4mm+AFB-2mm-(VOCO). Following adhesive application, BFC were applied and polymerized according to the manufacturer's instructions. All samples were aged under thermomechanical loading using chewing simulator for 240.000 chewing cycles with load of (50N) and thermocycling (5°C/55°C). Then they were immersed in 0.2% methylene blue before sectioning and examination for microleakage. In the evaluation of the data, descriptive statistical methods as well as the chi-square test was used for the comparison of qualitative data.

Results: Although no significant difference was found between microleakage distributions of groups G1-G2 and G5-G6 in proximal gingival margins (p>0,05), G3 was found higher than G4 (p=0,018). When coronal microleakage values of G5 and G3 were compared, lower microleakage values were obtained in G5 (p=0,039). In the SEM evaluation, gap formation is more common in groups where the flowable BFC is applied at a thickness of 4mm.

Conclusion: This *in vitro* study showed that when using flowable BFC in MOD cavities, the use of different matrix structures does not eliminate leakage on restoration margins located below or above the CEJ. However, 2mm thickness may be preferred instead of 4mm thickness to control microleakage.

Keywords: microleakage, ormocer, bulk-fill composite

EP – 050

Surface Characteristics of Used and New Retreatment Instruments: An AFM Study

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Aim: The aim of this study was to investigate the surface quality of new and used retreatment instruments [PTUR (ProTaper Universal retreatment files; Dentsply Maillefer, Ballaigues, Switzerland), R-Endo (Micro Mega, Besancon, France), Mtwo-R (VDW, Munich, Germany) and D-RaCe (FKG Dentaire, La Chaux-de-Fonds, Switzerland)] by using Atomic Force Microscopy (AFM) method.

Materials and Methods: Forty extracted lower first molars with curved mesial roots were used in this study. The roots have similar curvatures as 30.4º ($P > 0.05$). All the canals were prepared with Revo-S (Micro Mega) and filled with cold lateral compaction with gutta percha cones. The root canals were divided into 4 main groups of 10: PTUR D3, R-Endo R3, Mtwo-R1 15.05 and D-RaCe DR2 for AFM analysis. Total of 12 files ($n = 2$ used and $n = 1$ non-used for each group) were analyzed. Each file was used only one time and analyzed with the AFM on 10 points along a 4 mm section at the tip of the file. All statistical analyses were performed with SPSS, 17.0 (SPSS for Windows; SPSS Inc, Chicago, IL, USA). The Shapiro–Wilk test was used to test whether the data variables showed a normal distribution. According to the results of this test, a Kruskal–Wallis variance analysis and Mann–Whitney U with Bonferroni test were applied. $P < 0.05$ was considered statistically significant.

Results: D-RaCe files used for retreatment were significantly different from the other groups in both roughness average and root mean square values ($P = 0.001$).

Conclusion: AFM results showed that D-RaCe suffered from significant surface deterioration after its use. Therefore, D-RaCe files should be used with attention to avoid file fractures in the clinical use. However, it should be noted that AFM results are dependent on the scanned area.

Keywords: nickel-titanium, retreatment, surface characteristic, atomic force microscopy

EP – 051

Effects of In-Office Bleaching Agents on Surface Roughness of Nanofilled Composite Resin Surface

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Aim: The aim of this study was to evaluate the effects of 2 bleaching agents on the surface roughness of nanofill composite resin finished with different polishing procedures. The hypothesis was that bleaching would have no effect on the surface roughness of the nanofill composite resin.

Materials and Methods: A total of 108-disc samples were prepared from a nanofill composite resin and randomly divided into three groups (n=36). Group I served as control group without polishing regimen. Group II was polished with Sof-Lex systems medium, fine and superfine aluminum oxide-impregnated discs for 15s. Group III was polished with OneGloss discs for 30s. Following polishing, the baseline surface roughness values were measured using a profilometer. Then each group were further divided into 2 subgroups and bleached by one of the in-office bleaching agents tested. The Opalescence Boost and Opalescence Quick agents were applied on to the surface of the samples according to the manufacturer's recommendations. At the end of the bleaching procedures, roughness was measured again. The statistical analysis was performed by Mann-Whitney U, Kruskal Wallis and Wilcoxon Signed Ranks test ($p<0.05$).

Results: After bleaching, surface roughness significantly increased in all groups compared to baseline ($p=0.001$). The highest mean initial surface roughness value was observed in OneGloss, followed by Sof-Lex and Control group ($p<0.01$). Among all groups, the % change in Ra values caused by the use of both bleaching agents was highest in the unpolished group (control) ($p<0,01$). In addition, no statistical difference was observed between the % change in Ra on the surfaces polished with Sof-Lex and OneGloss ($p>0.05$).

Conclusion: The hypothesis was rejected. The simulated bleaching with 40% HP or 45% CP increased the surface roughness of the nanofill composite. However, it has been observed that the Ra threshold value does not exceeded the clinically acceptable value of 0.2 μm after bleaching if an ideal finishing procedure was undertaken.

Keywords: nanofill composite resin, polishing, surface roughness, in-office bleaching

EP – 052

Evaluation of an Oil-Based Ozone Gel as Dentin Primer: A Preliminary Pilot Study

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Aim: To evaluate the effects of an oil-based ozone gel as dentin primer on the microtensile bond strength (μTBS) and endogenous enzymatic activity of two adhesive systems.

Materials and Methods: dle/deep coronal dentin blocks were divided into six groups (n=1) according to the following bonding procedures: 1) Two-step self-etch adhesive, SE (EnaBond SE, Micerium); 2) Dentin priming with an oil-based ozone gel, O_2 (Ozosan, Bioactiva) + SE: O_2 was applied to dentin strictly following manufacturer's instructions of storage and handling, water rinsed, the dentin surface was cleaned with 70% acetone solution and SE was applied; 3) SE applied after dentin cleaning with 70% acetone; 4) Monocomponent adhesive, EB (EnaBond, Micerium); 5) O_2 + EB; 6) EB after acetone application. After bonding procedures, two 1.5 mm increments of a nanohybrid resin composite were layered and light-cured with a LED lamp (Demi™ Plus, Kerr Dental). After 24h of storage in water, the specimens were serially cut and tested under tension with the microtensile bond strength test. Failure modes were observed with an SEM. Additionally, one tooth per group was prepared for *in situ* zymography and observed with a confocal laser scanning microscope. Data were statistically analyzed ($p<0.05$).
Results: SE performed significantly better than EB ($p<0.05$). O_2 primer application resulted in higher μTBS only for EB, while decreased the bonding values of SE. Confocal microscopy revealed higher enzymatic activity for SE compared to EB, independent of the dentin pre-treatments ($p<0.05$). O_2/EB resulted in inferior fluorescence signals at the bonding interface.
Conclusion: These preliminary data indicate that the use of the oil-based ozone gel as dentin primer before bonding procedures is material dependent. Further studies are warranted to evaluate hybrid layer stability over a longer period of time.
Keywords: dentin primer, MMPs, ozone, bond strength

EP - 053

Elasticity Moduls and Nanohardness Values of Various Restorative Materials

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Aim: Restorative materials are under constant loadings from mastication hence, it is important to have the knowledge on the mechanical properties of the restorative materials to have long term success on restorations. Nanohardness is being used to predict the wear resistance against masticatory forces and elastic modulus is the relative rigidity of a material. Therefore, the aim is to investigate the nanohardness and elastic modulus values of various restorative materials.
Materials and Methods: Disc-shaped samples (5 mm x 2 mm) were prepared from a high viscosity glass ionomer (Equia Forte Fil-EFF), a compomer (Dyract-DXP), a hybrid ionomer (Geristore-GS), a giomer bulk-fill (Beautifil-Bulk), two bulk-fill composites (Venus Bulk-fill-VB, Sonic Fill 2- SF) and a nanohybrid composite (Z250). Samples of each of the tested materials (n=9) were examined under nanoindentation to evaluate elasticity modulus and nanohardness scores. One of the samples had undergone through scanning electron microscopy (SEM) evaluation. Due to abnormal distribution of the data, Kruskal-Wallis test was used, and median values were calculated.
Results: Among all groups, SF had the highest elasticity modulus (GPa) (17.1) followed by Z250 (16.5) and DXP (14.3) without any statistical differences. However, GS had statistically the lowest elasticity modulus (4.8) followed by EFF (5.6) ($p<0.001$). Among nanohardness scores (GPa), there is not a significant difference between VB, EFF, DXP, Z250 and BB groups. While SF showed the highest (1.0), GS had the lowest nanohardness scores (0.3). SEM images showed the differences between filler sizes and shapes.
Conclusion: Filler volumes and loadings affected the mechanical properties of the tested restorative materials. Hybrid ionomer, Geristore, had inferior mechanical properties among all groups. Further *in vitro* studies should be carried out to address more mechanical tests to predict clinical performance of various restorative materials over time.
Keywords: glass ionomers, nanohardness, nanoindentation, resin composites, elasticity modulus

EP – 054

Evaluation of the Radiopacities of Various Dental Restorative Materials Using Digital Radiography

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Aim: The aim of this study was to evaluate the radiopacities of various types of restorative materials with different thicknesses compared with enamel, dentin, and aluminum.
Materials and Methods: Four bulk-fill resins, two hybrid ceramics, two micro-hybrid resin composites, six glass ionomer-based materials, two zinc-phosphate cements, and an amalgam were used in the study. Twelve disc-shaped specimens were prepared from each of the 17 restorative materials of thicknesses 1 mm, 2 mm, and 4 mm (n = 4). All the restorative material specimens with the same thickness, the Al step wedge, as well as enamel and dentin specimens, were positioned on a phosphor storage plate and exposed using a dental X-ray unit. The mean gray values were measured on digital images and converted to equivalent Al thicknesses. Statistical analyses were performed using Two-way analysis of variance and Bonferroni post hoc tests ($p<0.05$).
Results: Radiopacity was significantly affected by both the thickness and material type ($p<0.05$). At thicknesses of 1 mm and 2 mm, all of the tested materials showed higher radiopacity values than that of enamel (2.19 ±0.22 mm Al and 4.43±0.28 mm Al respectively) except for GCP Glass Fill (1.66±0.12 mm Al and 3.27±0.16 mm Al), Estelite Bulk Fill Flowable (1.93±0.11 mm Al and 3.41±0.24mm Al), Vita Enamic (2.01 ±0.10 mm Al and 2.31±0.12 mm Al), and EQUIA Forte (2.10±0.16 mm Al and 4.02±0.22 mm Al). At a thickness of 4 mm, Vita Enamic (3.56 ±0.20 mm Al), Estelite Bulk Fill Flowable (6.18±0.30 mm Al), and GCP Glass Fill (6.62±0.21 mm Al) showed lower radiopacity values than that of enamel (6.92±0.24 mm Al). Estelite Bulk Fill Flowable showed the lowest radiopacity values among the resin composites at all thicknesses ($p<0.05$).
Conclusion: Most of the restorative materials tested in this study met the minimum standard of radiopacity specified by ISO.
Keywords: dental digital radiography, dental radiography, dental materials

EP – 055

Effect of Beverages on Color Stability of a High Viscosity Glass Ionomer Cement

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Aim: The purpose of this *in vitro* study is to examine the color stability of a high viscosity glass ionomer cement (HVGIC) after immersion in frequently consumed beverages.
Materials and Methods: A total of 40 HVGIC (Fuji IX, GC) specimens were prepared and divided into 4 different groups including coffee, tea, red wine and distilled water (control group). All specimens were placed in an incubator at 37^0 C and 100% humidity for 24 hours. The specimens were then immersed in beverages and kept at 37^0 C and 100% humidity

for 14 days. The beverages were changed every day. Color of the specimens were measured by using spectrophotometer at baseline, 7th and 14th days. 14 days immersion in the beverages simulates 1 year consumption of 35 glasses of beverages per month of an individual. L^*, a^*, b^* values were recorded against white background and the color change values (ΔE^*) were calculated. Data was analyzed by using Shapiro Wilkinson test, repeated measures two-way analysis of variance (ANOVA) and Post Hoc Tukey tests.

Results: At the end of 14 days, the color changed significantly in all groups except the control group ($p < 0.05$). The color changes observed were above the clinical acceptability value ($\Delta E^* > 3.3$) in all experimental groups except the control group. Regardless of the duration, tea resulted in the highest color change, followed by coffee, red wine and distilled water, respectively.

Conclusion: Glass ionomer materials; nowadays are being used as permanent restorative materials. The results of this study show that these materials are still relatively susceptible to coloration and clinically perceivable color changed was observed with used of tea, coffee and red wine. This factor should be taken into consideration when applying HVGICs in aesthetic areas.

Keywords: HVGIC, spectrophotometer, discoloration

EP – 056

Evaluation of Radiopacity of Resin-Based CAD / CAM Using Digital X-ray System

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Aim: To assess radiopacity of resin-based CAD/CAM (RBCC) materials by areal grayscale pixel value measurement. First null hypothesis was RBCC materials would not have different radiopacity values; second null hypothesis tested was radiopacity of resin-based CAD/CAM materials would not be greater than that of dentin.

Materials and Methods: Six RBCC [CeraSmart (CRS), Grandio-Blocks (GRB), Lava-Ultimate (LVU), Shofu-Block-HC (SHB), TetricCAD (TTC), Vita-Enamic (VTE)] and one resin composite [Clearfil-Majesty-Posterior (CMP)] were evaluated. Five 1 mm-thick slices of each restorative material, two 1 mm-thick slices of and aluminum step-wedge (50 mm long, 10 mm wide; graded from 0.5 to 5 mm in 0.5 mm increments) were irradiated with digital x-ray unit. On radiographic images, radiopacity values (mm Al/1.0 mm specimen) of the materials and teeth were calculated with reference to grey values of the step-wedge. Weighted means and pooled standard deviations were calculated for each group. Data were analyzed using one-way ANOVA followed by Tukey's test (α=0.05). Elemental analysis was performed with energy-dispersive x-ray spectroscopy on field emission scanning electron microscope images.

Results: Resin composite, CMP (4,00±0,09), showed the highest radiopacity values ($P < 0.05$). Radiopacity values of two RBCC materials, SHB (0,55±0,06) and VTE (0,71±0,06) were significantly lower than that of dentin (1.34±0.11) ($P < 0.05$). EDS analysis revealed all tested restorative materials contain zirconium while five materials (CRS, GRB, TTC, VTE, CMP contain aluminum; three materials (CRS, GRB, TTC) contain barium and only CMP contain lanthanum.

Conclusion: Four RBCC materials (CRS, GRB, LVU, TTC) containing higher amounts of zirconia or barium (>18%) had significantly higher radiopacity values than that of dentin; while two RBCC materials (SHB, VTE) containing lower amounts of zirconia (<4%) and/or no-barium, had significantly lower radiopacity values than that of dentin. EDS analysis suggests materials containing elements with higher atomic numbers like zirconia and barium could exhibit higher radiopacity values.

Keywords: elemental analysis, energy-dispersive x-ray spectroscopy, radiopacity, resin-based materials, CAD/CAM

EP – 057

The Effect of Innovative Dentifrices on the Surface Mineral Composition of Bleached Enamel

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Aim: To evaluate the effects of dentifrices with different concentrations of bioactive glass and fluoride on the surface mineral composition and morphology of enamel after bleaching with 40% hydrogen peroxide (HP).

Materials and Methods: Thirty extracted human premolar teeth were allocated into five groups (n=6). The study groups were: Bleached test brushing with 1450 ppm fluoride dentifrice (Colgate Total: **COL**); Bleached test brushing with bioactive glass &1450 ppm F dentifrice (Sensodyne Repair&Protect: **SRP**); Bleached test brushing with bioactive glass & 530 ppm F dentifrice (BioMinF: **BIO**); Bleached control (**HP**), Unbleached control (**UC**). Samples were treated with 40% HP (Opalescence Boost) and were subjected to 45-days brushing. The surface morphology was evaluated with Scanning Electron Microscope (SEM). The surface elemental compositions of Ca, P, F, C, Si, Mg were determined by X-ray photoelectron spectroscopy (XPS) at eight different points for each sample. The data were subjected to One Way Variance Analysis (ANOVA) and Tamhane Post Hoc Test (SPSS 25, IBM, USA) (α=0.05).

Results: BIO was found to have higher levels of (atomic%) P% and Ca% (P%: BIO: 7,2 ± 1,95; UC: 4,48 ± 1,33; HP: 4,41 ± 1,63; COL:5,85 ± 2,06; SRP: 5,89 ±1,59 (Ca%: BIO: 10,49 ± 3,19; UC: 7,33 ± 1,8; HP: 7,69 ± 2,54; COL:9,66 ± 2,97; SRP:8,2 ± 2,28) when compared to UC, HP, COL and SRP using XPS. However, it failed to show statistically significant differences between the elemental levels of UC and HP; whilst Si% values were higher in SRP than UC and HP ($p < 0.05$). SEM detected surface alterations on bleached and dentifrice-treated samples.

Conclusion: The application of a dentifrice with bioglass and low concentration of fluoride resulted in higher elemental levels of calcium and phosphate on bleached enamel. The toothpastes containing bioactive glass used after bleaching were more effective in preventing mineral loss.

Keywords: bleaching, mineral loss, remineralisation, bioactive glass

EP – 058

Investigation of Microleakage in Conventional Method and Er:YAG Laser Prepared Class V Cavities

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Aim: This study was carried out to investigate the microleakage of different adhesive systems and composites in class V cavities prepared with traditional method and Er:YAG laser.

Materials and Methods: For this study, 48 permanent molars without decay and restoration were extracted and kept in distilled water after residual tissue were removed. Eight groups were formed with six teeth in each group; Group-1: Bur (B)+Clearfil Universal Bond Quick (UBQ)+ Clearfil Majesty ES-2 Classic (ME2); Group-2: (B)+Bisco Universal Primer ™ (UP)+(ME2); Group-3: (B)+(UBQ)+Ceram X SphereTEC™ (CX); Group-4: (B)+(UP)+(CX); Group-5: Laser (L)+ (UBQ)+(ME2); Group-6: (L)+(UP)+(ME2); Group-7: (L)+(UBQ)+ (CX); Group-8: (L)+(UP)+(CX). All teeth were thermocycled 1500 times (5–55^{0}C). Then it was kept in 0.5% basic fuchsin for 24 hours. The dye penetration at the adhesive system-dentin interface in longitudinal sectioned Class V cavities was evaluated under stereo microscopy according to the score table prepared by two observers. The adhesive material-dentin interfaces and the structure of the hybrid layer were examined by Scanning electron microscope (SEM) analysis. Statistical analyzes were tested with Mann-Whitney U test, Kruskal Wallis One-Way ANOVA and Dunn's multiple comparison ($p<0.05$).
Results: Microleakage scores on the cervical surfaces were higher than the occlusal surfaces scores in all groups. In addition, it was determined that the cavity preparation method did not create a statistically significant difference between the microleakage values on the occlusal surfaces of the restorations ($p>0.05$). It was observed that the adhesion method did not present a statistically significant result in terms of microleakage ($p>0.05$). Clearfil Majesty ES 2 composite resin was found to be more successful in terms of microleakage.
Conclusion: Clearfil Majesty ES 2 composite can be preferred for restoration of Class V cavities. More laboratory and clinical studies are needed to determine the performance of adhesive systems in cavities prepared with laser.
Keywords: Er:YAG laser, microleakage, universal adhesive, class V cavity

EP – 059

Effect of Simplified Polishing Procedures on the Surface Roughness of Composite Resins

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Aim: The aim of this study was to evaluate the effect of various simplified polishing procedures on the surface texture of two different anterior and posterior used multipurpose composite resin materials.
Materials and Methods: Composite resins with two different anterior and posterior uses, 3M™Filtek™Z550 NanoHybrid (Z550) and 3M™Filtek™Ultimate Nanofil Universal composite resins (Ultimate), and four different simplified polishing procedures (NovaTwist (NT)-President, Clearfil™TwistDia (CTD)-Kuraray, ZenitFlexPopOn (ZF)-President, OneGloss (OG)-Shofu) were used as dry and wet in the study. A control group of ten specimens of each material received no polishing after being cured under the Mylar strip. Ten specimens of each composite resin were randomly subjected to one of the following polishing techniques: **A**-Dry/NT;**B**-Wet/NT;**C**-Dry/CTD;**D**-Wet/CTD;**E**-Dry/ZF;**F**-Wet/ZF;**G-**Dry/OG;**H**-Wet/OG polishing techniques. The specimens were 5 mm in diameter and 2 mm in height. The surface roughness was measured at three separate points with a profilometer device, and the Ra values were recorded. Data were analyzed with ANOVA and Kruskal-Wallis statistical analysis.
Results: The Ra values of the control group of Z550 composite (0.24 ±0.16) were higher than that of the control group of Ultimate composite (0.13±0.23). For Z550 composite, the lowest Ra values that were statistically significant among both wet and dry polishing systems were determined as ZF and OG (Wet/ZF=0.015±0.07, Dry/ZF=0,009±0.03,Wet/OG=0.008±0.002,Dry/OG=0.01±0.02,Wet/CTD=0.06±0.04,Dry/CTD=0.12±0.08,Wet/NT=0.14±0.08,Dry/NT=0.36±0.18)($p<0.05$). On the contrary, for Ultimate composite, no statistically significant difference was observed between Ra values of both wet and dry polishing systems (Wet/ZF=0.011±0.004, Dry/ZF=0.017±0.01,Wet/OG=0.013±0.006,Dry/OG=0.017±0.01,Wet/CTD=0.011±0.003,Dry/CTD=0.011±0.005,Wet/NT=0.011±0.003,Dry/NT=0.011±0.002)($p>0.05$). The Ra values of Ultimate composite resin were lower than those of Z550 composite.
Conclusion: As a result, while all polishing systems for the Ultimate Nanofil composite showed similar results, ZF and OG polishing systems were found to be more successful than NT and CTD for Z550 NanoHybrid composite. For this reason, polishing systems preferred for clinical use should be selected according to the structure of composite resins.
Keywords: polishing systems, surface roughness, composite resins

EP – 060

Influence of A New Zirconium Salt-Based Etching System on Dentinal Enzymatic Activity

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Aim: Recently, a zirconium oxynitrate etchant (ZON, Ivoclar Vivadent, Schaan, Liechtenstein) has been introduced, showing promising results on bond strength to dentin and enamel. However, there is scarce information on the biochemical interaction of ZON with dental tissues. Hence, the aim of this study was to investigate by means of *in-situ* zymography whether ZON influences long-term endogenous dentinal enzymatic activity in non-restored and adhesively restored teeth.
Materials and Methods: Extracted sound third molars (n=10) were cut transversely to obtain two 1mm-thick slabs that were further divided in 2 (4 pieces in total) so that all the groups would be tested on the same substrate. Each tooth piece was randomly assigned to one of the following groups: 1) etched with 37% H_3PO_4 for 15s (TE, Ivoclar Vivadent) and thoroughly rinsed; 2) etched with ZON for 30s and thoroughly rinsed; 3) as group 1 followed by Scotchbond Universal application (SBU, 3M ESPE, St. Paul, MN); 4) as in group 2 followed by SBU. The treated specimens were further cut into sticks. Half of the sticks were processed for immediate *in-situ* zymography while the other half was stored for 12 months in the artificial saliva at 37˚C before testing. The sticks were then glued, polished and covered in fluoresceine-quenched gelatin. Confocal microscope images were made, and the level of fluorescence was quantified and statistically analyzed. Significance level was set at $\alpha=0.05$.
Results: Significantly lower gelatinolytic activity was found in specimens etched with ZON, regardless of the use of the adhesive system, at baseline, as well as after aging ($p<0.05$).
Conclusion: Long-term lower endogenous enzymatic activity in the teeth treated with ZON could contribute to the preservation of the hybrid layer over time. Studies involving other adhesive systems are required to reaffirm the validity of this novel system in clinical practice.
Keywords: confocal microscopy, dental etching, enzymatic activity, hybrid layer, adhesion

EP – 061

Stresses in Premolars Restored Using Different Post-and-Core and Crown materials: A FEA Study

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Aim: A post-and-core system is often used to improve the retention of the crown restoration in endodontically treated teeth. Different restorative materials can influence the stress responses in the restored tooth. Hence, the aim of the present study was to investigate the influence of three different post-and-core systems and two crown materials on the stresses in restored premolars using Finite Element Analysis (FEA).

Materials and Methods: An extracted maxillary second premolar was scanned using computed tomography to create a 3D tooth model in SolidWorks 2014 software (Dassault Systemes SolidWorks Corp, USA). A severe loss of tooth structure was simulated (1mm from the cement-enamel junction). Six different restorative options were tested: 1) glass-fiber-reinforced composite post and composite core (GFP)+ CAD/CAM leucite-reinforced glass-ceramic crown (LRC); 2) carbon-fiber-reinforced composite post and composite core (CFP)+LRC; 3) cast post-and-core+LRC 4) GFP+CAD/CAM composite resin crown (CC); 5) CFP+CC; 6) cast post-and-core+CC. Three-point occlusal loading (150N) was simulated and von Misses stresses were calculated.

Results: Although the maximum stresses in the crown and dentin were similar across the groups (137.9-139.2 MPa), there were important differences in stress distribution. In all the groups maximum stresses in dentin were located in the coronal root dentin area, while in the cast post-core+CC group they were on the bottom of the post preparation cavity. The stress values within the posts were as follows: CFP (4.8 MPa)>GFP (6.7 MPa)>cast post-and-core (10.3 MPa). The CC-restored models presented more stresses within the post and core compared to the LRC groups.

Conclusion: Cast post-and-core system transports occlusal loads on the bottom of the post preparation space and could hence lead to catastrophic failures. Both GFP and CFP showed favorable stresses distribution in the dentin and restorative materials, with GFP posing esthetical advantages. The more rigid crown material seems to protect the underlying restorative materials better than CC.

Keywords: fiber reinforced composite post, finite element analysis, von mises stress, cast post and core

EP – 062

The Effect of Whitening Dentifrices on the Surface Roughness of Different Composite Resins

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Aim: The aim of this *in-vitro* study was to evaluate surface roughness (SR) of two different composite resins after toothbrushing with different whitening toothpastes.

Materials and Methods: Filtek Z250 universal composite resin (3M) (3M ESPE, St. Paul, MN, USA) containing bis-GMA and Charisma Topaz (CT) nano-hybrid composite resin (Heraeus Kulzer, Wehrheim, Germany) without bis-GMA were used in the study. 50 disc-shaped specimens of 10 mm in diameter and 2 mm in thickness were prepared from each composite. The prepared discs were kept at 37^0C for 24 hours and then separated in 5 subgroups: G1 control (artificial saliva) group, G2 Colgate Optical White Active Charcoal (containing active carbon), G3 Yotuel (containing carbamide peroxide), G4 Opalescence (containing abrasive particle), and G5 Sensodyne, Promine (containing fluoride) pastes (n = 10). After initial measurements and SR1 values were recorded. The discs were brushed in continuous mode with an electric toothbrush (Triumph Professional Care, Oral B Braun GmbH, Kronberg / Ts., Germany) in a slurry (1:3 g/ml) of the tested toothpastes (1.5 N). Samples were brushed twice a day for 4 weeks and 8 weeks to mimic the daily routine. Samples were conserved in artificial saliva between brushing cycles. After 4 weeks and 8 weeks cycles, SR2 and SR3 values were recorded. The obtained data were analyzed by three-way mixed ANOVA.

Results: There were no statistically significant differences between the two composite resin materials (p=0.575). When the whitening dentifrices groups were compared for both materials, there was no statistical difference after 4 weeks and 8 weeks. The SR value of the control groups (0,948 ± 0,118 3M, 1,006 ± 0,187 CT) were significantly lower than the Charcoal groups (1,672 ± 0,314 3M, 1,653 ± 0,265 CT) at the end of 8 weeks (p<.05).

Conclusion: After simulated brushing with whitening toothpastes, similar degree of roughness was observed on the composite resins tested.

Keywords: surface roughness, toothbrushing, whitening toothpaste, resin composite

EP – 063

Color Stability of Nano-Composites After Characterization Material Application

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Aim: The aim of this *in-vitro* study is to investigate the effect of characterization material application on color resistance of nanohybrid resin composites.

Materials and Methods: Three different color light-cured characterization materials; red, khaki, and clear (Zenit Color Light-Curing-Stains on Composite; Germany) applied to two nanofilled composites (Clearfil Majesty Esthetic and Zenit Nano-Ceramic Composite, shade A2). Samples were immersed in tea and coca cola for 30 minutes as 2 times a day, 15 days. A spectrophotometer (Easyshade 4.0, Vita Zahnfabrik) was used for examining the color change of composites at baseline and after 1, 7, 15 days of immersion. Data was analyzed with one-way ANOVA, Mann-Whitney U test or Kruskal-Wallis test. For pairwise multiple comparisons, Tukey and Dunn tests were used.

Results: For stained in tea and coca cola, after applying characterization materials to Clearfil composite at baseline, the highest ΔE value was obtained from samples colored with red (for tea 10.37±1.68; for coca cola 10.87±1.25). According to the results observed at the end of the 15th day, more discoloration was observed from the samples of clear. For the Zenit composite at baseline (p<0.001), the highest ΔE value was obtained from samples with red (for tea 8.95±1.00; for coca cola 13.87±1.60) and the lowest ΔE value was obtained from samples with clear (for tea 2.90±0.92; for coca cola 6.08±1.06). At the end of the 15th days, the obtained ΔE values with clear characterization material were found to be different from the values obtained with khaki and red (p=0.001, p=0.006, respectively). The most discoloration was observed from samples with clear. Also, at the end of 15th day, Zenit composite showed more discoloration than Clearfil composite for clear.

Conclusion: Different color of the characterization material changed the result of stain resistance. For both composite materials, the level of discoloration of samples that kept in tea was significantly higher than those kept in coca cola.

Keywords: color stability, composites, discoloration, stain resistance, characterization materials

EP – 064

Antimicrobial and Mechanical Effects of Zeolite Use in Dental Materials: A Systematic Review

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Aim: Ion-incorporated zeolite is a widely used antimicrobial material studied for various dental applications. At present, there is no other systematic review that evaluates the effectiveness of zeolite in all dental materials. The purpose of this study was to review all available literature that analyzed the antimicrobial effects and/or mechanical properties of zeolite as a restorative material in dentistry.

Materials and Methods: Following PRISMA guidelines, an exhaustive search of PubMed, Ovid Medline, Scopus, Embase, and the Dentistry & Oral Sciences Source was conducted with 3 authors. No language or time restrictions were used, and the study was conducted from June 1, 2020 to August 17, 2020. Only full text articles were selected that pertained to the usage of zeolite in dental materials including composite resin, bonding agents, cements, restorative root material, cavity base material, prosthesis, implants, and endodontics.

Results: At the beginning of the study, 1534 studies were identified, of which 687 duplicate records were excluded. After screening for the title, abstract, and full texts, 35 articles remained and were included in the qualitative synthesis. Any disagreements between the authors were recorded and resolved through discussion. An Inter-Rater Reliability (IRR) test, which included a percent user agreement and reliability percent, was conducted for the risk of bias of each of the 35 articles. This IRR test evaluated the level of agreement between the authors for each test.

Conclusion: Although ion-incorporated zeolite may enhance the antimicrobial properties of dental materials, the mechanical properties of some materials, such as MTA and acrylic resin, may be compromised. Therefore, since the decrease in mechanical properties depends on zeolite concentration in the restorative material, it is generally recommended to add 0.2-2% zeolite by weight.

Keywords: antimicrobial, dental material, mechanical property, zeolite, anti-infective agents

EP – 065

High-Intensity Light Curing Unit: Total Radiant Energy and Microtensile Bond Strength

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Aim: In adhesive dentistry, both the quantity and quality of polymerization can be improved with a proper selection of light-cuing units and clinical curing techniques. Today, high-intensity light-curing unit and compatible composite resin restorative materials are available which allow shorter exposure times for a given depth of cure.

The aim of this study was to evaluate total radiant energy at 3 different clinically simulated curing distances of high-intensity LED light-curing unit and to evaluate the microtensile bond strength test (μTBS) of 3-s cured composite resin restorative material to dentin using a single step bonding agent.

Materials and Methods: To simulate the cavity depth, coronal part of extracted human mandibular first molar teeth were sectioned at 2mm, 4mm and 6mm height and standard cylindrical shaped occlusal cavities with 5mm diameter were prepared. High-intensity LED light-curing unit (Bluephase PowerCure, Ivoclar-Vivadent, Schaan, Liechtenstein) with 3-second irradiation time (3000mW/cm^2) was used to determine total radiant energy values utilizing Marc Light Collector (MARC-LC, BlueLight Analytics, NS, Canada).

Additionally, μTBS of composite resin restorative material (TetricPowerFill, Ivoclar-Vivadent, Schaan, Liechtenstein) utilized with single step bonding agent (AdheSE, Ivoclar-Vivadent, Schaan, Liechtenstein) to dentin using 3-s light curing mode with 2mm, 4mm and 6mm distances were evaluated (n=10). Data were analyzed with ANOVA and Tukey's HSD at α=0.05.

Results: The total energy delivered was ranged between 9.57 J/cm^2 and 6.59 J/cm^2 depending on the distance of the tip to the application surface. The μTBS did not show significant difference between the groups $p>0.05$. Means ± the standard deviations for μTBS of 2mm, 4mm and 6mm were 18.5±1.9 MPa, 17.3±1.9 MPa and 19.4±2.8 MPa, respectively.

Conclusion: Within the limitations of the present study, the 3-s light curing was effective for up to 6 mm depth stimulated cavities and did not show any difference in μTBS. Further studies should be conducted to evaluate the effect on different cavity depths.

Keywords: microtensile bond strength, radiant energy, resin-based composite, light cure polymerization

EP – 066

Effect of Different Applications on Bond-Strength of a Universal Adhesive to Caries-Affected Dentin

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Aim: The aim of this study was to evaluate the effects of different applications that might have the potential to increase the shear-bond strength of a new universal adhesive to caries-affected dentin.

Materials and Methods: One-hundred forty-four mandibular molars with occlusal caries were used for this study. Forty-eight non-carious mandibular molars were also used for control groups. The preparation of caries-affected dentin was performed by grinding the specimens using silicon carbide discs. Universal adhesive, Scotchbond^{TM} Universal Plus (3M ESPE) was used in etch-and-rinse or self-etch modes. All specimens were randomly allocated into six groups according to application protocol (n=12) :(1) passive application [without agitation]; (2) active application [with agitation]; (3) treatment with 2% chlorhexidine+passive application; (4) treatment with 2% chlorhexidine+active application; (5) disinfection with photodynamic therapy [100 mg/L methylene blue solution and Diode laser]+passive application; (6) disinfection with PDT [100 mg/L methylene blue solution and Diode laser]+ active application. In the control groups, adhesive was applied (1) in etch-and-rinse mode, (2) in self-etch mode, (3) with passive application; (4) with active application (n=12). After resin composite building (Filtek Universal Restorative, 3M ESPE, Ø=2.38mm, h=2.0mm), the shear bond strength test was performed. All failure modes were determined with light microscopy. Resin-dentin interfaces were also observed using SEM. The data obtained were analyzed with two-way ANOVA, Kruskal Wallis and Mann-Whitney U tests ($\propto$= 0.05).

Results: Bonding to sound dentin yielded better results compared to caries-affected dentin ($p<0.05$). For caries-affected dentin groups, etch-and-rinse modes performed better than self-etch adhesive modes ($p<0.05$) and active application showed higher bond strengths compared to passive application ($p<0.05$). Caries-affected dentin specimens treated with 2% chlorhexidine followed by active application of universal adhesive in etch-and-rinse mode represented the highest SBS values (21.02 ±2.29MPa). The lowest bond strength was displayed by passive application of adhesive with self-etch mode (12.32±1.40MPa).

Conclusion: Bond strength to caries-affected dentin can be increased by first applying 2% chlorhexidine and then using the universal adhesive in etch-and-rinse mode and agitating it.

Keywords: caries-affected dentin, chlorhexidine, photodynamic therapy, universal adhesive, active application

EP – 067

Evaluation of Shear Bond Strength of Resin-Based CAD/CAM Blocks Repaired with Resin Composite

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Aim: The aim of this *in-vitro* study was to evaluate the shear bond strength (SBS) of four different resin-based CAD/CAM (computer-aided design/computer-aided manufacturing) blocks repaired with a nano-hybrid resin composite by using a new universal adhesive system.

Materials and Methods: Four resin-based CAD/CAM blocks (Lava Ultimate, 3M; Cerasmart, GC corp.; Brilliant Crios, Coltene; Hc Block, Shofu) were investigated. Total of 40 specimens were prepared in 3 mm thickness and polished (n=10). Following aging with thermocycle (1.500 cycles; 5-55 °C; 20 sec dwelling time; 10 sec transfer time), specimens were roughened with diamond burs under water cooling and a universal adhesive agent (OptiBond Universal, Kerr) was applied in self-etch mode. For the repair procedure nano-hybrid resin composite material (Harmonize, Kerr) was placed into silicone molds and polymerized for 20 sec using a LED curing device in standard mode (1000 mW/cm^2; VALO Cordless LED, Ultradent). After 24 hours, specimens were exposed to an additional thermocycling procedure and then loaded in a universal testing machine (AGS-X Universal, Shimadzu) with a cross-head speed of 1 mm/min for shear bond testing until failure occurred. The failure type was determined with a stereomicroscope (Leica MZ 75, Leica Microsystems) under x20 magnification. Statistical analysis was done using Kolmogorov-Smirnov, Kruskal Wallis, and Fisher's Exact tests with a significance level set at $p<0.05$.

Results: There were no significant differences between failure types among the tested groups ($p<0.05$). The lowest SBS was obtained with the Cerasmart group (5.1±4.8 MPa), while the highest with the Hc Block group (12.2±7.6 MPa). Statistically significant differences were detected between Cerasmart-Hc Block and Cerasmart-Lava Ultimate groups ($p<0.05$).

Conclusion: Within the limitations of this *in-vitro* study, due to the higher adhesive failure rate, Cerasmart group was not able to achieve the repair bond strength of the other three groups and the type of the resin-based CAD/CAM block affected the SBS value.

Keywords: repair, shear bond strength, CAD/CAM block

EP – 068

Five Years Survival Rate of Teeth after Endodontic Treatments Performed by Students

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Aim: The aim of this study was to determine the survival rate of five years teeth treated and the quality of endodontics treatment performed by students in the conservative dentistry clinic of the Department of Odontology in Dakar University.

Materials and Methods: It's a retrospective descriptive study of quality of endodontics treatment performed by 4th and 5th years' students in the conservative dentistry clinic at Dakar University. After selecting complete files, the patients were referred to the clinic of the department of dentistry for clinical evaluation. The retention rate and the quality of endodontic treatments were evaluated according to Grossman's clinical criteria success.

Data were collected and then analyzed with SPSS software. The qualitative variables were expressed in absolute value and in percentage, the quantitative variables in mean and standard deviation. The Chi-square test was used to compare the qualitative variables. The significance rate was $p\leq 0.05$.

Results: After five years, the teeth survival rate was 75% and 15.8% of them was retreated. The survival teeth rate was higher for teeth treated by 4th year's students than those at the 5th year. The difference was not statistically significant $p\geq 0.05$. But 73.68% of survival teeth were treated at 2 - 3 sessions, 36.84% of them in 4 sessions and 22.8% between 5 and 6 sessions.

Regarding the indications of endodontics treatments 57.8% of teeth were treated for pulpitis (category III Baume) and 42.2% were necrotic pulp (category IV with or without periapical complications). The difference was not statistically significant $p\geq 0.05$.

Conclusion: The results are calling for the need to evaluate the teaching methods to understand the gaps and bring all students to compliance with all stages of procedure in endodontics to ensure the sustainability of treatment that guarantee the quality of their training and adapted the teaching methods.

Keywords: evaluation, quality, teaching, endodontic treatment

EP – 069

Comparison of Bond Strengths of Glass Ionomer Restorative Materials to Resin Composites

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Aim: This study was aimed to comparatively evaluate the effect of glass ionomer cement type, maturation time and surface treatments on the bond strength between glass ionomer and resin composite used in sandwich technique.

Materials and Methods: The four glass ionomer based restorative materials Fuji II LC, Fuji IX GP, EQUIA Forte HT and Fuji TRIAGE (GC, Tokyo, Japan) samples were prepared. Each glass ionomer cement group was divided into two subgroups (7 minutes and 7 days) according to their maturation time. Then, each subgroup was divided into three subgroups; group 1, control group with no surface treatment; group 2, adhesive application (G-Premio Bond, GC, Tokyo, Japan) and group 3, adhesive application (G-Premio Bond, GC, Tokyo, Japan) after roughening with diamond bur. Glass ionomer samples that surface treatments were completed, were placed in acetal resin molds to bond resin composite (G-Aenial Posterior, GC, Tokyo, Japan). The bond strength was measured in a universal testing machine and the obtained data were analyzed with t-test, ANOVA and Tukey HSD post hoc analysis ($p=0.05$). Then, the fractured surfaces were examined by light microscopy.

Results: Glass ionomer cement that provides the highest shear bond strength with composite resin is Fuji II LC. Except for Fuji TRIAGE, 7 minutes and 7 days maturation differences of GIC materials in all control groups significantly affected the bond strength values between GIC and resin composite ($p<0.05$).

Conclusion: The type of glass ionomer cement used in the sandwich technique in terms of composite resin-glass ionomer cement bond strength plays an important role. Surface treatment with adhesive or diamond bur + adhesive on glass ionomer cement before bonding resin composite increases the bond strength.

Keywords: composite resin, glass ionomer cement, sandwich technique, bond strength

EP – 070

Single Bond Universal in Restoring NCCL's Extending to Root Surface - A Randomized Controlled Trial

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Aim: To compare clinical performance of Universal Adhesive in different modes in NCCL's extending to root surface.

Hypothesis states that "There is no difference in the clinical performance of Single Bond Universal adhesive (SBU) in self-etch (SE) and selective

enamel etch (SEE) modes when compared with Adper Single Bond 2 in etch & rinse (ASB E&R) mode in restoring NCCL's extending to root surface".

Materials and Methods: Patients with NCCL's extending to the root surface were included and the morphological characteristics of the lesion were noted. The samples were randomized into three groups.

Group1: Adper single bond 2 (3M ESPE) in total etch mode,

Group 2: Single Bond Universal (3M ESPE) in self -etch mode

Group 3: Single Bond Universal (3M ESPE) in Selective enamel etch mode.

which will then be restored with Filtek™ Z350 XT composite (3M ESPE). 2 calibrated dentists evaluated the clinical performance of restorations for 12 months in 129 samples (21 participants) using modified USPHS criteria.

The influence of morphological characteristics of the lesion on the clinical performance was also analyzed.

Results: Descriptive statistics were used to calculate the frequencies and the Chi-square test to compare proportions. Comparison of mean between the groups was done using ANOVA. Statistical significance was set at $p<0.05$.

For intergroup analysis, there was statistically significant difference at the end of 6 and 12 months. SEE performed better than SE and E&R for Retention ($p = 0.003$). For all the other criteria tested, SEE performed better at the end of 12 months ($p = 0.046$).

Conclusion: Overall for NCCL's extending to the root surface, Single Bond Universal in selective enamel etch mode performed better as compared to Single Bond Universal in self etch mode and Adper Single Bond 2 in etch and rinse mode at the end of 12 months

Keywords: NCCL, root surface, universal adhesive, modified USPHS criteria

EP – 071

Shrinkage Vectors in Bulk-fill Composites Restoring Endodontic Access Cavities

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Aim: The success of endodontic treatment depends on both apical and coronal seal of the obturated root canals. Deep endodontic access cavities can be quickly filled with bulk-fill composites rather than the incremental application of hybrid composites.

Materials and Methods: 18 extracted human third molars were divided into 3 groups (n=6), cylindrical endodontic access cavities (diameter=6mm, depth=8mm) were prepared, canal orifices were flared (Gatesglidden, NaOCl), filled (AHplus, warm gutta percha), simulating root canal filling, and bonded with a self-etch adhesive (Adhese_Universal, Ivoclar Vivadent).

In group-1 SDR (Dentsply) was covered with Tetric_EvoCeram_Bulk_Fill (TBF, Ivoclar Vivadent), in group-2 Tetric EvoFlow_Bulk_Fill (TEF, Ivoclar Vivadent) was covered by TBF, and in group-3 TBF was covered with TBF; each composite application was 4mm thick.

TEF and SDR were mixed with 2wt% traceable radiolucent glass-beads serving as tracers, while in TBF minute air bubbles were traced. Each material application was scanned in the micro-CT (Micro-CT40, Scanco-Medical-AG) at standard resolution (16μm) in the uncured state, and after light-curing (40s, 1100mW/cm^2). Scans were subjected to rigid registration followed by shrinkage vector evaluation.

Results: Greatest mean values of shrinkage vectors were in group-2-TEF (bulk1) 24.8±24.1μm and group-1-SDR (bulk1) 23.4±15.9μm, followed by group-3-TBF (bulk1) 22.2±13.0μm and group-3-TBF (bulk1) +TBF (bulk2) 17.6±5.6μm, and were smallest in group-1-SDR (bulk1) + TBF (bulk2) 11.2±6.8μm and group-2-TEF (bulk1) +TBF (bulk2) 10.5 ±3.9μm. Greatest upward movement was found in group-3-TB (bulk1) +TBF (bulk2) -11.9±9.6μm, minute upward movement in group-1-SDR (bulk1) +TBF (bulk2) -1.5±9.9μm, group-3-TBF (bulk1) -1.2±16.2μm and group-2-TEF (bulk1) +TBF (bulk2) -0.8±5.6μm, while group-1-SDR (bulk1) 0.9±22.5μm and group-2-TEF (bulk1) 2.3±18.0μm displayed downward movement toward the cavity floor (one-way ANOVA with post-hoc Tamhane's-T2, $p<0.05$, SPSS).

Conclusion: Deeper parts of endodontic access cavities when restored with flowable bulk-fill composites exhibit a more favorable shrinkage pattern than when restored with hybrid bulk-fill composite TBF. Larger shrinkage vectors and axial movement away from the cavity floor with hybrid bulk-fill composite TBF only might be due to detachment from cavity boundaries, especially the cavity floor, which allows more movement.

Keywords: endodontic access cavity, micro-CT, self-etch adhesive, shrinkage vectors, bulk-fill composites

EP – 072

The Effect of Different Orthodontic Adhesives and Brackets in Adhesive Remnant Index on Enamel

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Aim: The aim of this study was to determine the effects on ARI (Adhesive remnant index) of two different orthodontic adhesives (composite resin and resin-modified glass ionomer cement) and two different types of brackets (metal and porcelain) using a 3D performance stereomicroscope.

Materials and Methods: A total of 40 premolars, all extracted for orthodontic reasons were divided into 4 groups. In groups 1 and 2, 10 metal and 10 porcelain brackets were bonded with the adhesive system of GC Fuji ORTHO LC and GC Fuji Ortho Conditioner (GC, Japan). In groups 3 and 4, 10 metal and 10 porcelain brackets were bonded with the adhesive system of Ormco Enlight Light Cure Adhesive (Ormco, USA) and etching gel (Ivoclar, Vivadent, Liechtenstein). After 48 hours, all brackets were debonded. Using a microscope (Apochromatic Stereo Microscope ZEISS Stemi 508), we calculated the total area of the adhesive residue remaining on the tooth surface and at the bracket base surface expressed in μm^2. We further used these values to obtain the adhesive residue index using the ARI formula.

Results: The value of the ARI index was highest in Group 4: ORMCO PORCELAIN (78.45 ± 17.02) followed by Group 2: FUJI PORCELAIN (59.33 ± 17,129), followed by Group 3: ORMCO METAL (54.54 ± 11.67) and lowest in Group 1: FUJI METAL (44.81 ± 16, 86).

Conclusion: Porcelain brackets attached with composite resin to the enamel leave largest amount of adhesive remnants, requiring more aggressive method for removal.

Keywords: orthodontics brackets, remnants, adhesives

EP – 073

Five-Year Clinical Performance of Two CAD/CAM Materials for Onlays

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Aim: To compare the five-year clinical performance and survival of onlays fabricated with two CAD/CAM materials, Lava Ultimate (3M Oral Care) and IPS e.max CAD (Ivoclar-Vivadent), according to FDI criteria.

Materials and Methods: Twenty patients in need of two restorations in posterior teeth, that required at least one cusp to be covered, received two onlays made with resin composite Lava Ultimate (n=20) and lithium disilicate ceramic IPS e.max CAD (n=20). Onlays were adhesively luted following the manufacturers' instructions. Two blind observers evaluated the restorations at baseline and five years later, according to the FDI criteria. Statistical analysis was performed using Mann-Whitney U and Wilcoxon tests and the survival rates (retention/fracture) were analyzed using Kaplan-Meier and Log-rank tests ($p<0.05$).
Results: After five years the recall rate was 80%. The overall survival rate was of 90.6%, being for Lava Ultimate onlays of 81.3%, and for IPS e.max CAD onlays of 100% with a statistically significant difference ($p=0.025$). Three onlays made of Lava Ultimate failed, two were lost and one presented a bulk fracture with partial loss. One tooth restored with IPS e.max CAD had to be extracted due to a coronal-root fracture. The clinical performance of both CAD/CAM onlays was statistically similar at baseline and 5-years recall ($p>0.05$). However, there was a significant deterioration of the marginal staining, color/translucency, fracture/retention and marginal adaptation parameters for Lava Ultimate onlays after five years of clinical service. IPS e.max CAD onlays also showed a significant worsening of the following parameters: marginal adaptation, anatomical form of the proximal contact point and integrity of the tooth structure.
Conclusion: After five years of clinical service, Lava Ultimate and IPS e.max CAD onlays showed a similar clinical performance. However, Lava Ultimate onlays showed a statistically significant lower survival rate than IPS e.max CAD ones.
Keywords: clinical performance, lithium disilicate, onlay, resin composite blocks, CAD/CAM materials

EP – 074

A Meta-Analysis of *In-Vitro* Bonding of Glass-Ionomer Restorative Materials to Primary Teeth
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Aim: Restoration of primary teeth is among main indications for all types of restorative glass-ionomer cements (GIC). The aim of the study was to review *in vitro* studies that reported on bond strength of GI restoratives to enamel and dentin of primary teeth.
Materials and Methods: A literature search was performed in PubMed/Medline, Scopus, Web of Science and Cochrane databases to identify studies published until March 2021. The search strategy was: ("glass") and ("ionomer") and ("primary" or "deciduous") and ("bond" or "tensile" or "shear"). Two researchers independently selected titles and abstracts, read the full text of selected articles, extracted data from eligible studies, and assessed the risk of bias. The meta-analysis was performed using the Comprehensive Meta-Analysis Software version 3.
Results: From 357 potentially eligible studies, 21 was selected for the full-text examination, and 12 were included in the analysis. The majority of studies (76%) presented medium risk of bias. The analysis of GI bond strength did not show difference between sound and caries-affected primary dentin. Overall, resin modified GIC performed better compared to the conventional GIC.
Conclusion: The *in vitro* literature suggests superior performance of resin modified GIC in primary teeth. However, there is a lack of studies that examine properties of novel GI formulations.
Keywords: meta-analysis, primary teeth, restoration, glass-ionomer cements

EP – 075

Assessment of Bond Strength of Single Bond Universal Adhesive at Different Air-Drying Protocols
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Aim: This study aimed to assess the quality of hybrid layer by confocal microscope and microtensile bond strength of Single Bond Universal adhesive in self-etch and etch-and-rinse strategies with varying solvent evaporation protocol.
Materials and Methods: Occlusal grinding of 80 permanent human premolars was done to expose middle cervical coronal dentin followed by wet polishing with 600 grit SiC disc to standardize the smear layer. 3M Espe Single Bond Universal (SBU) adhesive was applied in two bonding strategies: 1) Self-etch (SE) wherein SBU was directly applied on the exposed dentin surfaces with gentle rubbing motion; 2) Etch-and-rinse (ER) wherein prior acid etching with 37% phosphoric acid was performed and adhesive was applied as per the manufacturer's instructions. Air-drying of adhesive was done for 0 (control), 5, 15, and 25 seconds. After light irradiation of the adhesive, the resin composite was incrementally condensed, polymerized and samples were stored in distilled water for 24 hours. The specimen was sectioned longitudinally into two halves for evaluation of depth of resin tag penetration under confocal microscope and microtensile bond strength (MTBS) was assessed at crosshead speed of 0.5mm/min until failure.
Results: The difference of mean penetration depth of two SBU in SE and ER mode was statistically significantly different with p-value <0.05 for all the solvent evaporation duration. Highest depth of resin tag penetration (250.91 μm) was seen at air-drying interval of 25 seconds in ER strategy. Highest MTBS was observed in SE group with solvent evaporation duration of 15 seconds. The difference of mean MTBS between two adhesives was statistically significant for all evaporation durations except 25 seconds.
Conclusion: In SBU, optimal air-drying time enhances penetration of adhesive through the smear layer into dentin which results in superior hybrid layer formation. This may eventually increase bond strength for Single Bond Universal adhesives in self-etch mode.
Keywords: hybrid layer, microtensile bond strength, solvent evaporation, universal adhesive, air-drying

EP – 076

Clinical Evaluation of Universal Adhesive's Different Application Modes: 36-Month Follow-Up
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Aim: To evaluate the clinical performance of different adhesive strategies of a universal adhesive in bulk-fill restorations for a period of 36 months.
Materials and Methods: Thirty-five subjects having at least two approximal caries in posterior teeth were included in the study. The universal adhesive's (Adhese Universal VivaPen) etch-and-rinse (ER) or self-etch (SE) strategy were applied randomly on each tooth following manufacturers' instructions. A total of 84 class II restorations were placed by one operator using a bulk-fill resin composite (Tetric EvoCeram Bulk Fill). The restorations were evaluated by two calibrated examiners at baseline and after 6-, 12-, 24-, and 36-month using modified USPHS criteria. For each evaluation criteria, the comparison of the two adhesive strategies was performed using the chi-square test ($\alpha=0.05$). The baseline scores were compared with those at the recalls using the Friedman and Cochran's Q-test.
Results: At 36 months, 82 restorations (ER:41, SE:41) were evaluated in 34 patients with a recall rate of 97.1%. None of the restorations was failed due to retention. At the end of 36 months, one restoration from ER and 8 from SE group were scored as bravo for marginal discoloration. In terms of marginal adaptation, ER and SE group's alpha scores were 92.7% and 82.9%, respectively. Neither secondary caries formation nor postoperative sensitivity was observed in any restorations. No statistical differences were found among the different adhesive strategies of the tested

universal for the evaluated criteria ($p>0.05$) except for marginal discoloration ($p<0.05$).
Conclusion: After 36 months of clinical follow-up, all restorations were clinically acceptable, whereas restorations in self-etch mode showed less satisfying performance in terms of marginal discoloration.
Keywords: etch&rinse, self-etch, universal adhesive, bulk-fill

EP – 077

Diastema Closure by Direct Composite Resin: 18 Months Follow - Up
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Aim: Diastemas caused by aesthetic irregularities and tooth deficiencies in the anterior region; today it is treated more practically and conservatively. Due to clinical and economic reasons, the use of direct composite resin in diastema cases is the first choice, as it yields successful results. The aim of this case report is to treat the patient who applied to our clinic with diastema complaints in a single session with direct composite resin.
Materials and Methods: A systemically healthy 45-year-old male patient was admitted to our clinic with complaints of diastema in his upper central teeth. Consent was obtained from the patient and color selection was made using the button technique. All enamel surfaces to be restored were roughened with 37 % phosphoric acid (3M ESPE, USA) for 30 seconds. Bonding agent (Adper Single Bond, 3M ESPE) was polymerized with a LED light device. Using the silicon index, the cervical of the central teeth was restored using Clearfil Majesty ES-2 (Kuraray, Tokyo, Japan), a nanohybrid composite resin in A3E and A3D color. The middle and incisal of the teeth were restored using Clearfil Majesty ES-2 (Kuraray, Tokyo, Japan), a nanohybrid composite resin in A2E and A2D color. The restoration is completed by finishing and polishing processes with Sof-Lex discs (Sof-Lex Contouring and Polishing Discs,3M ESPE, USA).
Results: Restorations were evaluated using radiography and modified USPHS criteria at 6 and 18 months. In the 6th month, it was seen that all scores were 'Alpha (Clinically perfect restoration)'. In the 18th month, it was seen to be 'Alpha (Clinically perfect restoration)' in terms of retention, anatomical form, surface roughness, sensitivity, secondary caries and color matching, and 'Bravo (Clinically acceptable restoration)' in terms of marginal adaptation and marginal coloring.
Discussion: Direct composite resin applications are among the most appropriate clinical options that can be preferred in a short time in terms of aesthetics and functionality. Direct composite resins, which were preferred in the literature review due to their economical and clinical application convenience, provided satisfactory results.
Keywords: direct composite resin restoration, follow-up, diastema

EP – 078

Aesthetic Rehabilitation of Anterior Teeth with White Spot Lesions: Report of Two Cases
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Aim: In this case report, it was aimed to rehabilitate white spot lesions by a resin infiltration method.
Materials and Methods: A 21-year-old female patient and a 15-year-old male patient presented to our clinic due to aesthetic problems resulting from white spot lesions in their central maxillary teeth. In the examination, teeth were found to be healthy, and it was decided to treat them by a resin infiltration method. To this end, 15% HCl acid gel (Icon-Etch) was applied to the teeth surfaces, including the 2 mm periphery of the lesions, for 2 minutes. Afterward, it was irrigated with water for 30 seconds for removal. Ethanol (Icon-Dry) was applied for 30 seconds to dry the lesion areas, and then the teeth surfaces were dried up. Acid and ethanol were applied twice more for color change in the opaque lesions. Later, Icon resin (DMG, Germany) was applied to the lesion surfaces. It was given 3 minutes for penetration and then polymerized for 40 seconds. The resin was reapplied and given 1 more minute for penetration and then polymerized for 40 seconds.
Results: Immediately after the application, a noticeable improvement was observed in the tooth surfaces. It was observed that recovery was preserved in the follow-up 6 months later, and the lesion was further masked in the follow-ups one year later. The resin infiltration technique can be considered as an alternative treatment method for white spot lesions.
Discussion: Since the depths and structures of lesions may vary due to etiologic reasons, the effect of the material may also differ. The treatment we applied in our cases was quite satisfactory in terms of color masking. This technique is more conservative than restorative treatments and microabrasion methods. The healthy structure of the tooth is maintained, and no local anesthesia is required. It is also economically more advantageous. No financial support was received from any company or institution during this study.
Keywords: resin infiltration, white spot lesion, aesthetics

EP – 079

Color Recovery Effect of Home Bleaching System on a Discolored Nanocomposite Resin
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Aim: Discoloration in composite resin restorations is a common problem and whitening systems might be an alternative to their replacement. The purpose of the present study was to evaluate the color recovery effect of a home bleaching system on a discolored nanocomposite resin.
Materials and Methods: Twenty disc-shaped (8 mm in diameter and 2 mm in height) specimens were fabricated using Teflon molds, and they were kept in distilled water for 24 hours. Nanocomposites (Filtek Ultimate; 3M ESPE, USA) were wet grounded with silicon carbide papers up to 1200-grit, and immersed either in distilled water or coffee for 1 week. After immersion, nanocomposite samples were subjected to home bleaching protocol with 16% carbamide peroxide (Opalescence PF 16%; Ultradent, USA) for 4 hours daily for 2 weeks. Color measurements were performed with a clinical spectrophotometer (Easyshade; Vita Zahnfabrik, Germany) according to CIELAB system at baseline, after staining, and after the first and second weeks of bleaching. Discoloration of specimens was calculated by means of ΔE compared to baseline values. The value ΔE=3.3 was considered as clinical acceptable threshold. Repeated measures of one-way ANOVA with post-hoc test was used to analyze the data.
Results: After 1-week of immersion, nanocomposite resin ($\Delta E = 5.3 \pm 1.4$) was significantly discolored compared with the controls ($\Delta E = 1.2 \pm 0.3$), which was above the clinical acceptable threshold ($\Delta E = 3.3$). After bleaching, there was a significant decrease in the discoloration of the specimens kept in the coffee (Week 1, $\Delta E = 3.1 \pm 0.4$; Week 2, $\Delta E = 2.2 \pm 0.4$), whereas a slight increase was observed for the control group.
Conclusion: The nanocomposite exhibited significant discoloration after immersion in coffee. However, home bleaching effectively recovered the discoloration of nanocomposite and reduce it to below clinically acceptable threshold.
Keywords: composite resin, discoloration, home bleaching, nanocomposite resin, color stability

EP – 080

Antimicrobial Properties of Concentrated Growth Factor (CGF) Against Bacteria Induced Oral Diseases
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Aim: Concentrated Growth Factor (CGF) is particularly gaining acceptance and popularity in regenerative dentistry. Nonetheless, there was no available studies showing its effect against microorganisms of oral cavity particularly in chronic oral diseases induced biofilms. This *in vitro* research was conducted to determine the antimicrobial effects of CGF against *Staphyloccocus aureus* (*S. aureus*) and *Streptococcus mutans* (*S. mutans*).

Materials and Methods: Blood samples were obtained from a healthy volunteer. CGF was then prepared using specialized centrifugation equipment (Medifuge, Silfradent, Santa Sofia FC, Italy) and protocol. Antimicrobial activity of CGF was observed and recorded on standard strains of *S. aureus* and *S. mutans* using well diffusion method to determine inhibition zone, broth microdilution to determine Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) and crystal violet assay for biofilm assessment with CHX 0.12% used as a positive control. Statistical analysis was done by using One-Way ANOVA followed by Tukey Test post-hoc analysis.

Results: It was observed that there was a presence of clear zones of inhibition around the CGF after 24 hours of incubation. The mean diameter of inhibition zone was 1.26±0.12 nm and 1.20±0.06 nm for *S. aureus* and *S. mutans*, respectively with significance difference ($p<0.05$) against control group CHX 0.12%. The MIC values of the CGF against *S. aureus* and *S. mutans* were 47.9% and 34.17%, respectively and the MBC values of the CGF against *S. aureus* and *S. mutans* were 100%. The viability and the ability in inhibiting the biofilm formation of the *S. mutans* and *S. Aureus* following treatment with CGF showed reduction in concentration-dependent manner as compared to control.

Conclusion: CGF possessed antimicrobial and antibiofilm activity against *S. aureus* and *S. mutans*.

Keywords: antibiofilm, concentrated growth factor, oral pathogen, platelet rich concentrate, antibacterial

EP- 081

Whiteness Index of Discolored CAD/CAM Materials After Dental Bleaching

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Aim: To evaluate the whiteness index of discolored CAD/CAM materials after dental bleaching.

Materials and Methods: Eighty specimens were prepared (2.0 mm in thickness) from 4 different CAD/CAM materials, [Cerec Block (CR), Shofu Block HC (SH), Cerasmart (CRS), Lava Ultimate (LU)] and a resin composite [Filtek Z250 (Z250)]. Specimens were subjected to thermal cycling in a coffee solution for 5000 cycles. Initial color parameters were calculated with a spectrophotometer (VITA Easyshade V, VITA Zahnfabrik). Then the specimens were divided into two subgroups and two different bleaching procedure was applied as follows: 16% carbamide peroxide (Home bleaching (HB): Opalescence PF- 8 hours in a day for 14 days), and 40% hydrogen peroxide (Office Bleaching (OB): Opalescence Boost- 3 times 20-minute periods for a total of 60 minutes). After bleaching procedures, second color measurements were recorded. For evaluating of bleaching efficiency, CIELab systems and 'whiteness index (WI_D)' formula was used. The generalized linear model method was used to examine the main effects and interactions of different dental materials, bleaching methods on whiteness index and Bonferroni correction was used for multiple comparisons ($p<0.05$).

Results: Whiteness index values increased significantly in groups except CRS, but the type of bleaching method did not cause any difference for the materials. The highest ΔWI_D values were observed in Z250 group with home bleaching, followed by LU group in both bleaching methods, the Z250 group with office bleaching, and CR group with home bleaching. While the SH group with both bleaching methods and the CR group with office bleaching showed average changes in values, no statistical difference was found between them. The lowest ΔWI_D values were observed in the CRS group, regardless of home or office bleaching.

Conclusion: Within the limitations of this study, it can be concluded that the effect of bleaching procedure on ΔWI_D values of discolored CAD/CAM blocks are material dependent

Keywords: dental bleaching, whiteness index, CAD/CAM blocks.

EP – 082

Does Different Surface Sealents Effet the Discoloration of Omnichroma Composite Resin?

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Aim: Recently, a "universal shade" resin-based composite, Omnichroma, that is truly universal and blends with any shade dentition, is gaining attention from the clinicians. The aim of this study was to investigate the effect of different surface sealants on discoloration of Omnichroma composite resin and a multishade nanofilled composite resin.

Materials and Methods: Ninety samples were fabricated in molds from G'ænial Anterior composite resin (GC, USA) shade A1 and Omnichroma composite resin (Tokuyama Dental, Tokyo, Japan). They were light cured (20 sec, Elipar S10, 3M ESPE) and allocated into three groups (n=15); Group 1:no surface sealant, Group 2: Permaseal (Ultradent Products, USA), Group 3: Biscover LV (Bisco, USA). Then samples were immersed in daily refreshed coffee solution (Nescafe Classic, Nestle, Switzerland) at 37°C for 7 days. Color parameters were measured with a spectrophotometer (Spectroshade Micro, MHT, Italy) before and after immersion. Restorative materials are polymerized in line with the recommendations of the manufacturers. CIELab coordinates were recorded, and color difference analysis (ΔE) was made using the CIEDE-2000 formula. Data were analyzed using the one-way variance (ANOVA) test. A p value <0.05 was considered to be significant.

Results: A significant protective action of Permaseal was found on only staining of Omnichroma, except this group all samples showed clinically unacceptable discoloration($E_{00}>1.8$). In Group 1 and 2 Omnichroma showed more discoloration than G'ænial ($p<0.001$). There was no favorable effect of using surface sealants on G'ænial composite resins to prevent discoloration ($p=0.971$).

Conclusion: Current restoratives with/without surface sealant materials discolor over time. The composition of dental materials and their interactions seemed to be a causative factor.

Keywords: omnichroma, surface sealants, discoloration

EP – 083

Anti-Cariogenic Effect of Experimental Resin Cement Containing Ursolic Acid Using Microcosm Model

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Aim: To evaluate whether in microcosm biofilm model, ursolic acid containing resin cement can show anti-cariogenic activity and which concentration was effective.

Materials and Methods: Experimental resin cement was prepared according to UA concentration (0, 0.1, 0.5, 1.0 and 2.0 wt%). Fifty extracted human molars were prepared with a 2 x 4 x 2 (width x width x depth)

cavity on the occlusal surface. For each sample, an indirect resin inlay was made of Tescera™ following the manufacturer's instructions. Indirect resin inlays were cemented with experimental resin cement. Acid-resistant nail varnish was applied, except for the area 2 mm around the restoration.
Dental microcosm biofilms were initiated from human saliva. Biofilms were grown on teeth specimens for 10 days in basal medium mucin (BMM) artificial saliva medium to induce artificial caries. To evaluate the caries progression, Quantitative Light-induced Fluorescence (QLF) was used to compare the before and after caries induction. One-way ANOVA followed by the Tukey post-hoc analysis was used to statistically analyze the data ($p < 0.05$).
Results: On ΔF (-%) and ΔQ (-%·Px) values as QLF parameters, there was no significant ΔF changes after caries induction. Otherwise, there was a tendency of ΔQ (-%·Px) changes after caries induction being lower in groups of resin cement containing higher concentration of UA. The difference between before and after caries induction of ΔQ in control group was -3660.6 but the value of 2% group was only -404.8. It means that artificial caries was less induced in the area around resin cement containing UA of more than or equal to 1.0% significantly ($p<0.05$). There was no difference between the groups containing UA of more than or equal to 1.0%.
Conclusion: Within the limitations of this study, resin cement containing at least 1.0% of UA [1] showed an anti-cariogenic effect using dental microcosm biofilm.
Keywords: microcosm model, quantitative laser fluorescence, ursolic acid, antibacterial composite

EP – 084

Effect of Mouthrinses on Color Stability of Icon Resin Infiltrant

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Aim: Resin infiltration technique provides an ideal treatment alternative for white spot lesions. Although ICON® resin infiltrant (DMG, Hamburg, Germany) has been widely used as a dental material to fix the initial esthetic problems associated with white spot lesions, there is still a lack of information about its color stability. The aim of this *in vitro* study was to evaluate the color stability of ICON® upon exposure to different mouthrinses.
Materials and Methods: A total of 75-disc shaped specimens, 1mm in height and 8mm in diameter were prepared and randomly divided into five groups (n=15) according to immersion media containing four different ingredient types of mouthwash; distilled water (control), essential oils (Listerine®), chlorhexidine gluconate (Klorhex®), stannous fluoride (Meridol®) and zinc (Dentasave®). The specimens of control group were stored in distilled water at 37°C for 7 days. The others were immersed in mouthrinses for 2 minutes twice a day (with a 12-hour interval between exposures). Color parameters were measured with a spectrophotometer (SpectroShade®) at baseline and at the end of 7 days. Color differences were calculated according to CIEDE 2000 (ΔE_{00}). One way ANOVA test was used to evaluate the differences in ΔE_{00} measurements among groups and multiple comparisons were evaluated with Tukey test.
Results: The highest ΔE_{00} value was calculated for Listerine® group and it was significantly different only from the control group. No significant ΔE_{00} differences were noted between other groups. Clinically acceptable color changes were observed for all groups tested ($E_{00}<1.8$)
Conclusion: Within the limitations of this *in vitro* study, it can be concluded that discoloration effect of the tested mouthrinses on ICON® resin infiltrant was similar, and between clinically acceptable values. However, further research with longer usage periods and comparisons with other types of restoration materials are needed.
Keywords: ICON resin infiltrant, mouthrinse, discoloration

EP – 085

Investigating the Cytotoxic Effects of Dual - Cured Bulk-Fill Resin Materials on L929 Cells

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Aim: To investigate cytotoxic effects of dual-cured bulk-fill resin materials polymerized with a third generation LED light curing unit (LCU) on L929 fibroblast cells in terms of morphology and viability.
Materials and Methods: Three novel dual-cured bulk-fill materials flowable bulk-fill material containing antibacterial zinc oxide (Fill-Up!™), bioactive material(ACTIVA™ BioACTIVE-RESTORATIVE™), dual-cured bulk-fill composite material containing nano-hydroxyapatite (HyperFIL® HAp) polymerized by LED LCU (VALO™ Cordless) were tested. Each material was placed in plastic rings (4x5mm) in a single layer. Unpolymerized rings filled with material were placed in direct contact with cells then polymerized. After polymerization removed medium was readded to wells. In this study three control groups were performed. Medium-free control group: Medium was removed. After waiting for the longest polymerization time of materials medium was readded. Medium control group: No treatment was applied to cells in medium. Physical control group: Medium was removed then only plastic rings with cotton inserted into them were placed on cells then medium was readded. Three samples were prepared from each group. After 24 hours, morphology of cells was examined and WST-1 test was performed. Percentage of cell viability (PCV) of each group was calculated according to medium control group measuring absorbance in microplate reader (BioTek Synergy H1 Hybrid Reader, USA). Experiment was repeated three times. Data were analyzed by Kruskal-Wallis Test. $p<0.05$ was considered significant.
Results: PCV of all groups was found to be significantly lower than medium control group $(p<0.05)$. Lowest PCV was obtained in HyperFIL® HAp while highest in Fill-Up!™. In the morphology of cells related to experimental groups, it was observed that spindle structures of cells were disrupted due to cytotoxicity, cells became rounded and intercellular space increased. There were no significant differences between control groups $(p>0.05)$. All control groups showed acceptable PCV (>70%) and cells were spindle-like, similar to the original fibroblast cells.
Conclusion: Although the percentages of cell viability were below 70% for all of the dual-cured bulk-fill resin materials, it was determined that the flowable bulk-fill material containing antibacterial zinc oxide had the highest percentage of cell viability in terms of biocompatibility.
Keywords: cytotoxicity, dual-cured material, fibroblast cells, bulk-fill material

EP – 086

Color Stability Assessment of Composite Resins Submitted to Coffee Staining by Spectrophotometer

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Aim: The aim of this *in vitro* study was spectrophotometric evaluation of the color stability of two composite resins with different resin microstructure following extrinsic staining with coffee.
Materials and Methods: A hundred disc-shaped specimens (10mm diameter x 2mm thickness) were prepared from two different composite resin materials (Charisma Topaz A1, Kulzer; Harmonize Enamel A1, Kerr) with different monomers TCD-DI-HEA and Bis-GMA,

respectively. Polymerization was performed with a LED curing unit (Valo, Ultradent) for 20 sec. Baseline color measurement of all samples were performed following thermocycling (10,000 cycles, 5°C-55°C, 20 sec dwell time) by using a spectrophotometer (Vita Easyshade V, Vita Zahnfabrik), according to the CIE (L*, c*, h[BT1] *) system. Each composite group was divided into two groups as experimental (n = 40) and control (n = 10). The color change analysis was performed after the groups were immersed in coffee solution for 6 days by replenishing the solution daily (10gr/200ml, Nescafe Gold, Nestle), while the control groups were kept in distilled water during this period. The color measurements were repeated on days 3 and 6, under the same conditions. Data were analyzed with generalized models. The significance level was $p < 0.05$.

Results: The results revealed significant differences in color change between the solutions tested ($p<0.001$). No color change was detected in distilled water group with time, but coffee caused discoloration although time factor did not make a significant difference ($p>0.001$). There was a statistically significant difference among the composite resins tested ($p<0.001$), as Harmonize showed more color change.

Conclusion: Within the limitations of this study; all the tested composites immersed in coffee were found to be susceptible to extrinsic staining. Charisma Topaz showed less color change than Harmonize. The discoloration caused by coffee was not increased over time.

Keywords: color stability, composite resin, spectrophotometer, coffee staining

EP – 087

Color Stability Evaluation of Composite, Hybrid-Ceramic, and Ceramic CAD/CAM Materials

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Aim: The aim of this *in vitro* study was to compare the color stability of composite (Brilliant Crios [CB], Coltene); hybrid-ceramic (Grandio Blocs [GB], VoCo; Cerasmart [CS], GC; Cerasmart 270 [CS270], GC), feldspathic (Cerec [CE]; Dentsply Sirona) and zirconia reinforced lithium silicate (Celtra Duo [CD],Dentsply Sirona) ceramic CAD/CAM materials exposed to staining solutions.

Materials and Methods: 180 specimens in 2-mm thickness were obtained from six different CAD/CAM blocks (n=30). Following initial color measurements with a spectrophotometer (Minolta CM-2600d, Konica-Minolta Co.), each material group was randomly divided into three subgroups as artificial saliva (control), coffee, and red wine (n=10). Coffee and red wine specimens were immersed in the respective solutions for 6 hours and then kept in artificial saliva for 18 hours, while control group specimens were kept in artificial saliva during the study. Color measurements were repeated after 1 and 2 weeks, and color change (ΔE_{00}) was evaluated. Data were statistically analyzed using two-way ANOVA, t-test, and post hoc Tukey tests ($p<0.05$).

Results: Two-way ANOVA revealed a significant interaction between CAD-CAM materials and staining solutions ($p<0.01$). All the tested CAD/CAM materials resulted in statistically significant color changes with coffee and red wine after 1 and 2 weeks ($p<0.05$), while artificial saliva revealed no significant color change ($p>0.05$). At the end of the 2nd week, CE ($\Delta E_{00}=2.17\pm0.94$), CD ($\Delta E_{00}=2.26\pm0.63$), and CS270 ($\Delta E_{00}=1.28\pm0.31$) exhibited significantly lower ΔE_{00} values than CB ($\Delta E_{00}=2.48\pm0.22$), GB ($\Delta E_{00}=3.31\pm0.83$), and CS ($\Delta E_{00}=2.83\pm0.65$) in coffee. In red wine, CB ($\Delta E_{00}=8.85\pm1.93$) and GB ($\Delta E_{00}=7.2\pm1.84$), which was not significantly different from each other ($p>0.05$), revealed significantly higher color change than CS ($\Delta E_{00}=3.91\pm0.98$), CS270 ($\Delta E_{00}=5.41\pm0.55$), CE ($\Delta E_{00}=3.58\pm1.34$), and CD ($\Delta E_{00}=3.87\pm1.06$) ($p<0.05$).

Conclusion: Hybrid-ceramic, feldspathic, and zirconia reinforced lithium silicate ceramic CAD/CAM materials were more color stable than the composite material in staining solutions. Red wine caused above clinically acceptable color change in all types of CAD/CAM materials ($\Delta E_{00}>2.25$) and color change increased with increased exposure time.

Keywords: color stability, dental materials, CAD/CAM

EP – 088

The Effect of Expiration Date on Microhardness and Water Solubility of Resin Composites

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Aim: The aim of this study was to evaluate the effect of expiration date on the Vickers hardness and water solubility of five different resin composites.

Materials and Methods: Five different expired (E) and non-expired (N) shelf-life resin composite materials; GrandioSO Heavy Flow (GHF, Voco GmbH, Cuxhaven, Germany), SDR (SDR, Dentsply DeTrey, Konstanz, Germany), SonicFill 2 (SCF, Kerr, Orange, CA, USA), Beautifil 2 (SBF, Shofu, Kyoto, Japan), CeramX SphereTec One (CRX, Dentsply DeTrey, Konstanz, Germany) were used. Ten specimens of each composite were made in a Teflon matrix (2 mm thickness, 5 mm diameter), separated into two groups, and submitted to Vickers microhardness and water sorption test. (n=5) Vickers hardness measurements were made on the top and bottom surfaces. For the water sorption test, initially all specimens were weighted, the thickness and diameter of each specimen were measured, and the average volume of specimen was calculated. Then, each specimen was immersed in distilled water and kept in an incubator for 7 days and finally weighed again.

Results: For water sorption analyses, according to the one-way ANOVA and Tukey-HSD test showed that there was not a significant difference ($p>0.05$) between resin composites for expired and non-expired groups separately. Additionally, there were statistically differences between non-expired CRX, SDR and SCF, SBF, GHF groups ($p<0.05$) for Vickers microhardness results, there was not a significant difference ($p>0.05$) between the expired composites. The data submitted to the paired t-test did not a significant difference in microhardness and water sorption for the composites used after their expiration dates except SBF.

Conclusion: Expiration date only affected the microhardness and water sorption of the SBF composite. The microhardness and water sorption of the composite materials varied depending on the type of composites.

Keywords: expiration date, microhardness, water sorption, composite resins

EP – 089

Color Stability of Flowable Composites in Different Viscosities

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Aim: This *in vitro* study was aimed to evaluate the color stability of resin-based composite materials in different viscosities, that immersed in various colorant solutions.

Materials and Methods: Composite samples of A2 shades (n=250) were prepared using two high-viscosity flowable composites (G-aenial Injectable, GC, Tokyo, Japan; Estelite Super-Low Flow, Tokuyama Dental, Japan), a bulk-fill flowable composite (Filtek Bulk-Fill, 3M, USA), a flowable composite (Filtek Ultimate Flowable, 3M), and a packable composite (Filtek Ultimate, 3M). Samples were polymerized with a LED curing unit (Valo Grand, Ultradent Products, Switzerland) and polished with polishing discs (Sof-Lex, 3M). The test groups were colorant solutions (n=10 for each) coke, tea, coffee, red wine, and physiologic saline solution. Samples were discolored for 144 hours in an incubator at 37°C and repolished after discoloration. Color

measurements were performed using a spectrophotometer (EasyShade IV, Vita, Germany) and a colorimeter (ShadeStar, Dentsply, USA). Two-way ANOVA and Tukey HSD tests were used for statistical analyses.
Results: Composite material and colorant solution were considered effective factors for influencing the color change. Filtek Ultimate Flowable presented significantly the highest level of color change among all ($p<0.001$), for both 'after discoloration ($5,34\pm3,78^{b}$)' and 'after repolishing ($3,93 \pm 2,23^{b}$)' periods. Only Filtek Ultimate Flowable presented perceptible ($\Delta E^{*}>3.7$) color change (3.93 ± 2.23^{b}) among all. Red wine solution showed significantly the highest level of color change ($8,00 \pm2,08^{d}$; $p<0.001$), and followed by coffee ($4,59\pm1,52^{c}$), tea ($3,38\pm1,21^{b}$), and coke ($1,58\pm0,99^{a}$), respectively. A strong relation was found between spectrophotometer and colorimeter.
Conclusion: Viscosity was considered an effective factor for discoloration. Color stability of high viscosity flowable composites were similar to packable composite. Red wine was the most effective colorant solution, followed by coffee, tea, and coke. The repolishing procedure was considered effective for reversing back the surface discoloration.
Keywords: discoloration, flowable composite, repolishing, viscosity, color stability

EP – 090

Evaluation of Wear Resistance after Acid Treatment of Self-Adhesive Restorative Materials
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Aim: Next generation bulk fill glass hybrid long-term restorative system EQUIA Forte HT (EFH) System (consist with EQUIA Forte HT Fil (EFHF) and EQUIA Forte Coat (EFC)) was introduced in 2019. EFC nano-fillers increases surface hardness and wear resistance.
The aim of this study was to evaluate wear resistance after acid treatment of self-adhesive restorative materials for long-lasting restorations.
Materials and Methods: Two experimental groups of occlusal wear resistance were compared: A) EFHF + Capsule Mixer CM-II (GC Corporation), B) Surefil one (SO) (Dentsply Sirona) + PROMIX one (Renfert). The specimens were mixed and hardened following the manufacturer's instructions. The mixture was filled into the mold (φ2.3 in test surface, 5mm in height) and the specimen assembly were stored 37°C/ 90%R.H. Specimens were removed from the mold after 1 hour storage. Then, EFC was applied on the EFHF surface. Specimens were immersed in 100 mM Lactic acid buffer (pH 2.74) at 37°C for 24 hours. After acid treatment, the wear testing was performed (horizontal running 20000 times, load of 300g, PMMA: glycerin: distilled water = 1: 1: 1 slurry) by the occlusal wear test machine (Tokyo Giken) and the data were analyzed (Tukey-Kramer, $p<0.01$) (n=5).
Results: Mean (± SD) values of wear depth were 8.4 (2.4), 38.1 (3.1) μm for EFH, SO respectively. Values of EFH was significantly smaller than SO.
Conclusion: From this study, it was confirmed that EFH has high wear resistance after acid treatment. Therefore, it was suggested that the restorative system can be expected to have high durability even under acidic conditions.
The authors belong to GC Corporation.
Keywords: self-adhesive, wear resistance, acid treatment

EP – 091

Effect of TiO2-n on the Antibacterial Properties of Low - Viscosity Bulk - Fill Composite
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Aim: The purpose of this study is to evaluate the antibacterial properties of low viscosity bulk-fill composite resin with/without titanium dioxide nanotubes (TiO_2-n) in different proportions.
Materials and Methods: TiO_2-n were synthesized by the hydrothermal method under laboratory conditions. Characterization of TiO2-n was performed using FTIR Spectroscopy (100 FTIR Spectrometry, Perkin Elmer, USA) and Raman Spectroscopy (Renishaw Streamline, Germany) device. In order to determine the morphology of TiO2-n, HR-SEM (High resolution) was used (FEI brand QUANTA FEG 250 ESEM, FEI, USA) and analyzed at x 50.000 and x 400.000 magnification. TiO2-n was manually added to low viscosity bulk fill composites (Estelite Bulk Fill Flow, Tokuyama Corp, Japan) in different proportions (0.1%, 0.5%, 1% by weigh) and handled with spatulation for 20 minutes. Antibacterial effectiveness against *Streptococcus mutans* and *Lactobacillus casei* was determined by direct contact test. Statistical analysis was performed using IBM SPSS Statistics 22 (IBM SPSS, Turkey). Kruskal Wallis and Dunn's test was used to compare group differences. Significance was evaluated at the $p<0.05$ level.
Results: Plateau stage refers to the stage in which bacterial growth becomes stable. There was no statistically significant difference between the groups in terms of mean *S.mutans* in the Plato stage (18th hour) ($p>0.05$) A statistically significant difference was determined between the groups in terms of *L.casei* averages in the Plato stage (18th hour) ($p<0.05$). It was observed that the 0.5% TiO2-n group had a statistically significantly lower value than the, 0.1% TiO2-n, 1% TiO2-n and the control groups ($p<0.05$). No significant difference was determined among other groups ($p>0.05$).
Conclusion: Although, addition of TiO_2-n did not give the low viscosity bulk fill composite resin an antibacterial effect against *S.mutans* ($p> 0.05$), addition of 0.5% TiO_2-n give an antibacterial effect against *L. casei* ($p <0.05$).
Keywords: nanotube, titanium dioxide, low viscosity bulk fill composite resin

EP – 092

Effect of Two Glutaraldehyde Desensitizers on Dentin Bond Strength and Enzymatic Activity
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Aim: To investigate the effects of two glutaraldehyde-based desensitizer solutions, GLUMA Desensitizer PowerGel, and GLUMA Desensitizer (Heraeus Kulzer GmbH, Germany) on the bonding potential and endogenous enzymatic activity of simplified universal adhesives to dentin.
Materials and Methods: Non-carious teeth (n=4 per group) were cut to expose middle/deep dentin, randomly assigned to 6 groups, and treated according to manufacturer's instructions: G1: Gluma Desensitizer (GD) applied for 60 s and bonded with iBond Universal (Kultzer) in self-etch mode (IBU); G2: Gluma Desensitizer Powergel (GDG) for 60 s and bonded with IBU; G3: bonded with IBU (control); G4: GD for 60s bonded with Adhese Universal (Ivoclar Vivadent, Schaan, Liechtenstein) in self-etch mode (AU); G5: GDG for 60 s bonded with AU; G6: bonded with AU (Control). Specimens were further subjected to microtensile bond strength

test and stressed until failure after 24h storage in artificial saliva at 37°C. Furthermore, 4 additional extracted molars were employed for the *in situ*-zymography, to estimate the MMPs endogenous activity within the hybrid layer using a multi-photon confocal laser scanning microscope. The data of the microtensile test were analyzed using two-way ANOVA and post-hoc Tukey tests with the significance set at p=0.05.
Results: Treatment with a desensitizing agent significantly influenced bond strength values (p<0.05). Statistically higher values were recorded for the GDG groups with IBU and AU (63,54 ± 15,16 and 45,66 ± 13,71 respectively). IBU/GDG showed the highest mean μTBS among the tested groups (p<0.05). The groups treated with both GDG and GD showed a lower level of gelatinolytic activity.
Conclusion: Dentin application of a desensitizing agent prior to adhesion procedures with two simplified adhesives systems yielded superior bonding performances, possibly due to the changes in the enzymatic activity. Aging studies should be performed to understand whether this effect is only immediate or also long-term.
Keywords: desensitizer, enzymatic activity, microtensile bond strength test, MMPs, dentin

EP – 093

The Effect of Shade and Irradiation Time on Microhardness of a Microhybrid Composite
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Aim: The purpose of this *in-vitro* study was to evaluate the effect of shade and curing time on the microhardness and depth of cure of Triofill (Dentac), which is a recently released microhybrid resin composite.
Materials and Methods: 45-disc shaped (8 x2 mm) composite samples were prepared in three different shades (A1, A2, A3) of Triofill (Dentac) composite. Samples were polymerized for 10, 20, and 30 s with Valo Cordless (Ultradent) LED curing unit (1200mW/cm^2). Following polishing and finishing procedures of the top surfaces of the samples using four different grain sized Finishing Discs (Bisco) Vickers microhardness test (VHN) was performed at 3 indentations on the top and bottom of each sample (Shimadzu-HMV-2T) after storage for 24 h in distilled water in a dark room at 24°C temperature. Wald chi-square test was used to compare microhardness of resins in different shades. The significance level was set at p <0.05.
Results: Shade of the composite had statistically significant effect on the surface microhardness values (p=0.002). The mean microhardness values of the shades A1, A2, and A3 were 111.9, 111.3, and 93.1, respectively. Significant differences were observed between the microhardness values on both surfaces of the samples with regard to 10, 20, and 30 s curing time (p=0.022; p<0.001). The effect of curing time was found to be statistically significant (p<0.001) however, the effect of shade was not found to be statistically significant on the depth of cure (p=0.869). No correlation was detected between the shade and curing time on depth of cure (p=0.550).
Conclusion: Based on the limitations of this *in vitro* study, 30 s of curing time provides better mechanical properties in Triofill (Dentac) composite as recommended by the manufacturer.
Keywords: depth of cure, microhardness, microhybrid composite, shade, curing time

EP – 094

Evaluation of Spectral, Mechanical and Surface Properties of One-Shade Universal Composites
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Aim: The aim of this study was to assess the Vickers's microhardness, degree of conversion and surface properties of two different one-shade universal composites.
Materials and Methods: In this study, 2 different one-shade universal composites (Omnichroma, Tokuyama Dental and Essentia U, GC) were used (n=5). 10 discs shape samples were prepared with a diameter of 8 mm and a depth of 2 mm. It was polymerized (Demi ™ Ultra, Kerr) for 20 s with 1100 mW/cm^2. The top surfaces were polished using discs (Finishing Discs, BISCO). Samples were kept at room temperature in distilled water and in the dark for 24 hours. For Vickers's microhardness tests (VHN) (SHIMADZU - HMV-2T) measurements were made on the top and bottom surfaces (three indentations for each specimen) using a 0.49 N load for 15s. The degree of conversion (DC) of 6 uncured samples and 6 cured samples were evaluated using FT-IR spectroscopy (JASCO FT-IR 4700) under these conditions: 4 scans, 4 cm^{-1} for the resolution over a wavelength of 400 to 4000 cm^{-1} and temperature of 20 °C. Two samples were analyzed with a Scanning Electron Microscope (SEM) at x1000, x5000 and x10000 magnification. The data was evaluated using the Independent Samples t-Test. The significance level was set at p <0.05.
Results: There is no significant difference detected between VHN of tested groups (p=0.301). The mean VHN of composites Omnichroma and Essentia U were 114.2, 92.6, respectively. No significant difference was found between depth of cure values of composites (p=0.097). DC values of Omnichroma and Essentia U were 40.93%, 52.09%, respectively and not differ significantly (p=0.448). In SEM evaluation Omnichroma showed the spherical filler and Essentia U showed the nanofill particle distribution.
Conclusion: Under the limitations of this *in-vitro* study; one-shade universal composites with different filler particle shapes showed similar mechanical and spectral properties.
Keywords: depth of cure, microhardness, one-shade universal composite, SEM, degree of conversion

EP – 095

Effect of Home Bleaching Agent on Surface Properties of Chairside CAD/CAM Blocks
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Aim: Surface changes of restorative materials after bleaching applications are of clinical importance in terms of the durability and survival of restorations. In this study, it was aimed to evaluate the effect of home bleaching on the surface roughness, microhardness and surface analysis of the currently introduced chairside CAD/CAM blocks.
Materials and Methods: Specimens were prepared from composite resin (Brilliant Crios: BC), resin nanoceramic (Lava Ultimate: LU), polymer-infiltrated ceramic-network (Vita Enamic: VE) and zirconia-reinforced lithium silicate glass ceramic (Vita Supriniy: VS) CAD/CAM materials. Specimens were polished using 800, 1000, 1200 and 2000 grit SiC papers. Each type of restorative material randomly divided into two groups: control and bleaching (n=10). The 16% carbamide peroxide bleaching agent (Whiteness Perfect 16%, FGM) was applied to the specimens for 4 hours/day for 14 days. Surface roughness values (Ra) were obtained using a profilometer and microhardness values (VHN) were obtained using a Vickers microhardness test. Surface analysis of specimens were evaluated with Scanning Electron Microscopy (SEM). Data were analyzed using Kruskal-Wallis and Mann-Whitney U test (p<0.05).
Results: A significant difference was found between the material groups in terms of surface roughness and microhardness (p<0.001). Bleaching did not significantly affect the surface properties of VS. Surface roughness of VE significantly increased (p=0.028) and the microhardness of BC and LU decreased (p=0.009; p=0.007) after bleaching. SEM evaluation showed material-dependent surface damages after bleaching procedures.

Conclusion: Surface properties of chairside CAD/CAM blocks adversely affected by 16% carbamide peroxide home bleaching agent. Effect of home bleaching agent on surface roughness and microhardness of chairside CAD/CAM blocks is material dependent. Before bleaching, restorative materials should be protected by the application of protective barrier and contact with the bleaching agent should be minimized. Also, after bleaching, the restoration surface should be carefully inspected and re-polished may be beneficial.

Keywords: CAD CAM, lava ultimate, Vita enamic, Vita suprinity, Brillant crios

EP – 096

Comparison of Microhardness Values of Composite Materials with Indirect Indications after Thermal Cycling

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Aim: The clinical durability of composite restorative materials may be significantly affected by cyclic temperature changes. Thermal cycling is able to reflect the clinical behavior of restorations subjected to these changes. Mechanical tests are being used to evaluate the changes in restorative materials after thermal cycling. Thus, the *in vitro* study investigated the effects of cyclic temperature changes on surface hardness of composite resins that could be used indirectly.

Materials and Methods: Disc-shaped samples (5 mm x 2 mm) were prepared from resin composites with indirect indications [ENA HRi Bio Function (BF), Gradia (GR), Enamel Plus HRi (HRI)] and a direct composite [Herculite (HL)]. Composite samples were polymerized for 20 sec. or 60 sec. with either a LED or halogen curing units or with a dual mode light curing unit (Labolight DUO) (n=10). All of the samples were kept in distilled water for 24 hours and then, specimens were subjected to ageing through 5000 thermal cycles at temperatures alternating between 5°C and 55°C with a dwell time of 30 seconds in water baths. Finally, all samples were subjected to hardness testing using a digital microhardness tester. Scores in Vickers values were analyzed statistically using ANOVA and Bonferroni tests at $p<0.05$.

Results: Thermal cycling had significantly affected the microhardness values of groups polymerized with both of the halogen (GR- 60sec., HRI- 60 sec.) and LED units (HRI- 60 sec.) ($p<0.05$). Dual mode curing had significantly increase the microhardness scores of HRI and HL groups ($p<0.05$). Among all groups, regardless of the curing time or unit, BF had the highest microhardness scores. Groups of tested composites polymerized with a halogen unit (HRI- 20 sec., HRI- 60 sec., HL- 20 sec.) showed inferior microhardness values.

Conclusion: Although thermal cycling had significantly affected the microhardness scores of composite resins with indirect indications, its efficiency could be reported as inconsiderable.

Keywords: light curing, microhardness, resin composites, dual mode curing

EP – 097

Color Stability of Resin-Based Composites Following Exposure to Active Charcoal Mouthwashes

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Aim: This study was aimed to evaluate the effect of active charcoal mouthwashes on color stability of nanohybrid resin-based composites by using spectrophometer.

Materials and Methods: In this *in vitro* study, 50 disc-shaped specimens (10mm diameter x 2mm thickness) were prepared from two different composite resin materials (Charisma Topaz A1, Kulzer; Harmonize Enamel A1, Kerr) containing different monomers bisphenol A glycidyl methacrylate (Bis-GMA) and bis-(acryloyloxymethyl) tricyclo [5.2.1.0.sup.2,6] decane, respectively. Baseline color measurement of all samples were performed following thermocycling (10,000 cycles, 5°C-55°C, 20 sec dwell time) by using a spectrophotometer (Vita Easyshade V, Vita Zahnfabrik), according to the CIE (L*, C*, H*) system. The samples of each group were randomly divided into 5 subgroups (n=5). Color change analysis was performed after the samples in the experimental groups were immersed in two different charcoal mouthwashes (The Humble Co.; Beauty Formulas, Drammock International Ltd.), a whitening mouthwash (Advanced White, Listerine), and an ordinary mouthwash (Cool Mint, Listerine) for three days, while the control samples were immersed in distilled water. Two-way ANOVA, Bonferroni and Tukey's HSD tests were used to analyze the data at a significance level of 0.05.

Results: Baseline color measurements after thermocycling revealed no significant difference between the specimens ($p>0.05$). Following the immersion in mouthwashes, significant interactions were found between composite resins and mouthwashes on color change. Although there was no significant difference between the mouthwashes ($p>0.001$), color change was significantly different from the control group ($p<0.001$). Also, there was a significant difference between composite resins; Harmonize group showed more color change than Topaz ($p<0.001$).

Conclusion: After immersion in different mouthwashes, all tested composite resins showed acceptable color change that was not visually perceptible ($\Delta E^*ab<3.3$). Charisma Topaz showed less color change than Harmonize. Within the limits of this study active charcoal content in the mouthwashes did not affect the coloring of the composite materials.

Keywords: color, composite resins, mouthwashes, spectrophotometer, active charcoal

EP – 098

Mechanical Properties of an Adhesive with Arginine Mesoporous Silica Nanoparticles

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Aim: To develop an experimental adhesive filled with arginine functionalized mesoporous silica nanoparticles in different concentrations and to evaluate its mechanical properties.

Materials and Methods: Experimental adhesives filled with arginine functionalized mesoporous silica nanoparticles (Arginine-MSN) in a percentage of 0.5, 1 and 2%, and an experimental unfilled adhesive were prepared. Two commercial adhesives (Scotchbond 1XT (SB1XT) and Scotchbond Universal Plus (SBUP), 3M Oral Care) were used as reference. Ten bar-shaped samples of each adhesive were prepared using silicone molds (10x2x2 mm) and light-cured for 20 seconds with the Elipar S10 LED unit, 1200mW/cm^2 (3M Oral Care). Samples were stored at 37°C for 24 hours and subjected to three-point flexural strength (FS) and modulus of elasticity (E) tests. Also, ten samples (10x4 mm) were similarly prepared for ultimate tensile strength (UTS). All tests were performed using a universal testing machine (Instron 3345) at a crosshead speed of 0.5 mm/min. Five disc-shaped specimens were prepared (5x1 mm) with each adhesive to determine microhardness (VHN) after

performing 10 indentations with a micro indenter (Buehler) applying 50 gr for 30 seconds. All results were analyzed by one-way ANOVA and Tukey tests ($p<0.05$).
Results: The highest FS values were obtained for the unfilled experimental adhesive, followed by the experimental adhesives containing 0.5, 1 and 2% AFSNs, SB1XT and SBUP. All experimental adhesives attained significant higher E values than both commercial adhesives. SBUP exhibited the highest UTS values, followed by the experimental filled and unfilled adhesives, and SB1XT. Regarding microhardness results, the experimental adhesives showed significantly higher VHNs than SBUP, exhibiting SB1XT the lowest.
Conclusion: The experimental adhesives filled with arginine functionalized silica nanoparticles in a percentage of 0.5, 1 and 2% attained FS, E, UTS and VHN values comparable or higher to those obtained for the commercial adhesives SB1XT and SBUP.
Acknowledgements: Supported by Spanish government, Grant No. CTQ2017-88642-R.
Keywords: dental adhesive, mechanical properties, silica nanoparticles, arginine

EP – 099

Tooth Replacement Using Fiber-Reinforced Composite and Natural Tooth Pontic: A case report
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Aim: The aim of this case report is to describe a minimally invasive treatment procedure for the replacement of a periodontally compromised maxillary central incisor used as a natural tooth pontic bonded polyethylene fiber.
Materials and Methods: A 58-year-old healthy male patient presented at the Restorative Dentistry Department seeking treatment for increased tooth mobility at the maxillary right central incisor. On clinical examination, #11 was showed grade-2 mobility and x-ray examination revealed vertical bone loss up to 1/3 of the tooth and hence extraction was indicated. Treatment options were discussed with the patient and implant treatment was decided. The patient was worried about aesthetics after the extraction. Following the atraumatic tooth extraction, the root was resected just below the CEJ and the pulp chamber was filled with a flowable resin composite. The sealed apical portion was contoured to obtain an oval pontic configuration and then polished. The required length of the polyethylene fiber (Construct, Kerr) was predetermined by using a metal matrix. A groove preparation was done on the lingual portion of the pontic and micro cavities were prepared on abutment teeth. Adhesive procedures were done both on the abutment teeth and on the pontic. Afterward, the pontic was positioned carefully in its correct position, stabilized with flowable composite and fiber strip was positioned lingually on pontic and abutment teeth, and light cured. After finishing and polishing procedures, static and dynamic occlusion was checked.
Results: The procedure was completed minimal invasively at the chairside and provided a cost-effective treatment procedure for the patient. The one-year follow-up showed no failures or complications. The patient was very satisfied with the result and delayed the implant treatment.
Discussion: Fiber-reinforced composite bridge using the patient's own natural tooth as a pontic provides psychological benefits, perfect esthetic for the patients, and can be used as an interim or permanent restoration.
Keywords: natural tooth pontic, fiber-reinforced composite

EP – 100

Management of an Uncomplicated Crown Fractured Maxillary Central Incisor by Reattachment Technique
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Aim: Anterior crown fractures are a common form of traumatic dental injury that generally affects the maxillary incisors, especially in children and adolescents. With the development of adhesive dentistry, a patient's own fragment can now be used to restore fractured teeth.
Materials and Methods: An 8-year-old boy who had fallen down from the stairs the previous day presented to our clinic with an uncomplicated crown fracture on his maxillary left central incisor. His parents brought the autogenous crown fragment to us stored in a container of distilled water. Clinical and radiographic examinations revealed that the tooth had a vital pulp tissue. The autogenous crown fragment was reattached using a 37% phosphoric acid and a self-etch adhesive system (Tokuyama Bond Force II, Tokuyama Dental, Italy), then filled using a flowable composite (i-FLOW N, i-dental, Lithuania).
Results: 3 and 6-month follow-up visits were completed. Aesthetics, pulp vitality, and periodontal status were satisfactory both clinically and radiographically at these follow-up visits.
Discussion: Tooth fragment reattachment is a conservative, time efficient method. This procedure can meet a patient's aesthetic demands without long term complications. The reattachment of fractured tooth fragments offers a viable restorative alternative. The procedure supplies good and long-lasting aesthetics, because the original morphology, color, and surface texture are preserved. Each case should be treated individually, and the optimal technique applied depending on the clinical situation and patient's expectations.
Keywords: fracture, reattachment, crown

EP – 101

Direct Composite Restoration of Molar Incisors Hypomineralization: A Case Report About Dental Substrate
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Aim: Molar-incisor hypomineralization (MIH) is alterations in tooth structure characterized by a quality-defective tissue associated with staining. The treatment implies a minimally invasive approach in order not to compromise a roughly underlying tissue. The objective of this case report is to describe the management of deficient dental substrate in the MIH during composite restoration.
Materials and Methods: A 20-year-old male patient requested the aesthetic restorations of his brown stained incisors. Dental history and clinical examination led to diagnosis of MIH. The direct resin composite restorations were opted for the aesthetic and functional rehabilitation. The teeth were isolated under rubber dam. Mechanical abrasion was performed with a spheric carbide bur of the outside surface of the enamel without any further preparation. A two-step etch-and-rinse adhesive system was performed with 37% phosphoric acid for 20 seconds, then 15-seconds application of one component adhesive (Single Bond, Universal Restorative Kit, DMP, Markopoulo, Greece) prior to the curing stage. A microhybrid light curing composite (Bright Light, Universal restorative kit, DMP, Markopoulo, Greece) was used for restorations of two to three increments.
Results: The aesthetic response was noticeable to the patient's satisfaction. Evaluation at 4-years postoperatively showed stability of the functional rehabilitation, absence of tooth sensitivity, necrosis or secondary caries.
Discussion: A key factor to consider in MIH's treatment is the deficient dental substrate. In order to provide the possibilities of retreatment, reversible and minimally invasive technique using resin composite should be considered as a priority. The first

challenge is to control the remove of damaged and non-adherent tissue from the outside surface. Achieving the appropriate dentin moisture is essential to optimize the wetting and penetration of the adhesive system through the denatured collagen and thus to improve bond strength. A microhybrid composite with high diametral and flexural strength, high fracture toughness, and resistance to wear ensures the long-term stability of restorations.

Keywords: direct composite restoration, molar incisors hypomineralization, deficient dental substrate

EP – 102

Esthetic Restoration of the Fracture Line, Following a Re - Attachment Procedure

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Aim: This case report is aimed to cover the fracture line of the maxillary right central incisor, following the reattachment of the fractured crown fragment. The fractured crown fragment of a 17 years-old patient was reattached 5 years ago. However, the patient was unsatisfied with the discolored fracture line on the labial surface of the tooth. Additional slight enamel fractures were also observed on incisal surfaces of tooth 12 and 21.

Materials and Methods: The present root canal treatment was renewed for tooth number-11 and then a non-vital bleaching agent (Opalescence Endo, Ultradent Products, USA) was used for internal bleaching. After two weeks, following the rubber-dam isolation, a slight bevel was prepared on the labial surface for the fracture line of the tooth. No composite shade selection was performed. Etching and bonding procedures were undertaken, and a thin layer of an opaque resin composite (Omnichroma Blocker, Tokuyama Dental, Japan) was applied as a very deep cover layer for the fracture line. The top surface was covered with a single-shade resin composite (Omnichroma, Tokuyama) with a high blending effect. Additionally, slight fractures of teeth number-21 and 12 were restored with the single-shade composite without preparations. Surface polishing was performed with polishing discs (Tor-Vm, Russia) and spiral rubber wheels (DiaComp-Plus, Eve, Germany), respectively. The patient was recalled after one-week and three-month.

Results: All of the restorations were scored according to the modified USPHS (The United States Public Health Service) criteria and considered successful at the short-term three-month follow-up.

Discussion: Internal bleaching is a useful pre-restorative approach to obtain a more minimally invasive treatment plan. The fracture line on the enamel surface can be masked by using a single-shade composite resin with an opaque blocker on the bottom layer. Single-shade composite resins with a blending effect may mimic the color of the surrounding enamel tissue when used for small incisal fractures.

Keywords: fracture line, internal bleaching, reattachment, single-shade composite, direct restoration

EP – 103

Aesthetic Rehabilitation of Anterior Crown Fracture and Multiple Diastema: A Case Report

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Aim: An 18-year-old male patient applied to our clinic with aesthetical needs. The presence of multiple and irregular diastemas after orthodontic treatment and, a traumatic crown fracture on left central incisor (#21), were observed. This clinical case presents a treatment plan based on direct composite restorations in minimally invasive concept.

Materials and Methods: Firstly, a diagnostic impression was taken. Then a silicon index was obtained on the waxed-up cast. The teeth were isolated with rubber dam (Nictone, Velopex, UK). No preparation was made on the teeth surfaces except the fractured tooth. Enamel surfaces were conditioned with a phosphoric acid gel (Scotchbond Etchant, 3M ESPE, MN, USA). The adhesive (Scotchbond Universal Adhesive, 3M ESPE, MN, USA) was applied and then light-cured for 10 seconds (Elipar DeepCure-S, 3M ESPE, MN, USA), in accordance with the manufacturer's instructions. Palatal walls were formed using silicon index. Opaque (OA2), body (A2) and enamel (CE) composites (Estelite Sigma Quick, Tokuyama Dental, Tokyo, Japan) were applied onto the tooth structure of #21, using multi-layered technique. For the other teeth, single shade body composite (A2) was used in layers. Each increment was light-cured for 20s. 12-blade flame carbide burs (EVE, Germany), interdental tapes (Kerr, Italy), polishing discs and spirals (Sof-Lex, 3M, St. Paul, MN, USA) were used for finishing and polishing. Recalls were arranged after 1 week and 6 months.

Results: At the follow-up observations, direct resin restorations were scored according to the modified USPHS (United States Public Health Service) Criteria, and all the scores were considered as 'successful' without any gingival inflammation, fracture, discoloration or lack of gloss and marginal integrity.

Discussion: In cases like crown fractures, diastemas, malpositions and malformations, direct composites could be a suitable clinical choice to restore anterior teeth, preserving sound tooth tissue with respect to minimally invasive dentistry.

Keywords: diastema, fracture, minimally invasive dentistry, composite restoration

EP – 104

Restoration of Discolored Anterior Teeth with Direct Composite by Using Layering Technique

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Aim: Discolorations and adaptation problems in old restorations can be solved with composite restorations. The aim of this case report is to provide anterior aesthetic of discolored upper incisors with conservative approach by using layering technique with direct composite restorations.

Materials and Methods: Intraoral and radiographic examination of 31 years old male patient who was admitted to our clinic due to discoloration and caries of his upper incisors, revealed that endodontic treatment was completed in tooth 12 (FDI), there were discoloration, caries and incompatible restorations on upper incisors. It is planned to restore upper incisors with direct composite resin after devital and vital bleaching treatment. 35% hydrogen peroxide containing agent (Opalescence Endo, Ultradent, USA) was applied in tooth 12 for devital bleaching. Office bleaching was performed on maxillary and mandibular teeth after devital bleaching with 40% hydrogen peroxide containing agent (Opalescence Boost, Ultradent, USA). 15 days after bleaching, color selection was made, teeth were isolated with rubber-dam (NicTone, Mexico) and caries were removed. After applying 30 seconds 37,5% phosphoric acid (iGel, Lithuania) to the enamel surfaces, universal adhesive (Premio Bond, Gc, Germany) was applied according to the manufacturer's instructions and polymerized with LED light source (Smart Lite Focus, Dentsply Sirona, Germany). Teeth were restored with layering technique using dentin and enamel composites (Ceram.X Duo, Dentsply: D2, E1). 12-blade flame carbide burs (EVE, Germany), polishing discs (3M Sof-Lex, Germany), interdental tapes (Kerr, Italy) and spiral discs (Twist Diacomp Plus, EVE, Germany) were used for finishing and polishing. Recalls were arranged for 1 week and six months.

Results: Restorations were evaluated according to Modified USPHS Criteria, after six months follow-up, there were no evidence of any fracture, surface defect or discoloration.

Discussion: It was concluded that direct composite restorations are simple and conservative treatment option with patient satisfaction in discolored tooth cases.

Keywords: bleaching, composite resin, layering technique, aesthetic dentistry

EP – 105

Diastema Closure Using Direct Resin Composites and Zirconia Crown

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Aim: To restore the anterior teeth of a patient with resin composite and zirconia crowns.

Materials and Methods: A 70-year-old female patient came to our dental clinic with a chief complaint about her anterior teeth restorations having very poor appearance. Her aesthetic problems on maxillary incisors were complex and linked to decayed teeth and spacing. She had discolored old resin restorations to close the diastema between #11 and #21 and a fractured restoration and secondary caries on #22 and dental caries on #12.

Among different treatment options, direct resin restorations on #11,12, 21 and zirconia full crown on #22 were chosen. For direct resin restorations on #11, 12 and 21, Filtek Z350 (3M Oral Care) A4 body shade and A3 enamel shade were used with all bond universal (Bisco) adhesive system. For #22, a zirconia crown restoration, ceramill zolid fx multilayer block (Amann Girrbach) was used with z-primer (Bisco) and relyX U200 (3M Oral Care).

Results: With the help of direct resin composite and zirconia crown restoration, we reached an acceptable aesthetic outcome. The spaces between teeth were closed and unsatisfactory shape and color of old restorations were corrected.

Discussion: The treatment options for diastema closure are direct resin composite restorations, porcelain laminate veneers or zirconia full crowns. Direct resin composite restorations are the most conservative method. A porcelain laminate veneer can adjust color and shape of tooth, but if there is a lot of dentin exposure, its bonding durability is poor. When residual dentin is in small amount, using direct resin restorations increases the risk of fracture, then zirconia full crown may be a good alternative.

For aesthetic restoration of anterior teeth, the clinician should consider several factors to select proper material and method. Not only the aesthetic shape, but also the prognosis of the tooth is an important consideration.

Keywords: direct resin restoration, esthetic, zirconia crown, diastema

EP – 106

Management of External Cervical Resorption

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Aim: The aim of this case report is to manage teeth diagnosed with external cervical resorption in a healthy and functional condition through conservative treatment. This case report presents 2 clinical cases on the management of external cervical resorption (ECR) using two different restorative materials.

Materials and Methods: In the first case, a 30-year-old male patient was referred to our clinic from the department of orthodontics because of cervical cavity on maxillary right canine (#13), diagnosed as external cervical resorption with chronic apical periodontitis. He has a history of double jaw surgery and cleft lip surgery. In the second case, a 61-year-old female patient was referred to our clinic from a local dental clinic because of upper left central incisor (#21), diagnosed as external cervical resorption.

In the first case, root canal treatment and flap operation were planned to manage ECR lesion of tooth #13. Pulp extirpation was carried out, followed by partial removal of granulation tissue. The mucoperiosteal flap was lifted to remove the granulation tissue completely. The defect was restored with resin modified glass ionomer (Fuji II LC, GC). The canal was obturated with gutta-percha and AH26 plus (Dentsply). The flap was repositioned and sutured. In the second case, the mucoperiosteal flap was reflected to curettage of the defect on tooth #21. The coronal defect was restored with composite resin (ESPE Filtek Z250, 3M). The flap was repositioned and sutured. Pulpal extirpation was carried out, followed by enlargement of the canal. The canal was obturated with gutta-percha and AH26 plus (Dentsply).

Results: In both clinical cases, follow-up examination over the next 3 months revealed that healing was undertaken, and the tooth functioned normally.

Discussion: Both clinical cases showed the successful management of the external cervical resorption with root canal treatment, flap operation and conservative treatment. To treat external cervical resorption, complete removal of the ECR lesion and repair of ECR lesion using proper restorative material are important.

Keywords: external cervical resorption, flap operation, RMGI, composite resin

EP – 107

Functional, Esthetic and Conservative Rehabilitation of a Class III Malocclussion: An Interdisciplinary Ortho-Restorative Approach

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Aim: To describe the relevance of an interdisciplinary ortho-restorative clinical case of the treatment of a class III malocclusion in an adult patient with the purpose of restoring occlusal function and improving aesthetics through a minimally invasive treatment.

Materials and Methods: A 43-year-old male patient, sought dental care in private practice looking for a smile makeover. Clinical examination and cephalometry revealed a skeletal class III associated with a bilateral posterior crossbite and positive Bolton analyses. Patients who present malocclusion associated with discrepancies in size or spaces, should first, consider an orthodontic treatment as the most conservative choice in order to avoid invasive restorative treatment. In cases such as this, orthodontics alone will not enhance the aesthetics, but it is a key factor to achieve minimal dental preparation in order to preserve the tooth vitality.

The treatment plan consisted of a first orthodontic phase, in which the maxilla was expanded with the micro-implant-assisted rapid palatal expander (MARPE) and fixed orthodontic appliances. The restorative phase was carried out with porcelain laminate veneers with feldspathic ceramic to restore the upper and lower teeth.

Results: The restoration of the patient's dental aesthetics was achieved through an interdisciplinary treatment. The maxillary expansion and the the bilateral crossbite were corrected. Dental alignment was achieved by establishing occlusal function. After the orthodontic treatment, porcelain veneers were placed.

Discussion: Class III malocclusion in adult patients is one of the most complex cases to treat in orthodontics. Non-surgical palatal expansion, using micro-implants, seems to be an efficient solution for maxillary transverse deficiency and also a conservative alternative to SARPE in non-growing patients. A bilateral posterior crossbite, can be successfully corrected in combination with a minimal veneer preparation to achieve functional and aesthetic rehabilitation through interdisciplinary planning. Laminate veneers and orthodontic treatment may be considered complementary in terms of improving the final aesthetics.

Keywords: insterdisciplinary, orthodontics, restorative, veneers, conservative

EP – 108

Non-Generalized Dental Erosion Treatment: A Conservative Ortho-Resto Approach Applying Dahl´s Principle

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Aim: To improve aesthetics, occlusion and eliminate dental sensitivity caused by erosion, through an interdisciplinary ortho-restorative treatment.

Materials and Methods: A forty-one-year-old woman came to the dental office complaining about her aesthetics and hypersensitivity. She also referred gastrointestinal problems and vomits since the two years.

Clinical examination revealed chemical palatal tooth wear, from 1.3 to 2.3 with associated hypersensitivity, besides excessive gingival display and a class II division 2 malocclusion.

An interdisciplinary treatment with the following phases was proposed:

At first, a restorative phase in which the palatal of the anterior maxillary teeth was treated, eliminating all dental hypersensitivity. At the same time this produces a posterior open bite, which helps the extrusion of the posteriors with the aid of an orthodontic treatment, increasing vertical dimension by applying Dahl's principle.

In a second twelve-month phase, an orthodontic treatment through transparent aligners, stabilized occlusion, helped intruding anterior maxillary teeth to diminish gingival display and corrected the posterior open bite.

In a third and final phase, the conservative restorative treatment was performed with felspathic veneers from teeth 1.3 to 2.3, over a minimally invasive preparation of the tooth, achieved through mock-up preparations and laser gingivectomy to correct the gingival margins.

Results: Full dental hypersensitivity elimination was achieved during the first day of the treatment. Occlusion, aesthetics, and function were improved by the orthodontic treatment applying a modification to Dahl's principle and the placement of the anterior ceramic restorations creating an efficient anterior guide. The vitality of all teeth was maintained.

Discussion: Through the synergy of the different odontology disciplines, it has been able to carry out the different objectives of the treatment, being able to maintain tooth vitality, satisfying the aesthetic and functional expectations of the patient.

Keywords: hipersensitivity, occlusion, orthodontic, veneers, esthetic

EP – 109

Pre-Orthodontic Long-Term Mock-Up in a Patient Affected by Attrition: A Conservative Approach

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Aim: To improve function and aesthetics in a patient affected by attrition and generalized diastemas through a conservative approach, using a pre-orthodontic mock-up.

Materials and Methods: A 25-year-old male patient, pursued dental care complaining about the black spaces between his teeth, and their size and shape.

Clinical examination revealed type II malocclusion division I, positive Bolton analysis, deep overbite and severe attrition of the anterior dentition.

The treatment plan began with a restorative phase; the pre-orthodontic long-term mockup, to achieve the correct dental proportions in the anterior maxillary attrited dentition. After that an orthodontic phase was carried out, in which the goal was the closure of maxillary and mandibular diastemas with transparent orthodontic aligners, the achievement of occlusion to class I and correction of deep overbite. After that, a second restorative phase was carried out, changing the long-term mock-up by porcelain feldspathic veneers on upper and lower anteriors to improve the esthetic condition in this region.

Results: The pre-orthodontic mockup offered the patient time prior to the end of the treatment to get used to the new dental size and shape, also helped the orthodontist to achieve a correct position for the teeth and a common esthetic goal with the restorative dentist, while allowing the placement of the final restorations with no preparation.

Discussion: The placement of pre-orthodontic mock-up can play a key role in interdisciplinary treatments ahead of an orthodontic treatment which assists the orthodontist in the correction of the patient's overbite and diastemas, achieving optimal functional and aesthetic and maintaining the space required for ceramic restorations, moreover allowing time for the patient to get used to the new dental size and morphology.

Keywords: diastema, mock-up, orthodontics, restoration, attrition

EP – 110

Aesthetic Correction of Gingival Display, Overbite and Overjet: An Interdisciplinary Restorative Approach

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Aim: To propose a treatment through an interdisciplinary team with the patient as the main treatment objective, correcting function, and aesthetics in an orthodontic and prosthetic treatment failures scenario.

Materials and Methods: A forty-year-old patient consults with concerns about her aesthetics and the masticatory function. On clinical and radiographic examination, old full coverage porcelain restorations were observed, associated with gum inflammation, marginal bone resorption, deep caries lesions and augmented overbite and overjet, all of them giving an unaesthetic and nonfunctional result.

The treatment consisted of three stages, first, an endodontic and prosthodontic approach was carried out, having root canal treatments on the deep carious lesions, installing three implants in the mandible, and restoring the endodontically treated tooth.

Then, an orthodontic phase was carried out to intrude the maxillary teeth, correcting the gingival display and overbite. Old first quadrant fixed partial denture was cut to help the orthodontist distalizing the maxilla and correcting the overjet.

Finally, the aesthetic and restorative phase went on by crafting a digital mockup to guide the treatment and anticipate the outcome to the patient, correcting the gingival margins with a gingivectomy and testing with a PMMA provisional. Re endodontic treatment of the second right premolar and left lateral incisor were needed in this stage.

Final crowns, veneers, bridges, and implant restorations were carried out with felspathic ceramic and monolithic zirconia, respectively.

Results: The conservative treatment was achieved through an interdisciplinary approach, the aesthetics were improved, so as the biology and function.

Discussion: The cases in which patients seek to regain masticatory function, but above all to improve aesthetics, represent a challenge for us clinicians, especially if we have a scenario with previous restorations in poor condition. It is particularly important that we work in an interdisciplinary way to achieve the best result for the patient.

Keywords: gingival display, overbite, overjet, restorative, aesthetic

EP – 111

Aesthetic Rehabilitation of a Poly-diastema Patient with Direct Composite: A Case Report

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Aim: Diastema is the space between two teeth. Diastemas can cause problems such as aesthetic problems, speech disorders and decreased chewing efficiency. In orthodontic treatments, diastemas may be left in the anterior region for various reasons. In this case report, the aesthetic restorations of poly-diastemas with direct composite resin material after orthodontic treatment was presented.
Materials and Methods: A 20-year-old male, complaining from aesthetic problems due to poly-diastema, applied to department of Restorative Dentistry, Hatay Mustafa Kemal University. The periodontal health status was within the accepted limits and had no caries lesions on teeth. After the patient was informed about the treatment options, it was decided to restore the teeth with the direct composite resin. Composite restorations were applied directly without any abrasion. After the treatment, oral hygiene instruction was told to the patient. Control visits was 1st week, 6th and 12th month and the scores of the restorations was recorded as alpha according to the USPHS criteria.
Results: Presence of diastema causes aesthetic problems. Generally, prosthetic and invasive treatments are preferred by the clinicians. However non-invasive direct composite applications have many advantages such as no loss of dental tissue, no post-operative sensitivity and completion in a single visit. In this case report, the clinical success of direct composite restorations on diastema was successful (alfa) on one year term.
Discussion: This clinical report describes the direct composite restoration technique for anterior poly-diastema. These restorations are conservative and aesthetic restorations that can be completed in a single visit. The clinical success of direct composite restorations on diastema closure, is the acceptable on long term.
Keywords: composite, direct restoration, poly-diastema, aesthetic

EP – 112

Surgical Approach of Hyperplasia on Edentulous Patients
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Aim: In some situations, while examining edentulous patients, we are facing some anatomical obstacles either they are mucous or osseous.
Our approach may be by conditioning area bearing which depends on old prosthesis and in extremes cases we call upon surgery where we are looking for improving vestibule height.
Materials and Methods: This clinical case was about an old wearer of an unfavorable complete dentures with a flabby ridge which was the indication of corrective surgery by subtraction "vestibuloplasty". A simulation of surgery was performed on the cast and a surgical guide was used the day of the surgery. The definitive prosthesis was inserted the day of the surgery which was relined by soft conditioner.
Results: A gain in vertical space and treatment of hyperplasia by surgery and tissue conditioning using the new prosthesis and resin took delayed by an immediate insertion. The prosthesis guided the healing process. Also control sessions were carried out and ended with a rebasing of the prosthesis.
Discussion: Indication of surgery view that hyperplasia is irreversible also the insufficiency of the height of the crest.
Surgical guide has been used in occlusion in order to imitate physiological pressure while the patient uses his prosthesis.
Keywords: removable complete denture, stability, surgery, vestibuloplasty, prosthetic

EP – 113

Combination Syndrome: About a Case Report
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Aim: Combination syndrome (CS) is a dental condition consisting of severe anterior maxillary resorption combined with hypertrophic and atrophic changes in different quadrants of maxilla and mandible that requires a rational treatment planning to provide improved prosthetic retention and stability for removable prostheses.
The aim of this case report is to illustrate the management of a CS patient with a completely edentulous maxilla and partially edentulous mandible with preserved anterior teeth.
Materials and Methods: This work is about a case report of a 62-year-old patient wearing a complete maxillary denture opposing a mandibular fixed anterior prosthesis and posterior edentulism.
It illustrates a successful treatment of a CS patient consisting on:
- Patient education: an important aspect of prevention and including good plaque control and periodontal health of the remaining teeth, denture care instructions and regular recall and maintenance.
- Surgical management of flabby anterior ridge
- Conventional prosthetic treatment with full upper and partial lower dentures with multiple remakes due to continuing bone resorption.

The necessity of a multi-disciplinary approach for early prevention and treatment of this complex condition was emphasized.
Results: The patient has been recalled for observation 1, 2 and 3 weeks after denture insertion. He was satisfied with the prosthesis fit, comfort mastication and phonetics.
Mucosal inflammation, Ridge resorption and prosthetic instability have been minimized by considering the following provisions: broad stress distribution, bilaterally balanced occlusion minimizing anterior contacts and effective border seal.
After a month, the healing was observed to be satisfactory without scaring or signs of recurrence and with anatomic sulcus integrity.
Discussion: The flabby ridges, associated with the combined syndrome described by Kelly in 1972, are present in 24% of edentulous maxillae with a preference for the anterior region.
This makes it a challenging condition that requires significant experience along with advanced restorative and surgical skills.
Keywords: complete dentures, edentulous maxillae, flabby ridges, preprosthetic surgery, combination syndrome

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Direct Layered Restorations to Replace Defective Veneers In a High Demanding Aesthetic Situation
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Aim: A 20-year-old female patient attended our clinic. She was dissatisfied as her upper lateral incisors were restored with defective resin composite veneers with alteration of shape and color. The aim of this case report is to describe the sequence of treatment followed to improve esthetic, including external bleaching and replacement of the resin composite veneers.
Materials and Methods: Intraoral polarized and non-polarized photographs were taken. It was a challenging situation due to discoloration of the microdontic teeth, the presence of a slight anterior open bite that caused a permanent black background, and the anatomic details of the adjacent teeth. Central incisors exhibited translucencies along the incisal edges, marked mamelons and value varieties on each crown third. An external bleaching with 10% carbamide peroxide was performed, beginning on the lateral incisors. Afterwards, four restorative try-ins were needed to select the composite layers that reproduced all the details of each lateral incisor. The final two veneers were performed using rubber dam isolation and a silicone index. Layers of five different resin composites were used: Trans 20 (IPS Empress Direct - Ivoclar Vivadent), Light Dentin and Light Enamel (Essentia - GC), Clear Translucent (Filtek Supreme XTE – 3M Oral Care) and G-aenial Anterior A1 (G-aenial - GC).
Results: After a 25-day external bleaching the desired shades were reached, four restorative try-ins were carried out, and final composite veneers were

performed. The patient was happy with the new color, size, and shape of the upper lateral incisors since they were integrated with her natural teeth.
Discussion: Composite veneers combined with a previous bleaching is a conservative treatment suitable for most daily clinical situations requiring an aesthetic upgrade with an excellent natural result. However, a wide knowledge of the available composite systems and several restorative essays may be required for an optimum result.
Keywords: composite veneers, microdontic lateral incisor, bleaching

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Diagnostic Performance of Fluorescence Methods for Occlusal Caries Lesions in Permanent Teeth
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Aim: The aim of this study to evaluate the performance of two fluorescence-based methods in the detection of occlusal carious lesions in permanent teeth, compared with visual inspection and radiographic examination.
Materials and Methods: The occlusal surfaces of 63 extracted human permanent molar teeth were examined once by two examiners using the International Caries Detection and Assessment System (ICDAS-II) graded scores 0–6, FluoreCam (Daraza), and DIAGNOdent Pen® (KaVo). Standardized periapical radiographs were taken. Then the teeth were sectioned for histological validation and examined under x25 magnification using a stereomicroscope (Leica M27.5) using Downer criteria 0-4. The results obtained from stereomicroscope were used as the gold standard. The correlation of diagnostic methods with microscopic analysis was evaluated using Spearman's rank correlation coefficients (rho). The inter-examiner reproducibility was analyzed using Cohen's Kappa (κ).
Results: After visual inspection using ICDAS-II, all teeth were scored from 0 to 6. The mean (SD) DIAGNOdent Pen® values were obtained 5,71(3.04), 16(2.29), 29(7.09), 52(11.19), 99(0), 99(0) and 99(0) respectively. Mean lesion levels observed from FluoreCam were 0(0), 1.2(0.44), 1.75(0.71), 2.63(0.52), 3(0), 3(0), 3(0) respectively. The diagnostic results obtained using the ICDAS-II criteria (rho=0,9672), Radiography (rho=0,9616), FluoreCam (rho=0,8814), and DIAGNOdent Pen® (rho=0,9432) were found acceptable with the results obtained from the microscope. The inter-examiner reproducibility (Kappa values) was high for microscopic evaluation (κ=1), ICDAS-II (κ=1), Radiography (κ=0,9564), FluoreCam (κ=1), and DIAGNOdent Pen® (κ=0,8775). The association strength of ICDAS-II, Radiography, FluoreCam, and DIAGNOdent Pen® with the microscopic evaluation was very strong.
Conclusion: FluoreCam and DIAGNOdent Pen® measurements performed similarly. Radiography is not specific for early carious lesions but can be used as an adjunct method for dentinal caries. ICDAS-II classification is an accurate method for clinical examination of occlusal caries however using fluorescence methods additionally as a quantitative and visual (FluoreCam) examination is quite supportive and reinforcing especially for detecting enamel lesions.
Keywords: DIAGNOdent Pen, FluoreCam, ICDAS II, radiography, caries detection

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Effects of Enamel Matrix Proteins on Re-Hardening of Initial Enamel Carious Lesions
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Aim: The aim of this study was to determine the effect of enamel matrix proteins on re-hardening of initial enamel carious lesions *in vitro*.
Materials and Methods: Fourty enamel samples were prepared from extracted human molar teeth without caries. All enamel blocks were embedded in polymethylmethacrylate, the labial enamel surfaces were polished and painted with one layers of acid-resistant nail varnish, leaving a 3mm x 6mm window exposed. Surface microhardness of the prepared enamel blocks was measured before demineralisation, after demineralisation and after remineralisation treatments from three different points by applying at a load of 50 g for 15 s, using microhardness tester (Shimadzu, Japan). Teeth randomly divided into four groups (n=10). Group NaF: 5% Sodyum fluoride varnish (Enamelast, Ultradent, South Jordan) was applied for 5 min; Group EMD-5:Emdogain (Straumann, Biora, Sweden) was applied for 5 min, Group EMD-10:Emdogain was applied for 10 min Group S: Teeth were stored in saliva without treatment. After remineralization procedures, samples were stored in freshly prepared artificial saliva for 7 days. The Shapiro-Wilk test was performed to test normality of the data. Variance analyse, and Bonferroni test was used to compare surface microhardness ($p=0.05$).
Results: The surface microhardness values obtained after remineralization in NAF, EMD-5, EMD-10 groups were significantly higher than the values determined after demineralization ($p<0.05$). There was no significant difference between demineralization and remineralization microhardness values in the saliva group ($p>0.05$). When the remineralization degrees of the test groups were compared, no difference was found between NAF and EMD-5 in terms of microhardness ($p> 0.05$). This value was higher than the saliva group ($p<0.05$).
Conclusion: Emdogain applied for 5 min has a re-hardening capacity as much as sodium fluoride varnish in the initial enamel caries lesions.
Keywords: caries, emdogain, emineralization, fluor

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YouTube™ as a Source of Information on Composite Veneers
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Aim: YouTube is a video-sharing site with a large user network that allows users to watch videos containing health information. The aim of this study was to investigate videos related to composite veneer on YouTube™ in terms of content.
Materials and Methods: Keywords related to 'composite veneer' treatment were searched on YouTube™. The exclusion criteria were defined as; another language than English, unrelated to the topic, poor video quality and duplication. All the 100 videos were analyzed in terms of general features, main purpose, information content, audiovisual quality. Also, viewers' interaction index and viewing rate formulas were calculated for each video. The Mann-Whitney U-test and Kruskal-Wallis test were performed for statistical analysis.
Results: Most of the evaluated 100 videos were uploaded by dentists (n=33), followed by companies related to dentistry (n=31), 21 of the videos by dental clinics and 15 of them by YouTube™ channels. Most of the videos (85%) were classified as having poor general information content, 15% were rated as good. The videos generally involved educational content (66%), followed by patient information (34%). Only 3% of the videos (n=3) had viewers' interaction index values of greater than 3.00. Videos uploaded by dentist had significantly higher reliability of information and global quality scale index values than others ($p< 0.001$).
Conclusion: YouTube™ may not be excepted as the most important source for neither patients nor dentists. Reliable and informative videos should be uploaded by dental professionals about composite veneer treatment.
Keywords: internet, social media, YouTube, composite veneer

EP – 118

A Gender- Based Approach to the Current Situation of Spanish Dentists

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Aim: To determine the perception of Spanish dentists about the situation of the profession nowadays and how the changes occurred in dental workforce (in number and gender of the past twenty years) have affected their personal and professional lives, under a gender-based approach.

Materials and Methods: An online survey comprising of 51 opinion and socio-economic questions, divided into 9 sections of different topics, which was administered between the members of 13 professional associations.

Results: Valid responses were received from 422 participants with a mean age of 41 years old and 66% of female dentists. Most dentists considered their selves in a "good" position, however, 72.3% of them said the profession "has had worsened". Opinions significantly differed between women and men in gender equity and the pay gap between them could be observed (29.4% of males earned more of 4000 euros a month, while only 15.1% female dentists did). Also, 49.5% of female dentists felt underrepresented in the highest association of Spanish dentists (General Council of Dentist - Consejo General de Dentistas) and 38.4% declared they have had suffered verbal violence coming from patients repeatedly.

Conclusion: A generally negative perception of dentists' work quality was found among respondents. Also, opinions between males and females differed in important aspects of professional development. Further research projects are needed to have growing evidence on problems and disparities in the dental workforce which would help the institutions to make improvement actions.

Keywords: gender, health workforce, survey, dentists

EP – 119

Students' Perspective and Satisfaction on Distant Learning in Dental Education During COVID-19 Pandemic

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Aim: This study aimed to evaluate the dental students' satisfaction on distant education during the COVID-19 pandemic.

Materials and Methods: A survey including 38 questions was prepared and conducted to the dental students of all grades of Hacettepe University. The survey included 4 sections: technical features, distant learning, lectures and lecturers. Obtained data were analyzed using the Chi square test (p=0.05).

Results: Survey was responded by 219 students (139 female [63.8%], 74 males [33.9%], 3 nonbinaries [2.3%]) but 2 sets of answers were invalid and not included in the study results. 23% of the participants were grade 1, 33.6% grade 2, 24% grade 3, 8.8% grade 4 and 10.6% were grade 5. 28.2% of the participants were fully satisfied with the technical infrastructure, 25.8% were fully satisfied with the display and sound quality, notwithstanding both 4,6% were not pleased with those features. Majority of the participants (36.1%) stated that help provided by the administration wasn't exactly on time and fast. 65% of the participants thought distant education was effective during the pandemic and 42.1% agreed on one of the most important advantages of this education was being able to repeat the lectures. Duration and the content of the lectures were found adequate by the 39.5% and 37.7% respectively. 46% stated that the lectures were prepared properly and 40.7% thought the lecturers were motivative. However, 44.2% thought they weren't ready for the dental practice and 57.7% felt lacking the experience dental school can provide them. 46.5% of the participants didn't think distant education equals to face-to-face education and 43.5% thought that e-learning cannot be used in all lectures in formal education.

Conclusion: The results showed that students' satisfaction about the distant education was inadequate and they obviously prefer face-to-face education.

Keywords: distant education, pandemic, dental education

EP – 120

Aerosol Formation During Different Dental Treatments and Suction Methods

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Aim: Due to the formation of potentially infectious aerosols during dental treatments, dental personnel are considered being at increased risk for aerosol transmitted diseases like COVID-19. The aim of this study was to evaluate aerosol formation during different dental treatments and settings as well as the efficacy of dental suction to reduce aerosol spreading.

Materials and Methods: Dental powder-jet (PJ; Air-Flow®), a water-cooled dental handpiece with a diamond bur (HP) and water-cooled ultrasonic scaling (US) were used in a phantom head, mounted on a dental unit. As a proxy of aerosols, air-born particles of less than 10 μm (PM_{10}) were detected using a Laser Spectrometer in 30 cm distance from the mouth. The influence of suction by a small saliva ejector (SE) and high-volume suction (HVS) on aerosol formation were evaluated. As control, background particle counts (BC) were measured before and after experiments. For each setting 8 measurements were performed at different teeth and quadrants.

Results: With only SE, integrated aerosol levels [median (Q25/Q75) $\mu g/m^3 s$] for PJ [91.246 (58.213/118.386) $\mu g/m^3 s$, $p<0.001$, ANOVA] and HP [11.852 (7.706/16.426) $\mu g/m^3 s$, $p<0.05$] were significantly increased compared to BC [7.243 (6.501/8.407) $\mu g/m^3 s$], whilst US did not increase aerosol levels significantly [6.558 (6.002/7.066) $\mu g/m^3 s$; $p>0.05$]. The use of HVS significantly decreased aerosol formation for PJ [37.170 (29.634/51.719) $\mu g/m^3 s$; $p<0.01$] and HP 6.630 (5.615/7.062) $\mu g/m^3 s$; $p<0.01$] compared to SE only, even reaching BC levels for HP usage ($p>0.05$).

Conclusion: To reduce the exposure to potentially infectious aerosols, HVS should be used during aerosol-forming dental treatments whenever applicable.

Keywords: COVID-19, dental suction, dental treatment, dentistry, aerosol

EP – 121

Exploratory Pilot Study of Dental Aerosol Production and Reduction Using an Extraoral Scavenger

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Aim: Dental treatments generate spray and aerosols (AGP), which may pose an aerogenic infection risk. This pilot study investigated the particle number concentration (PN, n/m^3) of aerosols between ≥0.1 μm to ≤5.0 μm generated during treatment on manikin head. A high-speed handpiece (HSH), an ultrasonic scaler (US) and an air polishing device with non-abrasive powder (APD) were used. All experiments were performed using a high-volume suction system with a 16-mm intraoral cannula (HFS) and were tested with versus without an extraoral scavenger (EOS).

Materials and Methods: Twenty trials of ten minutes each were performed in a closed treatment room ($16.94 m^2$) on a manikin head. Each experimental run consisted of two minutes of pre-treatment (e.g., for inspection, anesthesia), two minutes of treatment time with AGP, and six minutes of post-treatment time (e.g., for control, patient instruction). PN were determined using an aerosol monitor (Lasair III 110, PMS Inc., USA). The difference in PN (ΔPN) was calculated for eight particle size classes (ΔPN= [post- PN]-[pre-PN]).

Results: All the ΔPN results were very low and between -8.65E+06 (2.86E+07)n/m^3 for particles with diameter 0.15 μm and 6.41E+04 (2.77E+05)n/m^3 for particles with diameter 1.0 μm. Using the additional

EOS, a significantly higher reduction in ΔPN was observed for the smaller particle groups (0.1μm-0.3μm; p<0.001), whereas no differences were detected for larger particles 0.5-5.0μm compared to using an HFS alone without EOS (p≥0.089). Furthermore, no significant differences for ΔPN were found between the three different AGPs (p>0.05) nor between all AGPs compared to the control (without AGP) (p>0.05).
Conclusion: Considering the study limitations, optimal use of an HFS during different AGPs showed little change in particle number concentration. For dental interventions without AGPs, when an HFS cannot be used during AGPs or room conditions are not ideal, the benefit of utilizing an EOS could be considered to further reduce the aerogenic infection risk.
Keywords: dental treatment, extraoral scavenger, high-volume suction system, particle number concentration, aerosol

EP – 122

Prevalence and Morphologic Analysis of C-shaped Canals in a Korean Population: A CBCT Analysis

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Aim: The aim of this retrospective study was to investigate the prevalence, configuration and the lingual wall thickness of root with C-shaped canal and to investigate root forms in panoramic radiography related to the root with C-shaped canal in the cone-beam computed tomography (CBCT) in permanent mandibular second molars by using CBCT from a Korean population.
Materials and Methods: Two endodontists examined 1884 CBCT images of Korean mandibular second molars to determine the presence of C-shaped canals by age, gender. Bilateral occurrence and relationship with panorama radiographic root morphology of C-shaped canal were examined and statistically analyzed using a Chi-squared test. Configurations of C-shaped canals according to ages were categorized using the classification of Fan et al. The lingual wall thickness of root with C-shaped canal was measured by dividing mesial, middle and distal area at the orifice and 5mm from the apex level. Mean difference of thickness between orifice and apex level was analyzed using Mann-Whitney U test.
Results: Of the 2508 mandibular second molars, 924 teeth (36.8%) had root with C-shaped canals. The prevalence of teeth with C-shaped canal was significantly lower in 60s (24.08) than in 20s (40.02%) and higher in female (43.2%) *(p<0.001)*. Teeth with C-shaped canals were mainly bilateral (85.9%). C-shaped canal with Fan's C1 type (35.3%) was most common. The prevalence of C-shaped canal with Fan's C1 type was decreased and Fan's C3b type was increased with age. The teeth with fused roots in panoramic radiograph were observed in 75.2% of teeth with C-shaped canal in CBCT. The difference of lingual wall thickness of root with C-shaped canal between at orifice and 5mm from apex was significantly large in the middle area in all configuration type (*p<0.05*).
Conclusion: Clinicians should consider the prevalence and anatomical variations of teeth with C-shaped canals to reduce the risks during endodontic procedures.
Keywords: C-shaped canal, Korean, mandibular second molars, minimum wall thickness, cone-beam computed tomography

EP – 123

Do Cross Section and Pitch Affect the Mechanical Behavior of Endodontic Rotary Files?

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Aim: The aim of this study was to analyze the stress distribution of endodontic rotatory files during bending and torsional conditions regarding the cross-section design and pitch.
Materials and Methods: Finite element analysis (FEA) of NiTi rotatory files were made using a 3-dimensional modeling program. Squared and triangular cross section design endodontic rotary files with 25 mm total length, 0.25 mm at the tip, 1.20 mm at 16 mm from the tip were generated with the following pitch values: 2mm, 4mm, 8mm and 16mm, and submitted to bending and torsional conditions by clamping the last 3 mm of the endodontic rotary file and applying a transverse load of 0.1N and a torsional moment of 0.3 Ncm. Thus, a statistical analysis of 8 different models of files were made for numeric comparison of torsional and bending stiffness.
Results: The results of the finite element analyses showed a maximum vonMises stress related to the triangular cross section with 4 mm pitch (1250.4 MPa) and a minimum vonMises stress associated to the squared cross section with 16 mm pitch (517.7 MPa) resulting to the flexural bending analysis and a maximum vonMises stress related to the triangular cross section with 4 mm pitch (2054.4 MPa) and a minimum vonMises stress associated to the squared cross section with 16 mm pitch (828.6 MPa) resulting to the torsional analysis.
Conclusion: The triangular cross section design showed higher stress rates at both bending and torsional forces than squared cross section; however, the pitch did not influence on the stress distribution.
Keywords: endodontic rotary file, finite element method., flexural bending, torsional stiffness, cross-section

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6-12-36 Month Follow-ups of Single Visit Endodontic Treatments Filled by Bioceramic Sealer

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Aim: This study aimed to evaluate the technical quality and apical healing at 6-12- and 36-month follow- ups of single visit root canal treatment of chronic apical periodontitis filled by a bioceramic sealer.
Materials and Methods: Fifty-two non-vital teeth were treated in single visit. The main inclusion criteria were radiographic evidence of chronic apical periodontitis and a diagnosis of pulpal necrosis. The canals were prepared with ProTaper Universal (Dentsply Maillefer, Ballaigues, Switzerland). The gutta-percha master cone was used for final irrigation activation using alternatively 2.5% NaOCl and 17% EDTA. Canals were filled by a single cone of gutta-percha and bioceramic sealer (Endosequence BC sealer™ and Endosequence BC point™, Brasseler, USA). The technical quality of root filling was evaluated by control radiographs according to length and density. Apical healing was assessed using the periapical index score after a 6-12- and 36-month follow-ups. Two experienced raters were calibrated by evaluating 10 radiographs that were not included in this study. The Kappa values ranged from 0.75 to 0.80. They evaluated the radiographs on two separate occasions and classified the periapical lesions in accordance with Ørstavik's PAI. Moreover, in discordant cases, scores obtained by consensus were included in the final analysis. The data were analyzed using the Mann-Whitney U and chi-square test, the level of significance was 5%.
Results: Study showed that 87% of root canal filing were an acceptable quality level. Assessment of the apical healing revealed success rates at 6-12- and 36-month respectively of 96.2, 98. 1 and 98. 1%, with a statistically significant difference between 6 and 12 months (P<0,005).
Conclusion: This study revealed that a single-session endodontic treatment of infected teeth by single-cone root canal obturation associated with bioceramic sealer showed a good technical quality of root canal filling and a high success rate of root canal treatment.
Keywords: bioceramics sealer, chronic apical periodontitis, endodontics, outcomes, apical healing

EP – 125

Clinical Management of Missed Canal and Open Apex Tooth of Maxillary Molar: A Case Report

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Aim: Infection of the root canal leads to the endodontic failure. The aim of this report is to discuss the management of the missed MB2 and open apex.

Materials and Methods: A 65-year-old male patient visited Okaguchi dental clinic in Tokyo, Japan with a chief complaint of discomfort on his maxillary right second molar. The tooth was restored with gold crown and sensitive to percussion. From the periapical radiograph and CBCT images, root canals other than MB2 were treated. Palatal root canal had wide apex and periapical lesion was observed around apex and distal aspect. It was suggested that palatal root may be fractured. Tooth was diagnosed as Previously Treated and Symptomatic Apical Periodontitis. Informed consent was obtained. After gold crown removal, tooth was isolated with rubber dam. Fracture line was observed in the palatal root. Gutta-percha was removed with ultrasonic files and micro excavator. MB1, MB2 and distobuccal root canals were prepared with Ni-Ti files. Palatal root canal was already wide open. Therefore, this root canal was disinfected carefully with micro excavator and NaOCl 5.25%. MB2 was filled with gutta-percha and sealer. Other root canals were filled with MTA. Tooth was built up with fiber core and restored with ceramic crown. All procedure was done with the microscope.

Results: After treatment, his symptoms disappeared and at the 1-year follow-up, the prognosis of the condition is good.

Discussion: This case seemed that treatment was difficult. Palatal root had open apex and fracture. But the patient wanted to save this tooth as long as possible. Therefore, MTA was selected for apical plug and root canal filling materials. From CBCT image, the location of MB2 was identified and treated. After treatment, his discomfort and percussion disappeared. From periapical radiograph, periapical lesion improved. However, prognosis of this kind of tooth is unclear. Long term follow up is required.

Keywords: fractured tooth, MB2, MTA apical plug, open apex, CBCT

EP – 126

Minimal Invasive Direct Esthetic Restorations for Fractured Incisors Teeth: Two Case Reports

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Aim: To demonstrate a minimally invasive treatment for restoring large incisor fractures using nano-hybrid resin composite guided by silicon index.

Materials and Methods: Female patients aged 23 and 25 presented with fractured maxillary incisors due to trauma. The teeth vitality was established using vitalometry and the composite shade was determined by button technique. An impression, a cast and diagnostic waxing were developed, and a silicon index was fabricated. After local anesthesia was established, rubber dam isolation was achieved, and a 45-degree bevel was placed. Teflon tape was placed followed by etching enamel and dentin for 15 seconds (Gluma Etch 35 Gel), rinsed for 30s, universal adhesive (Gluma Bond Universal, Kulzer) was applied in two layers and polymerized for 20s (Demi Ultra, Kerr). A thin layer of the composite A2 shade (Charisma Diamond) was placed in the matrix, pressed against the lingual bevel and polymerized for 20s. Dentin shade (OM, Charisma Diamond) composite was shaped to replace the dentin layer. A final increment of A2 shade composite was placed on the facial surface. The finishing process was initiated with yellow ring bur and coarse disk (Sof-Lex, 3MESPE) to produce the contours of the teeth followed by silicon polisher (Optra Pol, Ivoclar). Diamond polishing paste (Meisinger Luster) with goat-hair brush and felt wheel were used after occlusion adjustment.

Results: The color and contour details of the contralateral incisor were mimicked on the restoration. This chairside minimal invasive treatment provides a fast, esthetic, and long-lasting clinical outcome. After 14 days, the patient was quite satisfied in terms of shape and appearance.

Discussion: The important factors to consider in these cases are the invasiveness, cost, and longevity of the restoration. To restore fracture with an indirect ceramic restoration, root canal therapy, post and core and clinical crown lengthening procedures would be needed which makes it invasive, prolonged and high cost.

Keywords: anterior teeth, color, fracture, resin composite, adhesive system

EP – 127

Tooth Fragment Adhesive Reattachment: A Case Report

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Aim: Coronal fractures are the most common injuries in permanent anterior dentition, particularly in younger patients. This case report presents the adhesive fragment reattachment procedure for treating an uncomplicated crown fracture (N 502.51 WHO classification, 1994).

Materials and Methods: A 9-year-old female patient suffered a traumatic uncomplicated crown fracture of the left maxillary central incisor. The fragment was intact and well preserved, so we decided to proceed with adhesive reattachment. The fractured segment was disinfected with chlorhexidine and stored in physiological solution to maintain hydration. The operating field was isolated with a rubber dam and the remaining tooth structure was cleansed; then, only a three-step etch-and-rinse adhesive system was used to reattach the tooth fragment using a procedure without interposing composite and without performing any additional retentive tooth preparation.

Results: The immediate postoperative view displayed very good aesthetic results and functional recovery. The follow-up after 1, 3, 6 and 12 months revealed that tooth vitality, assessed by thermal tests, was preserved. Clinical evaluation 24 months after the reattachment treatment demonstrated favorable physiological and aesthetic outcomes.

Discussion: The high prevalence of coronal trauma represents a challenge for achieving aesthetic and functional results quickly, using a viable technique, with a conservative approach and predictable outcomes. Thus, the tooth fragment reattachment should always be considered when the fragment is present (1). This case report shows how the adhesive reattachment has many advantages over traditional restorative procedures (2). This ultra-conservative and cost-effective technique allows to re-establish the tooth's original shape, surface texture, color and brightness (3). However, the clinician must have knowledge of the correct treatment protocol, taking care of operating field isolation, bonding procedures, fragment hydration and regular follow-up consultations.

Keywords: dental trauma, fracture, fragment, reattachment, adhesion

EP – 128

Management of Perforating Root Resorption Using Biodentine As a Restorative Material

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Aim: Root resorption can happen internally and externally and may lead to tooth loss. Especially, when external root resorption expanded into the

root canal, it is more complex and difficult to manage successfully. This case report describes a case of a 33-year-old male who presented with cervical caries and gingival swelling on left canine area. Radiographic examination revealed perforating external root resorption on the coronal third of the root. Both root canal therapy and perforation repair with flap reflection was planned to save the tooth. For this case, Biodentine was used as repair material, because of location and size of resorption defect.
Materials and Methods: At the first appointment, the canal was negotiated, cleaned, shaped, and irrigated. 2 weeks later, trapezoidal flap was reflected from tooth #22 to #24 to expose the resorptive defect. The perforation site was detected at the coronal third of the root. The resorption defect was removed with highspeed bur and the root canal was filled with gutta-percha and MTA sealer. Biodentine powder was mixed according to the manufacturer's instructions and was firmly condensed into the resorption cavity. 3 months later, exposed Biodentine above gingival margin was replaced with composite resin.
Results: After 10 months, the patient remained asymptomatic and the gingiva around restoration was stable. The tooth showed no sensitivity to percussion, and the peri-radicular lesion was healed in periapical radiograph.
Discussion: Accurate diagnosis and selection of optimal restorative material to resorption defect is also of paramount importance. Biodentine, a new calcium silicate-based material, has been proposed as a favorable repair material as it can be placed in contact with periradicular tissue due to its bioactivity and biocompatibility. In the present case, along with root canal treatment, restoration with Biodentine was performed with periodontal flap surgery. Root resorption could be managed successfully with Biodentine even in pericervical area.
Keywords: perforating root resorption, biodentine

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Restorative Rehabilitation of Multiple Severe Cervical Caries Lesions after Orthodontic Treatment

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Aim: The aim of treatment was to remove the caries lesions caused by lack of dental hygiene during orthodontic treatment and provide the teeth with their natural appearance.
Materials and Methods: A 28-year-old male patient with esthetic concern regarding multiple caries lesions in his anterior dentition consulted our clinic.
Past dental history revealed that the patient had poor oral hygiene during his orthodontic treatment. The patient reported no history of pain or discomfort except tooth #13. Intraoral clinical findings demonstrated that teeth numbers 13,12,11,21,22,23,32,33,42 and 43 had caries. Based on the radiographic and clinical findings, direct composite restorations were planned. The patient was motivated for the treatment, and oral hygiene instructions were explained.
A rubber dam was placed for the isolation of the working field. After caries removal and cavity preparations, the enamel surfaces were etched with phosphoric acid, and the teeth were washed and dried. Celluloid strips were placed, bonding material applicated (Single Bond, 3M, USA), and then light-cured. Composite resin (Clearfil Majesty Esthetic, Kuraray, Japan) (A2 shade) was layered, and light-curing was carried out. All restorations were finished and polished using finishing burs and composite discs (Super Snap Rainbow, Shofu, Japan).
Results: After the treatment, a satisfactory aesthetic result was achieved, and it was observed that the patient's complaints of sensitivity decreased and ended.
Discussion: During orthodontic treatment, patients should prioritize their dental hygiene, as they have a higher risk for plaque retention. As a result, dentists should pay additional attention in order to identify early caries lesions such as white spot lesions. As in this case, if caries lesions are not treated with any remineralization agent in the early stages, restorative procedures may be needed. Direct composite resin restorations are the most common treatment option as they are conservative, repairable, inexpensive, and can be completed in a single appointment.
Keywords: direct composite, esthetic, cervical caries

EP – 130

Aesthetic Restoration of Peg Lateral Incisors: A 12-month Clinical Follow-up

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Aim: One of the most common forms of localized microdontia affects the maxillary lateral incisors, called "peg lateral." In this case study, bilateral peg shape lateral incisors were treated with direct composite resin restorations in order to achieve aesthetic rehabilitation.
Materials and Methods: A 16-year-old female patient who was admitted to our clinic was included in this case report. The patient's history revealed no systemic disease. After the radiographic and clinical examination, bilateral peg lateral incisors were detected. The patient was informed about the treatment options. It was decided to perform restorations with composite resin. After isolation, etch and rinse adhesive system was applied (37% orthophosphoric acid (Scotchbond ™ acid, 3M-ESPE, USA) and bond (Singlebond ™ Universal, 3M ESPE, USA)) and polymerized for 10 seconds utilizing an LED light source (Built in C Guilin Woodpecker, China, 1200 mW / cm^2). Finally, restorations were completed using a composite resin in A2 shade (Tokuyama Palfique Estelite, Japan). Finishing burs, polishing discs, and paste were used for finishing and polishing procedures. The patient was recalled for a clinical examination at 12 months, and the restorations were evaluated regarding marginal integrity and discoloration.
Results: In this case report, composite veneer restorations performed in peg-shaped teeth were found to be successful in patients both aesthetically, psychologically, and functionally. At the 12-month follow up there was no staining or fracture in the restored teeth. Interproximal hyperemic gingiva was detected in the distal region of tooth #12. The patient was informed about dental hygiene procedures.
Discussion: The direct composite restoration option was chosen because it preserved tooth structure. Also, resin composite restorations exhibit excellent physical properties, marginal integrity, and esthetics which was supported by this case report. The patient's esthetic expectations were still satisfied with the direct composite restorations.
Keywords: direct composite, peg lateral, aesthetic

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Esthetic Rehabilitation of Maxillary Anterior Teeth: A Case Report

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Aim: The aim of this study was to esthetically rehabilitate maxillary anterior teeth with non-vital bleaching procedures and direct composite resin restorations.
Materials and Methods: Clinical examination revealed that the patient had an amalgam restoration and percussion sensitivity on tooth 11 and an approximal caries on tooth 21. Color measurements were made with a spectrophotometer (VITA-Easyshade-Advance 4.0, VITA-Zahnfabrik, Bad Säckingen, Germany). An inadequate root canal filling was observed radiographically in tooth 11. Root canal filling was removed with Protaper Universal Retreatment Files (Dentsply-Maillefer, Ballaigues, Switzerland) and the root filling was performed. The orifice was sealed with a flowable glass-ionomer lining material (Glass-Liner, Willmann & Pein, Barmstedt, Germany) placed over gutta percha to create a mechanical barrier. Non-vital bleaching was carried out with 35% hydrogen

peroxide gel (Opalescence, Ultradent, Utah, USA), were placed in the cavity of tooth number 11. At the second appointment, the cavity was filled with a mixture of distilled water and powdered calcium hydroxide for fourteen days. At final examination, as desired results had obtained, teeth number 11 and 21 were restored. Selective etching adhesive system (Single-Bond-Universal, 3M, USA) was applied and composite resin (Filtek-Z250 Universal, 3M, Minneapolis, USA) were layered on teeth. Each step was polymerized with light for 20 seconds (VALO-Cordless-LED, Ultradent, USA) Polishing strips (Hawe, Kerr dental, Bioggio, Switzerland) and polishing discs (Sof-Lex Extra-Thin, 3M, USA) were used for polishing.
Results: At the end of the treatment, both teeth were restored esthetically, and the patient was satisfied with the final result. Beside the retreatment of the root canal and the waiting period, the esthetic rehabilitation was performed in a single session.
Discussion: Before a non-vital bleaching procedure, the quality of the root canal filling needs to be evaluated. Then a bleaching procedure can be performed with hydrogen peroxide or sodium perborate. To avoid cervical root resorption, a mechanical barrier should be placed, and calcium hydroxide must be applied for 2 weeks before any restorative procedures. In this case, a direct composite resin technique was applied for the esthetic rehabilitation of the patient. This procedure was quick, conservative and minimal invasive.
Keywords: esthetics, non-vital bleaching, direct restorations

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Rehabilitation of Mandible with All-on-4 Concept: A Case Report
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Aim: To rehabilitate the edentulous atrophic mandible with all-on-4 concept.
Materials and Methods: A 75-year-old healthy male patient suffering from edentulous posterior extensions and mobile anterior teeth (#32 - #42) in the mandible reported to the Hospital of Dentistry, Near East University. All teeth were serially extracted. After healing, a CBCT scan was acquired. Although CBCT evinced a normal trabecular pattern; a significant decrease in bone quantity was found bilaterally in the posterior region (PR), which made axial implant-placement impossible. Thereby, all-on-4 concept was implemented. Two axial implants into the anterior region and two distally tilted implants into the PR were inserted. Straight and 17-degree-angled multi-unit abutments (MAs) were used. At early prosthetic phase, prefabricated complete denture (CD) was filled with polyvinyl siloxane (PVS) and then placed intra-orally to index the positions of the MAs. Indexed areas were drilled to create the access holes on the CD. Screwed temporary copings were shortened to avoid deterioration of the occlusion. CD refilled with PVS was intra-orally fixed by filling the holes with resin-pattern. CD attached to temporary abutments was unscrewed for final lab-adjustments. The patient used this provisional denture for 6 months. At late prosthetic phase, multi-unit impression copings were screwed and splinted. An open-tray impression was made with a custom tray filled with PVS. A titanium framework was milled. Denture tooth-setup was conducted. Consequently, screw-retained hybrid denture was fabricated.
Results: This protocol positively influenced the psychology of the patient. Moreover, chewing efficiency and aesthetic features were enhanced. During follow-ups, no mechanical or biological complications were detected.
Discussion: This protocol allows immediate function and avoids regenerative procedures that increase the treatment price and patient morbidity, as well as the drawbacks inherent to these procedures. Distal angulation of posterior implants maximizes the use of available remnant bone in atrophic jaws and minimizes cantilever-length.
Keywords: atrophic jaw, hybrid denture, implant, screw-retained, all-on-4

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Interdisciplinary Restorative-Orthodontic Treatment in a Case of Tooth Wear
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Aim: Patient who presents wear of the anterior teeth and an anterior open bite, due to an attrition component, although the main one is erosion since the patient consumes many drinks. The restorative objective is to increase the vertical dimension, reduce the sensitivity and give aesthetics.
Materials and Methods: In the first restorative phase, the vertical dimension is increased with direct restoration of composite. The materials used are: pitercatomas, mortenson condenser and double spatula. Selective etching, rinsing and application of adhesive XP bond (Dentsply) in the posterior with Palodent plus matrices and wedges. Application of fluid composite SDR (Dentsply) on the base of the cavity and on the top of the cavity, a translucent ceramic nanohybrid with brown tint (Kerr Dental) are used. The orthodontic phase is initiated with aligners to achieve a perfect fit and more restorative space to place the veneers in the anterior. Second restoration phase is continued with the temporary resin Integrity (Dentsply) to create the mock-up. The guided carving is performed on mock-up. The impression is taken with Aquasil monophase and putty. The final phase of the restoration includes etching of teeth with orthophosphoric acid, etching veneers with hydrofluoric acid, and luting of veneers with resin cement.
Results: By adjusting the anterior and posterior occlusion, the oral functionality is achieved with a satisfactory esthetic result for the patient.
Discussion: Since the patient is not an oral respirator or does not have tongue habits, we do not need to concern about the reoccurrence of open bite. The guided carving performed on the mock-up is chosen for two reasons: one is to keep as much enamel as possible to adhere the restoration; the second is to not produce pulp irritation by not touching the dentin.
Keywords: orthodontic treatment, restorative treatment, tooth wear, veneers, esthetic

EP – 134

Treatment with Direct Composite Laminate Veneers for Esthetic Anterior Teeth
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Aim: A 13-years old woman visited Kyung Hee university dental hospital for checking her tooth. The left lateral incisor (#22) and left canine (#23) was dental caries state in the buccal surface of the crown, involving enamel and some dentin without pulp exposure. She wants conservative and quick restoration, so it was proposed to treat with the direct composite laminate veneers for esthetic anterior teeth.
Materials and Methods: Before treatment, alginate impression was performed for study model on Mx., Mn. Anterior. The caries was removed on the tooth #12,13. 35% phosphoric acid was applicated on tooth #12,13 enamel surface. After selective etching on enamel, the Bisco's All-Bond Universal was applicated on the entire tooth #12,13 surface. Resin build-up was performed by 2-layer incrementation; Dentsply Sirona's Ceram.X Sphere TEC A2 shade on body part, and A1 on thin labial enamel part. After finishing with fine diamond finishing bur and Sof-Lex disc, several type of Pogo and Enhance were used for polishing.
Results: 6-months follow-up examination revealed that no visual problem and the tooth functioned normally.
Discussion: Direct and indirect laminate veneers, as esthetic procedures, have become treatment alternatives for patients with esthetic problems of anterior teeth in recent years. In deciding between those two treatment options, the cost, social and time factors have to be considered. In this

case, direct laminate veneer restorations can be a treatment option for patients with esthetic problems of anterior teeth, for time, cost and young age. The patient's age was main reason for this case. After growth, patient can change the restoration. But good patient hygiene motivation is most important factor.
Keywords: laminate veneers, esthetic anterior teeth

EP - 135

Management of Subgingival Root Caries with Flap Reflection
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Aim: For the treatment of root caries with direct composite resin restoration, it is critical to isolate the cavity from bleeding and any interfering gingiva. This case report describes a case of a 51-year-old female with subgingival root caries on the left maxillary canine and first premolar. Minimal gingival damage and esthetic appearance were desired considering the patient's diabetic medical history and that teeth were in the esthetic area. In this case, subgingival root caries was managed with direct resin restoration with flap reflection.
Materials and Methods: The surgical area was disinfected, and infiltration anesthesia was done. The Incision was made from the left maxillary lateral incisor to distal aspect of maxillary first premolar with blade and flap was reflected with a periosteal elevator. Caries was removed and bevel was made on enamel surface with #330 bur, EF TF-12 bur, and round bur. To avoid hypersensitivity, 2-step self-etching bonding system was utilized, after selective enamel etching. The cavity was filled with composite resin and the restoration was highly polished with polishing bur and points. The surgical site was sutured with 5-0 nylon. After 2 weeks, the suture was stitched out and fluoride varnish was applied to prevent further caries occurrence.
Results: At the recall visit, patient reported no symptom and the surrounding gingiva seemed to have healed without complication.
Discussion: Subgingival root caries is difficult to manage because of limited access and harder bleeding control. Some methods to overcome these problems were suggested, such as gingivectomy with electrosurgery, cord packing, and flap reflection. In this case, it was determined that flap reflection would be an ideal treatment method, because the pocket depth on the buccal aspect of the maxillary canine was measured 6mm, caries was on the subgingival area, and the patient had a diabetic medical history.
Keywords: flap reflection, root caries, diabetic medical history

EP – 136

Orthodontic Extrusion of Subgingivally Crown-root Fractured Maxillary Incisor: A Case Report
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Aim: There are four treatment options for crown-root fracture: extraction, crown lengthening procedure, surgical extrusion, and orthodontic extrusion. Orthodontic extrusion is considered the most conservative approach among these options. The objective of orthodontic extrusion is to provide a sound tooth margin for restoration and to maintain biological width for periodontal health. This case report describes a case of a 17-year-old patient who presented with a subgingival crown-root fracture of the maxillary right central incisor. The tooth showed no pain as it had already been root canal treated 5 years ago. For this case, orthodontic extrusion was chosen as the treatment plan for the aforementioned reasons.
Materials and Methods: Post and resin core build-up was performed for restoring aesthetics and attaching mini tube appliance (MTA). Orthodontic extrusion was performed using MTA which attached canine to canine and 012 Ni-Ti wire. Neighboring teeth were splinted with 019 x 025 wire to prevent unwanted movement. MTA was placed apically on #11 to facilitate extrusive movement. After extrusion, the crown lengthening procedure was done, and the tooth was prepared and restored with an all-ceramic crown.
Results: The patient was asymptomatic without relapse during three, six, and twelve-month recall visits. Sufficient length of clinical crown for restoration was obtained using orthodontic extrusion.
Discussion: Orthodontic extrusion in the fractured tooth is a conservative and relatively safe procedure. In this case, MTA was preferred over wire and hook that are traditionally used in orthodontic extrusion because MTA is more comfortable and esthetic due to its smaller size. The use of 012 Ni-Ti wire also has the advantage of having low friction resistance and fast movement. Orthodontic extrusion with MTA and super-elastic wire can be suggested as a simple and esthetic treatment option in dealing with crown-root fractured anterior teeth.
Keywords: mini-tube appliance (MTA), orthodontic extrusion, subgingivally fracture, crown-root fracture

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Treatment of Endodontically Treated Teeth with Endocrown
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Aim: This case presents that endocrowns can be considered as a feasible alternative to full crowns for restoration of severely damaged coronal hard tissue associated with an endodontically treated premolar.
Materials and Methods: A 36-year-old female patient visited because of the pain on left maxillary first premolar (#24), diagnosed as dental caries. On the first visit, the caries was removed, and the pulp was exposed, but hemostasis did not occur, so endodontic treatment was performed. On the second visit, Smart Dentin Replacement (SDR-Dentsply) was applied on the pulp chamber as a base and endocrown preparation was done. After preparation finished, impression was taken, and temporary crown was made and placed to the tooth. Clinical examination on the third visit showed asymptomatic, insensitivity to percussion and temporary restoration was in a good condition. E-max endocrown surface was etched on surface, rinsed, and silane was applied. Adhesive step is also done on tooth surface, selective etch and bonding was done on all prepared the tooth surface. Dure-cured resin cement (Duo-Link Universal–Bisco) applied to surface of restoration and restoration was applied to the tooth.
Results: Follow-up, 2 months after insertion showed that the tooth was asymptomatic, insensitive to percussion, and neither tooth mobility nor periodontal abnormalities. Restoration was under good condition and neither transformation nor discoloration of restoration observed.
Discussion: Endocrowns are relatively new, easy and quick to perform. It has several advantages like a smaller number of interfaces in the restorative system. Preparation design is conservative and biologic width is minimal. The main disadvantage of this technique is debonding and risk to root fracture as a consequence of different elasticity modulus between ceramic and dentine. Thus, a ceramic material that provides appropriate acid etching for bonding to dentine is beneficial to guarantee restoration stability. Therefore, it is a conservative approach for mechanical and aesthetic restoration of endodontically treated teeth.
Keywords: endocrown

EP – 138

Management of Complicated Crown-root Fracture for Successful Restoration
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Aim: Teeth with crown-root fractures extending subgingivally may have problems in endodontic isolation, periodontal maintenance, and coronal restoration. This case report presents a case of an 18-year-old male who was referred to dental hospital due to tooth fracture after falling down. Initial examination revealed complicated crown root fracture on right maxillary lateral incisor. The fracture line was located 3mm subgingivally at palatal aspect. In this case, intentional replantation with 180° rotation was chosen to expose fracture line and achieve biologic width and ferrule.
Materials and Methods: Root canal treatment was done immediately to reduce pain and avoid inflammatory root resorption. The tooth was luxated gently with forceps and was rotated 180° clockwise with minimal damage to periodontal ligament and immediately replanted and repositioned. The fracture line was exposed supragingivally. And then tooth was splinted with adjunct teeth with resin-wire for 2 weeks. A glass fiber post was placed a week later. The fiber post was cemented using self-adhesive resin cement and core build up was done using composite resin. Crown preparation was done with the margin placed 1mm subgingivally, and the tooth was restored with indirect composite resin crown.
Results: At recall visit, there were no pathologic signs or symptoms and the radiographic examination showed normal periapical structures.
Discussion: Rotational replantation can be useful because the palatal subgingival fracture line changed to supragingival margin. Because of the root curvature and contour, this procedure can make extrusion and has better anchorage than simple surgical extrusion. In addition, with surgical extrusion, operator can assess root surface thoroughly to find fracture or crack. In complicated crown-root fracture, rotational replantation could be used to make biologic width and ferrule for successful restoration.
Keywords: rotational replantation, complicated crown-root fracture

EP – 139

Management of Deep Caries Lesion with Silver Diamine Fluoride (SDF): A Case Report
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Aim: Removal of deep caries lesion often results in pulp exposure. This case report describes a case of a 22-year-old female who visited because of food impaction and sensitivity of mandibular second molar. Recurrent caries close to pulp chamber under resin restoration was visible in periapical radiograph. Because patient had no sign or symptom of irreversible pulpitis and reluctant to do root canal treatment, SDF was applied to form reparative dentin and arrest caries lesion.
Materials and Methods: Composite resin restoration and secondary caries were removed very carefully with highspeed carbide bur, low speed round bur and spoon excavator. Deep affected dentin and caries lesion close to pulp chamber were remained without excavation. SDF (Riva star) was applied at the remained caries lesion with micro brush. Cavity was temporary sealed with cotton pellet and IRM. SDF was applied 2 times with 1 month interval. After 3 months (from the last visit), temporary restoration was removed, and cavity floor was hard when probed with explorer. Therefore, cavity was restored with RMGIC base and composite resin.
Results: At recall visit, patient had no sign or symptom of pulpitis and the radiographic examination showed slight formation of reparative dentin.
Discussion: Silver diamine fluoride (SDF) is composed of large amounts of silver and fluoride in addition to ammonia. SDF formula (Ag (NH3)2F) is known to have ability to arrest and prevent dental caries with antibacterial action. Because of that effect, SDF has been used for children or old people who are hard to get dental treatment. Management of deep caries lesion with SDF could be a useful treatment option to avoid unwanted pulp exposure and root canal treatment.
Keywords: deep caries, SDF, silver diamine fluoride, arrest caries lesion

EP – 140

Biological and Esthetic Rehabilitation of a Traumatized Immature Tooth
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Aim: The aim of this case report was to summarize the apexification procedure by the use of mineral trioxide aggregate (MTA) to perform an apical plug in a traumatized, immature tooth with discoloration secondary to pulpal degeneration.
Materials and Methods: After access cavity preparation and determination of the working length, the root canal system was flushed with 2,5% sodium hypochlorite (NaOCl) and gently instrumented to ISO 90/.02. Then the root canal was filled with an injectable calcium hydroxide paste and sealed with a temporary restoration material. Two weeks later the root canal was re-opened, the calcium hydroxide was removed, and the apical two-thirds of the root canal were filled with MTA Plus (Prevest DenPro, Jammu City, India) by the use pluggers. After complete setting of the MTA, the residual part of the canal was obturated using the cold lateral compaction technique. The tooth was bleached in another session with a %35 nonvital bleaching agent (Opalescence Ultradent, South Jordan; UT, USA). Four months later, the tooth was bleached once again due to discoloration caused by MTA.
Results: The plug composed of MTA was successfully established at the apical portion within the borders of the periodontium. The bleaching was satisfactory at first but lasted only 4 months until a second discoloration due to MTA became evident. A second bleaching session was performed then.
Discussion: Apexification with MTA is an alternative to calcium hydroxide and is associated with numerous favorable properties, such as high biocompatibility and low cytotoxicity, as well as regenerative and sealing abilities. Despite these advantages, MTA has shown some drawbacks such as long setting time, difficult handling, and tooth color change. Although white MTA has been developed to overcome the discoloration caused by the application of grey MTA, further studies are recommended in order to overcome the controversies.
Keywords: apical plug, dental trauma, MTA, nonvital bleaching, apexification

EP – 141

Restoration of Anterior Diastema Case with Direct Composite Resin: Case Report
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Aim: Diastema can be caused by differences in tooth size, or by differences in tooth size and space in the dental arch. Direct composite restorations are a conservative treatment option for closing non-aesthetic interdental spaces. In this case report, it was aimed to restore the space between the lateral tooth and the zirconium crown with direct composite resin.
Materials and Methods: A 21-year-old female patient reported to department of Restorative Dentistry, University of Dicle, complaining about maxillary anterior region aesthetics. It was learned that the patient's medical history no systemic disease. The patient was informed about the treatment options and decided to restore it with direct composite resin. Isolation of the teeth was provided. 37% orthophosphoric acid (Scotchbond; 3M ESPE, USA) was applied to the enamel surfaces of the right upper lateral tooth for 30seconds to be restored. After rinsing and drying with an air-water spray, the adhesive agent (3M ESPE, USA)

was applied to the tooth surfaces in accordance with the manufacturer's instructions. Lateral tooth was restored with A2 (body and enamel) composite resin (3M Filtek Ultimate, USA). The finishing and polishing processes were completed using Sof-Lex discs (3M ESPE).
Results: Direct composite resin restorations are commonly used in diastema treatment because of their minimally invasive treatment option, low cost, and the advantage of ending the treatment in a single visit.
Discussion: In the treatment of diastema cases, direct composite resin restorations with the silicone guide technique are also applied but require an additional appointment. Porcelain laminate veneers are another treatment method used in the treatment of diastema. However, the disadvantages include the difficulty of repair, the inability to change color after bonding, and the inability to polish easily such as composite filling materials when their brightness is lost.
The source of funding for this clinical case report is Department of Restorative Dentistry, University of Dicle, Faculty of Dentistry.
Keywords: direct composite resin, diastema

EP – 142

Prevention of Early Post-Eruptive Enamel Breakdown in MIH-Affected Molars: A Conservative Approach
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Aim: Molar-incisor hypomineralization (MIH)-affected molars present an inner frailty that makes conservative treatments the strategies of choice to maintain as much as possible dental structure and to postpone more aggressive definitive restorations. Severely affected molars are prone to develop early post-eruptive enamel breakdown (PEB) and dental caries. A conservative strategy for the prevention of these complications is presented.
Materials and Methods: A 6-year-old boy was referred to the dental clinic, complaining high hypersensitivity during eating and oral hygiene, with a significant modification of diet and tooth brushing. The presence of extensive brown opacities on the lower first permanent molars (FPMs) were observed. After medical anamnesis and clinical inspection, the diagnosis of MIH was done. Oral hygiene, dietary recommendations and mineralization strategies were reinforced systematically. The cementation of orthodontic bands combined with the application of glass-ionomer sealants was used as interim approach to protect FPMs from caries and PEB until the complete eruption of the teeth. No anesthesia was required, and no tooth preparation was performed.
Results: After 36 months, the FPMs were completely erupted, with no caries, dental sensitivity nor PEB. The cooperation of the child increased. At the completion of teeth eruptions, definitive restorative treatments will be planned.
Discussion: Temporary treatment approaches are useful to preserve MIH affected FPMs. The combined use of luted orthodontic bands and glass-ionomer sealants participate to reinforce MIH-affected teeth against PEB and caries.
Keywords: molar incisor hypomineralization, paediatric dentistry, MIH

EP – 143

Diastema Closure in Maxillary Anterior Teeth Using a Sectional Matrix
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Aim: Treatment options for diastema closure include prosthetic treatments, orthodontic treatments, and composite resin restoration. Among these options, direct resin restoration is the most conservative and immediate. However, restoration of anatomical shape without making black triangles is very technique-sensitive and difficult procedure. This case report describes a case of a 26-year-old female whose chief complaint was closing the midline diastema on her maxillary teeth. For this case, composite resin and contoured sectional matrix were utilized to reproduce desired anatomical shape quickly and easily.
Materials and Methods: Before starting the treatment, a shade guide and a cheek retractor were used to select appropriate shade and isolate soft tissue and the lips. Mesial surfaces of both maxillary central incisors were etched with 37% phosphoric acid and then rinsed. Gingival retraction cords were placed to create space for placing resin composites. Dentin bonding agent was applied and cured. A contoured sectional matrix was then placed on the mesial surface of right maxillary central incisor. One end of the matrix was put slightly into the sulcus to achieve the progressive emergence profile of the resin composites. The tooth was then built up with flowable resin and hybrid composite in the space created by the matrix. The same procedure was repeated for left maxillary central incisor. After closing the diastema, the restoration was finished and polished.
Results: The restoration was polished at three-month recall visit. The restoration remained intact without discoloration, fracture or loss, and the patient was highly satisfied.
Discussion: Clear strips and wedges are commonly used for restoring anterior contour with resin composites. In this case, however, the anatomical shape was reproduced more quickly and easily by using a contoured sectional matrix that is rigid and similar in shape of interproximal area of the anterior teeth.
Keywords: sectional matrix, diastema closure

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Management of Crown Fractured Anterior Tooth after Delayed Replantation
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Aim: Complex traumatic dental injury is often challenging in clinical situation. This case report describes a case of a 20-year-old male who slipped down forward 15 hours ago, and his teeth was fallen out. Left maxillary central incisor was completely avulsed and both maxillary central incisors were fractured without pulpal involvement. Treatment plan was delayed replantation and direct resin restoration. Because direct resin restoration is relatively fast, easy, less invasive and economical, it could be the first option of permanent treatment for both young and old patients if the fracture size is small or medium
Materials and Methods: PDL cells of avulsed tooth were removed by gauze, and then the tooth was soaked in 2% NaF for 20 minutes and replanted for preventing inflammatory resorption. Resin wire splint was applied from canine to canine. Then, root canal treatment was performed on avulsed tooth. Splint was removed after 5 weeks. Class IV restoration was carried out with layering technique. Treatment was performed in the order of beveling, body shade filling, enamel shade filling and finishing and polishing.
Results: Until 6 months of follow-up, the patient had no sign or symptom, and replanted tooth showed no mobility at all. Resin restoration had satisfactory appearance in the shape, color tone, and surface gloss. However adjacent teeth had unusual broad white spot, surface sealant material was applied for unity and harmony.
Discussion: Over time, surface of the resin restoration absorbs moisture and may become a little rough. For this reason, it is important to follow-up regularly and carryout polishing. Although ceramic restoration usually showed better esthetic result than composite resin, the biological

consequences and high initial cost of invasive treatment must be considered in the treatment planning. Minimally invasive treatment can be replaced later by more invasive treatment if the patient's or dentist's expectations are not met, but vice versa.
Keywords: delayed replantation, class IV restoration

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Management of Crown-root Fracture by Surgical Extrusion with 180° Rotation
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Aim: This case presents a surgical extrusion with 180° rotation as a treatment modality for crown-root fractures.
Materials and Methods: A 23-year-old female patient visited for treatment of fractured maxillary central incisor (#11), traumatized from traffic accident. Exposed dentin and pulp of the tooth was restored with glass-ionomer cement provisionally in the emergency center a day ago. Clinical examination revealed that the fracture line extended subgingivally on the palatal side. The tooth was diagnosed as 'complicated crown-root fracture ', and accordingly surgical extrusion with 180° rotation, RCT, fiber post, resin core and prosthetic restoration was planned. The tooth was gently luxated and extruded to the desired position. Resin wire splint was applied for immobilization of the tooth. A week later, the root canal treatment was performed. The working length was measured on an electronic apex locator (Root ZX, J.Morita USA Inc., Irvine, CA, USA) and periapical radiographs. Canal preparation was conducted with the step-back technique and was accompanied by canal irrigation using NaOCl. After confirming the treated tooth had a negative response to percussion with no exudate discharge through the canals and no symptoms, the root canal was obturated with gutta-percha and root canal sealer (AH plus, Dentsply DeTrey, Konstranz, Germany) using a lateral condensation technique. The tooth was restored with a fiber post (DT light post, Bisco Inc., Schaumburg, IL, USA) and resin core, followed by laminate restoration.
Results: At 6-month and long-term follow-up, the tooth showed satisfactory aesthetics and function. There were no symptoms and pathologic findings in radiographs.
Discussion: In this case, surgical extrusion with 180° rotation was performed for the recovery of lost biological space. Surgical extrusion can be used successfully for the management of crown-root fractures. With appropriate case selection, surgical extrusion is a one-step procedure, which is simple and timesaving.
Keywords: surgical extrusion, crown-root fracture

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Interdisciplinary Orthodontic and Restorative Minimally Invasive Approach to Treat the Anterior Dental Attrition
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Aim: To describe a minimally invasive interdisciplinary ortho-restorative management for the anterior teeth wear due to dental attrition.
Materials and Methods: This case report involves a 53-year-old patient with aesthetic and functional problems who came to the dental clinic asking for a rehabilitation of the worn anterior teeth.
Clinical analysis showed teeth wear located in the incisal edges of the anterior dentition caused by attrition due to a deep overbite.
The treatment plan included a first orthodontic phase in which we carried out the intrusion of the upper and lower incisors in order to correct the overbite and gain space for the restorative material. As a result of the minimally invasive approach, we were able to maintain all the remanent enamel and the pulp vitality. Once the orthodontic treatment was finished, a restorative minimally invasive approach was executed by placing eight feldspathic veneers on the upper and lower incisors. The upper and lower canines were restored by direct composite restorations in order to improve shape and size.
Results: Due to an accurate interdisciplinary evaluation we achieved successfully the functional and aesthetic expectations of the patient through the orthodontic treatment and the placement of feldspathic ceramic veneers.
Discussion: Patients with a worn anterior tooth experience a reduction in the vertical dimension with the consequent loss of the anterior guidance and altered aesthetics. Furthermore, in these cases, the interocclusal space for our restorations may be reduced. Therefore, the orthodontic phase has the purpose of increasing the vertical occlusal dimension and creating space for the restorative material.
The interdisciplinary ortho-restorative approach turns out to be an efficient option in anterior guide rehabilitation with minimal invasiveness improving aesthetics and achieving the functional parameters as demonstrated by the maintenance of the full remanent enamel and the pulp vitality in all teeth.
Keywords: minimally invasive, orthodontics, restorative, teeth wear, feldspathic veneers

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Restoration of a Lateral Tooth with Uncomplicated Crown Fracture: A Case Report
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Aim: The aim of this case report is to present the restoration and 6-months follow-up of a permanent lateral tooth with a horizontal crown fracture and a central tooth with enamel cracks following a traumatic injury.
Materials and Methods: An 18-years-old systemically healthy female patient applied to our clinic the day after the trauma for the treatment of her teeth 21 and 22, which were traumatized as a result of falling off the bicycle. In the intraoral examination, a enamel crack in the incisal third of tooth 21 and a horizontal crown fracture in tooth 22 was observed. The patient had fixed orthodontic retainers between the canines in the lower and upper jaws. Clinical examination revealed tenderness to percussion and palpation. Gingival hemorrhage and mobility or replacement of the teeth were not detected. Radiological examination did not reveal any root fracture. As an emergency treatment, teeth were splinted with the patient's existing retainer and the exposed dentin surface was closed with a composite material. Electric pulp testing 2 weeks after the trauma indicated that tooth 21 was non-vital but tooth 22 maintained its vitality. Following the endodontic treatment and removal of the splint, the staining and irregularities on tooth 21 were removed with polishing discs (Tor VM). Horizontally fractured tooth 22 was restored with Fantasista V Universal Composite Resin A2-A3 (Sun Medical) under rubber dam isolation. Finishing and polishing were completed with Twist Diacomp Plus composite polishing discs (Eve Technik) and the fixed orthodontic retainer was then replaced.
Results: The esthetic expectation of the young patient, who is psychologically disturbed by her appearance, was met using direct composite. 6-months recall revealed no discoloration or fracture on the restorations.
Discussion: With direct composite restorations, it is possible to obtain satisfactory results that meet the esthetic and social expectations of the patients.
Keywords: crown fracture, esthetics, composite restoration

EP – 148

Aesthetic Adhesive Full-Mouth Rehabilitation of a Severe Tooth Wear Case

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Aim: An increasing number of patients is affected by severe tooth wear, with notable consequences on function and aesthetic. A step-by-step documentation of a full-mouth rehabilitation of a severe worn dentition performed with a combination of direct/indirect adhesive restorations is presented.

Materials and Methods: A 75-year-old female patient attended the clinic with the desire to improve her esthetic appearance as the teeth were no longer visible during smiling. Medical and dental history indicated good general health and dental hard tissue loss due to attrition with consistent VDO decrease. Clinical and radiographic examination revealed tooth loss (3.6, 4.6, 4.7), no caries, periodontal problems, temporomandibular disorders, and oro-facial pains were identified. After professional oral hygiene, data were recorded (photos, videos, rx, impressions), a mock-up was fabricated and wear for 1 month when the patient felt comfortable with the new VDO. Prosthetic plan consisted in the preparation of the upper and lower premolars to receive resin nanoceramic veneerlays (Lava Ultimate, 3M) that were adhesively cemented after 2 weeks under rubber dam isolation using a 3-steps etch-and-rinse adhesive (Optibond FL, Kerr) and pre-heated composite (Empress Direct, Ivoclar). The adhesive was placed on the preparation (20s light-cure) and on the veenerlay where it was left uncured. Upper anterior teeth (1.3-2.3) were prepared to receive lithium-disilicate monolithic crowns (IPD e-max Press, Ivoclar Vivadent) that were luted with a self-adhesive resin cement (RelyX Ultimate, 3M). Teeth from 3.3 to 4.3 were directly restored (Asteria, Tokuyama). Afterward, a nightguard was delivered. Controls and adjustments were performed periodically.

Results: After 2 years no chipping, debondings, fracture, temporomandibular problems or oro-facial pains were observed. The patient was satisfied with the esthetic results achieved.

Discussion: Adhesive techniques and protocols allow clinicians to obtain predictable esthetic and function results. The combined direct/indirect approaches were used to rehabilitate a severe worn dentition.

Keywords: full-mouth rehabilitation, wear, worn dentition, aesthetic

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Minimally Invasive Adhesive Rehabilitation of Worn Dentition Cases with Contemporary Restorative Materials

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Aim: The aim of this study is to report minimal invasive treatment protocols of two cases with worn dentition with a decrease in vertical dimension of occlusion.

Both cases represent erosive/abrasive worn dentition and both were reconstructed with a combination of minimally prepared ceramic veneers, occlusal veneers and direct composite restorations.

Materials and Methods: A combined indirect and direct treatment protocols were planned for a 42-year-old female patient having significant tooth wear and erosion due to excessive alcohol consumption and the other 50-year-old patient experiencing tooth wear as a result of extensive bruxism and erosion as well. Both patients had reduction in vertical dimension of occlusion.

The erosive/abrasive worn dentitions were diagnosed and planned within occlusal dynamics, functional and esthetic improvements with a diagnostic mock-up and further minimal tooth preparations were applied on the upper arches. Facial and occlusal lithium disilicate ceramic veneers (IPS e.max Press, Ivoclar Vivadent) were cemented and the palatal veneers were performed with direct composite restorations (Filtek Universal, 3M ESPE) to maintain the required vertical dimension increase. An occlusal splint was used in the post-restorative phase.

Results: Occlusal and vestibular veneers with minimal preparation provided esthetics and function by increasing the vertical dimension of occlusion with possible reduction in dental hard tissues. Beside preserving the enamel and dentin, enhancement of the contemporary monolithic ceramic material which are etchable provided high strength of adhesive performance for a sustainable clinical performance.

Discussion: Both treatment protocols were driven minimally invasively to achieve esthetic, functional and biomimetic rehabilitation of severely worn dentitions using partial restorations of lithium disilicate all-ceramic material with direct composite restorations discarding extensive loss of sound dental hard tissues with two years follow up.

Keywords: laminate veneer, minimally invasive rehabilitation, tooth wear, VDO, erosion

EP – 150

Multidisciplinary Treatment Approach for Fractures of Both Maxillary Central Incisors

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Aim: Management of fractured incisor is challenging for clinician. Complex cases, in which more than one tooth are involved, with fractures differing from each other, require specific treatment of each fracture depending on the remaining tooth structures. A 35-year-old female patient presented with both broken maxillary central incisors. Clinical examination revealed crown-root fracture and root fracture with pulp exposure on #11 and #21. The aim of this clinical report is to present a multidisciplinary approach to dissimilar crown fractures of both maxillary central incisors.

Materials and Methods: A conservative treatment was taken into consideration.

#11: After conventional root canal therapy, the tooth was restored with direct resin composite (A2 shade; Filtek z350 XT, 3M) under universal bonding system (All bond universal, Bisco) using silicone index.

#21: After conventional root canal therapy, a full-thickness conventional flap was elevated and resective osseous surgery was completed. A fiber reinforced composite post (Dentsply Sirona) was fitted and bonded in both radicular and coronal cavities of the tooth. Fragment was reattached using composite resin core (Luxacore, DMG) under universal bonding system (All bond universal, Bisco).

Results: The patient was clinically asymptomatic, and the teeth retained esthetic appearance up to the 9-month follow-up. Consequently, the patient was entirely satisfied with her treatment outcome.

Discussion: Crown fracture restorations in the superior incisor area need to be evaluated from several perspectives, including the extent and pattern of fracture, presence/absence of fractured tooth fragment, occlusion, esthetics and finances. Fragment reattachment using FRC posts and composite materials can be a simple and efficient procedure for the treatment of anterior traumatized teeth with excellent esthetic and functional results. It also requires less chair time in the dental office with less cost.

Keywords: fragment reattachment, multidisciplinary approach to dissimilar crown fractures, fiber reinforced composite post

EP – 151

Intentional Replantation: An Option for Horizontal Root Fractured Tooth

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Aim: Horizontal root fracture following trauma should not be considered as an indication for extraction. It is important to monitor the tooth for an

extended period for pulp vitality. If permanent pulpal necrosis of the coronal segment occurs, it is required to root canal treatment. The aim of case report is to present the clinical and radiographic results on a 17-year-old boy after treatment of horizontal root fractures (middle 1/3) on maxillary central incisor.

Materials and Methods: In this case, a 17-year-old male patient has been described. A day ago, the patient run into his friend and then, his teeth shook, diagnosed as horizontal root fracture (middle 1/3) on upper left central incisor (#21) and subluxation & crown fracture without pulp exposure on upper right central incisor (#11). The initial treatment consisted in repositioning, applying a stainless-steel wire. Endodontic treatment with the upper right and left central incisors was initiated. But the working length of upper left central incisor (#21) was not correctly determined and bleeding. Through cone-beam computed tomographic images, extraction of apical fragment on #21, followed by an intentional replantation of #21 coronal fragment was performed. Resin wire splint was held 2 months. After removal of RWS, splinted diastema on #11,21 and lingual retainer on #13-23.

Results: At 3-month follow-up, tooth #21 was not tender to percussion or palpation and presented physiologic mobility.

Discussion: In this case, coronal fragment of horizontal root fractured tooth (middle 1/3) was filled with MTA, which is called intentional replantation. Surgical extraction of apical fragment was performed. Lingual retainer was helped for immobilization. For this reason, conservative management of horizontal root fractures is aesthetic and cost-effectiveness more than implants. However, tooth should be monitored carefully to prevent pathologic events such as root resorption, discoloration, and so on. Also, long-term follow-up is necessary after treatment.

Keywords: intentional replantation, lingual retainer, splinted diastema, trauma, horizontal root fracture

EP – 152

Prepless Polydiastema Closure with Using Direct Adhesive Restorative Materials: A Case Report

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Aim: The aim of this study was to explain step-by-step procedure of the treatment procedures performed by applying prepless direct adhesive restorative materials for polydiastema case.

Materials and Methods: A 25-year-old female patient approved our clinic with complaint of esthetic problems due to polydiastema and yellowing of the teeth. Office type bleaching agent (Zoom!; Discus Dental, USA) was applied for 4 times 15 min activation sessions according to manufacturer's instructions. Restorative treatment procedure for prepless polydiastema closure was performed 3 weeks after the bleaching. Firstly, a supranano spherical inorganic filler containing resin composite, were selected by using the 'Button Technique'. After isolation with rubber dam, the two-step self-etch adhesive resin (Clearfil Liner Bond F, Kuraray, Japan) was applied by selective etching. A transparent and sectional matrix system (TOR VM, Moskow, Russia) was used to create the palatal and approximal profiles of the restorations, respectively. 'A1B' shade resin (Estelite Asteria, Tokuyama Dental, Japan) was used for enamel and dentin replacements. 'Modeling Liquid' (GC, Japan) was used to model composite material. All the composite increments were applied with layering technique and polymerized for 10 sec for each layer according to the manufacturer's instructions. Finishing and polishing were accomplished with a red banded knife-edge tip diamond bur (Acurata, Germany), polishing discs (Super-Snap, Shofu, USA), interdental strips (Epitex, GC, Japan) and polishing twists (Twist Dia, Kuraray, Japan).

Results: In terms of color and anatomical form, a highly esthetic restoration has been achieved in harmony with the surrounding natural tooth structure.

Discussion: Recently, diastema closure with direct composite resins is a clinically proven treatment procedure and also no preparation is needed if only proper enamel adhesion is caried out.

Keywords: esthetic, polydiastema, prepless restoration, direct adhesive materials

EP – 153

Aesthetic Regulations of Anterior Teeth Showing Shape and Color Disorder

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Aim: The aesthetic success of a dental treatment depends on the correct diagnosis, treatment plan and clinical procedures. The aim of this case report is to describe a patient's smile design with combined approach with tooth discolorations and diastemas between upper anterior teeth.

Materials and Methods: 19-year-old female patient referred to our clinic for aesthetic complaints on anterior teeth. After oral examination and giving information about treatment choices to the patient, application of home bleaching, non-vital bleaching, and direct composite resin build-ups were concluded. For home bleaching 16 % carbamide peroxide home-bleaching kit (Whiteness Perfect, FGM Dental Products, Brazil) was used for 14 days. Endodontic access cavity was prepared for gel application on left central incisor. 37 % carbamide peroxide gel (Whiteness Super Endo, FGM Produtos Odontologicos, Brazil) was applied. Patient was recalled after three days for changing the bleaching gel. Color match with other sound teeth was obtained at third recall. Fifteen days after bleaching, teeth were restored with composite restorations. Only the build-up application areas of the teeth were selectively etched and bonding agent (OptiBond XTR, Kerr Corporation, USA) was applied. Nano-hybrid composite resin (Tokuyama Estelite Sigma Quick; Tokuyama Dental Corporation, Japan) was applied with an incremental technique. Restorations were finished with ultra-fine burs and polished with Sof-Lex (3M Espe, USA) polishing discs.

Results: At six months follow up, color stability of the bleached teeth and color compatibility of the restorations were satisfying.

Discussion: Although bleaching of discolored non-vital teeth may sometimes require longer treatment period, the bleaching procedure is more economical and conservative than other restorative alternatives.

Keywords: composite restoration, diastema closure, tooth discoloration, anterior diastema

EP - 154

Interdisciplinary Management of the Midline Due to a Concrescence

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Aim: The purpose is to describe the interdisciplinary surgical, orthodontic, periodontic and restorative management for a middle line correction, maintaining the vitality of a concrescence tooth and improving the aesthetics of a patient.

Materials and Methods: A male 56-year-old patient, consults concern about his aesthetics.

Oral and radiographic exploration revealed a concrescence upper lateral incisor that deviate the middle line. Also, a calcic degradation in one of the central incisors.

The first phase of the treatment plan consisted in create space and correct the middle line extracting part of the concrescent tooth, maintaining the vitality of the remaining one and centering the middle line with the help of the orthodontist.

In a second phase, a combination of periodontal treatment with a connective tissue graft and a restorative treatment with feldspathic veneers was carried out.
Results: The correction of the middle line and maintaining the vitality of the remaining concrescent tooth were achieved, also the aesthetics and expectations of our patient.
Discussion: Dental concrescence is a rare dental abnormality resulting in the joining of two teeth at the level of the cementum. In this case the middle line was affected due to the increased volume in the first quadrant. Finding the most conservative approach to re-place the middle line and improving the aesthetics is particularly challenging for the clinician, especially if we introduce more variables as calcium degradation in the nearest side of the symmetry, 2.1 tooth. However, is in this kind of cases when we could see the importance and the results of an interdisciplinary work.
Keywords: midline, orthodontics, restorative, concrescence

EP – 155

Minimal Invasive Treatment of Molar Incisor Hypomineralization: A Case Report

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Aim: Molar incisor hypomineralization (MIH) is an enamel defect that develops in the molar and incisors as a result of exposure of ameloblast cells to various environmental and systemic factors during the maturation phase of amelogenesis, thus causing aesthetic concerns. In this case report microabrasion and home bleaching was planned for the treatment of MIH.
Materials and Methods: A 17-year-old female patient who referred to our clinic with the chief complaint of white lesions on maxillary incisor teeth, were examined clinical and radiographically in both the maxillary and mandibular arch, visible opacities were detected and microabrasion and home bleaching techniques were planned for the treatment of lesions. Before microabrasion application, Tooth Mousse Gel (GC) was applied on the lesions for two weeks. Shade selection was performed by spectraphotometer (Vita EasyShade V). Under the rubber dam isolation (maxillary-arch) and gingival barrier (mandibullary-arch) Opalustre (Ultradent) was applied in 3 consecutive cycles using OpalCups (Ultradent) according to manufacturer's guidelines. Fluoride varnish (4% NAF, ProShield, President Dental) was applied for 4 minutes following the microabrasion. Home bleaching gel was applied for 5 weeks with custom made bleaching tray using 16% Carbamide Peroxide (Opalescence PF, Ultradent). Patient were recalled for 7,14,21,28,35 day for the examination of the lesions and color of teeth.
Results: The using of ACP-CPP containing gel before the treatment, made a difference in the visibility of enamel hypomineralizations. The shades of incisor teeth which, was the patient's complaint was B3 initially A2 after microabrasion and A1 after bleaching. The patient was satisfied with the treatment results.
Discussion: Application of remineralisation gel for two weeks, reduced the size of enamel hypomineralizations. The combined use of microabrasion and home bleaching is more effective in reducing lesions, eliminating aesthetic concerns and provided a more comfortable treatment process for the patient with MIH.
*We do not have any financial resources.
Keywords: home bleaching, microabrasion, remineralisation, ACP-CPP

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Restoration of Maxillary Central Incisor with Fiber-Post and Composite Resin: A Case Report

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Aim: Fiber-post and direct composite resin application in root canal treated teeth with high substance loss are one of the preferred methods in conservative dentistry. In this case, a large old restoration with discoloration and fractures in the maxillary central incisor was detected. The purpose of this case report is to present the restoration of the old filled central incisor with fiber post and composite resin application.
Materials and Methods: In the oral examination of a 27-year-old male patient, it was determined that tooth 11 had a large and old composite restoration and that the natural tooth structure was lost as far as the cervical line. No lesions were found in the root tip and surrounding tissues in the radiographs taken. Adequate isolation was provided with cotton roll suctions in the patient, and the old restoration was removed and the stage of insertion of the fiber post was initiated. Suitable space was created in the canal in such a way that the apical 1/3 was left to the gutta-percha. After the radiographic controls, the fiber post (Q.P. Fiber Post, Korea) was cemented with a dual-cure cement (G-CEM LinkAce, Japan). The core of the tooth was restored with freehand technique using an adhesive system (Clearfil SE Bond, Kuraray, Japan) and enamel-dentin composites (NE-A2B, Estelite Asteria, Tokuyama, Japan). Finishing and polishing operations were carried out with abrasive discs (Sof-Lex, 3M ESPE, USA) and polishing rubbers.
Results: The patient's tooth 11 was successfully restored using fiber post and composite resin.
Discussion: While a successful and aesthetic result can be achieved in a single visit with fiber post and direct composite resins used in the restoration of root canal treated teeth with high substance loss. They can be an alternative to metal posts and indirect restorations with their conservative and low costs.
Keywords: composite resin, fiber-post, central incisor

EP – 157

Aesthetic Restoration of Severely Worn Dentition

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Aim: The treatment of severe worn dentition can be challenging because of the alteration in the vertical dimensions. This clinical case presents the management of severe tooth wear dentition in a functionally and aesthetically compromised patient.
Materials and Methods: A 55-yr old male patient referred to the dental clinic complaining difficulties during mastication and the desire to improve the aesthetic of his smile. After medical and dental anamnesis, photographs were taken of the face and the mouth and a radiographical status was performed. The dental examination confirmed the diagnosis of severe tooth wear due to attrition (clenching and bruxism) with considerable reduction in the VDO. The treatment plan foresaw a combination of adhesively bonded indirect restorations and implant-supported crown rehabilitations. An interim mock-up was used to achieve the comfortable VDO before bite registration. Definitive restorations were performed with lithium disilicate monolithic restoration (E.Max press; Ivoclar) that was screwed on implants (1.6, 2.6, 3.3 4.6) or bonded (1.1-1.5, 2.1-2.5, 3.1-3.2, 3.4-3.6, 4.1-4.5) under rubber dam isolation with a 3-steps Etch&Rinse adhesive (Optibond FL, Kerr; 30s enamel etching, 15s dentin etching) and a dual-cure resin cement (Variolink DC - Ivoclar Vivadent)
Results: The case showed the analytical diagnostic steps taken to formulate the treatment plan. After 1 month of mock-up, a comfortable VDO was encountered. The plan was finalized in 4 months from first consultation and after 1yr of follow-up no debondings, chippings or dental/periodontal problems were observed.
Discussion: Nowadays, minimally invasive rehabilitations allow for quality restorations of generalized tooth wear in general practice. After 1yr, the aesthetic and the function completely fulfilled patient's requirements.

Keywords: mock-up, wear, worn dentition, lithium disilicate ceramic

EP – 158

Direct Composite Resin Restorations on a Patient with Development Defects of Enamel

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Aim: Developmental defects in the enamel are defined as disturbances in hard tissue matrices and in their mineralization. Disorders that occur reduce the amount or thickness of the enamel, resulting in white spots, tiny grooves, depressions and fissures in the enamel surface. The aim of this case report is to investigate clinical performance of direct composite restoration of development defects of enamel.
Materials and Methods: A 24-year-old female patient was referred to the dental clinic (Istanbul University Department of Restorative Dentistry), reporting a visual discomfort from the presence of irregularities and discoloration in the maxillary anterior teeth. The patient was systemically healthy, presented a good oral hygiene and the restorative area was free from visible plaque. The composite shade was determined. %35 phosphoric acid (Scotchbond Acid, 3M ESPE, St.Paul, MN, USA) applied. Etch was rinsed with water and air dried. Adhesive agent (Scotchbond Universal Bond, 3M ESPE, St. Paul, MN, USA) was applied as per manufacturer's instructions. Nanohybrid composite (Filtek™ Z250 Nanohybrid Universal A2, 3M ESPE, St. Paul, MN, USA) was used to restore the teeth afterwards. Light source (Demi Plus, Kerr Corp. Orange, CA, USA, Wavelength: 450-470 nm, Lux: 1100-1330 mW/cm^2) was used to polymerize both adhesive and composite for 20 seconds per application. Sof-Lex System (3M ESPE, St. Paul, MN, USA) was used as multi-step finishing-polishing system.
Results: The restoration was performed with minimally invasive concept without any grinding from the teeth. Teeth were restored its original physical integrity.
Discussion: Application of direct composite resin restorations in cases of development defects of enamel is a reliable method as it prevents removing excessive tooth tissue using principals of minimal invasive dentistry. Aesthetic loss can be restored using direct composite which provides saving time and a reasonable option financially. The self-esteem of the patient can be achieved with this approach.
Keywords: direct composite restoration, enamel defect, esthetic dentistry, minimal invasive dentistry, composite resin

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Alternative Strategy to Treatment of the Deep Dental Caries During the Covid-19 Pandemic

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Aim: The Covid-19 pandemic and the high risk of contagion in the use of aerosols has made dentistry try to reduce the use of instruments. The clinical time of treatments should be reduced, recommending simple methods. The objective of this clinical case is to present an alternative method for the restorative treatment of deep caries.
Materials and Methods: Brix 3000® (E.B.E.), Biodentine® (Septodont); Futurabond U® y VisCalor® bulk Composite (VOCO GmbH) color A3. Clinical case: 25-year-old male patient with deep caries in 47. After removal of the dentin infected with Brix 3000 and excavator; and cleaning and cavity shaping, the absolute isolation of 45, 46 and 47 was carried out. A Biodentine base was applied to the bottom of the cavity. After setting, self-etching adhesive (Futurabond U) was applied with a selective etching enamel technique, after polymerization the cavity was filled in a single step and increment with VisCalor bulk in a 65º cycle. The isolation was removed, and the restoration was polished.
Results: The functional and esthetic result of the restoration had been correct. One year after treatment, shows the good evolution of the filling with positive pulp vitality.
Discussion: The treatment of deep caries requires the elimination of infected dentin. Usually, it is carried out with rotating material at low speed with refrigeration, which implies the emission of aerosols. Alternative chemical methods such as the one used in this case reduce the risk of contamination, without generating aerosols. On the other hand, conventional composites require application in layers to guarantee the polymerization of the entire mass and reduce the shrinkage stress, which requires clinical time. New materials such as VisCalor bulk allow us to fill in a single increment and also improve the fluidity of the composite thanks to temperature, considerably reducing clinical time.
Acknowledgement: Nothing to disclose.
Keywords: composite bulk film, Covid-19 pandemic, deep caries, aerosols

EP – 160

Aesthetic Rehabilitation of Coronal Deformities and Diastemas of Anterior Teeth: A Case Report

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Aim: During the tooth development phase, deformities may occur in the coronal region due to the trauma of the tooth germ. After orthodontic treatment, interdental diastemas can be observed depending on the incompatibility of tooth size and jaw size. Direct resin restorations are one of the conservative ways of treatment of closing the diastemas and reshaping of the deformity.
Materials and Methods: A 17-year-old male patient was referred to our clinic by his orthodontist for aesthetic restorations after completion of his orthodontic treatment. After the clinical and radiological examinations, it was determined that tooth #21 had root dilatation with coronal deformity and the presence of diastema between teeth #11 and #12. Treatment of #12 and #21 was planned to make direct composite resin restoration. 'TN'and 'O4' shades (Amaris, VOCO) were selected using the button technique. High Opaque 'HO' shade (Amaris, VOCO) was selected to cover the translucency enamel structure reflected in the transition from tooth enamel to restoration. Following rubber dam isolation, a slight bevel was prepared, and surfaces were etched with 37% phosphoric acid (Vococid, VOCO) and a universal adhesive (Futurabond U, VOCO) was applied according to the manufacturer's instructions. Palatinal wall and proximal walls made with 'TN' and dentin layer added with 'O4' and light cured for 20sec (VALO, Ultradent). Polishing was done by using polishing discs (Sof-Lex, 3M ESPE), spiral rubber discs (DiaComp Plus, Eve) and interdental bands (Epitex, GC). Patient was kept on recall after 1 week, 1 month and 1 year for the evaluation according World Dental Federation (FDI) criteria.
Results: At recalls, the restorations were evaluated for esthetic properties, surface texture/finishing/staining, color stability/translucency and anatomic form according to FDI criteria and scored as 1.
Discussion: We can mimic the natural teeth; using a layering technique in a minimally invasive way with the complete patient stratification.
Keywords: coronal deformities, diastema, esthetic, adhesion

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Intentional Replantation and Root Resection: A Case Report

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Aim: The aim of this case report is to intentionally reimplant a vertically fractured tooth treated outside of the mouth.

Materials and Methods: A 25-year-old patient comes to the clinical with pain in his 4th quadrant. In the clinical examination, a cervical sinus tract was observed in the right mandibular first molar. The radiographic examination revealed a prior endodontic treatment with radiolucent image that involved the entire mesial root. The diagnosis was compatible with vertical root fracture. The tooth was luxated passively with forceps. Remaining granulomatous tissue was attached to the mesial root, which made it difficult to identify the cause of the failure. In order to have the tooth outside the mouth the least time possible, mesial root resection and distal root apical resection was performed. Root-end cavity preparation in both roots was made. Root-end cavities were sealed with an apical plug using white root repair material (ProRoot MTA; Dentsply Sirona). Throughout this process, the tooth was hold by its crown with a saline-soaked gauze as a measure to provide continued hydration of the root surface and periodontal ligament cells. Finally, intentional surgical repositioning was performed, and a splinting for 2 weeks was undertaken. After the radiographic control of 6 months, a lithium disilicate overlay restoration was made.
Results: In the 1-year follow-up, the patient was totally asymptomatic, and the restoration was functional and aesthetic.
Discussion: In this case, there were 4 treatment options: root canal retreatment, endodontic surgery, intentional reimplantation and extraction. Orthograde retreatment was ruled out because the presumptive diagnosis was vertical mesial root fracture. Between apical surgery and intentional reimplantation, the patient finally opted for reimplantation. After the controls carried out, it can be said that the root resection represents an alternative treatment for those teeth where the root canal treatment failed in one of the roots.
Keywords: root resection, intentional replantation

EP – 162

Anterior Aesthetic Rehabilitation with Adhesive Composite Resins: A 2.5 Year Follow-Up Case Report

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Aim: Diastema is an aesthetic problem caused by gaps between teeth, differences in tooth sizes, or discrepancies between jaws and teeth. Although there are different treatment alternatives for the closure of diastemas, adhesive resin composite restorations is the most conservative treatment approach. The purpose of this case report is to restore the diastema between maxillary central teeth and the fracture incisal of the central tooth with direct adhesive resin composites.
Materials and Methods: A 28-year-old female patient with the complaints of diastema between the maxillary central teeth and incisal fracture in tooth number 11 tooth was admitted to our clinic. According to the clinical and radiographic examination, no dental caries or periodontal problems were found. A gentle beveling was performed on the fractured surface of the tooth number 11. No preparation was made on the other enamel surfaces. Phosphoric acid gel and adhesive resin (Adper Single Single Bond 2, 3M ESPE) were applied, respectively, and the fractured surface was restored by using composite resin (Estelite Sigma Quick, Tokuyama) with the layering technique. The aesthetic integrity of the anterior teeth was achieved by closing the diastema.
Results: In the 6-month follow-up; there was only a small diastema formation was observed between the central teeth. However, since the patient did not complain about this diastema, no intervention was performed. During the 2.5-year follow-up, an increase in the formation of diastema and abrasion on the incisal surface of the tooth number 11 were observed. Aesthetics impairments was restored by using adhesive resins again.
Discussion: Minor interventions with adhesive restorative materials may be needed during follow-up periods to maintain anterior aesthetic rehabilitation. One of the most important advantages of using adhesive resin restorations is that aesthetics and patient satisfaction can be provided by eliminating in the most conservative and fastest way the aesthetic problems that arise in previous restorations.
Keywords: diastema closure, resin composite restorations, anterior aesthetic restorations

EP – 163

Root Canal Treatment of Mandibular Canines with Two Canals

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Aim: This report presents root canal treatment cases of mandibular canines with two canals. One case shows two canals in two separated roots and the other shows two canals which merge into a single canal at the apical third.
Materials and Methods:
Case 1: A 73-year-old man visited the hospital with the chief complaint of pain in mandibular left canine. The tooth #33 revealed severe attrition and electric pulp test revealed no response. Periapical radiographs revealed two canals in two separated roots with apical radiolucency. A diagnosis of pulp necrosis was made and RCT was performed. The buccal and lingual orifices were identified. The working length was measured with an apex locator and verified with a radiograph. Cleaning and shaping of the canals were performed using NiTi rotary file systems (ProTaper Next and ProFile). The canals were irrigated with 5.25% NaOCl and filled with gutta-percha and AH+ sealer using continuous wave technique. The access cavity was restored with composite resin.
Case 2: A 72-year-old man suffering from pain in mandibular right canine presented the hospital. The tooth #43 had severe attrition with sharp pain. Periapical radiographs revealed two canals in a single root without any periapical changes. Accordingly, it was diagnosed as irreversible pulpitis and RCT was performed. The lingual canal was merged with the buccal one at the apical third. The similar steps with the same materials to the previous case were performed in the entire procedure.
Results: At the 6-months follow up, both endodontic treatment of mandibular canines had successful outcomes.
Discussion: Comprehension of anatomical variations of the root canal systems is essential for successful endodontic treatment. The mandibular canine normally comprises one canal, but some may have two canals. To find the additional canal, careful examination of pulp chamber and interpretation of the radiographic features is critical.
Keywords: mandibular canine, root canal anatomy, root canal treatment, canal configuration

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Minimally Invasive Treatment to Aesthetic Rehabilitation of a Conoid and Missing Lateral Incisor

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Aim: A 19-year-old female patient came to the clinic after finishing her orthodontic treatment asking for aesthetic rehabilitation. She presented agenesis of the left maxillary lateral incisor, the contralateral was a conoid tooth with a defective composite restoration, and white spot lesions on the central incisors. Treatment focused on improving the teeth color, central incisors shape and prosthetic rehabilitation of the conoid tooth and the agenesis until an implant would be placed.

Materials and Methods: Photographs, a digital smile design and a wax-up were performed to analyze the case. At-home bleaching (Opalescence PC 16%, Ultradent, USA) was carried out for 4 weeks by means of an essix that was also used to shape the gingival margin of the missing lateral incisor. Once the color was stable, direct composite restorations were performed on both central incisors to improve the shape using an A1 Enamel nanohybrid composite (FiltekTM Supreme XTE, 3M Oral Care). After the vertical preparation of the conoid tooth, a digital impression was taken (CS 3700®, Carestream Dental) to make a crown, and a single-retainer resin-bonded fixed dental prosthesis (RBFDP) for the agenesis without tooth preparation. Both were made of lithium disilicate (IPSe.max® CAD, Ivoclar Vivadent) and adhesively bonded. Finally, white spots were infiltrated with a low viscosity resin (Icon®, DMG, Germany).
Results: Direct and indirect restorations were integrated achieving a natural aesthetic smile. The patient was very satisfied after improving gingival margin positions, color and shape of the teeth, with a minimally invasive approach.
Discussion: The successful outcome demonstrates the importance of an accurate diagnostic and interdisciplinary planning to combine different minimally invasive treatments to achieve a harmonic smile in young patients. Non-preparation RBFDPs made of lithium disilicate are an optimum alternative to the traditional protheses or implants in congenitally missing lateral incisors.
Keywords: conoid tooth, lithium disilicate, RBFDPs, resin infiltration, congenitally missing teeth

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Interdisciplinary Management of Idiopathic Gingival Fibromatosis and Rampant Caries: A Case Report
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Aim: The aim of this case report was to present a case report characterized by a severe gingival overgrowth and rampant caries
Materials and Methods: A 27-year-old man with a chief complain of gingival swelling in the left side of his mouth and pain in multiple teeth. He had extensive overgrowth of soft tissue in combination with several caries lesions, with implications in speaking, eating and in his aesthetic appearance. The DMFT index was extremely high for his age, with rampant caries and loss of 4 permanent teeth. Patient was diagnosed with generalized periodontitis stage III/grade C. Radiographic examination did not reveal abnormal bone contour or alveolar bone loss in the area of gingival enlargement. The patient was smoking cannabis and consuming large amounts of sweets.
Results: A multidisciplinary therapy started with non-surgical periodontal therapy. The role of oral hygiene and smoking cessation was emphasized. An individualized preventive caries plan was formulated. Root canal therapies were carried out and extended carious lesions were treated using resin composite. When oral hygiene was significantly improved, surgical removal of soft tissue overgrowth was performed. After healing, caries lesions that were previously almost covered by the gingival fibromatosis, were also treated. Finally, patient initiated orthodontic treatment to correct the malocclusion, that was created by the excessive gingival overgrowth.
Discussion: The idiopathic gingival fibromatosis is a rare condition with unknown etiology. This case was of non-syndromic idiopathic gingival enlargement. Clinical and radiographic examination, along with hematological investigations ruled out any systemic association (hypertrichosis, epilepsy or medication). Cannabis seems to have contributed to the periodontitis, the rampant caries and in the fibromatosis of the soft tissue. A strict follow-up has to be performed, to observe oral hygiene, control caries risk and to make early diagnosis of new caries lesion or gingiva re-growth.
Keywords: idiopathic gingival fibromatosis, interdisciplinary management, minimal invasive dentistry, rampant caries, cannabis smoking

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Surface Roughness of Bulk-Fill Versus Nano-Hybrid Composite: Effect of Different Polishing Cups
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Aim: The aim of this study was to compare the surface roughness's of two different composites polished with three different polishing cups.
Materials and Methods: A bulk-fill (Tetric EvoCeram Bulk Fill, Ivoclar Vivadent) and a nano-hybrid composite (Tetric N-Ceram, Ivoclar Vivadent) were selected for this study. Disk-shaped specimens of 10 mm in diameter and 2 mm in thickness were made using a stainless-steel mold. Each specimen was cured under mylar strips for 20 s from the top surfaces with a LED unit. All of the specimens were stored in distilled water for 24 h at 37°C. For each composite, specimens were divided into 4 groups according to the followings; Group-1=Control, Group-2=Two step composite polishing system, Group-3=Paste-impregnated polishing felt (disk), Group-4=One-step polishing cup. Surface measurements were carried out using a contact profilometer (Mahr surface profilometer) in terms of surface roughness (Ra values). Three measurements were made from the surface of each sample. There were 8 groups (n=15) in total. The data were statistically analyzed using two-way ANOVA and Tukey's post-hoc tests (SPSS 20.0).
Results: Significant differences were found between the study groups ($p<0.05$). The Ra values of the control group of bulk-fill composite (0.167±0.06) were higher than that of the control group of nano-hybrid composite (0.065±0.02). For both composites, Group 2 showed the highest Ra values (0.294±0.04 for nanohybrid, 0.203±0.02 for bulk-fill composite), while Group 3 exhibited the lowest Ra values (0.059±0.02 for nanohybrid, 0.067±0.03 for bulk-fill composite).
Conclusion: Although the type of composite does not affect the surface roughness, polishing systems may cause different surface roughness's on different composites. Felt type polishing systems impregnated with polishing paste considerably reduced the surface roughness of composite resins.
Keywords: polishing, surface roughness, composite resin

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Lightness Difference Thresholds of Maxillary Central Incisor in Digital Simulated Facial Portraits
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Aim: To assess the visual perceptibility and acceptability thresholds for lightness differences of a single central incisor using digital facial portraits and to investigate possible differences in these thresholds between the type of the observers.
Materials and Methods: A series of images were created by altering the lightness (L) of the maxillary central incisor of a male Caucasian, on a frontal view full-portrait image. 15 different images were created by modifying digitally the right central incisor 1 ΔL unit ($\Delta L=\Delta E=1$) in each step. One image served as the control, 7 had increased and 7 had decreased lightness. The images were presented in random order in a digital calibrated monitor. 160 participants (80 dentists, 80 laypersons) were instructed to fill out a questionnaire, evaluating every image for a perceptible or an acceptable mismatch. Based on best fitting curves, the 50 % perceptibility and 50 % acceptability thresholds (PT and AT) with their 95 % CI were calculated. A test of propotions was performed for each step of color difference ($p>0.05$).
Results: An increase in lightness of $\Delta L\geq 1$, altered significant perceptibility, both for dentist and layperson group. A decrease in lightness of $\Delta L\geq 2$ for the dentists and of $\Delta L\geq 3$ for the laypersons, perceived

significant different compared to control. A decrease in lightness of $\Delta L \geq 3$ and an increase of $\Delta L \geq 3$, lead to a significant difference in the acceptability for both groups. False perception rate was higher in dentist group (55,7%) compared to layperson group (22,8). Perceptibility thresholds between laypersons and dentists were significant different ($p<0.05$). 50% perceptibility thresholds were at a $\Delta L = 2,3$ for the layperson and at a $\Delta L = 0.12$ for the dentist group.
Conclusion: Taking into account the limitations of a digital image environment, the present study indicates that even minor changes in the lightness of a single central incisor can be perceived, both for dentists and laypersons. Accurate lightness matching of direct or indirect restoration is critical.
Keywords: digital simulation, facial portraits, lightness difference, tooth color, color threshold

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Dental Separation and Silicone Impression in the Management of Interproximal Carious Lesions
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Aim: A 29-year-old patient visited the University clinic for a dental check. The diagnostic digital bite-wing X-ray (Carestream CS 7600) revealed a carious lesion on the distal proximal surface of the 1.5 affecting the outer third of dentine (D1). However, it was not possible to determine whether the enamel surface was cavitated. Therefore, temporary dental separation with an orthodontic rubber ring followed by direct visual inspection was performed.
Materials and Methods: Considering the impossibility of assessing the visual and tactile characteristics of the proximal carious lesion, an orthodontic rubber ring was placed between 1.5 and 1.6 for a week. Once the patient returned to clinic, a direct visual access was allowed revealing enamel cavitation. The texture was soft to gentle probing and it was remarkably oriented towards the buccal surface. Moreover, an impression with a low-viscosity addition silicone was taken that confirmed the enamel cavitation.
Results: The direct access allowed to perform a minimally invasive operative treatment of the carious lesion (ICDAS 3) from buccal surface, preserving the marginal ridge and the contact point. A direct resin composite restoration with a microhybrid resin (Filtek Z250, 3M Oral Care) with the application of a universal adhesive with selective enamel etching (Scotchbond Universal, 3M Oral Care).
Discussion: Tooth separation allows to confirm if approximal lesions are cavitated and to perform a more conservative approach of the lesion. Also, preventive or micro-invasive treatments could be applied easily in non cavitated surfaces. However, it implies more appointments, requires a greater collaboration from the patient and separation obtained is not always enough.
Keywords: dental separation, direct visual inspection, interproximal carious lesions, silicone impression, cavitation

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Finite Element Analysis of ProTaper, ProTaper Next and ProTaper Gold Endodontic Files
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Aim: The present study is aims to compare three endodontic file systems namely ProTaper, ProTaper Next and ProTaper Gold based on their static and dynamic finite element analysis.
Materials and Methods: 3D models of ProTaper were created using Design Modeler of ANSYS Workbench and 3D solid models of other two file system were created using white light scanning technique. Finite element analysis was carried out for all the three endodontic file systems

1. Static analysis
    a. Bending due to concentrated load applied at tip of file
    b. Bending due to displacement applied at tip of file
2. Transient analysis
    a. Bending under increasing displacement at tip of file

Results: ProTaper Gold file remain in transition phase (500-540 MPa) for longer duration of 2.7686 mm as compared to ProTaperNext file 2.1036 mm
Conclusion: ProTaper file is the most rigid file as compared to other two file models. ProTaper Gold shows longer transition zone as compared to ProTaper Next file.
Keywords: finite element analysis, endodontic files

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Aesthetic and Conservative Approach to Restore Molar Teeth with Root Canal Therapy
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Aim: The aim of this study was to investigate the clinical outcome of ceramic cuspal coverage restoration (Endo-Crown) versus the conventional ceramic crown and to assess the clinical success in function. Also, our goal was to evaluate the health of periodontium and the success of root canal treatment in relation to efficiency of coronal seal.
Materials and Methods: A group of 25 patients were enrolled in the study. All patients have received root canal treatment for one maxillary and one mandibular molar tooth as minimum and referred to have restorations with cuspal coverage. All patients were evaluated, and they were informed about the study and the fact that they will receive a ceramic conventional crown and a ceramic overlay per each jaw (split mouth protocol). The intact unrestored molar teeth in each patient were used as a control. Cases were evaluated at baseline visit and during the 6 recalls for the two years periods. Statistical Descriptive scores were used to investigate the difference in plaque accumulation using the disclosing solution. Statistical Descriptive scores were used to evaluate the presence of recurrent caries lesions clinically with assisted magnifying field, dental macrophotography and transillumination techniques. Carious lesions in proximal areas were detected radiographically.
Results: We observed that there was no significance of the plaque and gingivitis scores between teeth restored with conventional ceramic crowns and endo-crowns. Also, secondary caries lesions were not detected around restoration margins. We observed 2 debonded endocrowns and recemented them with the same bonding procedure.
Conclusion: We conclude that the cuspal coverage restorations for endotreated molar teeth with ceramic bonded overlay system have shown very successful treatment option with minimal procedural risk.
Keywords: ceramic cuspal coverage, restoration of endodontically treated teeth, ceramic cuspal coverage

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