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AIC 19th International Congress and CONSEURO "Clinical Procedures and Digital (r)Evolution: contemporary synergies in conservative/restorative dentistry"

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Biomaterials

P Sessione Poster

Poster P.1

A DEEP MORPHOLOGICAL CHARACTERIZATION AND COMPARISON OF DIFFERENT DENTAL RESTORATIVE MATERIALS

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Giomer is a relatively new class of restorative material with aesthetics, handling and physical properties of resin composite and benefits of glass ionomer: high radiopacity, anti-plaque effect, fluoride release and recharge.
Different chemical-physical tests (mechanical tests: indentation strength test; characterization of surface tests: UV–vis spectrophotometry, MicroRaman spectroscopy analysis; ageing test in saliva-comparison; ageing test in sugary drink-comparison; weight variation test in saliva) were performed in an in-vitro comparative study of a giomer (Beautifil II by Shofu Dental Corporation Osaka, Japan), a compomer (Dyract Extra by Dentsply, Caulk, Germany), a glass ionomer cement (Ketac Fil Plus by 3M ESPE) and a resin composite (TetricEvoceram by Ivoclar Vivadent AG, Schaan, Liechtenstein).
Materials investigated showed very similar behavior even if giomer demonstrated an hardness two times higher than compomer and resin composite despite the release and recharge capability of the material. The chemical nature of all materials appears to be analogue and comparable. Aging in saliva showed an almost absent of organic contamination on Giomer surface, it was the smallest among the materials tested. Aging in sugary drink do not damage Giomer instead, in Composite Resin some chemical permanent alteration occurred. No changes in weight decease or material loss were observed in samples.
The results obtained confirm the high quality of Giomer material and indicate possible improvements in their usage.

Biomaterials

Poster P.2

AGE-RELATED ACTIVITY OF DENTINAL MMPS

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Endogenous dentin matrix-metalloproteinases (MMPs) are claimed to be responsible for the degradation of resin-dentin interface over time. The age of the patient could influence the amount of enzymatic activity, which could affect the results of the studies on dentin. The aim of the study was to investigate whether there were differences in the age-related activity of dentinal gelatinases using zymographic assay and in situ zymographic assay.
In the zymographic assay analysis, separate pools of dentin powder were obtained from sound teeth of: (1): mixed ages (control), (2) deciduous teeth, (3) permanent molars up to 18 yr patients and (4) permanent molars of >60 years old patients. Each pool was divided in two, with 1a, 2a, 3a and 4a left mineralized (as control), while 1b, 2b, 3b and 4b were demineralized with 10% phosphoric acid. Different pools of dentin powder were submitted to the zymographic analysis. Further, in situ zymographic assay was performed on sections of dentin of the same groups in accordance with Mazzoni et al., 2014.
Deciduous dentin powder groups showed phantom expressions in the area of the bands for MMP-2 and MMP-9. As for the permanent dentin, all demineralized groups showed higher gelatinolytic activity with respect to the mineralized ones. The signal of the MMPs was stronger and more clearly delineated in the young dentin as compared to the old one. In situ zymography also displayed distinctive differences in the activity of MMPs in different groups.
Deciduous dentin powder seems to be inadequate for use in the zymographic assay. The discrepancies in the enzymatic activity could be related to the differences in the amount of mineralized dentinal tissue in different age groups. Additional studies are required to further investigate this hypothesis and evaluate the possible influence on bonding procedures.

Biomaterials

Poster P.3

APICAL SEALING, BIOACTIVITY AND BIOCOMPATIBILITY OF TWO EXPERIMENTAL ROOT-END FILLING CEMENTS

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The aim of this study was to assess the apical sealing ability, bioactivity and biocompatibility of an experimental penta-aggregate calcium silicate cement and a light-curing penta-aggregate calcium silicate cement doped with di-calcium-phosphate as innovative root end filling materials.
A calcium silicate Portland-based (Control, PC), an experimental penta-aggregate calcium silicate (Exp. ENDOPASS) and a penta-aggregate calcium silicate cement doped with di-calcium-phosphate (ENDOPASS LC) were assessed for their alkalinising activity (pH) and biocompatibility. Single-root canal teeth were endodontically treated, filled with gutta-percha and finally submitted to apicectomy. Root end fillings were performed using all tested cements, and their apical sealing ability was evaluated up to 4 weeks of immersion in simulated body fluid (SBF). The mineral precipitation ability at the apical region and the cement adaptation to root dentine was also evaluated through non-destructive optical microscopy both at 24h and prolonged water storage (4 week).
ENDOPASS LC had neutral pH, and it showed the greatest sealing ability after 24h. ENDOPASS also showed excellent fibroblasts proliferation. ENDOPASS presented excellent sealing ability after two and four weeks, as well as biocompatibility after 4 and 7 days, similar to ENDOPASS LC. The control PC cement showed the lowest sealing ability, the greatest alkalinisation properties and greatest cytotoxicity compared to the tested experimental cements. Mineral precipitation, as well as optimal adaptation to the root dentine was observed with the use of the two experimental materials.
ENDOPASS LC and ENDOPASS may be promising materials for root end obturation as they present appropriate (in vitro) sealing ability, biocompatibility and capacity to induce mineral precipitation.

Biomaterials

Poster P.4

ARE THERE ANY RELIABLE CRITERIA DETERMINING DENTAL NANOCOMPOSITES' STRUCTURE-RELATED MECHANICAL PROPERTIES?

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The aim of this study was to test different commercially available dental restorative nanocomposites and to analyse differences between their mechanical strength relative to their structure.
Four dental nanocomposites were chosen for the testing, two nanofilled (Filtek Ultimate Body, 3M ESPE – FUB, and Filtek Ultimate Translucent, 3M ESPE – FUT), and two nanohybrid (Filtek Z550, 3M ESPE – FZ550 and Tetric EvoCeram, Ivoclar Vivadent – TEC) with one microhybrid composite, as a reference material (Filtek Z250, 3M ESPE – FZ250). Ultimate strength of these materials, under static loading, was verified by subjecting the specimens to compressive and diametral tensile strength test and Vickers hardness test. SEM images of tested materials were obtained in order to have insight to their microstructures. The data were statistically analysed by ANOVA.
Generally, TEC showed the lowest values of compressive, diametral tensile strength and Vickers hardness, and was statistically different from the other tested materials throughout all mechanical tests, as opposed to the fact that it has the highest amount of the inorganic volume fraction in its composition (graph 1). Nanofilled FUB did not show higher strength nor hardness from microhybrid reference material, as it could be expected, considering its specifically created nano-structure composed of specifically formed fillers – nanoclasters, and monodispersed nanoparticles. SEM micrographs showed essential differences between structures of tested materials, clearly presenting the fracture zone between prepolymerized fillers and the rest of the filled polymer in TEC, emphasizing the significance of the question on material's structure-related mechanical properties.
It is certain that mechanical strength of dental composites depends on their structure, but none of the singular parameters (chemical composition, particles' size-range, presence of nanometric fillers, prepolymerized fillers, fillers volume fraction) cannot be considered as a reliable criterion of their mechanical success, if they are considered apart from their overall composition.

Biomaterials

Poster P.5

BOND STRENGTH EVALUATION OF A NOVEL HYDROPHILIC UNIVERSAL ADHESIVE SYSTEM

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The aim of this in vitro study was to compare conventional adhesive systems and universal adhesives with a novel hydrophilic adhesive system. The null hypothesis is that there is no difference between adhesive systems tested.
Sixty-four freshly extracted, non carious, human third molars were collected for this study and divided into five groups (n=16 per group) according to adhesive system employed. Universal adhesives were employed both with a etch&rinse (8 teeth) and etch&dry (8 teeth) techniques. Group 1: experimental hydrophilic adhesive (Kuraray, Japan). Group 2: Adhese Universal (Ivoclar Vivadent, Liechtenstein). Group 3: Scotchbond Universal (3M, USA). Group 4 (n=16) was divided into 2 sub-groups (n=8): OptiBond FL (Kerr, USA) and Clearfil SE BOND 2 (Kuraray Noritake Dental, Japan). Every adhesive was applied on dentin according to manufacturers' instructions. After light curing, the restoration was completed with nano-hybrid resin composite (Clearfil ES-2; Kuraray), which was placed in 2mm horizontal layers and light-cured individually for 20 s. After 7days, samples were submitted to microtensile bond strength test. In sixteen additional teeth (n=4/group) the restoration was performed with flowable composite (ES-2 Flow, Kuraray) to perform interfacial nanoleakage evaluation. Data were statistically analyzed with 2-way ANOVA test and significance was set for $p<0.05$.
ANOVA test showed no significant statistical difference among the groups in terms of adhesive system employed. However, the etch&rinse technique showed significantly higher bond strength than etch&dry technique on dentin.
The null hypothesis is partially accepted since the adhesive tested showed similar bond strength, even if the etch&rinse techniques was better than the etch&dry.

Biomaterials

Poster P.6

CAD-CAM BLOCKS MICROTENSILE BOND STRENGTH ON CORONAL DENTIN

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The aim of this in-vitro study was to evaluate different adhesive cementation procedures on coronal dentin bond-strength of two different CAD-CAM materials with μTBS test.
36 molars crowns were flattened and standardized smear layer was created with 600grit paper. Samples were randomly divided in 2 groups according to the CAD-CAM material: G1) Litium Disilicate (IPS e.max CAD, Ivoclar Vivadent); G2) Flexible Nano Ceramic (Cerasmart, GC). Subgroups were then created, according to the adhesive cementation protocol:
SG1: Panavia V5 (Kuraray)SG2: FuturaBond U (Voco) + Bifix QM (Voco)
SG3: Estecem (Tokuyama). Then 4mm CAD-CAM block were prepared, sintered if necessary and luted on the coronal dentin and cured for 180" with a multi LED lamp. Specimens were serially sectioned to obtain 1mm thick beams in accordance with the μTBS test technique. Beams were stressed to failure after 24h. Two-way ANOVA was performed to evaluate the effects of adhesive resin cement and restorative material on coronal bond strength. Significance was set when $p<0.05$.
Two-way ANOVA showed that adhesive luting technique significantly influenced bond strength, while the Flexible Nano Ceramic showed comparable adhesion to dentin than lithium disilicate.
CAD-CAM materials show variable bond strength, based on the luting agent employed. It is however fundamental to evaluate the degradation of hybrid layer after sample aging to understand the possible adhesive longevity of CAD-CAM based restorations.

Poster P.7

Biomaterials

CHEMICAL-INTERACTION AND BOND-DURABILITY OF UNIVERSAL ADHESIVES CONTAINING ADVANCED HIGH-PERFORMANCE FUNCTIONAL MONOMERS

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The objective of this study was to compare chemical interaction and the bonding performance of a recently developed universal adhesive containing poly-GDMAP (glycerol-dimethacrylate- dihydrogen-phosphate) functional monomer to a commercial adhesive containing 10 MDP.
Poly-GDMAP and 10-MDP were first formulated and then submitted to ATR-FTIR to analyse their chemical spectra before and after application (30s) onto middle-dentine specimens (2x2x2mm) and also after washing the dentine with absolute ethanol (30s) followed by distilled water (30s). Twenty extracted human molars were prepared and divided into 2 groups (n=10). Specimens were bonded using two universal-adhesives and light-cured for 20s: Adhesive containing poly-GDMAP (NEB: DEI New Extra Bond One, DEI Italia, Varese, Italy) or containing 10-MDP (CUB: Clearfil Universal Bond, Kuraray, Japan). A build-up of 6 mm using universal nanohybrid composite (Amira Fusion, Voco, Germany) was performed. Specimens were then cut into beams (0.9 mm), immersed in distilled water for 24 hours or 1 year at 37oC and submitted to MTBS; results were analysed by ANOVA and Tukey test ($p < 0.05$). Fractured specimens were analysed with a stereomicroscope and SEM.
FTIR results indicated that poly-GDMAP performed alike the "gold-standard" 10-MDP. Indeed, both monomers were still attached to the dentine surface after water/ethanol washing. Bonded specimens showed that the two adhesives presented no significant differences both at 24h and after one year of storage and no statistically significant drop in MTBS after 1 year of water storage. Both groups quite often showed factures of cohesive type at 24h and mixed/cohesive after a year in water.
The new NEB adhesive with poly-GDMAP as well as that formulated with 10-MDP can create resin-dentine interfaces with a stable and durable bond strength. In clinical practice, the use of self-etching adhesives containing high performance acidic functional monomers can improve the durability of composite restorations.

Biomaterials

Poster P.8

DEGREE OF CONVERSION OF EXPERIMENTAL BIOACTIVE GLASS-CONTAINING COMPOSITES

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To investigate the degree of conversion (DC) of experimental composites containing bioactive glass (BG). These composites were previously shown to be capable of precipitating a hydroxyapatite layer on the material surface, which may aid in the prevention of secondary caries.
Five light-curable composites were prepared by blending a Bis-GMA/TEGDMA resin mixture with 4 μm particles of 45S5 BG, barium glass and silica in variable ratios. Total filler load was 70 wt%, whereas the ratio of BG varied from 0–40 wt%. Composite specimens (n=5 per material) were light-cured (20 s at 1000 mW/cm2) in cylindrical split-molds and the DC was investigated by FT-Raman spectroscopy immediately after curing and 24 h post-cure, for layer thicknesses up to 4 mm. A commercial composite was used as a reference.
The surface DC of experimental composites measured immediately after light-curing ranged from 52.9-67.4%. A significant post-cure DC increase of 9.6-13.8% occurred in all experimental materials. A decreasing tendency of the extent of post-cure reaction in materials with higher percentage of BG was observed. Post-cure DC values ranged from 62.5-81.2% at the material surface, 55.8-80.2% at 1 mm, 39.2-78.3% at 2 mm, 25.1-74.6% at 3 mm, and 10.7-64.5% at 4 mm. The tendency of the DC to decrease with increasing percentage of bioactive glass was consistent for all measuring depths. Thus, in all the abovementioned DC ranges, the lowest and the highest values correspond to composites with 40 and 0 wt% of BG, respectively. The DC for the commercial reference material ranged from 17.4-72.9%.
Experimental bioactive composites filled with BG were capable of attaining the DC in the range of commercial composites. However, high amount of BG considerably impaired the maximum DC at the composite surface and caused a more pronounced DC decline at increasing layer thickness.

Biomaterials

Poster P.9

DENTAL COMPOSITES CYTOCOMPATIBILITY ASSESSMENT: EFFECT OF MESOPOROUS FILLERS AND RESIN COMPOSITION.

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Many new dental composites have been developed to improve their longevity, wear resistance and particularly cytocompatibility. We compared the cytocompatibility of commercial and new experimental dental composites containing mesoporous silica fillers to improve rheological properties and enhance the resin–filler interface. We particularly investigated composites with the resin monomers bisphenol A (BPA)-glycidyl methacrylate (Bis-GMA) or triethyleneglycol-dimethacrylate (TEGDMA) and with porous particles for filler blends.
Five commercial composites with different resin matrices and mineral fillers were compared to four experimental composites designed without any BPA-based monomers or TEGDMA. Porous fillers, with or without silanation, were added in some of the experimental composites. Two reference resin matrices were also selected. Cytocompatibility with cultured primary human gingival fibroblasts was assessed by confocal laser scanning microscopy combined to time-lapse imaging. Fourier transform infrared spectroscopy was used to control monomer conversion rate.
Conversion rates of the experimental composites ranged from 57% to 71%, a comparable ratio for commercial composites. Experimental samples were better tolerated than tested commercial samples not containing TEGDMA and significantly better than those containing TEGDMA. Experimental composites with porous fillers exhibited good cytocompatibility, especially when filler particles were silanated. A correlation between cytotoxicity and the resin

amount was found; a more significant influence of the resin nature was shown.
Cytocompatibility was directly related to the amount of resin in composites. TEGDMA led to acute toxicity and therefore should be avoided in new formulations. TEGDMA affected cytocompatibility more than Bis-GMA. Mesoporous fillers were found to be equally safe as conventional non-porous fillers in dental composites. The sensitive confocal imaging method could be helpful in assessing the long-term toxicity of experimental composites after aging.

Biomaterials

Poster P.10

DENTAL INTERFACE WITH A BULK-FILL COMPOSITE USING ORMOCER® TECHNOLOGY: A COMPARATIVE STUDY

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Polymerization shrinkage of composite materials is often identified as the main cause for failure in posterior teeth restorations. Conventionally, the implementation requires a 2mm layer application in order to overcome this shrinkage stress. The bulk-fill packable composites allow one-time restorations on 4mm depths. A new class of resin composites has been introduced, with fillers and resin matrix based purely on silicon oxide (ormocer® technology), with claims of less than 1.25 % shrinkage during olymerization. The aim of the study was to assess the integrity of the interface with a bulk-fill nanohybrid ormocer® material and compare results obtained with a universal dental composite and a bulk-fill packable composite.
Three different materials were tested: an ormocer® composite (Admira Fusion X-tra, Voco), a bulkfill composite (X-tra fill, Voco) and a universal composite (GrandioSO, Voco). 24 occlusal cavities (4mm depth, 4mm diameter) were generated on third healthy molars. The universal adhesive (Futurabond U, Voco) was used, according to the self-etching mode. The 3 materials were then applied and cured according to the manufacturer's instructions. Half of the samples were thermocycled (1000 cycles). Then, the teeth were cut with a precision diamond disc, under irrigation (Isomet, Buehler).
The interface between the material and the tooth was evaluated by scoring fuchsine dye penetration using optical microscopy (0: no leakage, 1: enamel, 2: dentine, 3: cavity floor). No statistical difference of interface leakage was observed before aging ($p=0.13$) although the three materials had significant different behaviors after thermocycling ($p=0.02$). Ormocer® revealed a better mean leakage score (0.2±0.15) than the others (X-tra fill 2.62±0.3 and Grandioso 2.55±0.58). Scanning Electron Microscopy of the interface confirmed these observations.
This comparative in-vitro study suggested an excellent behavior of the bulk-fill nanohybrid ormocer® composite. Future long-term clinical trials should be conducted to confirm these results.

Biomaterials

Poster P.11

DENTAL SEALANTS:USE OF HYDROPHILIC MATERIALS IN CLINICAL PRACTICE AND IN TRAINING PROFESSIONALS

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Hydrophilic composite resin materials (WETBOND) are compatible with damp environments and can effectively polymerize in the presence of water without affecting the result of the restoration. They have been developed to provide the professional of healthcare a valid alternative when the use of invasive moisture insulating techniques cannot be employed since to compliance and patient comfort. The aims of this split-mouth study were: i) to provide rational indications and guidelines to use such materials; ii) to test their strength when in an oral environment for short and long time; iii) to test the successful employment of these devices by students enrolled in the Dental Hygiene degree program, at the at the Pio Albergo Trivulzio Institute University of Milan, Italy.
24 patients (up to 14 years of age) were selected, in which a minimum of four teeth hadbeen prepared to be sealed (at least one for maxillary or mandibular quadrant). The oralcavity was divided into two halves: the elements of the quadrants 1 and 4 were treated with a hydrophobic photopolymerizable composite material. The elements in quadrants 2and 3 were treated with the hydrophilic composite light-curing Embrace Pulpdent®. Sealed teeth were subjected to instantaneous control and evaluation by an highly trained dental hygienist, and then re-examined at 3 months. Instanteneous control was made evaluating proper material insertion and integral covering of occlusal surface using a Simonsen's derived score.
Our preliminary results suggest that the employment of sealants WETBOND may represent a valid choice when the use of waterproofing methods is not possible, therefore showing increased quality of the seals made with such materials, along with a better short-term persistence in the mouth.
The WETBOND composites are a good alternative to drybond materials, resulting in even better production aspects, quality, persistence and clinical convenience for experienced staff and in training personnel.

Biomaterials

Poster P.12

DO ZIRCONIA TRANSLUCENCY AFFECT BOND STRENGTH OF RESIN-BASED CEMENTS?

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To evaluate if yttria-stabilized tetragonal zirconia polycristals (Y-TZP) of different translucency and thickness affect the bond strength of a resin-based cement irradiated with different curing protocols. The null hypothesis was that the bond strength to Y-TZP was not influenced by translucency, thickness, and curing time.
Four Y-TZP of different translucencies were selected (Noritake Katana UTML, Noritake Katana STML, Noritake Katana ML, Amann Ghirrbach Ceramill Zi White), selectioned in order to obtain 1 mm and 2 mm disks and sintered. The disks were air-abraded with 46 μ Al2O3 and, according to the manufacturers' instructions, the resin-based luting cement (Panavia SA) was employed to lute 2 mm diameter composite cylinders to Y-TZP surface. Dual-cure resin cement was light-cured with a LED unit with different curing time protocols: no light, 10 seconds and 60 seconds by placing the light-curing tip in contact to the opposite surface of each disk. Shear-bond strength test was performed. The translucency parameter (TP) of each zirconia was calculated from the color difference of the material on a black versus a white background. Results were statistically analyzed with ANOVA test and post- hock Tukey test ($p<0.05$).
ANOVA test showed that the bond strength was not influenced by the translucency of the Y-TZP, but was significantly affected by its thickness ($p<0.01$) and by the curing procedure ($p<0.001$). Longer curing time significantly increase the cement's bond strength in all groups.
The null hypothesis was partially accepted since the bond strength to zirconia mainly depended on thickness and curing procedure.

Biomaterials

Poster P.13

DOUBLE COMPETITION: DENTISTRY STUDENTS AND DIRECT COMPOSITE RESTORATIONS

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To demonstrate the efficiency of a new combined technique and to stimulate students' performance in competitions.
50 students from Tirgu Mures Dentistry Faculty who fulfilled the criteria (4, 5 and 6 clinical years, volunteers, without any conflict of interest) were made familiar with the application of ultimate generation of composite. Students have been instructed before the hands-on to perform fillings in vitro on the same models, using the same materials and techniques in a given period of time. A commission of lecturers classified the students (and fillings) according to certain criteria and marked them. The first 20 students were qualified for the next stage, which means they had to perform 2 restorations (one front and one lateral) in vivo, following the protocol. Finally, the best 5 students were named as highest performers.
All participants' results have been compared with classical techniques usually used during practical works and internships. All 50 students practiced and studied theoretically before the hands-on, without having the pressure of an exam. All practical applications (restorations) in vivo and in vitro have been of high quality and the selection was tough on everyone. Students' performances were not dependent on their study year but they were influenced by the correct use of a good composite and protocol.
In vivo and in vitro results were superior compared to classical techniques. Students, mindful of time, knowledge and the versatility of the composite were interested and appreciated the new combined technique. The aim was to introduce this new technique in the curricula of the Faculty of Dentistry of Tirgu Mures.

Biomaterials

Poster P.14

EFFECT OF ACCELERATED AGING ON THE FLUORIDE RELEASE OF FLUORIDE RELEASING MATERIALS

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The aim of the study was to determine whether five fluoride containing resin restorative materials could maintain fluoride release, fluoride recharge, and decharge over accelerated aging using active carbon.
Fluoride containing compomer (Ivoclar Compoglass F, Voco Glasiosite),Resin-Modified Glass Ionomer Filling Material (3M PhotacFil) and glass ionomer (3M Ketac Molar, Voco IonoStar Plus) were analyzed. Specimens of each material(n = 5) were fabricated for six test groups : 24h later, 1st accelerated defluoration for 3 days,1st recharge (with 4min in APF gel), 2nd accelerated defluoration for 3 days,2nd recharge (with 4min in APF gel),3rd accelerated defluoration for 3 days. The fluoride release from these specimens was measured using a HPLC with anion column at the end of the each period.
The amount of fluoride release for aged Compoglass and Glasiosite markedly increased in water storage after recharging with APF. The difference was not so great for aged Ketac Molar and Ionofil after first recharge. Photacfil didn't show alteration in fluoride release by decharge or recharge of fluoride. APF application cause Compoglass,Glassiosite, KetacMolar and Ionofil to increase fluoride release. But APF didn't affected Photacfil's fluoride release over aging.

Biomaterials

Poster P.15

EFFECT OF CARBODIIMIDE(EDC) AND ACROLEIN ON PUSH-OUT BOND STRENGTH IN ROOT DENTIN

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The application of collagen cross-linkers as therapeutic primers to dentin has been reported to reduce the degradation of the hybrid layer over time. The aim of this study was to investigate the potential effects of two collagen cross-linking agents, 1-ethyl-3-(3-dimethylaminopropyl) carbodiimide (EDC) and acrolein, on bond strength of fiber posts luted to intra-radicular dentin with an etch-and-rinse adhesive system immediately and after thermocycling. The hypothesis tested was that cross-linking pretreatment does not affect push-out bond strength.
Thirty single-rooted human teeth were endodontically treated and randomly assigned to 3 groups (n=10) according to dentinal pretreatment: 1) Control: etching+no cross-linking treatment+bonding agent*+resin cement**; 2) EDC: etching+EDC solution for 60s+bonding agent*+resin cement**; 3) Acrolein: etching+acrolein solution for 60s+bonding agent*+resin cement**. Bonded specimens were sectioned into 1mm thick slabs and either submitted to thermocycling (TC - 40,000 cycles from 5°C to 55°C in artificial saliva, alternatively 30s for each bath) or stored 7 days in artificial saliva prior to push-out bond strength testing (T0).
Data were statistically analyzed with Kruskal-Wallis test (p=0.05).
Push-out bond strength values are listed in Table 1.
Table 1: Bond strength means and standard deviations (MPa) reached under push-out test at time zero (T0) and after thermocycling (TC).
Control
T0 3,70 (±2,57) a
TC 3,68 (±1,66) a
EDC
T0 3,98 (±1,80) a
TC 4,63 (±1,75) a
Acrolein
T0 3,80 (±2,57) a
TC 3,60 (±1,33) a
Different superscript letters indicate statistical differences ($p<0.05$).
The tested hypothesis was accepted since both EDC and acrolein, used as therapeutic primers, did not influence the bond strength values of fiber posts luted with an etch-and-rinse adhesive system immediately and after thermocycling. Further studies evaluating longer storage time and simulated aging are encouraged. Moreover, future studies are needed to clarify the biocompatibility of EDC- and acrolein-based primers and their use in clinical conditions.
* ExciTE F DSC, Ivoclar-Vivadent; **Variolink II, Ivoclar-Vivadent

Biomaterials

Poster P.16

EFFECT OF CHIT-MA70 ON THE MMPS ACTIVITY

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The aim of this study was to evaluate the effect of methacrylate-modified chitosan (Chit-MA70) on dentin endogenous enzymatic activity and to compare three different concentrations (1%, 0.5%, 0.1%) of this experimental modified polymer.
Human dentin was frozen and grinded in a miller. Powdered dentin aliquots were demineralized with phosphoric acid and treated with Chit-MA70 (at three different concentrations 1, 0.5 or 0.1%), a chitosan modified with methacrylic acid on 16% of the amino groups. Mineralized aliquots were also treated with the modified polymer. Additional aliquots of mineralized and demineralized dentin were used as control groups. Dentin proteins were extracted from each experimental group and electrophoresed under non-reducing conditions in 10% SDS-PAGE containing fluorescein-labeled gelatin. After electrophoresis, gel was washed and incubated in enzyme incubation buffer for 48 hours at 37°C. Afterwards, proteolytic activity was registered under long-wave UV light scanner (Chemi-Doc Universal Hood, Bio-Rad) and quantified by Image J software (NIH, Bethesda).
Dentin treatment with Chit-MA70 had an effect on the enzymatic activity registered by zymographic assay and depended on its concentration. The incubation with 1% ChitMA70 evidenced the presence of MMP-2 and MMP-9 with the expression increased compared to both controls groups (mineralized and demineralized). By contrast, 0.5 and 0.1% Chit-MA70 interfered on the MMPs activity, decreasing their expression. The highest enzymatic inhibition was revealed after incubation with 0.5% Chit-MA70.
0.5% Chit-MA70 resulted as the most effective concentration to reduce the MMPs expression on mineralized and demineralized dentin.

Biomaterials

Poster P.17

EFFECT OF CURING TIME ON BIOFILM FORMATION ON DIFFERENT NANOFILLED RESINS

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The aim of this in vitro study was to evaluate the effect of curing time on roughness, bagnability and bacterial biofilm formation of different nanofilled resins.
48 pressed round 2mm-thick disks of each tested composite were prepared (n=12). Group 1: Admira Fusion X-Tra (Voco, Germany); Group 2: Filtek Bulk Fill Posterior (3M, USA); Group 3: SDR (Dentsply, Germany); Group 4: Grandioso Flow (Voco, Germany). Before light curing with the same multiLED light, sample of each group were divided in 2 subgroup according to the curing toime (10 s and 80s). All prepared samples were stored in a drying oven at 37°C for 24 h. The upper surface was then serially tested to obtain superficial roughness (Ra), surface free energy and chemical constitution through EDX analysis. Then, samples were sterilized and stored in a bioreactor to simulate adhesion and biofilm formation by Streptococcus Mutans. The biofilm was then evaluated and quantified through a confocal laser microscopy after dead/alive coloration. Statistical analyses was performed with ANOVA test and significance was set for $p<0.05$.
The ANOVA test showed that curing time significantly affected the biofilm formation over composite surfaces ($p=0.0001$). Within tested composites, group 2 showed the less formation of biofilm after 10 second of polymerization.
The curing time of nanofilled composites seems a fundamental step to limitate biofilm formation over surface materials. Further studies are necessary to evaluate how aging process affect biofilm formation

Biomaterials

Poster P.18

EFFECT OF IMMEDIATE/DELAYED DENTINAL SEALING ON BOND STRENGTH WITH UNIVERSAL ADHESIVES

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The aim of this in-vitro study was to evaluate the influence of immediate or delayed adhesive system application on coronal dentin bond-strength with universal adhesives. The null hypothesis is that immediate dentinal sealing (IDS) do not provide higher bond strength than delayed dentinal sealing (DDS), independently of the adhesive technique.
50 molars crowns were flattened and standardized smear layer was created with 600grit paper. Samples were randomly divided in 2 groups: immediate dentinal sealing (IDS) and delayed dentinal sealing (DDS, after 8 weeks of storage in artificial saliva at 37°C). Subgroups were then created, according to the adhesive treatment:SG1: 3step etch-and-rinse (Scotchbond, 3M, USA)
SG2: Clearfil Universal Quick (Kuraray, Japan) applied in self-etch mode.
SG3: Clearfil Universal Quick (Kuraray, Japan) applied in etch-and-rinse mode
SG4: FuturaBond U (Voco, Germany) applied in self-etch mode
SG5: FuturaBond U (Voco, Germany) applied in etch-and-rinse mode
Then 4mm resin composite was applied and cured with LED lamp. Specimens were serially sectioned to obtain 1-mm-thick beams in accordance with the μTBS test technique. Beams were stressed to failure after 24h. Two-way Anova was performed to evaluate the effects of immediate/delayed sealing and adhesive procedure on coronal bond strength.
Two-way Anova showed that adhesive technique did not influenced immediate bond strength, while delayed bond strength was significantly worst ($p=0.0001$), above all with etch-and-rinse mode of application of universal adhesives.
Null hypothesis is partially refused since the immediate dentinal sealing provide higher bond strength, independently of the adhesive technique.

Biomaterials

Poster P.19

EFFECT OF WATER UPTAKE ON DIFFERENT NANOFILLED RESINS MECHANICAL PROPERTIES

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The aim of this in vitro study was to evaluate the effect of water uptake on hardness and elastic modulus of different nanofilled resins.
30 pressed round 2mm-thick disks of each tested composite were prepared (n=6). Group 1: Admira Fusion (Voco, Germany); Group 2: Admira Fusion X-Tra (Voco, Germany); Group 3: Ceramix Universal (Dentsply, Germany); Group 4: Filtek Bulk Fill Posterior (3M, USA); Group 5: Grandioso (Voco, Germany). All prepared samples were stored in a drying oven at 37°C for 24 h, and their masses were measured using a precision scale. This process was repeated until a constant mass was obtained. Then, samples were tested with a Nanoindenter XP (MTS/Agilent, USA), equipped with a diamond Berkovich indenter and characterized by a theoretical force resolution of 50 nN and a theoretical displacement resolution lower than 0.01 nm. The loading-displacement (P-h) curves have been analyzed by using the Oliver-Pharr method in way to obtain the Elastic Modulus and the Hardness. Samples were finally stored in artificial saliva and the above mentioned evaluations were repeated after 24h, 7 and 15 days of storage. Statistical analyses was performed with ANOVA test and significance was set for $p<0.05$.
After 15 days of incubation in artificial saliva, a significant increase in weight ($p=0.001$) and a reduction in mechanical properties was observed. The materials tested sowed comparable results.
The water uptake of nanofilled materials could impact in nanohardness and young modulus of tested materials. Further investigations are necessary to evaluate the effect of water uptake on longer incubation period and the effect of surface treatments on it.

Biomaterials

Poster P.20

EFFECTS OF DIFFERENT PHOTO-POLYMERISATION PROTOCOLS ON THE PHYSICOCHEMICAL PROPERTIES OF RESIN COMPOSITES

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Polymerization of dental composites occurs through a chain reaction that is induced by free radicals. If composite is exposed to air during this process, oxygen causes polymerisation interference or delay. The purpose of this in vitro study was to investigate the influence of light-curing performed in the presence of air or argon gas on the ultimate tensile strength, Knoop micro-hardness, water sorption/solubility and micro-roughness of different current composites.
A micro-filled (Enamel AURA, SDI, Australia), nano-hybrid (Dentine AURA, SDI, Australia), hybrid halloysite-nanotubular (Experimental), ceramic nano-hybrid (Admira Fusion - ORMOCER®, VOCO, Germany) were used. Ten disc specimens were light-cured for 30 s in the presence of air (n=5) or argon (n=5), and then submitted to Knoop micro-hardness assessment (50g/15s) before and after chemical degradation in alcohol for 24h (softening ratio). Further five disc specimens were prepared for each group and submitted to water sorption/solubility assessment. Further five cubic-shape specimens per group were first submitted to roughness measurement (Ra, μm), then sectioned in sticks (1.5 mm) and finally tested for ultimate tensile strength (0.5 mm/min).
Polymerisation under argon increased the micro-hardness and decreased the surface roughness in all composites. The SDI micro-filled composite showed the lowest ultimate tensile strength, both when light-cured in air or argon. Only Admira showed no significant reduction in water sorption, while all materials showed no significant change in water solubility when light-cured in air or argon. The experimental hybrid nano-tubular composite showed an important increase of its mass probably due to transformation of halloysite-nanotubes into calcium phosphates.
Light-curing procedures performed in the presence of argon avoid the formation of the oxygen-inhibited layer, so increasing the hardness and the polishability properties of resin composites. This alternative light-curing strategy may also reduce the water sorption of some types of composites and so their performance over time when applied in the oral cavity.

Biomaterials

Poster P.21

EVALUATING WEAR EFFECTS OF DIFFERENT BEVERAGES WITH DAILY CONSUMPTION HABITS ON COMPOSITES

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Consumption of various beverages with different structural features can change physical and mechanical properties of composites thereby undermine the quality of restorations. Patients can consume similar/different drinks at meals. Depending on this, chemicals in beverage formulations could lead to surface degradation and wear of composites. The aim of this study was to investigate cumulative effects of fruit juices or/and alcoholic beverages on the amount of wear on different composites by simulating oral environment in vitro.
168 composite samples were prepared (Clearfil AP-X, TPH, Filtek Ultimate-Enamel,Beautifil, polished, stored(37°C)in distilled water(24h).Daily beverage consumption habits model was created to simulate consumption frequency of acidic or/and alcoholic beverages. Experimental liquids were distilled water, beer,100%orange+pomegranate juice mixture. Specimens were immersed in different liquids for 2 min. in each meal periods everyday at exact time during a month. Group A:No beverage as control, B:Fruit juice once a day, C:Fruit juice twice a day, D:Fruit juice three times a day, E:Fruit juice twice a day, beer once a day, F:Fruit juice once a day, beer twice a day. After every immersion, samples were rinsed under tap water then kept into distilled water until next meal. Wear tests were carried out using reciprocating wear tester(7N loads, 2000 cycles),wear track length of 5mm,sliding speed of 10 mm/s. For counter body,Al2O3 balls(ø 6mm) were used. Wear track areas were measured with a profilometer. Two Way Anova and Tukey tests were used for statistical analyzes.
There was no statistically significant difference between control groups(composites not exposed to beverages)in terms of wear amounts ($p>0.05$).It was observed that physical properties of composite resins created an increasing effect on wear amounts of beverage consumptions. When considering experimental groups related to daily beverage consumption habits, a statistically significant difference was found between composites in terms of wear amount($p<0.01$).
Differences between cumulative effects of fruit juice and alcoholic beverages on wear amount of composites could be related to the composition of materials and content of beverages

Biomaterials

Poster P.22

EVALUATION OF NOVEL HYDRAULIC BIOACTIVE SEALERS IN TEETH WITH WIDE WET APICES

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The aim of the study was to assess sealing ability of new generation bioactive root sealers in simulated wet root canals with wide apex, and to evaluate calcium release, alkalinizing activity and the apatite forming ability by ESEM-EDX of novel endodontic sealers.
Polydimethylsiloxane-based sealers GuttaFlow bioseal, GuttaFlow 2, RoekoSeal Automix (Coltène/Whaledent Inc., USA), and calcium silicate-based sealers MTA Fillapex (Angelus, Brazil), BioRoot RCS (Septodont, France) and TotalFill BC Sealer (FKG Dentaire SA, Switzerland) were tested.
Roots were prepared to an apical diameter #40 using nickel-titanium rotary files (HyFlex CM, Coltène/Whaledent Inc., USA), obturated with single cone technique and inserted into simulated alveoli (silicon socket filled with 0.02 mL of HBSS) reproducing the clinical conditions of a wet apical environment. Sealing ability was evaluated as fluid filtration rate at 1,14,28 days, and 10 months.
Alkalinizing activity and calcium release was evaluated after 3 hours and 1,7,14,28 days. ESEM-EDX analyses were performed on root apices after ageing in the simulated alveoli for 28 days.
At 10 months, GuttaFlow bioseal (0.028±0.025) and BioRoot RCS (0.028±0.023) performed similarly, showing the most stable sealing ability.
Distributions of both pH and calcium significantly differed from Gaussian (Shapiro-Will test, $p<0.05$). BioRoot RCS and TotalFill BC Sealer showed the highest alkalinizing activity (pH values >10) up to 14 days. Calcium silicate-based sealers showed greater calcium release ability, especially BioRoot RCS up to 3 hours.
GuttaFlow bioseal demonstrated to be a promising endodontic material for teeth with wide wet apices. However, calcium silicate-based sealers due to their hydraulic behaviour (ability to set in wet environment) and high calcium release, might represent the best choice when apical barrier formation and periapical bone regeneration are needed.

Biomaterials

Poster P.23

EXPERIMENTAL EVALUATION OF EFFECTIVENESS BULKFILL'S COMPOSITE POLYMERIZATION BY LATEST LED LAMPS GENERATION

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The aim of this study was to assess the Conversion Degree (DC) of different bulkfill composites cured with different LED curing lamps at different distances between light tip and bottom of a simulated cavity.
Four bulkfill flow (SDR, 3M-Flow, Venus BulkFill, Vivadent Evo-Flow) and three bulkfill condensables (3M-Posterior Bulk, Sonicfill, Vivadent Evo-Ceram) were selected for the study. Five LED polywave or monowave curing lights (Valo, Bluephase, Demi, DeepCure-S, Smartlite-Focus) were used in combination with M.A.R.C (Managing.Accurate.Resin.Curing) to assay irradiance levels. 140 composite cylinders were made (2 for each lamp/material combination), 4 mm-thick and -wide. 70 specimens were polymerized at a distance of 2 mm, and 70 at 4 mm. After 24h Vickers's micro-hardness was assayed for both upper and lower surface of each sample with micro-hardness tester. The DC on the non-irradiated area (bottom) was considered as acceptable if equal or greater than Watts's index (80% cut-off), assuming 100% the directly irradiated surface. Data were statistically analyzed using two-way ANOVA, an analysis of multiple comparisons (with p set at 0.05).
MARC analysis reported that radiance for each curing light reached 16 J/cm2 only up to 3 mm from sensor. The presence of a 4 mm bulkfill composite cylinder, only some lamp/material combinations overpassed the 80% cut-off on the bottom in 20": 17 at a tip distance of 2 mm, and 11 at 4 mm. Smartlite-Focus and Elipar DeepCure-S showed the best efficiency. Heraeus-Bulk and SDR have passed 80% threshold among all composite materials.
The DC was found to change according to both light sources and composite materials used. This could be related to the percentage of filler as SDR (60%) revealed higher DC as Heraeus-Bulk (38%). LED monowaves, having a higher total energy/better light's management, showed higher DC values than LED polywaves, with lower light energy, at 20 s exposure.

Biomaterials

Poster P.24

GLOSS ANALYSIS OF CERAMIC MATERIALS TREATED WITH DIFFERENT PROPHYLACTIC PASTES.

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The aim of this study was to evaluate the surface gloss of ceramic materials after polishing with different prophylactic pastes.
One-hundred-twenty specimens obtained from ceramic blocks of glass-ceramic reinforced with leucite (IPS Empress CAD; Ivoclar Vivadent), lithium disilicate (IPS E.max CAD; Ivoclar Vivadent) and zirconium oxide (Zenostar; Ivoclar Vivadent) were divided into three groups, forty for each ceramic material. After ground finishing, each specimen was glazed and randomly divided into four groups for each material including the control group. The samples were polished with one of three prophylactic pastes, Cleanic Fine (CF), Nupro Fine (NF) and Proxyt Fine (PF) except for the control group. Specimens were polished for 2 minutes with a prophy cup mounted on the handpiece under a costant load of 400 gr at 2000 rpm. Surface gloss was measured with the glossmeter ZGM 1022 (Zehntner CH) with 20° of light geometry. Gloss values were indicated as gloss unit (GU). Zero value (0GU) was assigned to a completely non-reflective surface while 100 GU was the value assigned to a polished opal glass with a maximum refractive surface.
IPS Empress CAD: The control group showed higher surface gloss (GU 52,45) compared with the other groups (Nupro: GU 45,50; Cleanic: GU 51,60, Proxyt: GU 51,75). IPS E.max CAD: Control group and Proxyt (GU 45,45; GU 42,15) showed higher surface gloss than Nupro and Cleanic groups (GU 41,70 and GU 38,6). Zenostar MT 0: control group showed lower surface gloss (GU 33,75) compared with the other groups (Cleanic GU 38,1; Nupro GU 36,05; Proxyt 42,75).
The surface gloss showed a decrease when the roughness increased with IPS Empress CAD and IPS e.max CAD materials, whereas increase with Zenostar MT0. The prophylactic pastes could change the surface gloss of the ceramic materials.

Biomaterials

Poster P.25

INFLUENCE OF CURING-TIME AND CURING UNIT ON THE MICROHARDNESS OF BULK-FILL COMPOSITES

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The aim of this study was to investigate the influence of bulk thickness, curing time and light curing unit type on the microhardness of low and high viscosity bulk fill composites.
Bulk fill composites; Venus Bulk Fill and SonicFill were tested and, Solitaire 2 was used as control. For each bulk fill material, different incremental thicknesses (8 mm diameter, 2, 4 and 5 mm height) and only 2 mm thick specimens were prepared for the control group (n=7 per group). Specimens were light cured for 20 s and 40 s using QTH (850 mW/cm2) and LED (1500 mW/cm2) curing units. After light curing the specimens were stored in distilled water at 37 °C for 24 h. On each sample, three measurements were recorded at the top and the bottom surfaces by Vickers hardness tester and the bottom/top hardness ratio were recorded. The data were statistically analyzed by One-way ANOVA, Tukey HDS ($p<0.05$).
Bulk fill resin composites tested showed more than 80% hardness ratio in all increment thickness and irradiation times regardless of the light curing unit. There were significant differences in hardness ratio between 2 mm and 4 mm thickness ($p<0.001$), but no significant differences were observed among the 4 mm and 5 mm thick bulk fill samples ($p>0.05$). Among the specimens that were polymerized with LED LCU demonstrated significantly higher bottom/top hardness ratio than QTH lamp irrespective of the thickness, curing time, and material type ($p<0.001$). No significant differences were observed among the curing time ($p>0.05$).
Bulk fill resin composites tested showed more than 80% hardness ratio in all increment thickness and irradiation times regardless of the light curing unit. There were significant differences in hardness ratio between 2 mm and 4 mm thickness ($p<0.001$), but no significant differences were observed among the 4 mm and 5 mm thick bulk fill samples ($p>0.05$). Among the specimens that were polymerized with LED LCU demonstrated significantly higher bottom/top hardness ratio than QTH lamp irrespective of the thickness, curing time, and material type ($p<0.001$). No significant differences were observed among the curing time ($p>0.05$).
Key Words: Bulk-fill composites, depth of cure, QTH, LED, microhardness

Biomaterials

Poster P.26

INFLUENCE OF LIGHT-CURE ON THE SHEAR BOND STRENGTH OF UNIVERSAL ADHESIVES

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To evaluate the bonding ability expressed as shear bond strength (SBS) and nanoleakage (NL) expression of an experimental simplified universal adhesive system used in combination with dual-cure resin cements in presence or not of light activation.
Sixty composite cylinders (Venus Diamonds) were luted to deep coronal dentin according to the following bonding procedures: (i) iBond universal experimental formulation/Clearfil Esthetic cement (EXP; Heraeus Kulzer/Kuraray Dental); (ii) Scotchbond universal adhesive/Clearfil Esthetic cement (SCO; 3M/Kuraray); (iii) RelyX Unicem self-adhesive resin cement (RXU; 3M). Specimens were randomly divided in two subgroups according to the polymerization mode of the resin cements (n=10): self-cure mode (SC; 1h at 37°C) or dual-cure mode (DC; 20s light-cure followed by 15min self-cure at 37°C). After 24h storage (37°C, 100% relative humidity), SBS was measured with a universal testing machine. The failure mode was analyzed with an optical microscope and the fracture pattern was evaluated under SEM. Three additional specimens/group were prepared for the analysis of the interfacial NL expression. SBS data were statistically analyzed with two-way ANOVA/Tukey's test ($p=0.05$) including premature failures. NL expression was evaluated through light-microscopy.
The factor "SC" significantly influenced the SBS of the tested materials ($p<0.05$). EXP/DC and RXU/DC attained the highest bond strength results (13.1±2.8 and 11.3±3.6 MPa, respectively). No differences were found between the tested materials in absence of light activation ($p>0.05$), and EXP/SC showed the lower SBS values overall the groups (0.16±0.2 MPa). NL results showed higher percentage of $AgNO_3$ deposits when the materials were used in the SC mode, irrespective from the bonding material used.
Based on these preliminary results, light-cure improves bonding effectiveness and sealing ability of simplified universal adhesive systems compared to the solely self-cure activation.

Biomaterials

Poster P.27

INNOVATIVE RESIN COMPOSITES CONTAINING FUNCTIONAL HALLOYSITE-NANOTUBES FILLERS DOPED WITH TRICLOSAN

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Triclosan (TCN) is an antimicrobial agent easy to process and incorporate into alumonosilicate-(halloysite) nanotubes (HNTs). Incorporation of HNTs confers therapeutic properties such as antibacterial and remineralising. The aim of this study was to evaluate the physicochemical properties of three different experimental resin composites containing an aluminosilicate-(halloysite) filler doped with triclosan (HNT/TCN) and compare to those of commercial resin composites.
Three experimental resin composites were prepared using bis-GMA, bis-EMA, TEGDMA, camphorquinone and ethyl 4-dimethylaminobenzoate containing different amounts of a micro-hybrid filler (68.5wt% EXP-SS2; 72.3 wt% EXP-SS3; and 79.6 wt% EXP SS5) made of a constant amount of silica/barium glass (80wt%) and HNT/TCN filler (20wt%). Three commercial composites were used: a micro-filled (ENAM: Enamel AURA, SDI Australia), nano-hybrid (DENT: Dentine AURA, SDI Australia), and nano-cluster composite (SUPREME: Filtek Supreme XTE, 3M ESPE, USA). Ten disc specimens for each composite were submitted to Knoop micro-hardness assessment (50g/15s) before and after chemical degradation in alcohol for 24h (softening ratio). Further five disc specimens per group were submitted to water sorption/solubility assessment. Further five cubic-shape specimens per group were sectioned in sticks (1.5 mm) and tested for ultimate tensile strength (0.5 mm/min).

The experimental composites SS5 revealed no significant difference in microhardness and ultimate tensile strength compared to the nanocluster SUPPREME composite. All the experimental groups had comparable water sorption property to DENT-SDI and SUPREME. However, there were significant differences between the commercial composites and the experimental ones for water solubility, as all the experimental nano-tubular composites showed an important increase of their mass due to transformation of halloysite-nanotubes into calcium phosphates.
All the experimental composites filled with aluminosilicate-(halloysite) filler doped with triclosan (HNT/TCN) have comparable properties to those of commercial nano-hybrid and nano-cluster composites. Thus, EXP-SS2 may be potentially suitable for clinical application as enamel composite, while EXP-SS5 as composite for posterior restorations.

Biomaterials

Poster P.28

IONS-MODIFIED NANOPARTICLES AFFECT FUNCTIONAL REMINERALIZATION AND ENERGY DISSIPATION THROUGH THE RESIN-DENTIN INTERFACE

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To evaluate the remineralization at the hybrid layer through changes in the nanomechanical properties at dentin interfaces infiltrated with zinc and calcium doped polymeric nanoparticles (NPs).
Dentin surfaces were phosphoric acid etched, an ethanol suspension of NPs was applied (NPs, Zn-NPs, Ca-NPs) and were bonded with Single Bond (SB). After 24 h and 21 d of storage, the resin-dentin interface was evaluated using a Hysitron Ti Premier nanoindenter and a nano-DMA package. Modulus mapping of samples was conducted by imposing a quasistatic force setpoint, Fq=2 μN, to which a sinusoidal force (FA=0.10 μN;f=100 Hz) was superimposed. Data from 30×30 μm regions were collected (0.2 Hz). Mean and standard deviations (SD) were calculated and comparisons performed by ANOVA and Student-Newman-Keuls ($p<0.05$).AFM imaging was performed.
Means and SD of complex modulus attained in samples are presented in the table (GPa). Same capital letter indicates no significant difference between 24h and 21days storage. Same number indicates no significant differences between different zones within the same adhesive and storage group. Identical lower case letter indicates no significant differences between different adhesive groups.
SB NPs+SB CaNPs+SB ZnNPs+SB
24h
Hybrid Layer (HL) 44.66
(16.1)A12a 46.67
(9.4)A12a 64.34
(6.2)A2a 99.28
(7.2)A2b
Bottom HL
51.48
(13.7)A12a 35.99
(8.5)A1a 70.3
(8.1)A2b 51.8
(7.6)A2b
Intertubular dentin
65.91
(6.2)A2a 46.21
(8.6)A12b 116.84
(11.2)A3c 54.87
(2.9)A1b
Peritubular dentin 126.17
(13.95)A3a 54.69
(6.30)A2b 215.78
(36.26)A4c 179.97
(13.87)A3d
21d Hybrid Layer (HL) 41.50
(7.3)A2a 38.08
(2.8)A1a 116.16
(23.2)B2b 85.39
(7.9)A2b
Bottom HL
33.27
(3.1)B2a 45.49
(3.6)A2b 71.82
(2.8)A1c 89.73
(9.9)B2d
Intertubular dentin
30.60
(4.17)B2a 76.52
(9.49)B3b 65.84
(4.08)B1b 96.76
(5.08)B2c
Peritubular dentin 57.47
(5.7)B3a 70.64
(13.6)A3b 98.03
(20.9)B3c 116.97
(33.9)B2c
Ca-NPs infiltration produced a favorable dissipation of energy with minimal stress concentration through the crystalline remineralized resin-dentin interface, causing minor damage at this structure.
Project MAT2014-52036-P supported by the Ministry of Economy and Competitiveness (MINECO) and European Regional Development Fund (FEDER).

Biomaterials

Poster P.29

MARGINAL AND INTERNAL ADAPTATION OF RESIN BASED BIOMATERIALS IN CLASS II RESTORATIONS

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To evaluate the marginal and internal adaptation of new resin based biomaterials in class II MOD adhesive direct and indirect restorations by means of a 3D X-ray micro-computed tomography (micro-CT) analysis. Caries-free extracted lower human molars with similar size were assigned to groups A, B and C respectively (N = 10 per group). Class II MOD cavities were prepared. A resin bonding system in combination with a direct bulk resin composite filling material in a multi-layers technique with a light curing for 20 and 40 sec respectively (Elipar Freelight 2 LED, 3M Espe, USA) was adopted in Group A (Filtek bulk Fill and Scotchbond Universal, 3M Espe USA. A milled cemented resin composite inlay was adopted in Group B (Estelite blocks and Estecem, Tokuyama, Japan). A pressed cemented lithium disilicate inlay was used in Group C (IPS e.max CAD and Variolink Esthetic, Ivoclar-Vivadent, Italia). Marginal and internal resin based biomaterials adaptation were evaluated

by horizontal and axial sections. Cement thicknesses were measured using 3D micro-CT (Skyscan, 1172, Belgium) and analyzed using Statistics (Anova and Tukey's tests, alpha = 0.05).
No internal debonding was found in the three groups. Cohesive and adhesive fractures marginally occurred in group A in several samples and voids or air bubbles were discovered among the composite layers. In group B and C no voids were present. Good quality margins on the floor and lateral walls was found. In group B the mean marginal and internal thickness was of 38 (+/− 3 micron). In group C, it was estimated of 40 (+/−4 micron). No statistics significance was reported.
Marginal and internal resin-based biomaterials adaptation appeared different in large class II MOD direct and indirect posterior restorations. The use of an indirect adhesive restorations made by block resin composite or lithium disilicate biomaterials could be preferred.

Biomaterials

Poster P.30

MERCURIAL INTOXICATION IN DENTAL CLINIC: MYTH OR REALITY IN COTE D'IVOIRE?

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Dental amalgam, the coronary restoration material used in restorative odontology, is the subject of controversy because of the mercury present in its composition. Despite this, in Côte d'Ivoire, it remains the most used restoration material according to several studies. According to the US Environmental Protection Agency (US- EPA) and World Health Organization (WHO), The minimum value of mercury vapor tolerated is 999 ng/m3 ; Beyond that, there are risks (Neurodegenerative diseases, foeto-toxic, infertility, …) Incurred by the population. The objective of this study was to measure the level of mercurial vapors in the dental offices of Abidjan and to assess the risks faced by the practitioner, his staff and patients.
Using "Lumex", a spectrophotometer, we measured the levels of mercurial vapors in fifty dental offices in the city of Abidjan. The measurement was made as soon as the cabinet was opened before any care, then after the removal of an amalgam.
The results show variable rates ranging from 60 ng/m3 to 10060 ng/m3 according to the following information: the dental clinic is ventilated, not at all ventilated; and whether the amalgam is still used or not in the dental clinic.
It emerges from this study that the risks of mercury poisoning remain a reality in our country according to US-EPA and WHO standards.
Key words: Dental amalgam, mercurial vapors, intoxication, dental clinic

Biomaterials

Poster P.31

NANOINDENTATION VERSUS VICKER'S HARDNESS OF HYBRID CERAMICS

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Mechanical properties are an important part of the newly emerged hybrid ceramics as CAD/CAM blocks for indirect aesthetic restorations. The aim of this study was to evaluate hardness and elastic modulus of different CAD/CAM blocks using two indentation techniques (nanoindentation and Vicker's hardness).
In this study, eight materials with different filler loading were tested: a non-filled polymer, polyetheretherketone (PEEK) and a low filled polymer, Dentokeep (20% ceramic by weight). Nano ceramic resin materials: LavaUltimate (80% ceramic nano particles by weight); Cerasmart (71% silica and barium glass nanoparticles by weight); Crios (70% of glass and amorphous silica by weight); Shofu (61% silica-powder, zirconium silicate, microfumed silica by weight). Polymer infiltrated ceramic network (PICN) material, VitaEnamic (86% feldspathic ceramic, by weight). VitablocMark II: a feldspathic ceramic. Specimens of 16.5x4x2mm (LxWxH) dimensions were cut using a Diamond saw machine. All specimens had standardized geometry, were highly polished and cleaned with water ultrasonic bath. Thirty indentations were undertaken for each material for each test. Vickers hardness was measured by a micro hardness tester (FM-700, Future Tech Corp., Japan). Nano-indentation measurements were undertaken (elastic modulus, hardness) using nano indenter (Nanovea) equipped with Berkovich three-sided pyramidal diamond tip. One-way analysis of variance (ANOVA) and post hoc Bonferroni test were used to analyse the results using SPSS 22.0 software with 95% confidence.
The mean values ranges were: microhardness 25.7 (0.05) to 502.4 (2.28) (Kg/mm2); nanohardness 0.317 (0.008) to 6.83 (0.379) (GPa) and elastic modulus 2.53 (0.15) to 47.7 (3.47) (GPa). VitablocMark II showed the highest values while PEEK showed the lowest.
Within the limitations of this study, PICN block had a comparable hardness and elastic modulus to ceramic (VitablocMark II). CAD/CAM composite blocks with disperse fillers showed high hardness and elastic modulus values. However, these values were very low compared to ceramic (VitablocMark II).

Biomaterials

Poster P.32

NANOLEAKAGE AND MARGINAL QUALITY OF DIRECT COMPOSITE VENEERING SYSTEM FOR CERVICAL FILLINGS.

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Aim of this study was to evaluate the marginal adaptation and nanoleakage in class V bonded restorations before and after thermo-mechanical loading using Componeer Class V (CCV) compared to conventional composites. The null-hypothesis tested was that marginal adaptation and nanoleakage of CCV was not significantly different compared to conventional composites before and after thermo-mechanical loading. Standardized Class V cavities (width 2.0mm, length 3.0mm, depth 1.5mm) were created in 40 human premolars and molars at the cement-enamel junction. Cavity dimensions were standardized using a digital caliper. Teeth were divided in four groups (N=10): Group 1 One- coat-Bond-Self-etching bonding agent with Synergy-D6+CCV (Coltene); Group 2 One- coat-Bond-Self-etching bonding agent Synergy-D6-flow+CCV (Coltene), Group 3 Scotchbond Universal adhesive system with Filtek-Supreme-XTE (3M ESPE); (Group 4) Scotchbond Universal adhesive system with Filtek-Supreme-XTE-flow (3M ESPE). Restorations were placed according to manufacturers' instructions. Marginal quality was analyzed under a SEM using epoxy resin replicas before and after thermo-mechanical loading (240,000 mechanical cycles x 50N with a frequency of 1HZ and 7800 thermo-cycles between 5° and 55C° with chewing simulator CS4-Mechatronik). Data were statistically analyzed by two-way ANOVA and Tukey's post-hoc test (α=0.05).

Specimens were then processed to investigate nanoleakage expression under SEM.
The null hypothesis was partially accepted since no significant statistical differences were found in marginal adaptation with CCV compared to margins obtained with conventional composite both before and after thermomechanical cycling ($p>0.05$). Conversely the nanoleakage analysis showed only significant differences between group 1 and group 4 ($p<0.05$).
The marginal quality of class V cavities restored with CCV was similar to conventional composite restorations, both before and after thermomechanical cycling. Nanoleakage expression was dependent on the restorative material type. Further clinical research is essential to confirm that composite shells for direct veneering can be a valid restorative procedure.

Biomaterials

Poster P.33

NEW DEVELOPMENTS IN THE STUDY BY FIB OF ACIDIC ETCHED HUMAN ENAMEL

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Many methodologies have been reported to study acidic etched enamel such as microhardness, SEM, confocal microscopy, AFM. Focus Ion Beam (FIB) tomography has been used to investigate the subsurface of enamel after a wear process in acidic environment (Zhang 2015, Wu 2015)However, FIB methodologies are also able to provide quantitative data regarding porosities, anisotropic coefficient determination and finally 3D volume analysis. The aim of our study was to compare sound and phosphoric acid etched enamel to demonstrate the potential of such device in the study of enamel erosion.
After polishing to remove aprismatic layer, Human enamel samples were etched with phosphoric acid on one side and preserved without any treatment on the other side (sound enamel) Silver nitrate penetration was realized to penetrate porosities. After dehydratation, samples were observed in a FIB microscope and a 3 D analysis was conducted.
For healthy tooth enamel, silver nitrate doesn't penetrate the subsurface. Low mineralized structure (LMS) is distributed in two populations, the main one localized in the interprismatic area. The other population (38% of the LMS) is randomly distributed. Both populations of LMS represented 0.5% of the whole volume.
For acid etch enamel, porosities are infiltrated by silver nitrate and pore volume vary from 16% at the surface to 0.5 at a depth of 10μm. Silver nitrate infiltrated only interprismatic area. The other population is reduced to 17%. The determination of the anisotropic coefficient demonstrated an increase from sound enamel to etched enamel for interprismatic area (0,56 to 0,81)
FIB technique using 3D quantitative analysis enables to characterize different LMS in the structure of dental enamel. Percentage of porous volume, depth of penetration of silver nitrate, distribution of pore volumes, anisotropic coefficient determination are quantitative data to characterize the acid exposure effect.

Biomaterials

Poster P.34

NEW PROCEDURES FOR PROXIMAL BOX ELEVATION

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The deep margin elevation, also known as proximal box elevation (PBE) is a technique used for the treatment of deep cavities with sub-gingival limits. This technique consists to insert a flowable composite to relocate the margin to a supra-gingival location, facilitating the next steps of direct or indirect restorations. The aim of this study was to suggest new procedures, involving various combinations of filling materials and adhesive systems as an alternative of flowable composite under conventional direct composite to perform PBE.
Three filling materials were compared to flowable composite (Tetric Evo Flow, Ivoclar Vivadent): two high-viscous glass ionomer cements (HV-GIC) (EQUIA Forte and Fuji IX GP Fast, GC) and one bulk composite (SDR, Dentsply). For each HV-GIC, various adhesive systems were tested to bond to the overling conventional composite: an etch-and-rinse system (Scotchbond 1XT, 3M ESPE), a universal adhesive system (Scotchbond Universal, 3M), a self-etching system (Optibond All-in-one, Kerr) and a coat (Equia Coat, GC). Shear bond strength between the filing materials and the conventional composite was performed and type of failure (adhesive, cohesive or mixed) was noted.
Shear bond strength of the combinations HV-GIC+adhesive system/conventional composite were significantly lower than that of the combinations bulk composite/conventional composite and flowable composite/conventional composite. However they can be considered as sufficient, because of a very high percentage of cohesive fracture in HV-GIC. Besides, shear bond strength was not significantly different when a universal adhesive system was used compared to the others adhesive systems.
Bulk composite (rapid to implement) or HV-GIC (easy to use, moisture tolerant and with intrinsic adhesion to dental tissues, implying no need for rubber dam or conditioner and low microleakage) could be an eligible technique to substitute flowable composite in proximal box elevation technique. However clinical studies are necessary to confirm their usability in these situations.

Biomaterials

Poster P.35

NEW ZINC-CONTAINING DESENSITIZERS IMPROVE NANOMECHANICAL PROPERTIES OF DENTIN

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Biomaterials for treating dentin hypersensitivity and tooth tissue wear are evaluated, not only to efficiently occlude the dentinal tubules but also to increase dentin resistance to abrasion.
Dentin surfaces were treated with 0.5M EDTA to expose dentinal tubules. Surfaces were brushed with five experimental pastes containing different bioactive particles for 2 min, a control group was brushed with distilled water. Dentin surfaces were then immersed in artificial saliva for 24 h, and submitted to an acid challenge (citric acid during 1 min). Nanomechanical properties were assessed on dentin surfaces after both saliva immersion and citric acid application using a Hysitron Ti Premier nanoindenter and a commercial nano-DMA package. Modulus mapping of samples was conducted by imposing a quasistatic force setpoint, Fq=2 μN, to which we superimposed a sinusoidal force of amplitude FA=0.10 μN and frequency f=100 Hz. Data from regions approximately 15×15 μm in size were

collected using a scanning frequency of 0.2 Hz. Mean and standard deviations (SD) were calculated. Comparisons were performed by ANOVA and Student-Newman-Keuls ($p<0.05$).
Means and SD of complex modulus attained in samples are presented in the table. Within columns, same letter indicates no significant differences.
After salivaIntratubularIntertubularIntratubular
EDTA26.88(2.5) b14.30(0.6)AXXXX
Distilled Water47.38(10.5)cXX19.23(2.1) a12.58 (0.6)A
Monetite3.66(6.5)bc28.33(3.7)AB53.40(1.9) c88.44(15.9)C
Zinc-monetite130.84(15.4)e216.41(27.2)E102.16(6.6) e233.20(17.8)E
Brushite35.30(5.6)ab45.52(3.2)B36.37(6.7) b65.73(4.4) B
Zinc-Brushite89.73(11.2)d106.04(23.7)C58.43(5.1) d109.48(17.6)D
NovaMin®75.68(6.1)d175.14(38.4)D34.71(3.3) b109.71(19.2)D
Zinc-containing bioactive particles not only occluded dentinal tubules but also improved mechanical properties of dentin.
Project MAT2014-52036-P supported by the Ministry of Economy and Competitiveness (MINECO) and European Regional Development Fund (FEDER).

Biomaterials

Poster P.36

POLYMERIC NANOPARTICLES EXERT ANTIBACTERIAL ACTIVITY AGAINST STREPTOCOCCUS MUTANS

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To evaluate the antibacterial activity of bioactive polymeric nanoparticles (NPs) against Streptococcus mutans.
NPs composed by 2-hydroxyethyl methacrylate are fabricated trough polymerization precipitation. They were doped with calcium, zinc and doxycycline hyclate. Streptococcus mutans 700610 obtained from ATCC (Bethesda, MD) were grown, harvested and re-suspended in growth media. The number of bacteria per mL was determined by measuring the optical density at 600 nm and adjusting it to a standard bacterial suspension of 1×107 CFU/mL. NPs were suspended in PBS at concentrations (10mg/ml, 1mg/ml). Different NPs were placed into Eppendorf tubes with bacterial broths (1×107 CFU/mL for each NPs suspensions) and incubated for 3, 12, and 24 hours. The bacterial cell viability was assessed by determining their ability to cleave the tetrazolium salt (MTT) to a formazan dye. Purple formazan color produced from the MTT by viable cells was read at 560 nm using an ELISA reader. Each experiment was performed three times. Normalized average and standard deviation were calculated by considering values obtained for the PBS control. ANOVA and Scheffe's F were performed ($p<0.05$).
Average and standard deviation of viable bacteria are in the table. In rows letters and in columns numbers indicate similar groups.
NPs (mg/ml) Ca-NPs (mg/ml) Zn-NPs (mg/ml) Dox-NPs (mg/ml)
1 10 1 10 1 10 1 10
3 h 9105
(234)b1 3776
(98)B1 3770
(32)c1 702
(72)C1 13945
(824)a1 8856
(410)A1 476
(33)d1 344
(22)C1
12 h 19026
2179)a2 15574
(746)A2 18637
(2852)a2 6120
(3270)B2 14666
(639)a1 7867
(1292)B1 378
(68)b2 223
(23)C2
24 h 26838
(1824)a3 20840
(1171)A3 29427
(2286)a3 16308
(1868)B3 31232
(1833)a2 12892
(1664)B2 896
(114)b3 351
(59)C1
NPs (mg/ml) Ca-NPs (mg/ml) Zn-NPs (mg/ml) Dox-NPs (mg/ml)
1 10 1 10 1 10 1 10
3 h 9105
(234)b1 3776
(98)B1 3770
(32)c1 702
Ca and Zn-NPs at 10mg/ml presented high antibacterial activity at least up to 12h. Dox-NPs were always very active against S. mutans.
Project MAT2014-52036-P supported by the Ministry of Economy and Competitiveness (MINECO) and European Regional Development Fund (FEDER).

Biomaterials

Poster P.37

PROPERTIES OF TOTALFILL® PRE-MIXED BIOCERAMIC ENDODONTIC MATERIAL

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The study was aimed to evaluate the chemical-physical properties and the apatite forming ability of 3 novel calcium silicate-based cements for endodontics containing monobasic calcium phosphate, tantalum pentoxide and zirconium oxide (TotalFill BC sealer, TotalFill BC RRM, TotalFill BC putty RRM).
Calcium release, alkalinizing activity, initial and final setting times, radiopacity and ability to nucleate calcium phosphates (CaP) after 28day-ageing in a simulated body fluid were evaluated by ESEM-EDX and micro-Raman. The all tested materials induced a marked alkalization of the soaking water (pH 11–12) up to 28 days. Also their ability to provide calcium ions was very high throughout the entire test period (180–190 ppm at 3h-7d, approx. 10 ppm at 28d). Well detectable B-type carbonated apatite deposits were found on aged samples (biointeractivity-related CaP-forming ability).
The materials showed marked differences in the setting times. Total Fill BC sealer and RRM showed similar initial and prolonged final setting time (approx. 23 min and 52 min respectively) and adequate radiopacity (>7mm Al), Total Fill BC putty RRM showed fast initial setting time (2 min) and good radiopacity (>9 mm Al).
In conclusion all the materials showed marked biointeractivity with high calcium release, strong alkalinizing activity and apatite forming ability, with high radiopacity and appropriate setting times, and represents very attractive tailored endodontic materials.

Biomaterials

Poster P.38

REPAIR OF BULK-FILL COMPOSITES: EFFECT OF UNIVERSAL ADHESIVE AND DIFFERENT SURFACE TREATMENTS

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To compare the repaired microtensile bond strengths (μTBS) of aged bulk fill resin composite using universal adhesive and different surface treatments.
Thirty-five bulk fill specimens (Filtek Bulk Fill) were fabricated in teflon moulds (5×5×5mm) and submitted to 5000 thermal cycles. Specimens were randomly distributed into five groups and were subjected to five different surface treatments before the repair procedure was performed (n=7). Group I: no treatment (control), Group II: Universal adhesive-Single Bond Universal [SBU], Group III: 37% phosphoric acid etch + SBU, Group IV: Er,Cr:YSGG laser + SBU, Group V: Aluminum oxide (Al2O3) sandblasting + SBU. The repair was performed using Filtek Ultimate Universal composite that was placed incrementally on the treated surfaces to build a 10x5x5mm block. After storage in 37°C distilled water (24h), six beams per block were obtained. The specimens were submitted to μTBS testing and the obtained data (MPa) were evaluated by one-way ANOVA, post-Hoc test (α=0.05). Failure mode was examined using light microscope (10X).
One-way ANOVA indicated significant differences among the groups ($p<0.05$). Control group (no treatment) showed significantly lower values than treatment groups ($p<0.05$). While group II (universal adhesive) and group III (acid etch+ universal adhesive) provided similar bond strengths ($p>0.05$), group II showed significantly lower than that of the other surface treatment groups ($p<0.05$). Group III showed significantly lower bond strength values than laser treatment (group IV), but similar values to Al2O3 sandblasting (Group V). Surface treatment with laser (group IV)(36.94± 7.89MPa) yielded significantly higher repair bond strength than other tested groups ($p<0.05$), except for Al2O3 sandblasting (group V) (33.67±6.98MPa). The observed failure types were adhesive (46%), followed by cohesive (39%) and mixed (15%).
Surface treatments with laser and Al2O3 sandblasting seems to provide higher bond strength for repair of aged bulk-fill resin composite.

Biomaterials

Poster P.39

RESISTANCE OF ENDODONTICALLY TREATED MOLARS RESTORED WITH GLASS-FIBER ENRICHED COMPOSITE

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To evaluate marginal integrity,fracture resistance and fracture pattern of endodontically treated upper premolar,restored with different glass-fiber reinforced materials.
36 extracted intact premolars were endodontically treated;an MOD cavity was prepared and specimens were then divided in 6 groups:sound teeth (G1);no restoration (G2);direct composite restoration with fiber reinforced composite (Ever-x Posterior, GC)(G3),direct ormocer restoration(Admira Fusion, Voco) (G4);G3 reinforced with buccal-oral glass-fibers (G5) G4 reinforced with buccal-oral glass-fibers (G6).Specimens were scanned with micro-CT (SkyScan 1172: Bruker-microCT, Kontich, Belgium),before and after fatigue artificial treatment with Ball Mill Machine, to evaluate marginal integrity. Specimens were then loaded until fracture using a universal testing machine (Instron, Canton, MA, USA).The maximum breaking loads were recorded in Newton (N) and data were analysed with one-way ANOVA and post-hoc Bonferroni test ($p<0,05$).Fractured specimens were also analysed with SEM and fractography analysis was performed.
ANOVA test showed that horizontal glass-fiber insertion did not significantly improved marginal integrity of restorations.However, fracture resistance of G5 and G6 was significantly higher than G3 and G4 ($p=0.001$).All specimens fractured in a catastrophic way.In G5 and G6 glass-fibers inducted a partial deflection of the fracture, even if they were not able to stop the crack propagation.
For the direct restoration of endodontically treated premolars, the reinforcement of composite resins with glass-fibers or fiber-post could enhance the fracture resistance.The SEM analysis showed a low ability of glass-fibers in deviating the fracture, but this effect was not sufficient to lead more favorable fracture patterns, over the CEJ.

Biomaterials

Poster P.40

ROLE OF BENZALKONIUM CHLORIDE (BAC) ON DENTIN BOND-STRENGHT AND MMPS ACTIVITY

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Benzalkonium chloride (BAC) is a quaternary ammonium compound able to disinfect and inhibit dentin matrix metalloproteinases (MMPs) activity. Aim of the study was to investigate the immediate bond strength and the MMPs expression on dentin treated with a multi-mode universal adhesive (All-Bond Universal ABU; Bisco) with or without BAC blended within its formulation (either linked to methacrylate monomers or not) employed in etch-and rinse (E&R) or self-etch (SE) mode.
40 intact molars were selected and a smear layer was created using a 180-grit silicon-carbide paper on middle/deep human dentin surface. Specimens were assigned to the following groups according to the adhesive protocol: G1) ABU SE; G2) ABU E&R; G3) ABU+0.5% BAC SE; G4) ABU+0.5%BAC E&R; G5) ABU+1%methacrylate BAC SE; G6) ABU+1%methacrylate BAC E&R. Composite buildups were created on the bonded surfaces, then specimens were cut for microtensile bond strength test and stressed to failure at a crosshead speed of 1mm/min after 24-hour storage in artificial saliva. Additionally, adhesive/dentin interfaces were obtained for interfacial nanoleakage analysis. In situ zymographic assay was performed to investigate endogenous MMPs activity within the hybrid layer in accordance with Mazzoni et al., 2014.
Microtensile bond strength test and nanoleakage data showed no statistical differences among groups at baseline. However, in situ zymography quantification analyses revealed that all the experimental formulations tested seemed to decrease MMPs gelatinolytic activity.
Experimental adhesives with BAC blended within their formulation did not alter immediate bond strength and could decrease or inhibit dentinal gelatinolytic activity. Further studies are needed to better understand the influence of BAC blended within the adhesive formulation in improving bond longevity and dentin MMPs inhibition.

Biomaterials

Poster P.41

ROLE OF CHX BLENDED WITHIN AN ETCHANT ON HYBRID LAYER PRESERVATION

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The application of chlorhexidine (CHX) as a therapeutic primer to dentin has been reported to reduce the degradation of the hybrid layer over time due to the inhibition of endogenous MMPs. The aim of this study was to investigate the influence of 0.2% CHX incorporated within a commercially available etchant on long-term bond strength, by means of microtensile bond strength test, and analysis of the nanoleakage interfacial expression.
A standardized smear layer was created using a 180-grit silicon-carbide paper on 60 middle/deep human dentin surfaces. Specimens were assigned to the following groups (n=8) according to the adhesive procedure: G1) H3PO4 + Adhese Universal (Ivoclar Vivadent); G2) H3PO4 + Scotchbond Universal (3M ESPE); G3) H3PO4 + All Bond Universal (Bisco); G4) Cloetch (Cloetch, Sweden&Martina – 0.2% CHX) + Adhese Universal; G5) Cloetch + Scotchbond Universal; G6) Cloetch + All Bond Universal (Bisco). Ething was perfomed for 15s for all groups. Bonded specimens were cut and submitted to the microtensile bond strength test (μTBS) in accordance with the non-trimming technique after 24 h or 12 months storage in artificial saliva at 37°C. Collected data were statistically analyzed with three way ANOVA and statistical significance was set for $p<0.05$.
Each of three universal adhesive systems showed similar immediate bond strength regardless of the use of Cloetch. After 12 months, only Scotchbond Universal showed a statistically significant difference, where control groups had higher bond strength than experimental groups. Nanoleakage expression was not significantly different between controls and experimental groups at T0 or at T12. However, nanoleakage increased during aging.
Under this perspective no influence seems to occur when 0.2% CHX is blended within the Cloetch etchant.

Biomaterials

Poster P.42

ROUGHNESS OF CERAMIC MATERIALS TREATED WITH PROPHYLACTIC PASTES: 2 AND 3D ANALYSIS.

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This study evaluated the effect of prophylactic polishing pastes on the roughness of three difference ceramics.
A total of one-hundred-twenty specimens obtained from ceramic blocks of glass-ceramic reinforced with leucite (IPS Empress CAD; Ivoclar Vivadent), lithium disilicate (IPS E.max CAD; Ivoclar Vivadent) and zirconium oxide (Zenostar; Ivoclar Vivadent) were divided into three groups, forty for each ceramic material. After ground finishing, each specimen was glazed and randomly divided into four groups for each material including the control group. The samples were polished with one of three prophylactic pastes, Cleanic Fine (CF), Nupro Fine (NF) and Proxyt Fine (PF) except for the control group. Specimens were polished for 2 minutes with a prophy cup mounted on the handpiece under a costant load of 400 gr at 2000 rpm. After the polishing the specimens were cleaned and dried. The surface roughness (Ra, μm) was measured before and after the treatment using a 3D optical profilometer and a phertometer. At last the texture of the specimens was observed under the SEM.
Both instruments showed that Proxyt paste was the less aggressive followed by Clenic, and Nupro. There were significant differences inside each group of ceramic. The control group (0,29 μm) was significant different ($P<0,05$) to the other groups CF, NF and PF (0,62 μm; 0,63 μm; 0,44 μm for the IPS Empress CAD material. NF (0,55 μm) was statistical different to control group (0,97 μm) and PF (0,83 μm) for the E.max CAD ceramic. NF (0,67 μm) was statistical different ($P<0,05$) to the other groups in the zirconia material Zenostar.
Polishing procedures should be carried out with caution and using a prophylactic polishing paste with low aggression characteristics to not compromise the esthetic and the smooth surface.

Biomaterials

Poster P.43

SEALING PERFORMANCE OF TWO RETROGRADE FILLING MATERIALS USED IN ENDODONTIC SURGERY

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To evaluate the apical microleakage (ML) of root-end cavities filled with two different materials.
Single-rooted, one canal, human teeth were collected for the study. Exclusion criteria were: presence of caries, previous restorations and/or fracture. Forty teeth were succefully enrolled for the study. The teeth were endodontically instrumented (Mtwo), cleaned (5.25% sodium hypchlorite solution) and shaped (#25.06). Roots were filled with the Obtura system and the coronal access was temporary restored. After one week of storage (37 °C and 100% relative humidity), the teeth were sectioned 3 mm distant from the apex and retro-prepared at 3 mm with an ultrasonic tip (Satelec). The samples were randomly assigned to one of the four groups formed according to the back-up filling material used (n=10): a) Guttapercha (G; positive control); b) Composite (C; negative control); c) Biodentine (BD); d) Super-Eba (SE). After 48 h of storage, teeth were covered with a double layer of nail varnish, except the 1 mm apical, and immersed in 3% methylene blue dye solution for 24 h. The samples were then split longitudinally and observed under a light microscope for ML evaluation. Data were collected and statistically analyzed ($p<0.05$).
Statistical analysis revealed no significant differences in the sealing performances between G, BD and SE ($p>0.05$). BD showed, therefore, inferior dye infiltration when compared to SE. The C group showed a statistically lower sealing ability and when composite was used for retro-filling obturation, higher apical ML was found ($p<0.05$).
No differences were found in terms of apical sealing ability between the tested retro-filling materials. Further in vitro studies are necessary to assay the quality of the seal in the long-term period.

Biomaterials

Poster P.44

SPECTROPHOTOMETRIC ANALYSIS OF CERAMIC MATERIALS TREATED WITH DIFFERENT PROPHYLACTIC PASTES.

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The aim of this study was to evaluate in vitro the translucency of ceramic materials after polishing with different prophylactic pastes.
One-hundred-twenty specimens obtained from ceramic blocks of glass-ceramic reinforced with leucite (IPS Empress CAD; Ivoclar Vivadent), lithium disilicate (IPS E.max CAD; Ivoclar Vivadent) and zirconium oxide (Zenostar; Ivoclar Vivadent) were divided into three groups, forty for each ceramic material. The samples were polished with one of three prophylactic pastes, Cleanic Fine (CF), Nupro Fine (NF) and Proxyt Fine (PF) except for the control group. The translucency was measured before and after the treatment with a dental spectrocamera, Spectroshade Micro (Handy Dental) by calculating the degree of dispersion of light of the object being analyzed on white and black background. The spectrophotometer expressed the results of readings in the form of CIE L*a*b* parameters and the Translucency (TP) with the following formula TP=√(LB·LW)[2]+(a_B·a_W)[2]+(b_B·b_W)([2])where the subscript B was for the measurement on black background, and subscript W was for the measurement on white background.
IPS Empress CAD: The control group showed higher translucency (TP 6,200) compared with the other groups (Nupro: TP 5,180; Cleanic: TP 5,311, Proxyt: TP 6,004) but without statistical differences (P > 0,05). IPS E.max CAD: Cleanic and Proxit groups showed higher translucency (TP 6,114 and TP 6,042), while control group and Nupro showed less translucency (TP 6,031 and TP 5,789) (P>0,05). Zenostar MT 0: The control group showed higher translucency (TP 0,911) compared with the other groups (Cleanic and Nupro TP 0; group 12 TP 0,901) (P>0,05).
The translucency showed a decrease when the roughness increased, instead an increase when the roughness decreased, but there was not statistical significant difference between the groups after and before treatment. The prophylactic paste Proxyt changed the translucency less than the other pastes, followed by Cleanic and Nupro.

Biomaterials

Poster P.45

SURFACE CHARACTERIZATION OF ERODED ENAMEL, BEFORE AND AFTER A FLUORIDE VARNISH APPLICATION

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To evaluate the remineralizing capacity of the artificial saliva and fluoride varnish through Vickers Microhardness test and Scanning Electron Microscopy (SEM).
8 human molars were cut in axial direction in hemi faces and randomly divided into 4 groups: group A (n=8), exposed to deionized water; Group B (n=8), exposed to deionized water and fluoride varnish; Group C (n=8), exposed to artificial saliva; Group D (n=8), exposed to artificial saliva and fluoride varnish. All groups were subjected to a daily exposure (3x20 minutes with a break of 2 hours and 40 minutes), demineralized with Redbull®, at 37 and 30 rpm. After cycles, the specimens were rinsed with deionized water and the solution-test was renewed. Six specimens from each group were analysed with Vickers Microhardness tester; the other two specimens of each group were observed in the Electronic Microscope SEM, JEOL JSM 70001F. The data were statistically analysed by ANOVA using software SPSS with a significance level of p<0,05.
The average values for each group (Group A - 502.63 ± 50.24 HV; A.1 Group - 577.43 ± 43.36 HV Group B - 650.16 ± 14.45 HV, Group B.1 - 646.56 ± 19.74 HV; Group C - 436.12 ± 40.84) show an increase in hardness when using artificial saliva and fluoride varnish in comparison to sound enamel. Disorganization was observed in the orientation of the enamel prisms in group A in comparison to the other groups - artificial saliva and fluoride varnish application.
Both fluoride varnish and artificial saliva increase the surface microhardness of eroded enamel.

Clinical Cases

Poster P.46

MINIMAL INTERVENTION AND PREDICTABLE SUCCESS WITH LITHIUM-DI-SILICATE FOR FUNCTIONAL AND AESTHETIC REHABILITATION

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The foundation of actual dental practice revolves around Minimal Intervention Dentistry. The advancement in the field of adhesive dentistry has made this dream, a reality. Bonded restorations have become very popular since they require minimal tooth reductions. In this regard lithium-di-silicate can be considered as a breakthrough in ceramic, which enables the clinician to achieve predictable aesthetic as well as functional results. The performance of this material has reported by many long-term studies. This poster presents some clinical cases in which lithium-di-silicate was used for aesthetic and functional rehabilitation.
The progressive loss of enamel could occur due to wide variety of reasons such as ageing, gastroesophageal reflux disease, occlusal disease. Rehabilitation of these situations which involve in restoring lost enamel or dentin should primarily aim in preventing what is existing. The presented clinical cases illustrate the use of lithium-di-silicate as an occlusal veneer for functional rehabilitation. Lithium-di-silicate also helps us in wide variety of smile makeover cases.
All the clinical cases were successful at follow up in terms of function and aesthetics.
Minimally invasive porcelain restorations represent an extremely conservative option with excellent aesthetic and functional results.

Clinical Cases

Poster P.47

A CHALLENGE IN COSMETIC DENTISTRY-VITAL & NON-VITAL TOOTH BLEACHING CLINICAL CASE

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To describe a tooth bleaching technique by illustration, step by step, of vital and non-vital teeth discoloration, mixing two approaches, home- and walking-bleach.
Feminine patient, 58 years-old, attended the pedagogical clinical UFP unsatisfied with her teeth appearance. Clinical examination revealed malocclusion with needs for prosthodontic rehabilitation; Also, clinical observation showed anterior vital teeth extrinsic discoloration (A3 shade;

Vita Guide), and a non-vital tooth 1.1, endodontically treated, with intrinsic/extrinsic discoloration (approximate A4 shade). It was proposed a cosmetic treatment as part of an oral rehabilitation plan. Protocol for cosmetic procedures was applied as follows: 1°-User Information and Inform Consent; 2°-Tooth Rx/digital image; 3°-Shade registry and photography/each appointment; 5°-Written instructions for users. A mixing approach between Home-bleach (carbamide peroxide 16%, Perfect Bleach®-VOCO; personalized tray; 1 hour/day; 3 weeks) and Walking-bleach (hydrogen peroxide 6%, Poladay®SDI and sodium percarbonate; three in-office appointments). Internal bleaching 1.1 tooth procedure: 1°-Relative field isolation; 2°-Coronal access (remove all pigmented dentin); 3°-Root canal filling removing about "3mm"; 4°-Seal root canal (Glass Ionomer); 5°-Sodium percarbonate in chamber and provisional Seal; 6° In-office Hydrogen Peroxide 6% application, 30 minutes. Follow-up appointments once per week, during four weeks. Vital and non-vital teeth bleaching showed alterations of Vita Guide scale from A3 and A4 respectively to A1 shade. One week after last bleaching procedure, conservative restoring treatment with resin-based composite of non-vital 1.1 and vital 1.2 teeth (previously restored) was performed. Bleaching of both, vital and non-vital teeth can represent a significant dentistry challenge, and the cosmetic approach can be a first choice, once it does not compromise any future conservative rehabilitation. If applied properly and in carefully selected cases, the results can fulfil patient's aesthetic and functional expectations and self-esteem. The key is to know when such techniques should and can be applied and which prognosis achieve.

Clinical Cases

Poster P.48

ADDITIVE RESTORATIONS OF ANTERIOR TEETH:TREATMENT PLANNING TROUGH AESTHETIC DIGITAL SMILE DESIGN

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This report deals with one case of additive restorations on anterior teeth to close diastemas and to modify teeth shape after orthodontic treatment. The aim of this case report is to show the importance of Aesthetic Digital Smile Design (ADSD) to share with the patient therapeutic opportunities The patient was a 19-years-old female that decided to interrupt a complex orthodontic treatment after 4-year. The upper anterior region presented 2.2 conoid and diastemas between incisors. The initial treatment, planned by the orthodontist, provided the shape correction of 2.2. However, once the patient was visited, she was involved in the treatment planning with ADSD, that through a dento-facial analysis performs a digital project of the aesthetic treatment. The final aesthetic result chosen by the patient was realized on a gypsum model with wax, thus the dentist could obtain several silicon guides that are needful to replicate the ADSD result. Additive restorations were then performed following a standardized clinical procedure: field isolation through rubber dam; teeth cleaning with aluminium oxide sandblasting; etch-and-rinse adhesive system application; direct additive restorations were performed using Clearfil-ES2 in an incremental layering technique with the help of silicon guides; dentin and enamel shades were then layered to complete the direct restorations. After finishing and polishing procedures, radiograph were taken to check interproximal adaptation of the material
4-year follow up showed an aesthetical and functional preservation of the restored teeth. A slight change in surface texture of the composite was detected, which has been easily corrected with refinishing and repolishing procedures.
Direct additive restorations represent a conservative choice for diastemas closure and tooth shape modification. Nowadays ADSD is fundamental to let the patient understand the final result and let the clinician understand the best technique to reach that result.

Clinical Cases

Poster P.49

ADSD AS DIAGNOSTIC TOOL FOR ADDITIVE ANTERIOR RESTORATIONS

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This report deals with one case of direct composite on anterior teeth with important acid erosion on vestibular area. The aim of this case report is to show the importance of Aesthetic Digital Smile Design (ADSD) in treatment planning for the aesthetic result in order to guide the clinician in the best restorative technique to use.
The patient was a 32-years-old female that decided to improve her smile. The upper anterior region presented several acid erosion on the vestibular surface of 1.2 1.1 2.1 2.2.. The patient was involved in the treatment planning with ADSD, that through a dento-facial analysis performs a digital project of the aesthetic treatment. The final aesthetic result chosen by the patient was realized on a gypsum model with wax, thus the dentist could obtain several silicon guides that are needful to replicate the ADSD result. Additive restorations were then performed following a standardized clinical procedure: field isolation through rubber dam; teeth cleaning with aluminium oxide sandblasting; etch-and-rinse adhesive system application; direct additive restorations were performed using Clearfil-ES2 in an incremental layering technique with the help of silicon guides; interproximal contacts were created with shaped acetate matrices.
48 months follow-up showed perfect aesthetic result and complete patient satisfactionDirect additive restoration can be a conservative choice for direct composite veneers.
With this technique were obtained an aesthetic improvement of the smile and the disappearance of sensibility. Nowadays ADSD is fundamental to decide with patient its aesthetic restoration and to guide the dentist in performing it.

Clinical Cases

Poster P.50

AMELOGENESIS IMPERFECTA AND ALTERED PASSIVE ERUPTION: AN INTERDISCIPLINARY REHABILITATION.

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The aim of this poster is to present two clinical cases of amelogenesis imperfecta (AI) along with altered passive eruption (APE). Diagnosing APE in cases of AI and in any others case of discoloration due to alteration of the genetically enamel formation or drugs assumption (such as fluorine), is fundamental. In fact, restoring teeth without a diagnosis of

APE, it may lead to esthetic problems after maturation and repositioning of gums and teeth.
1st case: a 35-y patient was not happy with his smile. The patient denied the assumption of any drugs that may have led to teeth discoloration. AI diagnosis was done. Treatment plan started with one-month at-home 10% bleaching. Afterwards, micro abrasion with Opalustre® was performed. APE was treated with gingival surgery. Upper jaw was the one to be prosthetically treated with overlays and veneers. Provisionals were luted with the spot-etch technique. A 2-mm DVO increased was obtained. Lithium disilicate overlays and veneers were adhesively luted. Finally, the lower jaw was treated as the upper jaw. 2nd case: 34-y patient came to restore dental esthetics. From anamnesis it can be concluded that the patient is affected by AI. For economical reason patient would like to firstly treat anterior teeth (1.4 to 2.4). APE is treated surgically, firstly, to reduce both gummy smile and short tooth syndrome, and secondly, to create veneers on normal tooth dimensions. A wax-up and a mock-up were created. Lithium disilicate veneers were created by the technician and adhesively luted.
Clinical results of the study showed that correct diagnoses of AI and APE is crucial in obtaining excellent esthetics.
It can be concluded that an interdisciplinary rehabilitation should be mandatory and conservative therapies should be preferred to conventional prosthetic rehabilitation.

Clinical Cases

Poster P.51

BRINGING HARMONY: CORRECTING THE MIDLINE AND OCCLUSAL PLANE WITH PORCELAIN FELSPATHIC VENEERS

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Achieving ideal aesthetics is the optimum goal when referring to smile enhancement. The objective was to precisely derotate the midline and correct the asymmetrical soft tissue architecture. It is very important in complex cases to have the control throughout the whole procedure. The clinician and the technician should work in synergy through delicate stages transforming the soft and the hard tissues predictably.
In this case a 24-year old female with an inclination of the midline and gummy smile wanted to improve it after her second orthodontic treatment. Six months after the clinical crown lengthening of the teeth 14–24 the tissues were stabilized and the patient followed a home bleaching protocol for 16 days. Impressions were taken so that a wax-up was created for the teeth 13–24. The wax-up was tried-in through the mock-up procedure. The patient agreed with the new formed shapes and the teeth were prepared over the mock-up before a final impression was taken. The OneBite® system was used in this case together with photographs to help the technician mount the working model on the articulator with the same midline and cant as in the mouth. The lab created the feldspathic veneers using as a guide the wax-up. They were bonded under rubber dam isolation. Light curing composite cement was preferred because the veneers did not exceed 0,8mm in thickness. Due to the rubber dam use residues of the cement were completely removed with a scalpel N12.
Feldspathic porcelain veneers are the gold standard in achieving esthetics and durability with very high survival and success rates.
In cases with inclined midline the preparation of the teeth should follow the correct inclination to give adequate room for optimum laminate veneer thickness. Recalls are important to preserve the esthetic outcome.

Clinical Cases

Poster P.52

CLINICAL ANALYSIS OF TOOTH FRAGMENT REATTACHMENT WITHOUT ADDITIONAL PREPARATION

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The aim of this poster is to describe the clinical procedures of a direct fragment reattachment (DFR) technique without any tooth preparation and to present the results of a 3-year clinical study on the topic. The DFR technique provides a minimally invasive approach achieving clinical success, joining functional results with satisfactory aesthetics.
This clinical study included 9 patients (5 males, 4 females) with a coronal fracture. In all the cases the fragment was available and intact. The authors illustrate the adhesive procedure used. Under local anaesthesia and after placing a rubber dam, both the fractured parts of the tooth and the fragment were disinfected with 0.2% chlorhexidine, etched with 37% phosphoric acid gel, rinsed and infiltrated by the primer and the bonding agents of a 3-step adhesive system in order to obtain the retention without any additional tooth preparation.
After a 1-year and a 3-year follow-up the statistical analysis (McNemar's test) shows the good performances of direct fragment reattachment technique in terms of fragment position and stability, gingival swelling, presence of endodontic and periapical pathology (12 months p=0.008; 36 months p=0.016). After 36 months the detachment of the bonded fragment has been observed in 22.2% of cases (in one case the detachment occurred after a new trauma) and complications were recorded in 11.1% of the patients.
The DFR technique is an effective and excellent alternative to direct and indirect restorations. Our follow-up data show that this ultra-conservative procedure is fast, easy and offers a long-term predictability; it also allows good functional and aesthetic outcomes.

Clinical Cases

Poster P.53

CLINICAL APPLICATION OF 3D ORAL DENTAL SCANNER CONDOR FOR INDIRECT CERAMIC RESTAURATION

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To demonstrate the precision of 3D oral dental scanner Condor (Biotech dental, France) during his clinical application.
A 25-year-old patient was addressed by his orthodontist in the clinic of Montpellier dental faculty with the request of complete conservative treatment before the orthodontic treatment.
Diagnosis: Clinical examination demonstrated: 1) the presence of white spots on vestibular surfaces of 11 and 21 teeth and also on all maxillary posterior teeth; 2) DOL (distal-occlusal-lingual) amalgam restoration on tooth 26 with defected borders in his occlusal part; 3) Occlusal amalgam restoration tooth 36 and carious lesion ICDAS 4 tooth 37; 4) Occlusal composite restoration tooth 46.
Treatment plane: we realized a treatment plan in 4 steps: 1) treatment of tooth 37: caries excavation and direct composite restoration; 2)

replacement of amalgam restoration of tooth 36 by direct composite restoration; 3) replacement of amalgam restoration of tooth 26 by indirect ceramic restoration using intraoral scanner device; 4) there is not an esthetic request from the patient for the white spot treatment. They will be treated later by remineralization and/or erosion infiltration.
The indirect and the direct restorations were compared using an objective clinical criterion and the subjective criteria of the patient. We are clearly noticed that the 3D oral dental scanner Condor (Biotech dental, France) allowed a better restoration of the anatomical complexity of the tooth surface. In the same time the direct communication with the patient during the machining process help us on the color choices and improve the final form of the indirect restauration.
The use of the camera condor can be easily integrated into a daily dental practice.

Clinical Cases

Poster P.54

CLINICAL MANAGEMENT OF AN IATROGENIC ROOT PERFORATION IN A MAXILLARY CENTRAL INSICOR

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Root perforations are undesired complications of endodontic treatment which result in loss of integrity of the root and further destruction of the adjacent periodontal tissues. The size,location of the perforation and the time lapse in repair influence prognosis of the tooth. Root perforations can be solved by either nonsurgical or surgical approaches. Present case report illustrates nonsurgical root perforation repair by biodentine.
An eleven-year-old-girl was referred to Istanbul University, Faculty of Dentistry, Department of Pedodontics for the evaluation of maxillary right central incisor. She visited a dentist with the complain of spontaneous pain a week ago. The dentist decided for a root canal treatment. During the treatment a lateral perforation occurred and he referred the patient to a pediatric dentist. At the initial examination, the medical and dental histories were taken and stated as unremarkable. Radiographic examination revealed the presence of mesiolateral mid-root perforation of maxillary left central incisor.
The decision to nonsurgically manage the perforation using biodentine was taken with the informed consent. Root canal enlargement was performed. Hemostasis was achieved with absorbable haemostatic gelation sponge pieces. biodentine was mixed and carried to the perforation site. The root canal was filled with calcium hydroxide paste. after two weeks the canal was opened and biomechanical preparation was carried out. Irrigation procedure was performed by using NaOCI 5,25% and EDTA 17% combination. The root canal was filled with gutta percha and AH plus using lateral condensation technique. The crown restoration was made with composite resin.
At the 3-month follow-up, the radiographic and clinical examinations revealed that the patient was asymptomatic and biodentine provided on effective seal for perforation repair.

Clinical Cases

Poster P.55

CLINICAL MANAGEMENT OF SUBLUXATION AND CROWN FRACTURE IN MAXILLARY CENTRAL INCISORS

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Anterior crown fractures are common form of traumatic dental injuries that mainly affect the maxillary central incisors. This case report describes the management of maxillary central incisors with subluxation and crown fractures
A healthy 9-year-old girl was admitted to Istanbul University, Faculty of Dentistry, Department of Pedodontics, with a traumatic injury to the young maxillary central incisors, 16 hours after a fall from her bike. Both maxillary central incisors were subluxated and both had crown fractures without pulp exposure. Maxillary left incisor was sensitive to percussion and palpation. A flexible splint was made. As an emergency treatment calcium hydroxide and glass ionomer cements were applied to exposed dentin. Two weeks later, splint was removed after the stabilization of the incisors was achieved and both teeth were restored with composite resins. A fistula was detected at the apical mucosa of the maxillary left incisor after 3 months; prolonged Ca(OH)2 therapy was planned for both apexification and intracanal medicamentation, also antibiotic/corticosteroid paste was applied for the persistent infection. The apical constriction was observed after three months, root canal was filled using the lateral condensation technique with AHplus seal and gutta percha.
Both maxillary incisors were asymptomatic after 5 months recall. The patient is currently in the follow- up phase.
Since the teeth with subluxation and crown fracture without pulp involvement can lose vitality; periodical patient visits are significantly important.

Clinical Cases

Poster P.56

CONSERVATIVE THERAPY OF THE RADICULAR EXTERNAL RESORPTION: MTA VS ADHESIVE SYSTEMS.

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Conservative therapy in cases of severe radicular resorption allows to maintain the tooth otherwise irrevocably compromised. Clinical management of these cases carries the possibility of different biomaterials' use to gain the element's morpho-functional restoration. The objective of this study is to show two different therapeutic approaches due to clinical needs: in the first case is possible to observe the utilization of more traditional and reliable MTA while, in the second case, adhesive techniques with ultimate generation composites provides a good aesthetic result.
The first case, male, caucasic, 35y, with no evidences on medical history, showed a root external resorption on the palatal surface of 1.3, occasionally spotted. The second case, male, caucasic, 40y, negative medical history came to our clinic, Oral Rehabilitation University Department of Istituto Stomatologico Italiano, to evaluate the dyschromia on element 1.1.
After a detailed medical history collection, an objective examination and the use of instrumental exams (CBCT), it was possible to diagnose an extensive external radicular resorption in both cases. The complexity of the pathology, with the requesting of a surgical flap, results in a difficult field isolation, no matter which material we use. The possibility to perform the surgery and the restoration under microscope support allowed to upgrade the accuracy in high precision operative steps of positioning of materials.

The early diagnosis in external root resorption cases has an overwhelming importance: therapy success and predictability are inextricably linked to the amount of healthy dental tissue remaining. In order to use in the best way all the materials, we must both know characteristics and indications and pay attention to their management throughout all the surgical acts. A restoration correctly performed allows to recover the morphology of dental element and could affect the smile's aesthetic; therefore, the choice of the best material has paramount importance.

Clinical Cases

Poster P.57

CONSERVATIVE TREATMENT OF AESTHETIC PROBLEMS IN ELDERLY PATIENT WITH HIGH EXPECTATIONS

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Elderly constitute a special dental patient group, as their oral health might be affected by their general health and quality of life. They might experience problems such as xerostomia, crown and root caries, periodontal disease, lack of teeth and tooth wear. Some elderly patients, however, manage to retain their natural dentition for a long time. The purpose of this clinical case is the presentation of possibilities of minimal intervention dentistry to achieve an aesthetic result in an elderly patient.
A 74-year-old female patient in good medical condition was referred for dental treatment to our department as she was not satisfied with her smile. Clinical examination revealed extensive non-carious cervical lesions, incisal wear, black interdental triangles, old composite resin restorations with poor marginal quality and tooth migration due to periodontal disease. The patient mentioned that she consumes high amounts of fruits and juice between meals. Her requirements were whiter teeth and improvement of her smile with minimal intervention and low cost.
After discussing various treatment options with the patient, a combination of conservative methods was selected. First of all, instructions regarding her diet were given. Afterwards teeth were bleached using carbamide peroxide 16% for two weeks. After the end of the bleaching period and additional three weeks, we proceeded to restore upper cervical lesions with simultaneous treatment of the other aesthetic problems that were mentioned. The same principle was followed in the mandible. All restorations were done freehand with enamel and dentin composite resin shades, and the procedure will be described in detail.
The patient was fully satisfied with the result and after 1 year the restored teeth present excellent clinical appearance.
Conservative treatment of these defects is important not only to restore function and aesthetics, but also presents a positive psychological impact on elderly patients.

Clinical Cases

Poster P.58

DEEP INFILTRATION FOR THE TREATMENT OF MIH : CLINICAL CASE

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This case report presents the technique of deep infiltration for the treatment of hypomineralized enamel lesions in a young patient affected by MIH (Molar Incisor Hypomineralization) with the purpose of obtaining an aesthetic improvement in the affected vestibular enamel.
Deep infiltration treatment involves a sequence of steps starting with an initial mechanical abrasion of the outside surface of the enamel, followed by a phase of chemical erosion using 15% hydrochloric acid, penetration through the porosity of the enamel by a very fluid resin, and finally the repair of the thin layer of lost enamel using a composite.
The aesthetic improvement of the elements affected by hypomineralized lesions is discernable immediately following treatment and becomes more accentuated with time.
Deep infiltration allows the clinic to treat even a deeper enamel lesion like MIH at the expense of a minimal damage to surface enamel, offering the possibility of restoring an aesthetically pleasing smile for patients.

Clinical Cases

Poster P.59

DENTAL BLEACHING RESULTS USING A VISUAL AND INSTRUMENTAL METHOD FOR COLOUR MEASUREMENT

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The aim of this clinical case was to assess the shade differences after a dental bleaching treatment using a spectrophotometric method. The basis of the shade assessment was a visual scale.
A non-smoking and healthy female patient of the Lisbon Dental School was submitted to a three-week home-bleaching process. The procedure consisted in the use of a 16% carbamide peroxide (Opalescence® PF Regular) tray in the upper and lower anterior teeth for six hours daily. The efficacy of the treatment was analysed comparing the initial and final tooth colour using a visual method (Vitapan® Classical Shade Guide) and a spectrophotometric device (SpectroShade Micro®).
The teeth with high chroma resulted in a greater colour modification. The tooth with the biggest difference was the upper right canine, seven values lower. The colour change in the lowest teeth was symmetrical. The overall shade of the left upper incisor did not alter however when compared its areas individually it was observed a change in colour.
The spectrophotometer seems to be a more specific and effective method to measure the colour than the scale. Its numerous functions helped to see the changes in the different areas of the tooth, which were not visually noticeable. A combination of visual and spectrophotometric devices is useful in order to reproduce the right colour.

Clinical Cases

Poster P.60

DIRECT AND INDIRECT PULP CAPPING AFTER COMPLETE CARIES REMOVAL: A PRELIMINARY STUDY

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In this preliminary study, the survival of vital teeth treated by direct and indirect pulp capping following the complete caries removal in deep dentin lesion was evaluated. The secondary objective was to observe

the response of pulp dentin complex to different types of capping and restorative materials.
50 permanent teeth with deep dentin lesion were included in this study. After complete caries removal, different protocols were applied according to exposure or non- exposure of the pulp. While direct pulp-capping was applied to the groups with exposed pulp, the teeth of non-exposed groups were treated with indirect pulp-capping using pure calcium-hydroxide + zinc-oxide eugenol + amalgam OR factory product calcium-hydroxide Dycal® + glass-ionomer cement + resin composite OR Dycal® + resin composite. Clinical and radiographic evaluations were performed at 6 months according to clinical signs and symptoms (sensitivity to percussion or bite test, any other pain or discomfort, tooth mobility); and radiographic signs with periapical index (PAI).
After complete caries removal, unintentional pulp exposures were observed in 54% of the teeth and therefore, direct pulp-capping treatment was applied. On the other hand, 46 % of the teeth without pulp exposure were treated with indirect pulp-capping. The teeth (n=3) treated with direct pulp-capping and a tooth (n=1) with indirect pulp-capping failed due to acute or chronic inflammation. All failed restorations belonged to Dycal® and resin composite groups.
At 6 months, failure rate of pulp exposure group in terms of presence of acute or chronic pulp inflammation and with or without apical radiolucent was higher compared to non-exposure group. Additionally, pure calcium hydroxide as pulp-capping material seems to be more reliable than factory product calcium hydroxide paste for the success of pulp-capping treatment.

Clinical Cases

Poster P.61

DIRECT COMPOSITE APPROACH POST-ORTHODONTIC TREATMENT.

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This clinical case presents a treatment plan based on direct composite restorations in a purely minimally invasive concept adapted to high esthetics demands in young patients.
A 22 year woman came to the department of restorative and aesthetic dentistry of Universitat Internacional de Cataluña after receiving orthodontic treatment in the department of orthodontics of the same university, demanding high esthetics for her old restorations in the anterior-superior sector. The patient present old composite restorations on teeth 1.2 and 2.2 presenting both peg shape and dens in dente condition (radiographically diagnosed) and old restorations on teeth 1.1 and 2.1. After a clinical examination, it was decided to perform direct composite veneers in teeth 1.2 and 2.2 and new restorations on teeth 2.1 and 1.1 employing a microhybrid composite resin, with a bilayered technique (dentin and one final layer of enamel). To perform the veneers, the vestibular part of the old restorations was partially removed/prepared; the site was isolate using a rubber dam, the surface was conditioned using sandblast with aluminum oxide silica; and we adhere the new composite. For the restorations the existing old restorations were entirely removed; the site was isolate using a rubber dam; the new restorations were placed using a silicon key from a wax-up to reproduce the palatal surface and then stratifying one mass of dentin and one final mass of enamel. All composite resin employed were from the same brand.
After all the procedures, the patient was fully satisfied with her new restorations which fulfilled her esthetic expectations.
Direct composites constitute a good clinical option to restore anterior teeth, preserving sound tooth tissue in respect of minimally invasive dentistry.

Clinical Cases

Poster P.62

EFFICIENCY OF A DENTAL BLEACHING COMBINATED TECHNIQUE MEASURED WITH A SPECTROPHOTOMETER

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To quantify the efficiency of the technique of dental bleaching combinated treatment
The sample consisted in 220 teeth (incisors, canines, upper and lower premolars from 11 patients) affected by several dental discoloration. A session, consisting in 3 applications of 15 minutes of 25% hydrogen peroxide photoactivated with diodes, was used on a first stage. In order to avoid non-desired effects due to the high concentration of peroxide, rigorous protection of the oral soft tissues was needed. A second phase of at-home bleaching took place using personalized splints and 16% carbamide peroxide applied between 90 and 120 minutes every day during 3 and 10 weeks, until a color stabilization on each tooth was achieved. The color parameters L*a*b* and the space parameters CIE-L*a*b* were measured with a spectrophotometer at the start of the treatment and a week after finishing. This was done on 66 teeth (central upper incisors and upper and lower canines) and the ΔE was calculated for each of them. All 66 teeth were classified in three groups according to the initial luminosity (group 1: 60–70; group 2: 70–80; group 3 > 80).
ΔE above 6 (color modification visually noticeable) was achieved on 62 teeth (93%). Teeth from group 1 had higher ΔE than the teeth from group 3.
The dental bleaching combined technique (photoactivated and using splints at home) has shown to be an effective therapeutic alternative for the treatment of dental discolorations. Teeth with lower initial luminosity had a better response to the bleaching treatment.

Clinical Cases

Poster P.63

ELASTIC GLASS-FIBER POST RECONSTRUCTION. THREE YEARS OF EVOLUTION

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The clinical application of composite reinforced glass-fiber (FRC) has been extended to the different dental specialties, currently being used in conservative dentistry and endodontics in different clinical situations. The objective that we present is the reconstruction of a premolar with a FRC pole individually made for the case.
individually-made flexible post with FRC EverStick posts (GC); Adhesive system: G-aenial bond (GC); Cement: Grandia Core (GC) and as Restorative Material: G-aenial color A-3 (GC). All the materials have been applied following manufacturers' indications.
Individual posts made with FRC, called flexible fiberglass poles, can be made out of different FRC trademarks. We have used EverStick posts (GC), the ratio between glass fibers and resin allows for proper handling, nevertheless, it requires some skill and experience in handling the product. It is critical and very important to perform a polymerization of only 3–5 seconds of the post before proceeding to the cementation to ensure that the post reaches the most apical part of the bed made in the conduit.

To obtain a good clinical result it is important to ensure the compatibility of all materials used, as well as the occlusal adjustment of the restoration. In the case presented the restoration has three years of proven clinical success.
The preparation of the post requires time and is not without some clinical difficulty, which means that in daily dentistry it is not considered a practical therapeutic option. However, research papers give this type of posts good results obtaining more resistance to fracture and, if this happens, a type of fracture with greater possibility of repair compared with prefabricated posts
Key words: Glass fiber posts, flexible fiberglass posts and dental restoration

Clinical Cases

Poster P.64

EMBARRASSED TO SMILE? CONSERVATIVE APPROACHES AS AN ANSWER

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Diastema is a common esthetic complaint with different treatment options such as orthodontics, operative dentistry and prosthodontics. Direct composite resin restoration technique is considered to be a conservative and cost effective treatment for anterior diastema. The aim of this case report was to present diastema closure using incremental direct composite resin restorations.
After examining two patients with esthetic concerns of interdental gaps in anterior region, the following indications were identified:
Case A: In 19 years old, female patient; diastema between the upper and lower anterior teeth were observed.
Case B: In 18 years old, female patient; diastemas in upper anterior region were observed.
Direct composite resin restorations were planned for upper anterior incisors in order to achieve an esthetic appearance.After necessary isolation processes and total-etch adhesive system (37% orthophosphoric acid (Blue Etch®, Prudent, USA) and Adper Single Bond 2® (3M ESPE, MN, USA)) application, direct composite resin restorations were carried out using a universal dentin microhybrid composite resin (Filtek Z250®, 3M ESPE, MN, USA) for both cases and a supra-nanofilled composite resin (Estelite Sigma Quick®, CA, USA) in A2, A1 shades for cases A and B relatively, in appropriate increments.
In both cases direct composite resin restorations were accomplished with satisfactory marginal adaptation and esthetic.
Protecting dental tissues and achieving satisfying esthetic and durability are a few of the advantages of direct resin restorations. On the other hand the disadvantages of incremental direct composite resin technique such as marginal discolouration, fracture and possible periodontal problems may be prevented with a good oral hygiene and regular clinical controls. This method remains as a preferable alternative to prosthodontic treatment especially in young patients.

Clinical Cases

Poster P.65

ENDODONTIC TREATMENT OF TRAUMATIZED MANDIBULAR INCISORS WITH A LARGE PERIAPICAL LESION

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The aim of this article is to report the clinical efficacy of chemomechanical preparation of the root canals and effectiveness of calciumhydroxide in the control of root canal infection and healing of large periapical lesion following non-surgical root canal treatment.
A 10 year-old boy who had trauma to mandibulae because of falling off the bicycle was referred to Istanbul University Faculty of Dentistry with complaints of mobility and fistulae in 3rd year after the accident. Both of the mandibular central incisors were sensitive to percussion and palpation and there was severe mobility. The central incisors were displaced and the teeth showed large periapical lesion. The left incisor had internal resorption and both of the incisors had closed apices. Following access cavity preparation,the canal was prepared with size 15–40 K-files using a step-back technique. Canals were irrigated with 0.2% chlorhexidine gluconate and 5% sodium hypochlorite. Following the control of the infection with placing calcium hydroxide into canals for 2 months with 10 days periods, the right incisor was obturated with guttha-percha and left incisor's resorbed area was treated with MTA and guttha-percha was used for the rest of the tooth.
In one year follow up, healing of periapical lesion was evident, teeth were asymptomatic and the soft tissues were healthy. Meanwhile the incisors had returned to right places in the alveol bone spontaneously.
This case report confirms that even large periapical lesions can heal with root canal treatment.

Clinical Cases

Poster P.66

ESTIMATING CHRONOLOGICAL AGE WITH DENTAL AGE USING DIGITAL ORTHOPANTOMOGRAPHS AMONGST UAE NATIONALS

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The aim of the present investigation was to conduct a selected case study using a modified Kvaal method to formulate an equation that best estimates the actual age when applied to UAE Nationals. This study also aimed to produce statistically comparable and reproducible results, and evaluate the accuracy of this technique.
An Orthopantomographic study of 40 subjects, UAE Nationals aged between 15 – 40 were conducted. Maximum tooth length, pulp length, root length, pulp and root width at the level of the CEJ, midroot and at the midpoint between the CEJ and mid root of six selected teeth were measured. A correlation and regression equations were tested to find the relation between these parameters and to check its validity to predict the age of the selected cases.
There was a significant correlation between the age and the tested variables regarding teeth number 15, 12, 33, 34 and 44. However, the coefficient of determination (R2) was the strongest (0.188) for the mandibular first premolar (44) indicating that age can be estimated better with this particular tooth with only 2 years difference between the estimated and the actual age.
Using digital OPGs proved to be a useful method in predicting the actual age of unknown individuals. A novel formula was created during this study, on the UAE population, with an accuracy of 99.4%.

Clinical Cases

Poster P.67

EXTERNAL BLEACHING AND MICROABRASION: A CASE REPORT

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The aim of this case report is to describe an esthetic rehabilitation with combined external tooth bleaching and enamel microabrasion, in a 23-year-old leucodermic female.
The patient was referred to the Department of Operative Dentistry, College of Dentistry, Universidade de Lisboa. She was discontent with her smile due to the color of her teeth and the presence of opaque white spots on her upper teeth, up to premolars, but mainly in the 11 and 21, which were associated to a possible case of fluorosis, after anamnesis and clinical examination. At the first visit, a photographic record of the initial color was made, as well as an alginate impression for the confection of the silicon trays. At the second visit, the Opalustre microabrasion paste was applied 5 times in the central incisors and 3 in the remaining affected teeth, according to the manufacturer's instructions, and a final photographic record was performed.
After 32 days of bleaching, a change from the initial color, B3 to B1 (Vita Classic Shade Guide), was observed. In the end, microabrasion was effective in minimizing the white spots.
Changes in tooth color can now be resolved by more conservative procedures. Microabrasion combined with tooth bleaching are minimally invasive, easy techniques to perform and very effective removing white spots.

Clinical Cases

Poster P.68

EXTREME RECONSTRUCTION OF A LATERAL INCISOR USING A MULTI-FIBRE POST

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Dental reconstruction is one of the main challenges of conservative dentistry. The importance of the tooth in the oral cavity, depending on the clinical situation of the patient, forces that in many cases we have to carry out extreme reconstructions, especially in the anterior sector and in elderly patients, where other treatment options may not be an option. The aim we set out was the reconstruction of the left superior lateral incisor in a 79-year-old patient who had suffered a bevel fracture
A composite-reinforced glass multifibre post Rebilda Post GT System (Voco); Adhesive system: Futurabond DC Unidosis (Voco); Cement: Rebilda DC Dentin and as Restorative Material: Admira fusion color A-3 (VOCO). All materials were used according to the manufacturer's instructions.
The result of the restoration was satisfactory, giving the patient the function and aesthetics of the lateral incisor. The fact that the post is made up of several composite reinforced mini-posts allows a greater bonding surface with the cement and with the restorative material, which can help that the forces that the restoration receives are more dispersed, increasing the monobonk concept. On the other hand we have made selective engraving of the enamel to improve the adhesive strength and to guarantee the sealing since it was present in all the surface adhesive of the restoration.
: Composite-reinforces glass multifibre posts include mini-posts of different number of glass fibers, which allow for a greater integration between the post and the restorative material. The clinical application is good and mechanical properties should be evaluated in the laboratory in order to have greater reassurance in the long-term clinical outcome.
Key words: Glass fiber posts, restoration and composite resin cement

Clinical Cases

Poster P.69

FULL MOUTH REHABILITATION WITH DIRECT COMPOSITE RESTORATIONS

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A 26 year-old male patient presented at the Department of Restorative Dentistry, KULeuven. The main problem was chipping of his anterior teeth. The patient is a fervent sportsman, and during lifting of heavy weights, he clenches and grinds his teeth in a protrusal movement. This parafunction, combined with the excessive use of acidic sports drinks, resulted in early wear of the anterior teeth and molars. Minimal invasive treatment was indicated to restore function and esthetics.
A wax-up was made to evaluate the amount of tooth loss and to ensure a controlled build-up of the teeth. The normal morphology of the anterior and posterior teeth was restored using a 2-step self-etch adhesive (with prior selective etching of the enamel) and a nanofilled direct composite material. A sports guard was made to protect the restored teeth.
The patient was very pleased with the aesthetic result. Regular check-ups are planned to increase the longevity of the restorations.
A full mouth rehabilitation with direct composite restorations is a minimally invasive treatment option for young patients with moderate loss of tooth tissue due to wear.

Clinical Cases

Poster P.70

FULL-MOUTH REHABILITATION OF A PATIENT AFFECTED BY EROSION : ADHESIVE, ADDITIVE APPROACH

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Illustrate additive restorative approach to achieve the aesthetic and functional full-mouth rehabilitation of a patient with erosive tooth wear.
A healthy 25 year-old female with history of bulimia, wish to restore her smile. She's suffering from severe incisal wear (Anterior Classification Erosion class IV).
After clinical and radiographic examination a diagnosis wax-up was performed.
First the vestibular wax-up was transferred to the mouth in order to carry out the clinical validation of aesthetic parameters (anterior teeth´s length, incisal edges) through photographs.
In the second time, the patient's four posterior quadrants were restored at an increased vertical dimension with posterior composites, directly

performed in the patient's mouth with the transparent keys duplicating the occlusal wax up.
Finally reestablishes the anterior guidance with CAD/CAM composite palatal veeners, from an optical imprint made using the camera Condor.
With this procedure, it was possible to obtain a sucessful aesthetic and functional full mouth rehabilitation with minimal invasive technique. This technique is part of the progressivity of the therapeutic gradient.
Treatment by additive rehabilitation seems to be the most suited choice for treating erosive tooth wear. This technique preserve a maximum of tissue to achieve excellent functional and aesthetics rehabilitation. In addition this allows passage quadrant by quadrant to final restorations and an easy reintervention in the future.

Clinical Cases

Poster P.71

FULL-MOUTH REHABILITATION OF SEVERE GENERALIZED TOOTH WEAR.

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A 50 year old woman presented herself with severe occlusal wear. The significant loss of tooth structure had resulted in a reduced vertical dimension of occlusion with impaired function and aesthetics.A full-mouth rehabilitation was proposed, combining both direct composite restorations on the anterior teeth, as well as CAD-CAM overlays and all-ceramic crowns in the posterior region.
In a first step direct composite restorations were placed in the anterior region (upper and lower 6 anterior teeth), by which the new vertical dimension of occlusion was fixed. Next all posterior teeth (PM/M) in the upper jaw were restored with direct composite restorations, guided by the diagnostic wax-up, in order to create the correct occlusal line. The posterior teeth in the lower jaw were restored using hybrid composite overlays and zirconium crowns. Finally, the large direct composite restorations in the upper posterior teeth, were replaced by overlays.The endodontically treated posterior teeth with a limited amount of residual tissue, and the impossibility to have a strict isolation with cofferdam, were restored with adhesive post and core and conventional zirconium crowns.
The anterior teeth were restored with direct composite restorations. In the posterior region, the amount of tooth tissue was determining the type of restoration. Most of the PM/M were restored with chairside made CAD-CAM hybrid composite onlays (Vita Enamic) using the CEREC 3D system. Only when not enough tooth structure was left to durably bond the restoration, the teeth were restored with full crowns.
Total rehabilitation of severe generalized wear may present a challenge because all teeth need to be restored. For this rehabilitation adhesive restorations are the restorations of choice. Full crowns are only indicated in case of a very limited amount of tooth structure.

Clinical Cases

Poster P.72

FUNCTIONAL AND AESTHETIC FULL-ARCH REHABILITATION USING DIRECT COMPOSITE RESTORATIONS

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A 37 year old male with sleep apnea, was referred by the otolaryngologist. A tooth-supported mandibular repositioning apparatus could not be retained due to the severe generalized tooth wear.
In a first step the patient was instructed about his poor dietary habits and parafunction during the day. Oral hygiene instruction was given. The restorative procedure started with fabrication of a diagnostic wax-up of the anterior teeth, by which a direct mock-up could be made. The anterior teeth were build up with direct composite restorations (Filtek Supreme XTE, 3M) using a palato-incisal silicone key made on the diagnostic wax-up. A mild 2-step self-etch adhesive was used with prior selective etching of the enamel with phosphoric acid. After placing the anterior composite restorations in the upper and lower jaw, the new vertical dimension of occlusion was fixed. Alginate impressions were taken, in order to make a diagnostic wax-up of the posterior teeth. The posterior teeth were build-up with the same composite material using a transparent silicone key. After restorative treatment, the mandibular repositioning apparatus was fabricated.
Total rehabilitation of generalized tooth wear was realized placing minimal invasive direct composite restorations. The final result was highly clinically acceptable. Follow-up of the patient is planned each 6 months. Restoring severe generalized tooth wear with direct composite restorations can be considered as an acceptable treatment. Main advantages are their minimal invasive character and the low cost for the patient. Prevention of tooth wear, the oral hygiene of the patient, and maintenance of the restorations will determine their durability.

Clinical Cases

Poster P.73

FUNCTIONAL AND ESTHETIC REHABILITATION OF TOOTH WEAR WITH DIRECT COMPOSITE RESTORATIONS .

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A 28-year old male was referred by the orthodontist because of excessive wear in the last year. All upper and lower anterior teeth, as well as the lower molars showed loss of tooth tissue, caused by bruxism.
The treatment consisted of 1. Making the patient aware of the parafunction during the day; 2. Dietary counselling to prevent further erosion; 3. Restoration of the worn teeth with direct composite restorations; 4. Fabrication of night guard.A diagnosis wax-up was made to have a correct guidance for making the direct composite restorations. The teeth were isolated under rubberdam. The nanofilled composite, Filtek Supreme (A3B and A3E) and a 2-step self-etch adhesive with prior selective etching of the enamel (Clearfil SE) was used for restoring the teeth.In a first step, a direct composite build up was done on the lower incisors and canines using the technique of free hand modelling. Second, the upper incisors and canines were restored using a palato-incisal silicone key made on the diagnosis wax-up. To build up the occlusal surface of the lower molars a translucent silicone key was used. The premolars and upper molars were not restored as they didn't show significant wear. They erupted into occlusion after 3 months according to the Dahl principle. A night guard was made to protect the teeth during overnight parafunction.
The worn teeth were restored in the least invasive way using direct composite additions. The final result is highly clinically acceptable and expected to function well in the medium term.
Direct composite restorations of the worn dentition in combination with adaptation and compensatory remodelling of dentoalveolar tissues are a minimally invasive way to reestablish occlusal vertical dimension and a functional occlusion.

Clinical Cases

Poster P.74

GIVE UP OR SUCCEED: MULTIPLE ANGLES TO CONSIDER IN AESTHETIC DENTISTRY

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Aesthetics and minimal invasiveness are two of the key current topics of restorative dentistry. Diastemas, hypoplasies, congenital or acquired abnormalities, discolorations, abrasions and fractures are the main aesthetic problems in dentistry. In order to solve these kind of problems, more conservative approaches are being preferred by clinicians. Direct composite resin restorations have an important advantage compared with indirect restorations. The aim of this study is to investigate the success of anterior direct composite resin restorations applied to the patients with aesthetic problems. After clinical examination of two patients claiming for the esthetic appearance of anterior teeth, the following findings were registered.Case 1: An 18-year-old female patient referred to our clinic with noncomplicated crown fracture at maxillary central teeth because of trauma. After vitality tests, it was observed that left maxillary tooth was nonvital and discolorated. Before esthetic restorations, endodontic treatment and then nonvital bleaching were performed for maxillary left central.Case 2: : A 25-year-old female patient referred to our clinic with diastema between maxillary anterior teeth because of congenital absence of the maxillary left lateral and furthermore a noncomplicated crown fracture on maxillary right lateral was determined.Each in two cases; teeth were restored with nanohybrid composite materials.
Patients' satisfaction was ensured after the treatment. Six months later clinical and radiological examination showed that teeth were asymptomatic, patients were functionally using their teeth, and there were no significant color changes on composite restorations.
The aesthetic treatment of the anterior teeth is very difficult, especially if there is a crown fracture or multiple diastemas. However, developments in adhesive systems and materials often provide aesthetic and functional satisfaction without the need for prosthetic treatment. Direct resin restorations, with correct indications, are one of the most convenient options for anterior aesthetic restorations.

Clinical Cases

Poster P.75

IMMEDIATE REATTACHMENT OF FRACTURED FRAGMENT USING FIBER-REINFORCED POST: A CASE REPORT

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This report deals with two case of immediate reattachment of the fractured fragment on maxillary anterior teeth using fiber-reinforced post. The aim of this case report was to show the advantage of this conservative trauma treatment method.
Two patients, one 69-year-old male patient and another 56-year-old female patient presented to the department of conservative dentistry after crown-root fractures due to dental trauma. Both teeth had undergone root canal treatment previously, and both patients brought the tooth fragment with them. Treatment options including tooth fragment reattachment; post and crown; extraction and bridge; and extraction and dental implant, were explained to the patients. After thorough discussion, the patients chose immediate fragment reattachment using fiber-reinforced post. After post space preparation, the fragments were reattached with fiber-reinforced post and resin core material.
Fiber-reinforced post was used to retain the coronal fragment and help prevent dislodgement during lateral movement. The occlusion was checked, and the patients were followed up after one month and three months. The patients didn't report any discomfort.
Immediate reattachment using the fiber-reinforced post and dual cure cement resolves the traumatic emergency of tooth fracture with pulpal involvement and restores the original tooth structure. It is a challenging conservative procedure with clinical, emotional and economic benefit in one visit treatment.

Clinical Cases

Poster P.76

IMPROVING TRADITIONAL TECHNIQUES WITH INNOVATIVE MATERIALS: A BULK & BODY CASE REPORT

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In the posterior region, bulk fill materials have proven their excellent behavior. They allow faster sessions and show mechanical properties similar to conventional composites. Nowadays, these materials improved the early 90's Centripetal Build-Up procedure, allowing the development of the Bulk & Body technique. In the posterior restorations, this technique has the particularity of preview the final anatomy in only one stage, obtaining a good aesthetic result with less clinical steps.
A 34-years-old male patient requested the replacement of his metal restorations with an aesthetic material, in the lower right posterior sextant. X-rays examination did not reveal any caries nor periapical disease. After removal the restorations, cavities were simplified into a pseudo-class-I cavity with proximal walls built with an enamel shade.In order to reduce shrinkage stresses, 0.5 mm of flowable bulk composite (Tetric® EvoFlow Bulk Fill, Ivoclar Vivadent®) was placed onto the cavity floor. At this point the cavity was filled up with the bulk fill material (Tetric® EvoCeram Bulk Fill, Ivoclar Vivadent®) until 1 mm away from the margin. Finally, the residual amount of cavity was filled up and modeled with an A3 enamel shade (Tetric® EvoCeram, Ivoclar Vivadent®).
After finishing with diamonds burs and discs, and polishing with silicon rubbers, the restorations appeared perfectly integrated with the surrounding teeth, associated to a correct reproduction of the natural anatomy.
The Bulk & Body technique allows the achievement of a predictable and aesthetically satisfying clinical result, with substantial time consuming reduction if compared to other procedures.

Clinical Cases

Poster P.77

INTENTIONAL REPLANTATION AND GROOVE SAUCERIZATION FOR THE TREATMENT OF PALATOGINGIVAL GROOVE

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Appropriate diagnosis and treatment of palatogingival groove (PG) are challenging. PG often causes a deep localized periodontal pocket leading to pulp necrosis with a questionable prognosis. This poster reports a clinical case of a 40-year old patient who had a PG treated by surgery and who presented an almost complete periapical and periodontal healing.
A 40-year-old woman was referred from the Department of Orthodontics, Gangnam Severance Hospital for the management of the periapical radiolucency on the maxillary left lateral incisor. The tooth showed no response to vitality tests and revealed a pocket depth of 9 mm along the PG; a pulp necrosis with asymptomatic apical periodontitis was diagnosed. Radiographic examination also revealed signs of external root resorption. Root canal treatment was initiated first, and then intentional replantation carried out with filling of the groove with light-cure composite resin material. The surgical procedures involved meticulous tooth extraction and granulation tissue removal. The root end was resected, prepared with an ultrasonic instrument, and retrofilled with ProRoot® MTA. The PG was removed with a chamfer diamond bur, and 2-step etch-and-rinse system (All-bond Universal) and a flowable composite resin were used for filling. Then, the tooth was polished with a diamond polishing bur and was repositioned. A semirigid splint was applied for 3 months for stabilization.
After the treatment, there was no discomfort, and the patient received periodical check-ups for 29 months. After 5 months, bone formation was observed, and the pocket depth was decreased to 3mm along the groove.
This case demonstrated that a lesion originating from the PG could be successfully treated with intentional replantation and filling the groove with composite resin. However, more cases with long-term follow-up are needed in order to predict reliable prognosis for this treatment modality.

Clinical Cases

Poster P.78

INTERDENTAL PAPILLA LOSS: TREATMENT BY HYALURONIC ACID GEL INJECTION

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Obtaining predictable and aesthetically pleasing interdental papilla is a challenging dental reconstruction. Hyaluronic acid gel has been successfully used to reduce facial creases and similar abnormalities. The significance of the interdental papilla to smile aesthetics can be gleaned from the level of aesthetic concern generated either by changes in papilla dimensions. The purpose of this clinical study was to examine the clinical following aesthetic reconstruction of interdental papilla loss in anterior teeth, using an injectable, non-animal-based, hyaluronic acid gel.
Five systemically healthy adults, with at least one anterior site with class I or II interdental papilla loss, were recruited. Following local anesthesia, 0,2 ml of hyaluronic acid gel was injected directly into the base of the papilla. The injection was repeated twice 7 days later. Differences in lost papilla surface area between baseline and postoperative time points were statistically analyzed.
Each site was individually evaluated. Seven sites had 100% improvement between treatment examinations. Two sites improved from 70 to 85%, and two sites improved from 50 to 60%
Patients in this study were treated with a minimally invasive method for enhancing deficient papillae adjacent to teeth. Improvements were maintained for a range of 1 week to 12 months. Injectable hyaluronic acid gel may be a promising treatment for enhancing papillary esthetics.

Clinical Cases

Poster P.79

INTERDISCIPLINARY TREATMENT OF THE ANTERIOR GUIDANCE: A NEW CONSERVATIVE APPROACH.

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The aim of the poster is to describe an alternative treatment modality to rehabilitate the anterior guidance by a minimally invasive interdisciplinary ortho-restorative treatment.
Two 42 and 43-year-old male patients came to the dental clinic for restorative treatment in order to rehabilitate the worn anterior dentition. Clinical analysis showed tooth surface loss. Attrition was located at incisal edges of anterior teeth due to an inadequate anterior guidance, thus a consequent reduction of the occlusal vertical dimension. In the first phase, following Dahl's principle, resin attachments were placed in the upper canines. These attachments allowed the extrusion of posterior teeth in order to increase occlusal vertical dimension. At the same time, anterior teeth were intruded in order to create space for the restorative material. In the second phase, the restorative treatment was completed. A diagnostic wax-up was performed to restore mandibular incisors by direct composite restorations. A mock-up was prepared for the maxillary incisors. Its functionality and aesthetics were verified statically and dynamically. Then, maxillary incisors were prepared through the mock-up to ensure a minimally invasive technique. Afterwards, silicone impressions were taken for the preparation of feldspathic ceramic veneers. The color of the cement was selected by the try-in tests. Finally, veneers were cemented.
The ortho-restorative interdisciplinary treatment is the best option in cases of anterior guidance rehabilitation in which minimal invasiveness is required. In the present case, the functional and aesthetic parameters required by the patients were achieved, thus satisfying their needs/expectations.

Clinical Cases

Poster P.80

INTRODUCING A CHAIRSIDE CAD/CAM SYSTEM TO BEGINNER USERS: CLINICAL CASE SERIES

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Testing the feasibility of the introduction of a chairside CAD/CAM system to beginner users, while gathering data on the survival and success rates of different types of restorations realized with different dental materials and techniques.
A total of 76 patients were treated from December 2013 to July 2015; 12 clinicians attending the Master's Degree in prosthodontics have used the CEREC system under the supervision of trained tutors. 74 crowns, 43 partial restorations (inlays, onlays) and 5 bridges were realized using lithium disilicate (79 restorations), resin composite (38 restorations) or reinforced PMMA (5 restorations). Controls were performed during a follow-up of 24 months.
An Estimated Cumulative Survival rate (± standard deviation) and an Estimated Cumulative Success rate (± standard deviation) of 97.2±1.6% and 94.4±2.2% were respectively calculated. The outcomes of this prospective clinical case series correspond to those described in the literature and there are therefore good expectations for the continuation of the follow-up.

The chairside CAD/CAM system proved to be efficiently introducible to beginner users, so that even unexperienced operators could obtain good initial results after a brief learning period with trained tutors. The three fractures were due to substantial project errors, i.e. wide areas of the restoration under the factory-recommended thickness.

Clinical Cases

Poster P.81

MANAGEMENT OF ENAMEL HYPOPLASIA WITH DIRECT COMPOSITE RESTORATIONS : TWO CASE REPORTS

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Genetic or acquired effects on enamel structure may lead to the developmental alterations for tooth esthetics and function. This case report aims to briefly discuss the possibility of composite treatment options either to Enamel Hypoplasia or Turner Hypoplasia in order to achieve optimal esthetic results.
Case 1: A 10 year-old female patient was referred to the dental clinic; she reported a visual discomfort from the presence of irregularities and discoloration in the incisors. Dental history and clinical examination revealed that she had a severe form of enamel hypoplasia.
Case 2: A 6 year-old female patient was referred to the dental clinic for a fractured tooth with no history of pain or swelling. She reported a visual discomfort from the presence of irregularities and discoloration in the maxillary incisors.
Direct composite resin restorations were made for both mechanical and esthetic properties of the teeth.
The patients and their family were satisfied with the aesthetics and function at the end of the treatment.
The conservative rehabilitation of the enamel hypoplasia involving the incisors, the direct composite restorations seems to be the most reasonable option to restore the esthetics.

Clinical Cases

Poster P.82

MANAGING SUB-GINGIVAL FRACTURE BY MULTI-DISCIPLINARY APPROACH: ENDODONTICS, FORCED ORTHODONTIC EXTRUSION AND RESTORATION

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Subgingivally fractured teeth pose a true therapeutic dilemma to the dental team and require interdisciplinary approach. Attempts to expose the fracture line by periodontal crown lengthening may compromise the functional root length and esthetics. Controlled orthodontic extrusion is an alternative way to expose the fracture line.
A 20-year-old male was referred for extraction of subgingival fractured 15 and placement of an implant. The patient was assessed as high caries risk. The fracture line was 2mm subgingival on its palatal surface. The buccal cusp was intact. After clinical and radiographic examination and an analysis of factors, such as the patient's age, the root anatomy and length (26mm) and the existing gingival recession due to toothbrush trauma, which was a contra-indication for periodontal crown lengthening, it was suggested that the tooth was not of poor prognosis and could be saved by means of endodontic treatment and orthodontic root extrusion to deliver adequate ferrule and safely construct a full coverage restoration.After deep margin elevation, endodontic treatment, fiber post cementation, a core build-up was performed. Orthodontic brackets were bonded to three adjacent anchoring teeth. A bracket was bonded on the fractured tooth, in a more cervical position. The incisal aspect of the crown was reduced to prevent occlusal interference during the extrusive movement. An extrusion of 4mm was obtained in 2 months. After a stabilization period of 6 months, the tooth was restored with an all ceramic crown.
The patient was fully satisfied for saving his tooth and was motivated to change his oral hygiene and he moved to low caries risk with excellent oral hygiene.
Within the limits of the present clinical case, it can be concluded that orthodontic extrusion is a useful tool for the management of extensive subgingival fractures, especially in young patients.

Clinical Cases

Poster P.83

MASKING LARGE AREAS OF TRANSLUCENT ENAMEL WITH NO-PREP FELDSPATHIC PORCELAIN VENEERS.

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The poster presents a clinical case related to an aesthetic problem due to large areas of translucency in the upper anterior teeth with `no-prep´ adhesive restorations.
A 28-year old female came to the dental clinic complaining about the colour of her teeth. The clinical exploration showed the presence of very translucent upper incisors with grayish appearance.
The treatment plan consisted into the restoration of the upper incisors with feldspathic veneers. A diagnostic wax-up was performed from which a mock-up was made. The latter was used to evaluate the aesthetic and functional parameters.
Silicone impressions were taken for the preparation of feldspathic veneers. The veeners were bonded on enamel without any further tooth preparation. After checking the fit and aesthetics using a try-in paste, the veneers were boonded using resin cement (Calibra, Dentsply, Detrey Gmbh, Konstanz, Germany).
The aesthetic integration of the restorations was excellent, resulting in a high degree of patient satisfaction.
Veneers without preparation are the first choice for aesthetic treatments due to their minimal invasiveness. In this clinical case, both the aesthetic and functional parameters required by the patient were met, thus satisfying her expectations.

Clinical Cases

Poster P.84

MASKING SEVERE TETRACYCLINE DENTAL DISCOLORATION: MINIMALLY INVASIVE RETREATMENT. A CLINICAL REPORT

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To carry out the replacement with conventional feldspathic ceramic veneers in a patient with grade IV tetracycline stains, adopting a minimal invasive approach.
A 46-year-old woman, who had feldspathic ceramic veneers from 1.3 to 2.3 for 28 years, came to the dental practice change them to improve her smile. Clinical examination, revealed grade IV tetracycline dental discoloration, gingival retraction, colour change in veneers, cracked veneers in 1.1 and 1.3, and incisal wear in antero-inferior teeth. It was decided to retreat with veneers from 1.6 to 2.6 due to the wide buccal corridors. Restoration with veneers from 3.3 to 4.3 had also been considered due to their tetracycline stains and incisal wear. Opaque dentine mass of microhybrid composite was placed to mask the stains, after a minimum carving in the most intense locations and prior to making definitive impressions. The laboratory was asked to fabricate the feldsphatic ceramic veneers using the parallel stratification masking technique. For cementing, the composite was silicatized with and an opaque cement selected from the try-in tests.
A favorable and minimally invasive result was achieved to treat the tetracycline stains, surpassing the aesthetic expectations and the functional needs of the patient.
The placement of opaque composite prior to the placement of veneers of conventional feldspathic ceramic is a conservative treatment option for masking severe tooth discoloration.

Clinical Cases

Poster P.85

METHODOLOGICAL VALIDATION OF OVER-DENTURE USE IN THE MANAGEMENT OF SEVERE TOOTHWEAR: CASE-SERIES

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• To reconstruct the form and function of the dental framework affected by severe toothwear.• To validate the application of the use of over-denture in oral rehabilitation as presented previously by the author [1].
This is a case series to validate a method used to reconstruct occlusal collapse by the author [1]. The method is based on the use of composite build-up and over-denture to reconstruct the occlusion. A 62-year-old gentleman, who is fit and well with no allergies, non-smoker, and works as carpenter, presented to general dental practice with severe wear of upper anterior teeth (3–3) and loss of posterior support. The patient experienced frequent dental abscesses from UL3 and UR2 retained roots. The abscesses were stabilised by pulpal extirpation. Oral hygiene and caries were controlled prior to embarking on definitive care. In order to maintain the alveolar ridge, the anterior roots were endodontically treated and used as over-denture abutments. The lower anterior teeth were also built-up with composite to increase the occlusal vertical dimension. A cobalt chromium over-denture was construct at retruded contact position.
This conservative approach produced excellent aesthetic and functional results delivered with minimal cost to the patient.
This case series provide validation for the use of over-denture in management of severe toothwear.

Clinical Cases

Poster P.86

MINIMAL INVASIVE TREATMENT APPROACH OF A MILD FLUOROSIS CASE

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To mask the flourosed enamel tissue with a minimally invasive treatment "resin infiltration" protocol after pretreating with an alternative etching gel.
22 years-old male patient complaining teeth discoloration of white opaque enamel lesions. Extended enamel lesions were diagnosed as mild fluorosis corresponding Dean's index code 3.As a part of the non-invasive treatment protocol lesions were bleached in-office using 35% Hydrogen peroxide bleaching gel (Whitness HP, FGM) for 40 minutes to decrease the opaque shade difference of the enamel surface by camouflage effect. Following two weeks period, enamel surface was pretreated with 35% H3PO4 gel (Select HV® Etch w/BAC, BISCO) for 30s with brush, rinsed with air-water spray for 30s, dried and dehydrated with 100% ethanol (ICON dry®, DMG) for 30s. Enamel surface were then resin-infiltrated (ICON®, DMG) according to the manufacturer's instructions and light cured.
Resin infiltrated fluorosis lesions showed improved esthetic outcomes with a clinically acceptable ability to mask the opasity difference of the lesion.
To infiltrate such developmental lesions pretreated with phosphoric acid etching reveals effective and promising penetration depth to mask the surface appearance of the lesion. Further clinical and in vitro studies would enhance the effectiveness of the pretreatment techniques of resin infiltration.

Clinical Cases

Poster P.87

MINIMALLY INVASIVE APPROACH ON ANTERIOR TEETH WITH COMPOSITE – A CASE REPORT

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The present work is a clinical case of an anterior direct composite esthetic rehabilitation using the anatomic stratification technique.
A 54-years-old healthy melanodermic female was referred to the Department of Operative Dentistry, College of Dentistry, Universidade de Lisboa. Following the medical interview, the presence of generalized diastemas on the anterior sector was observed. The right central incisor (#11) showed a crown fracture and the right lateral incisor (#12) was peg-shaped. All anterior teeth were vital. The treatment plan proposed the placement of direct resin composite restorations. An alginate impression was taken for the wax-up procedure. A silicon index was made to help the construction of the palatal enamel. A mock-up for color determination was performed: dentin shade composite in the cervical region and enamel shade in the middle third, to ensure the correct shade measurement. All restorative procedures were made under rubber dam isolation, a 3-step total-etch adhesive (Optibond FL™, Kerr, Orange, USA) and ENAMEL Plus HRi resin composite (Micerium S.p.A.™ Avegno, GE, Italy). Thin increments of enamel shade composite UE2 were inserted in the silicone index to rebuild the palatal enamel. Then, the same shade was used to

build the distal and mesial walls. Layers of dentin shade composite, UD3 and UD3,5 were applied. The enamel shade composite UE2 was placed as the last increment in the buccal surface. Each increment was light-cured for 30s. Occlusal adjustment performed with diamond burs. Restoration's finishing and polishing were performed with sanding discs and Enamel Plus Shiny Kit (Micerium S.p.A. ™ Avegno, GE, Italy).
The two restorations have an esthetic result that is imperceptible, blending with the natural structures of the teeth.
Composite restorations allow for the conservation of healthy tooth structure while fulfilling esthetic expectations. The polychromatic composite layering technique mimics the natural tooth.

Clinical Cases

Poster P.88

MINIMALLY INVASIVE COMPLEX ORAL REHABILITATION WITH A CHAIRSIDE CAD CAM SYSTEM

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To show a complex oral rehabilitation clinical case with minimally invasive tooth preparations and cad cam restorative procedures using new dental materials.To present a complete clinical protocol from achieve muscle skeletal stable condylar position to final protective splint appliance installation.
A 37 years old female patient with aesthetic and functional requirements presented III and IV type tooth wear index in the upper and lower tooth, diminished vertical dimension, excessive gingival display, irregular smile line and midline deviation. Occlusal relationships were uncomfortable without functional anterior guidance. Digital planning was designed. Wax up according to the new vertical dimension was done in a new orthopedic muscle skeletal position of the condyle fossae relationship. A full mouth mock up was tested through the analysis of occlusal relationships. Gingivectomy with a diode laser was done in both central incisors. Once this planning was approved. 28 cad cam restorations with materials for the CEREC CAD/CAM technology were used. Modified PES WES index was used to evaluate the aesthetic quantitative results. Postoperative photographic registers were taken at 3, 6 and 12 months. Shortened form of the Oral Health Impact Profile (OHIP) for evaluating dental aesthetic outcomes was used.
Stable occlusal relationships and effective disoclusive guides were achieved. According to independent evaluator's, the PES score was 9.8/10 points. The mean WES score was 9.4. After 1 year of follow up occlusal surfaces with hybrid ceramic and anterior restorations with a leucite-reinforced glass-ceramic block for the CAD/CAM technology were mantainned without apparent wear neither loss of shine, color and marginal integrity. OHIP for evaluating dental aesthetic outcomes by the patient showed positive results.
As shown in this case, minimally invasive tooth preparations helps to preserve biological remanent. New CAD/CAM materials allow conservative approach. Decreasing time of dental laboratory procedures were advantages for patient and dentist.

Clinical Cases

Poster P.89

MOLAR INCISOR HYPOMINERALIZATION REHABILITATION WITH DIRECT COMPOSITE: A CASE REPORT

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Molar Incisor Hypomineralization" (MIH) is the term used to described teeth, generally permanent incisors and first molars, characterized by a developmentally derived deficiency in mineral enamel. Affected teeth present demarcated enamel opacities, ranging from white to brown, according to the severity of the disease and the hypoplasia that can be associated. This case report describes esthetic and functional rehabilitation of a young patient with MIH.
A 14-year-old woman presented with severe esthetic and functional problems.
This patient reported no history of tetracycline ingestion by either herself as a child or her mother during pregnancy and the patient's sister do not exhibited similar signs of a mild form of MIH.
Clinical examination revealed upper maxillary teeth affected by MIH while mandibular teeth were not affected.
The clinician opted for the esthetic correction of only element number 13-12-11-21-22-23.
Anatomic stratification involves the reproduction of dentin and enamel tissues to the proper thickness and position with Micerium's composite
The treatment options vary considerably, depending mainly on the patient's age, MIH type, disorder severity, and intraoral situation.
Composite resin is able to mimic tooth color through anatomical stratification and proper placement of tints and opaquers, to enhance the esthetic value.
Risks for failure include fracture and partial loss of restorative material.
The selection criteria for the rehabilitation of MIH patients can be summarized as: disorder type and severity, patient age, esthetic demand, treatment longevity, presence or absence of parafunctional habits, oral hygiene, cost. The protocol used in this paper has shown to be effective to improve esthetics; also in this case report a long-term patient collaboration is required.
Results seem to be stable, but they have to be monitored for a longer period of time.

Clinical Cases

Poster P.90

MOLAR INCISORS HYPOMINERALIZATION: RESTORATIVE, ORTHO AND AESTHETIC LONG TERM TREATMENT

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Goal of the study was esthetic fulfillment of a paradigmatic case of hypomineralized enamel correction on both anterior and posterior teeth in order to establish a clinical protocol for similar cases.
A 7-yr-old girl belonged to a group of MIH diagnosed children part of a supplementation project published in 2011. After supplementation using for two years GC Toothmousse-no fluoride, initial restorative treatment on lower left molar (Clearfil Majesty A2, Kuraray Europe) was performed and never repeated. Unaffected molars were sealed over time during full arches eruption.
Orthodontic treatment (3 years) was performed for class 2 malocclusion. After eight years from diagnosis and continuous follow up, a 2 visit bleaching protocol for the anterior group (presenting moderate severity) was applied using Opalescence Boost (Ultradent Products), bioactivated for 20 minutes with a diode laser (Pocket Laser, OROTIG MED), bleaching protocol.Aesthetic restoration on upper left incisor involved a slight ameloplasty of abraded and discolored white-yellow defect using round and rugby finishing red band burs (Intensiv SA) creating a bevel.

Filtek Supreme Ultra Universal Restorative, (color A2 body, 3M-ESPE) was used as a masking agent. Filtek Supreme Ultra Universal Restorative enamel (color A2, 3M-ESPE) was used as the final layer. Cusp and occlusal covering of upper right molar was done with composites, using both flowable composite (Filtek XTE Supreme Ultra Flowable Restorative, color A2) and brushed nano-filled material (Filtek Supreme Ultra Universal Restorative, color A2), as the final step.
Restorations were all polished by rubber cups (EVE, Econocomp, Ernst Vetter)
Figures 1–14
Usually, alternative approaches for MIH incisors include enamel microabrasion, aesthetic restorations and dental whitening.The present case suggests a delayed but stable approach, fulfilling both restorative and orthodontic needs, while matching the tooth polychromatic and improving adolescent self-confidence.

Clinical Cases

Poster P.91

NIR-TRANSPARENT SEALANTS FOR OCCLUSAL NON-INVASIVE RESTORATIONS

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Early occlusal caries are often not visible on bitewing x-ray and usually diagnosed by meticulous clinical examination. The detection and imaging of different stages of early occlusal caries is now possible by using the near infrared trans-illumination technology (DIAGNOcam, KaVo, Biberach, Germany). Sealing of early occlusal demineralization in enamel or even deeper lesions with non cavitated enamel is known to stop the progression of such lesions. Most of the restorative materials used for non-invasive occlusal restoration (sealants) deflect or absorb near infrared light which makes it impossible to monitor the eventual progression of the lesion in a noninvasive manner.Using a material that is transparent under near infrared light imaging devices for these occlusal restorations might help to keep the visualization of the lesion and monitoring its progression.
In this abstract the aim is to present a clinical case of a non-invasive occlusal adhesive restoration using a NIR-transparent material providing the before and after NIR images to be compared with a 10 months recall image.
Control Seal (VOCO GmbH, Cuxhaven, Germany), a transparent pit and fissure sealant with the physical properties of an opaque sealant developed for the use together with Fluorescent caries detection devices was used to this purpose. The material is 55% filled by weight, with high compressive strength, low shrinkage, and high flexural strength with low abrasion levels according to the manufacturerIts. NIR transparency makes it possible to use Visual, Near infrared, and all laser fluorescence based diagnostic methods to monitor changes of the occlusal lesions.
Its NIR transparency makes it possible to use Visual, Near infrared, and all laser fluorescence based diagnostic methods to monitor changes of the occlusal lesions.

Clinical Cases

Poster P.92

NON INVASIVE PROXIMAL ADHESIVE RESTORATION : A CASE REPORT

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The aim of this poster is to describe a minimal invasive approach for adhesive proximal sealing of non cavitated proximal lesions.
Infiltration and sealing are new trends in operative dentistry and they have has proved to be an effective approach to slow down lesion progression in multiple clinical studies. Specific and expensive materials have been developed in recent years in order to face this clinical situation.
In this case report we present a step-by-step technique for the infiltration and sealing of the proximal surface in definitive dentition in order to stop carious phenomenon's evolution by employing routinely available materials.
This minimally invasive technique is a valid ultraconservative approach for interproximal demineralisations and it represents an affordable alternative for general practitioners to practice early lesion infiltration.
Non invasive proximal adhesive restorations seem to be a promising and low cost approach in managing non cavitated proximal lesions

Clinical Cases

Poster P.93

NO-PREP FULL- MOUTH ADHESIVE REHABILITATION OF A SEVERELY WORN DENTITION

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The purpose of this clinical case is to present the treatment of a worn dentition due to attrition and erosion with a full-mouth additive rehabilitation with feldspathic ceramic no-prep veeners and direct posterior composite resin restorations.
A 55-year old male patient came to the clinic asking for treatment for damaged and worn teeth. Over the last decades patients have become more aware of the importance of minimally invasive procedures and the specific desire of our patient was not to prepare his teeth during the dental treatment. During the clinical examination a severely worn dentition with dentin exposures due to attrition and erosion was observed as well as the presence of multiple abfractions and diastemas. Photographs, radiographs and impressions were taken and a dynamic analysis of the smile was performed to establish the aesthetic and functional parameters of the final rehabilitation. The treatment plan consisted in increasing the vertical dimension with direct posterior composite resin restorations without any dental preparation and the rehabilitation of the anterior guidance and lateral sectors with feldspathic ceramic no-prep veneers. The modifications planned during the treatment were based on an additive diagnostic wax-up and in the mock-up.
The direct composite resin restorations and the feldspathic ceramic no-prep veneers allowed the reestablishment of the vertical dimension and a posterior stable occlusal scheme, as well as recovering the lost smile aesthetics, satisfying the expectations and treatment demands of our patient.
The treatment of worn teeth due to attrition and erosion represents a challenge for the clinician and may require an interdisciplinary approach. Nowadays, in the aesthetic and functional rehabilitation of a worn dentition, the maximum tissue preservation is achieved due to the development of the adhesive procedures.

Clinical Cases

Poster P.94

NO-PREP PORCELAIN VENEERS IN COMBINATION WITH TRANSPARENT ALIGNERS

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The aim of this clinical case is to present the aesthetic treatment of localized anterior dental wear by attrition in a patient with high aesthetic expectations using interdisciplinary approach with orthodontic transparent aligners and no-prep feldespathic veneers.
A healthy 35-year-old woman came to the dental office with an aesthetic improvement to her smile as major request. The oral examination showed attrition on the incisal edges of the upper anterior teeth.
Radiographs, intraoral photographs and study models completed the anamnesis for treatment planning. The first phase of the rehabilitation consisted in an orthodontic treatment performed using transparent aligners. Digital Smile Design (DSD) and ClinCheck softwares were used to determine the position for future restorations and, the desired space for the placement of the ceramic restorations. The diagnostic wax-up was molded, through which a mock-up was made and tried by the patient to evaluate all the aesthetic parameters.Once the mock-up was accepted by the patient, retraction threads were placed and impressions were taken for the elaboration of feldspathic veneers.
Through the interdisciplinary ortho-restorative treatment, the necessary space was obtained to avoid any tooth preparation (drilling), creating an efficient anterior guide and satisfying the patient's aesthetic expectations. The aesthetic and functional treatment of localized anterior attrition may require an interdisciplinary approach. The rehabilitation of the smile aesthetics should be based on adhesive procedures and maximum tissue preservation.

Clinical Cases

Poster P.95

NOVEL METHOD OF CAPTURING FLUORESCENCE IN CLINICAL DENTISTRY

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A fully integrated esthetic restoration should emit similar levels of fluorescence to that of natural dentition, while dental practitioners should be able to check on this property in their routine clinical setting. The aim of this study is to investigate the efficacy of a removable filter for a macro flash illumination set-up, required for the digital photography recording of the fluorescence emission of human teeth and dental restorations.
The traditional fluorescence capturing method in clinical dentistry, using continuous lightning, was compared with the proposed flash lightning method. A dslr Canon 550D camera, with Canon 100 mm macro lens and a commercially available standard Canon MT-24EX twin lite macro flash were readied for this study. A custom fabricated plastic O-ring was fixed with silicone to the original flash framework, which received a removable fluorescence filter composed of two 365nm UV glass filters on both sides, covering the flash lamps. The original protective plastic diffusers in front of the flash lamps were replaced with clear plastics to release the full excitation wavelength range of the xenon flash lamps. No additional filter was placed in front of the lens.
The results showed that with the proposed custom made flash/filter illumination source, f-numbers between 16–22 as well as a shutter speed of 1/60 together with ISO 800 or 1600 sensitivity settings attained satisfactory fluorescent digital images. Results were comparable to those accomplished using the traditional photographic technique, without the need of a dark room, extended exposure times and time-consuming set ups.
A contemporary photographic technique was demonstrated, using macro flash UV-A 365nm illumination allowing fluorescent digital pictures acquisition under standard dental office conditions. Fluorescence documentation using a quick and straightforward procedure can take place during the restorative session, to increase the success rate of dental restorations.

Clinical Cases

Poster P.96

ONE-YEAR CLINICAL EVALUATION OF THE BONDING EFFECTIVENESS ADHESIVE IN NON-CARIOUS LESION THERAPY

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This study evaluated the one-year clinical performance of a one-step self-etch adhesive to restore Non Carious Lesions (NCLs).
Thirty-one volunteers patients aged from 24 to 73 years, presenting NCLs and attending the operative dentistry clinic at Dakar University were included in this study that has been approved by the Senegalese National Committee of Ethics. The NCLs were restored by the same operator using self-etch adhesive (Optibond all-in-one) combined with the restorative composite (Herculite® XRV Ultra) shade A2. The operator was not involved in the evaluation of the restorations. At 3, 6 and 12 months after restoration, the clinical effectiveness was determined by two qualified evaluators using the modified United States Public Health Service (USPHS) criteria. Statistical analysis was done by SPSS®16.0 using the chi-square test, with level significant at $p < 0.05$.
At baseline, all restorations were 100% successful. At 6 months, the rate of retention was 84.2% with prior acid etching, and 77% without acid etching. At 12 months, 18 patients returned for examination. The retention rate was 84.15%. No loss of pulp vitality, post-operative sensitivity or secondary caries were observed.
In the literature, studies have evaluated the clinical performance of two-step self-etch adhesives. NCLs are commonly evaluated for a period of 3 to 5 years. In this study, the clinical performance of the one-step self-etch adhesive system "Optibond all-in-one" was evaluated using the modified USPHS criteria. Restorations of NCLs with the one-step self-etch adhesive in combination with the composite resin with or without prior acid etching of the enamel margins demonstrated clinically acceptable results after one year.

Clinical Cases

Poster P.97

OROFACIAL PIERCINGS AND DEPRESSION AMONGST UNIVERSITY STUDENTS IN THE UNITED ARAB EMIRATES

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The aim of the present investigation was to assess the relationship of depression with both piercing incidence and perception amongst university students in the United Arab Emirates (UAE)
This cross sectional study was carried out within different emirates of UAE including Abu Dhabi, Ajman, Dubai and Sharjah during the academic year 2015–2016. A total sample of 110 students aged 18–27 of

different academic years were selected. A self-administered questionnaire with Beck's Depression Inventory was used to assess the subjects.
There was a significant correlation between the subjects desire of having a piercing with depression with p-value 0.037. Students who desired body piercing are 2.4 times more likely to have moderate depression compared to those who did not (O.R= 0.41, 95% CI: 0.21-0.82).
The results of the present investigation showed a significant correlation between piercing desire and depression. So, subjects who desired to have a piercing were 2.4 times more likely to have moderate depression. However, there was no correlation between subjects who presently have orofacial piercings, and depression.

Clinical Cases

Poster P.98

REGENERATIVE ENDODONTIC TREATMENT VS. APEXIFICATION: COMPARISON OF TREATMENT OPTIONS IN IMMATURE TEETH

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Endodontic treatment of necrotic immature teeth has always been a challenge for several reasonssuch as wide apical foramen, infected canal space or thin dentin walls. These teeth are difficult to be sealed properly and vulnerable to cervical fractures. This report compares the treatment results of regenerative endodontic treatment and apexification in a pair of necrotic immature lower premolars.
A 10-year-old female patient was referred to our institution for the treatment on mandibular right second premolar (#45). The chief complaint was that she had a gumboil around the mandibular right second premolar. The apexification procedure using Vitapex® (Neo Dental Chemical Products, Tokyo, Japan) had been performed for the first premolar (#44) in local clinic a month ago. The mandibular right second premolar (#45) was diagnosed with pulp necrosis and chronic apical abscess and the first premolar (#44) was diagnosed with previously initiated therapy with asymptomatic apical periodontitis. The regenerative endodontic treatment with revascularization procedure using mineral trioxide aggregate (ProRoot® MTA, Dentsply, Tulsa, OK, USA) was performed for the second premolar (#45).
The teeth were routinely checked for 8 months after treatment of the right lower second premolar (#45), but the patient did not come for the further follow-up. After 4 years and 5 months, the patient came to our clinic to examine the teeth that had been treated. Both teeth were asymptomatic and showed complete radiographic healing of the initial periapical lesions. The root length and dentin wall thickness of the second premolar (#45) increased; however, the first premolar (#44) showed the apical closure without any change in root growth.
The regenerative endodontic treatment and apexification are both reliable treatment options in necrotic immature teeth. However, the regenerative endodontic treatment seems to be a better option leading to root development, making the tooth more resistant to future trauma and occlusal forces.

Clinical Cases

Poster P.99

RESTORATION OF DIFFERENT TYPES OF TRAUMATIC TEETH: CLINICAL REPORTS

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Dental fractures are undesirable from both aesthetic and functional aspects. In addition, there are also poor results that can occur as a result of traumas that occur during therapy. In such cases, treatment should be the primary objective of preserving the natural tooth structure. Direct restoration of the original fracture reattachment or composite resin materials in order to provide function, aesthetic and natural appearance will be more conservative and economical than prosthetic treatments.
CASE 1: A 25-year-old female patient referred to our clinic with an uncomplicated crown fracture #21. It has been reported that the patient could not find the broken part of her tooth. The examination of soft tissues was performed and radiographs were taken; the tooth was restored using a direct composite resin restoration.CASE 2: A 27-year-old female patient referred to our clinic for the replacement of old composite fillings in teeth #11 and #21. The clinical examination showed discolorations of the buccal gingival sulcus of tooth #11 and the old composite restorations. On tooth #11 which was endodotically treated, the entrance cavity was reopened and it was determined that the color change area was related to a cervical perforation. During the gingival tissue operation, perforation area was restored by composite restoration.
The patients were re-invited after 2 weeks to control of vitality in case 1 and soft tissue and color control for case 2.
Once the emergency situation of the patients has been solved out, proper treatment should be considered and at the same time clinical and radiological follow-up should be done regular basis. The color evaluations of composite restorations made and the vitality status of the teeth after trauma should be followed up and at the same time the damaged gums and soft tissues should be checked.

Clinical Cases

Poster P.100

RESTORE AESTHETICALLY THE ANTERIOR SECTOR RESPECTING THE "THERAPEUTIC GRADIENT": A CASE REPORT.

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The aesthetic integration of a restoration remains a complex challenge, especially as far as the anterior sector is concerned. This clinical case gave us the opportunity to use three different techniques on one single patient. The objective of the treatment was to restore the forms, volumes and colour of the four maxillary incisors keeping in mind, as much as possible, the tissue preservation.
A 30-year-old male patient consulted for an aesthetic reason. The aesthetic problem on maxillary incisors was complex and linked to an infected root, an old misshapen crown and poorly designed veneers restorations. The treatment involved the replacement of faulty restorations.The therapeutic decision relied on the "therapeutic gradient" in order to provide the least mutilating and aesthetic solutions for residual dental tissues. The treatment consisted in a combination of modern endodontic and restorative methods:- Endodontic surgery was performed on the right maxillary central incisor. The coronary sealing was ensured by the realization of a

corono-radicular restoration (glass-fiber post). A new all-ceramic crown was bonded after recontouring the prosthetic limits.- Two new ceramic veneers according to the aesthetic project were designed and bonded on the left maxillary central and lateral incisors.- For a better integration regarding shapes and colours, a direct layering technique was performed on the right lateral incisor.
The four maxillary incisors were restored with a natural appearance. The patient confirmed his satisfaction with the smile enhancement.
Modern dentistry techniques achieve the expectations of both patient and practitioner with maximum tissue preservation.

Clinical Cases

Poster P.101

RESTORING TOOTH WEAR FROM BRUXISM AND CORROSIVE AGENTS WITH COMPOSITE RESTORATIONS

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The aim of this poster is to describe, through a clinical case, the management of generalized loss of hard tissue in a young patient.
A 30-years-old male was referred to the postgraduate clinic of the operative dentistry department,dental school, Athens. The intraoral exam revealed a generalized loss of hard tissue especially on occlusal/cutting and palatal surfaces. Bruxism and high consumption of carbonated beverages were identified as the major causative factors. The treatment selected was direct and semi-direct composite resin restorations at an increased vertical dimension. After the recording of the centric relation, a diagnostic wax-up was made. First, the occlusal surfaces of the upper posterior teeth were directly built using silicone keys, followed by the restoration of the palatal and cutting surfaces of the maxillary anterior. Then, the mandibular posterior teeth were restored with semi-direct technique. Specifically, the wax-up was transferred intraorally through the procedure of the mock-up and the occlusion was set. A silicone mold fabricated, thin enamel composite shells were An impression was taken and a silicone mold was fabricated. Thin enamel composite shells were fabricated using this silicone mold and the original cast, and these shells were bonded to the unprepared teeth with composite resin. Then, the lower anterior teeth were restored with direct resin restorations. Finally, an occlusal splint was constructed in order to maintain the therapeutic result.
The functional and aesthetic rehabilitation was achieved by a minimally invasive approach preserving the remaining sound tooth structure.
The non-carious extensive loss of tooth hard tissue, especially in the occlusal and cutting surfaces is a growing phenomenon. The first step is to identify its causes and control them, followed by the functional and aesthetic restoration of teeth. In the past, such cases were usually restored by conventional prosthodontics procedures. Nowadays, the evolution of the adhesive techniques and the materials offers new approaches to rehabilitation.

Clinical Cases

Poster P.102

SOFT TISSUE AND CERAMIC ADDITIVE VENNERS: CASE REPORT

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This report deals with one case of indirect no prep veneers with asymmetric gingival levels area. The aim of this case report is to show the importance the management of erither soft either hard tissues with minimal invasive techniques to obtain good aesthjetic results.
The patient was a 28-years-old female that decided to improve her smile. The upper anterior regionpresented composite additive resorations on lateral upper incisors. The patient was involved in the treatment planning with ADSD, that through a dento-facial analysis performs a digital project of the aesthetic treatment. The final aesthetic result chosen by the patient was realized on a gypsum model with wax, thus the dentist could obtain several guides that are needful to replicate the ADSD result. Surgery was performed to regulate the symmetry of lateral incisors gingival zenith. After 4 weeks, composite was removed and impression was taken to create no prep lithium disilicate veneers. The cementation was performed with rubber dam application, adhesive treatment of the tooth enamel with 3-step etch-and-rinse system and of the lithium disilicate with 5% hydrofluoridic acid for 20 sec, silane and bonding. A light curing cement was employed and after polymerization finishing precedures were performed and radiograph were done to control interproximal sealing.
After 6 months of function the case showed perfect aesthetic result and complete patient satisfaction. the periodontal tissue healing showed a perfect integration between soft tissues and ceramic restorations.
A good aesthetic result could be obtained only when not only teeth shape and color is managed, but also perioodontal tissues are considered in the treatmemnt planning. The use of digital approach to simulate the final results with pictures could help the patient in understand the final results and the tratment necessaries to reach it.

Clinical Cases

Poster P.103

THE IMPORTANCE OF EARLY DETECTION OF MESIODENSES IN CHILDREN

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The aim of the present study was to analyze the frequency and radiological features of mesiodens in children.

The study was based on the retrospective radiographic evaluation of 2,142 pediatric patients who attended the Department of Pediatric Dentistry and Oral Surgery Department of Istanbul University, Faculty of Dentistry between September 2008 to December 2014.
Males were more frequently affected than females in the ratio 2.3:1. Of the 83 mesiodenses, 48.2% were conical, 31.3% were tuberculate and 20.5% incisor like, 22.9% were inverted, and 68.7% were fully impacted. The number of mesiodens was one in 36 cases (61.0%), two in 22 cases (37.3%) and three in one case (1.7%). The mean age at the time of diagnosis of the mesiodens was 9.5 years (the minimum age was 9.0 years). The main complication associated with the mesiodens was displacement or rotation of permanent teeth (73.3%).
In accordance with previous studies, the majority of the mesiodenses were unilateral located in the premaxillary region, were conical shaped, and remained unerupted.

Clinical Cases

Poster P.104

THE IMPORTANCE OF TIMING:INTERDISCIPLINARY CONSERVATIVE APPROACH USING DIRECT COMPOSITES & ORTHODONTICS.

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The clinical case reports the rehabilitation of a patient presenting dental crowding and moderate dental wear adopting an interdisciplinary, and conservative treatment sequence, which in turn facilitates all the different phases in this procedure.
A 32-year-old male attended the dental consultation because of the impaired appearance of his teeth. Following the clinical exploration, wear was evident due to attrition and erosion on the upper central incisors, lower central incisors, and the lower posterior teeth. Wear on the posterior segments was mainly due to attrition; however, wear on the anterior segment was a result of a lack of an appropriate anterior guidance. Firstly, the mandibular posterior segments were managed with direct composites to ensure a conservative technique, and to raise the vertical dimension of the patient, enhancing movements in the orthodontic treatment phase. Secondly, orthodontic treatment was initiated to adjust the teeth-transparent aligners in both arches assisted with lingual brackets from 2.3-2.1, and triangular elastics in the 2nd & 3rd quadrant. Once a good posterio-occlusal relationship has been achieved, the reconstruction of the incisal edges of the central incisors was executed with direct composites.
Adequate inter-occlusal space was attained in order to create an efficient anterior guidance. Moreover, the hypersensitivity was relieved, and aesthetic expectations were fulfilled.
Due to a correct and successful interdisciplinary scheme, the aesthetic and functional objectives of the patient have been met. This treatment is considered minimal invasive for combing two approaches of dentistry, reciprocating between the two, and preserving all sound dental tissues.

Clinical Cases

Poster P.105

VENEERLAY PREPARATION FOR ADHESIVE SINGLE RETAINER BONDED CANTILEVER BRIDGE FOR ANTERIOR TEETH SUBSTITUTION.

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Replacing single missing maxillary or mandibular teeth with resin-bonded fixed dental prostheses (RBFDPs) dates back to the 1970s. The main indications of the RBFDPs were splinting periodontally compromised anterior teeth or replacing missing teeth, due to their several advantages over other treatment options. The purpose of this case report was to assess technical and biological results of single-retainer cantilever all-ceramic resin-bonded fixed dental prostheses (RBFDPs), replacing single anterior teeth
The female patient presented canine inclusions (1.3 and 2.3) and the presence of canine milky teeth (5.3 and 6.3); her major expectation was to improve esthetic without surgery. The treatment plan started with an Invisalign® teeth alignment. Orthodontic pre-prosthetic treatment was important to improve occlusion, thus reducing early on-set future wear of the anterior teeth. At the end of the Invisalign® treatment, a wax-up of the new smile design was produce and a mock up was created to visualized with the patient the final esthetic result. Then, the two laterals and the two central incisors were prepared for feldspathic veneers and the two first premolars as abutment for veneerlay. Single retainer all ceramic fixed dental resin-bonded dental prostheses on veneerlay preparation on the two first premolar was digitally realized in zirconia and adhesively luted. After cementation and immediate follow up, the RBFDPs showed excellent esthetics, very good marginal fitting, very good superficial wear, no ceramic chipping nor delamination; tooth vitality was maintained
It can be concluded that replacing single missing maxillary or mandibular teeth with resin-bonded fixed dental prostheses may be a predictable and stable-over-time rehabilitation in cases with similar clinical conditions of those presented in the present clinical case.

Clinical Cases

Poster P.200

A MINIMAL INVASIVE APPROACH TOWARDS THE RESTORATION OF TRAUMATIZED ANTERIOR TEETH.

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The poster presents a clinical case related to the restoration of traumatized anterior teethundertaken in a conservative way, using a direct composite build-up.
A 17-year-old female came to our department after she suffered from a severe dental trauma. The clinical examination showed avulsion of teeth 11 and 21, enamel fracture on teeth 22 and 23 and enamel-dentine fracture with pulp exposition on teeth 12 11 and 21. After teeth were repositioned with soft digital pressure, aflexible splint was placed for 2 weeks. Root canal treatment of teeth 12 11 and 21 was initiated after 7 days.
Aesthetic evaluation was done using Digital Smile Design (DSD).The wax-up, guided by the DSD, was transferred in the mouth to show the result to the patient. A silicone index was used to have control on the form and colour build-up. After application of a 2-step self-etch adhesive (with prior selective etching of enamel) (Clearfill SE), the palatal walls were build up with an enamel composite (Essentia LE, GC). The dentin (Essentia MD, GC) was applied to build up the three mamelon shape at the incisal third. An opalescent enamel (Essentia OM, GC) and some white spots were placed in between the mamelons to mimick the youthfull appearance of natural enamel. Finally a buccal layer of enamel composite (Essentia LE, GC) was applied. The restorations were contoured with microfine diamond burs and Soflex discs before polishing.
The traumatized anterior teeth were restored in a minimal invasive way. The composite with simplified shade system was able to mimic the missing natural tooth structure. Following yearly maintenance of the restorations; a medium-term prognosis of these restorations is expected.
Teeth damaged by a severe trauma can be restored in a very natural way using a direct composite build-up, guided by a silicone index.

Operative Dentistry

Poster P.106

"SELECTION OF CERAMIC SYSTEM FOR ANTERIOR RESTORATIONS ACCORDING TO UNDERLYING TOOTH SUBSTRATE"

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To offer guidance in selecting the appropriate all ceramic system for veneers and crowns depending on the color of the anterior tooth substrate. Clinical cases with different underlying tooth substrates are presented. Clinical steps from initial situation, tooth preparation, ceramic material selection and final situation are analyzed. Emphasis is given on the optical and mechanical properties of the ceramic materials, in accordance with the level of discoloration of the abutment teeth. The underlying tooth substrate was divided in three categories depending on the degree of the discoloration. Category 1: No discoloration. Ceramics with high translucency (feldspathic, high translucency lithium disilicate) were reserved for clinical applications in which enamel and/or dentin substrate had acceptable color and the restoration could be bonded to tooth structure. Feldspathic veneers were chosen in cases of enamel preparation, whereas lithium disilicate was preferred when also dentin was exposed. Category 2: Mild or moderate discoloration. Medium opacity ceramic materials were chosen in these cases, including veneers and crowns. The material of choice was lithium disilicate. Category 3: Severe discoloration or metal substrate. When there is need for masking severely discolored teeth or metal substrates, ceramics with opaque core (zirconia, lithium disilicate high opacity) were chosen. These ceramics show high mechanical properties but pose a challenge when trying to match with natural tooth color. Following the guidelines for the final esthetic outcome, the color of the abutment teeth and the optical properties of the ceramic systems, restoration of anterior teeth from simple to more complex cases could be completed successfully and predictably. Knowing the indications and the limitations of the available ceramics is a key factor for the treatment planning of cases with high esthetic demands.
As available ceramic systems increase and evolve, practitioners must have knowledge of their optical and mechanical properties so as to make appropriate choices when faced with various esthetic challenges.

Operative Dentistry

Poster P.107

12-MONTHS RANDOMIZED CLINICAL EVALUATION OF MULTI-MODE UNIVERSAL ADHESIVE IN NON-CARIOUS CERVICAL LESIONS

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The purpose of this double-blind randomized clinical trial was to compare the 12-months clinical performance of an one-step multimode universal adhesive (PBOS- Prime & Bond One Select, DENTSPLY DeTrey GmbH, Germany) in combination with nano-ceramic resin composite (CXOU-Ceram.X One Universal, DENTSPLY DeTrey GmbH, Germany) for restoration of non-carious cervical lesions (NCCL).
Twenty-four patients were included in the study. A total of 237 NCCL were restored with CXOU, which were bonded with PBOS adhesive that can be used in three different modes. Self-etch (SE) mode was used for 82 restorations, selective-etch (SLE) mode was used for 75 restorations, total-etch (TE) mode was used for 80 restorations. Then, two blinded, calibrated evaluators assessed the restorations at baseline, 6 and 12 months using the FDI criteria. Data were analyzed with the Friedman and Wilcoxon signed-rank tests at a significance level of 5 % ($P<0.05$).
At baseline and 6 months, no significant differences were observed between the materials for any criteria evaluated. After 12-months 25 teeth were scored as 2 for marginal adaptation (10%), 5 teeth were scored as 5 for all criteria (2%), 2 teeth scored as 2 for fractures and retention (0.08%) and only 1 tooth was scored as 4 for surface roughness (0.04%) and the others were scored as 1 for all other criteria.
After 12 months, clinical evaluations of the restorations were not significantly different when compared with baseline and 6 months according to FDI criteria ($P>0.05$).

Operative Dentistry

Poster P.108

18 MONTHS CLINICAL EVALUATION OF FOUR ADHESIVE STRATEGIES IN CLASS V RESTORATIONS

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To compare the clinical performance of a "universal" adhesive in non-carious Class V lesions using four different adhesive strategies after 18 months.
36 patients participated in this study, in which 122 Class V restorations were placed with Filtek Supreme XTE (3M ESPE). The restorations were randomly assigned into four experimental groups according to the adhesive strategy of Adper Scotchbond Universal Adhesive (SBU, 3M ESPE): A. 3-step etch-and rinse: 34% phosphoric acid (PA, Scotchbond Universal Etchant, 3M ESPE) and application of SBU followed by one coat of the non-solvated bonding resin Adper Scotchbond Multi-Purpose Adhesive (SBMPA, 3M ESPE); B. 2-step etch-and-rinse: 34% PA followed by SBU; C. 2-step self-etch: SBU followed by one coat of SBMPA; D. 1-step self-etch: SBU alone. Then, two blinded, calibrated evaluators assessed the restorations at the baseline and after 6 and 18 months using the USPHS criteria. Data were analyzed with Kruskal-Wallis, Mann Whitney U, Friedman and Wilcoxon signed-rank tests ($p<0.05$).
Three restorations were lost after 18 months of clinical service. One from the experimental group in which SBU was applied as 2-step self-etch adhesive and the other two when SBU was used as 1-step. All the restorations exhibited a similar performance for all the clinical parameters evaluated after 18 months recall.The restorations in which SBU was applied as a self-etch adhesive showed a significant alteration in color parameters after 6 months that did not change at 18 months. A significant increase of marginal discoloration at 18 months recall was detected regardless of the adhesive strategy used.
A similar performance was recorded for SBU adhesive with the four adhesive strategies tested after 18 months evaluation with a deterioration of the parameter marginal discoloration for all the experimental groups.

Operative Dentistry

Poster P.109

1-YEAR EVALUATION OF RESTORATIONS PERFORMED WITH UNIVERSAL ADHESIVES

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The aim of this in vivo study was to evaluate the clinical performances of universal adhesives, employed either with an etch-and-rinse or in a self-etch manner.

156 restorations (I and II class) were performed on patients entering the following inclusion criteria: age 18–65, indication for Class I or II restorations, replacement of insufficient restorations or extensive primary caries, max. 4 restorations per person, vital teeth and sufficient command of the language. Cavities were measured, picture of all clinical passages were taken teeth were divided into 3 groups according to the adhesive employed: G1) Futurabond U; G2)Scotchbond Universal; G3) AllBond Universal. Each group was divided in 2 subgroups according to the application mode (E&R or SE). All restorations were filled with a composite (Grandioso, Voco). Each treated patient was, later, given a VAS scale form to fill in during the seven days following the clinical performance. Pain and tooth sensitivity was assessed at seven days' control and a clinical evaluation of the restoration overtime was done at 12 months follow up following the USPHS criteria. Data were statistically analyzed using ANOVA test and Tukey post hoc test. Statistical significance was set for $p<0.05$.
The statistical analyses showed that the clinical performance of the composite restoration performed was not influenced by neither the three adhesive systems employed ($p=0.876$) neither by the application mode of the adhesives (etch&rinse vs self-etch) ($p=0.0943$) at twelve months recall.
The application mode does not influence the 1-year performance of universal adhesives. Longer follow-up is necessary to obtain more evident results.

Operative Dentistry

Poster P.110

24 MONTHS CLINICAL EVALUATION OF ADHESE UNIVERSAL AS AN ETCH-AND- RINSE ADHESIVE

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The aim of this prospective study was the evaluation of the clinical behaviour of Adhese Universal in conjunction with the total-etch technique compared to ExciTE F etch&rinse adhesive. Particularly the occurrence of immediate postoperative sensitivity was evaluated, in addition to the semi-quantitative analysis of the clinical behavior through SQUACE and FDI criteria.
102 restorations (I and II class) were performed on patients entering the following inclusion criteria: age 18–65, indication for Class I or II restorations, replacement of insufficient restorations or extensive primary caries, max. 4 restorations per person, vital teeth and sufficient command of the language. Cavities were measured, picture of all clinical passages were taken teeth were divided into two groups according to the adhesive employed: G1) restorations performed with Adhese Universal E&R mode; G2) restorations performed with ExciTE F adhesive employed as suggested by manufacturer instructions. All restorations were filled with a bulk fill composite (TetricEvo Ceram Bulk Fill, Ivoclar). Each treated patient was, later, given a VAS scale form to fill in during the seven days following the clinical performance. Pain and tooth sensitivity was assessed at seven days' control and a clinical evaluation of the restoration overtime was done at 6, 12 and 24 months follow up following the SQUACE and FDI criteria. Data were statistically analyzed using ANOVA test and Tukey post hoc test. Statistical significance was set for $p<0.05$.
Statistical analyses showed no significant differences for both pain and sensitivity for the two adhesives employed. For both pain and sensitivity a noticeable decrease in patient perception was found starting from day 3. WIth regard to SQUACE and FDI values no differences were detected at 24 months.
Adhese Universal adhesive employed in E&R shows a clinical behaviour similar to that of a well known etch-end-rinse adhesive already established on the market.

Operative Dentistry

Poster P.111

3-YEARS CLINICAL EVALUATION OF ADDITIVE COMPOSITE RESTORATIONS ON ANTERIOR TEETH

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To evaluate the clinical performance of composite additive direct restorations on anterior sound teeth, performed with 2 different nanofilled composite materials.
All patients who presented anterior teeth with diastema to be restored on sound enamel were enrolled in this prospective randomized study. After radiograph evaluation, patients were randomly divided in two groups according to the composite material. G1: Clearfil ES2, Kuraray; G2: Asteria, Tokuyama. All restorations were performed by the same operator, following a standardized procedure: rubber dam positioning, teeth surface cleaning with pumice, enamel surface sandblasting with 50μm aluminium oxide and water rinse, 30 seconds enamel etching with phosphoric acid, application of bonding resin (Optibond FL, Kerr) on demineralized enamel and 40 sec light-curing, composite layering with the use of silicon index obtained by a wax-up. After finishing and polishing procedures, patients were dismissed and schedule for recall visits after 7 days, 6, 12, 24 and 36 months. During recall, the restorations were examined and evaluated by two blinded calibrated operators in accordance with FDI and USPHS criteria.
A total of 32 patients (G1: n=19; G2: n=13) received 97 restorations, 57 with Clearfil ES2, 40 with Asteria. The 3-year survival rate was 100% for both composites. The statistical analysis revealed no differences between the two composites that had been used. However, an initial degradation of margin quality (G1: 10.1%; G2:12.7%), marginal ditching (G1:4.7%; G2: 7.7%) and surface texture quality decrease (G1: 15.7%; G2: 18.5%) were observed after 3 years.
The 3-year survival rates showed that nanofilled composites performed well in diastema closure treatment with direct techniques. All restorations exhibited excellent scores and the initial degradation observed could be easily solved, suggesting that the direct approach is an excellent minimal invasive technique. Further controls are necessary to evaluate the clinical performance in the long period.

Operative Dentistry

Poster P.112

A MICROSCOPIC MARGINAL SEAL EVALUATION OF BULK-FILL COMPOSITE RESTORATIONS USING AN UNIVERSAL ADHESIVE SYSTEM IN SELF-ETCH AND ETCH&RINSE MODE

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The aim of this in vitro study was to evaluate the marginal seal of a nanohybrid bulk-fill composite compared to a nanohybrid non-bulk composite, using a universal adhesive applied in self-etch and total-etch mode.
12 non-carious molar were selected and two 4x4x4 mm cavities, buccally and palatally/lingually, were prepared. The samples were divided into four groups: in group 1 and group 2 the composite bulk-fill nanohybrid Admira Fusion x-tra (VOCO) was used, added in a single mass of 4 mm and cured for 1 minute; in group 3 and group 4 nanohybrid composite Admira Fusion (VOCO) was used, added in two increments of 2 mm each and cured for 40 seconds. The universal adhesive Futurabond U was used for all samples: in group 1 and 3 in the self-etch mode; in group 2 and 4 in the total-etch mode. All samples were immersed in a 10% methylene blue solution for 48 hours, occlusal surfaces were subjected to an abrasion process with a smoothing machine and subsequently analysed with a stereo microscope under 12x magnification to measure the possible penetration of the dye.
The best result was achieved by the group 2, in which there is no infiltration in 70.8% of cases, followed by the group 4 (66.7%), by group 1 (54.2%) and finally by the group 3 (41.7%). The average of marginal infiltration was 0.08 mm for group 4, 0.1 mm for group 2, 0.24 mm for group 1 and 0.31 mm for group 3.
The investigated materials showed a comparable marginal leakage. The universal adhesive Futurabond U used in total-etch mode, both for the bulk-fill composite and the nanohybrid control composite, scored the best results in terms of rate and extent in the depth of infiltration compared to the self-etch mode.

Operative Dentistry

Poster P.113

A NOVEL TECHNIQUE FOR TWO STEP DENTAL IMPRESSIONS.

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An accurate impression is a prerequisite for manufacturing well-fitting indirect restorations. Among the broad range of impression techniques and materials, the use of stock trays combined with vinyl polysiloxane (VPS) materials is very popular, as it is accurate and simple. The impression can be conducted in a one- or two-step procedure, with the latter having the advantage of no need for auxiliary personnel. The major drawback of the classic two-step technique is the increased intraoral setting time of the impression materials, and the need for relief for space making for the low viscosity material.The objective of this poster was to describe a novel technique for taking two-step putty-wash dental impressions with reduced intraoral time and no need for material relief after the first impression and still with no need of an assistant.
A gypsum cast of the wax-up/provisional restoration/initial situation before teeth preparations is needed. First, the putty material is hand mixed, placed at the stock tray, covered with a PVC film, seated on the gypsum cast and wiggled around for space making. After setting of the putty, the impression is taken off from the cast and the PVC film is removed. The light body material is placed onto the prepared teeth and over the putty material and then the tray is seated. After setting of the light material, the impression is removed from the oral cavity.
This modified two-step impression technique with an extraoral and intraoral component, offers reduced chairside time compared with the classic alternatives of two-step impression techniques.
Furthermore, the relief space is already formed using a cast, the PVC film and a wiggling motion. Therefore, there is no need for space relief with bur or scalpel after the setting of the first step with the putty material.

Operative Dentistry

Poster P.114

ACCURACY ANALYSIS OF THE OPTICAL IMPRESSION MADE USING A NEW INTRAORAL SCANNER

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Anew intraoral dental scanner (IOS) entirely software dependent arrived on the market. The objective of this study is to evaluate the accuracy of the Condor intraoral scanner, locally (on a preparation) and regionally (a complete arcade) and compare it to other scanners already in use (Cerec Omnicam, Itero and Carestream 3500).
Models of 5 identical reference pieces (e.g. flattened cone with chamfer), 5 dental preparations and 5 dental arches are made in plaster and scanned, using a tabletop scanner (Imetric 102, CH), in order to obtain 15 reference STL files (3 x 5) with a precision of less than 10 μm. These same 15 models are scanned 3 times using a dental stereoscopic IOS Condor (SAS Condor France) by 3 different operators. They allow to get 45 x 3 is 135 STL/PLY files (3 models by 3 operators). This manual scanning must be done within a reasonable timeframe, i.e. not to exceed one and a half minutes on the dental preparation or reference piece and two and a half minutes for a complete arch. Each of the 135 PLY/STL files obtained using the Condor camera are compared with 15 reference STL files using the CloudCompare V2 software. Precision histograms are generated based on comparisons with scans from other IOS systems.
Comparisons show an accuracy between 20 and 50 μm between the reference pieces and the dental preparations (on more than 80% of the points) and an accuracy between 20 and 150 μm on the dental arch (on more than 75% of the points). These measurements do not include the inherent tabletop scanner error.
The new intraoral scanner Condor, entirely software dependent, uses a stereoscopic method with a fixed focal. It's the accuracy equals of three reference scanner's present on the market.

Operative Dentistry

Poster P.115

CARIES-REMOVAL EFFECTIVENESS AND MINIMAL-INVASIVITY OF CARIES-EXCAVATION TECHNIQUES: A CLINICAL AND MICROBIOLOGICAL STUDY.

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To compare four alternative caries-excavation techniques with the traditional one in 50 primary molars.
A randomized-controlled-clinical-trial was designed and performed at the Dental Clinic of the University of Sassari. Healthy children (7–12 yrs, mean age 9.3) with one or more D1-D3 lesions involving at least one surface of primary molars prone to the exfoliation were invited to participate. Five different treatment protocols were applied and the teeth were

then randomly treated as follows: a: caries-removal with traditional technique (control group); b: caries-removal with Cerabur®; c: caries-removal with Carisolv® and dedicate hand instruments; d: caries-removal with Carisolv® plus Cerabur®; e: caries-removal with Carisolv® plus Cerabur® and final cavity inspection with caries detector. Use of rubber dam was always mandatory. Treatment time for caries-removal was registered. Information about cavity size were performed before and after excavation calculating: the outer diameter; the depth of the lesion through a periodontal probe and the cavity volume taking a silicone impression of the tooth before and after excavation. Dentine specimens from each tooth before and after treatment were placed in an Eppendorf tube containing 150 μl of sterile TE buffer and analyzed through the checkerboard DNA-DNA hybridization for cariogenic bacteria count. Statistical analysis was performed through non-parametric and parametric tests.
ANOVA test showed that caries removal with Carisolv® was always the slowest ($p<0.001$). Carisolv® protocols showed always the most conservative results (c: 55.32±5.54 mm3; d: 42.43±2.86 mm3; e: 56.91±3.63 mm3). Carisolv® revealed the most antibacterial effect against Flot Dentium, Dentocariosa, Migra, Odontolyticus, Oris and Parvula cariogenic strains.
Even if the conventional approach was the fastest, a complete caries-removal was always achieved. Moreover, Carisolv® protocols demonstrated to be less invasive and to have the strongest antibacterial effect.

Operative Dentistry

Poster P.116

CHEMICAL DURABILITY OF LITHIUM-DISILICATE GLASS CERAMIC BLOCK FOR CAD/CAM TECHNOLOGY

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Lithium-disilicate glass ceramics(LDS) are known as clinically useful dental materials from the viewpoint of aesthetics and biological compatibility. In accordance with the dramatic progress of digital-dentistry, various dental materials for CAD/CAM have been developed. We developed a new LDS CAD/CAM block with superior physical properties.Dental materials are used for a long term, so it is important to evaluate chemical durability in the environment simulating oral cavity. The purpose of this study was to evaluate the chemical durability (solubility) of our new LDS material.
The test materials were “MGCCBZAD04” (LiSi) (prototype LDS, GC), “Celtra DUO” (CE) (LDS, Dentsply Sirona) and “IPS e.maxCAD” (EM) (LDS, Ivoclar Vivadent). Chemical solubility tests were conducted according to ISO6872:2015 “Dentistry - Ceramic materials”. Amounts of dissolution were measured and one-way ANOVA was used to assess the statistical significant difference. After chemical solubility test, we observed surface of specimens with SEM and laser microscope to analyze crystal structure of each material.
Amounts of dissolution were 8.8x10^-6 g/cm^2(LiSi), 47.5x10^-6 g/cm^2(CE) and 22.1x10^-6 g/cm^2(EM). Chemical solubility of “LiSi” was significantly lower than “CE” and “EM” ($p<0.05$). SEM and laser microscope observation showed specimen surface of “LiSi” was negligibly degraded in acidic environment. On the other hand, “CE” and “EM” were significantly degraded. It was confirmed that the surface texture changed as amount of dissolution increased.
Materials used in oral cavity, which can be an acidic environment, need a resistance against acid. These results suggest that “LiSi” is useful material as a dental material to be used in the oral cavity for a long term.

Operative Dentistry

Poster P.117

COLOR AND TRANSLUCENCY OF A-SHADE SPECIMENS IN NINE DIFFERENT RESIN-BASED COMPOSITES

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To examine and compare the color and translucency of 4 A-shade specimens with respect to the shade numbers in 9 different resin-based composites (RBCs).
Four A-shades (A1, A2, A3, and A3.5) of 9 RBC products were included [Beautifil II (Shofu Inc., Japan), Ceram-X One (Dentsply, Germany), Estelite Sigma Quick (Tokuyama Dental, Japan), Esthet-X HD (Dentsply, USA), Filtek Z250 (3M ESPE, USA), Filtek Z350 XT (3M ESPE, USA), Gradia Direct (GC Corp., Japan), Herculite Precis (Kerr, USA), and Tetric N-Ceram (Ivoclar Vivadent, Liechtenstein)]. Six disc-shaped specimens (diameter=1mm, thickness=1,2 mm) were prepared for each shade of the RBCs, using a stainless steel mold.Color measurement was made according to the CIELAB color scale by using a colorimeter (CR-321; Minolta, Japan), and the color differences between the specimens (ΔE) were calculated. The translucency parameter (TP) was determined for each specimen, and the differences in TP between the specimens (ΔTP) were calculated. $\Delta E \geq 3.3$ and $\Delta TP \geq 2.0$ were used as thresholds of clinically perceivable difference.The L*, a*, b*, and TP were compared among the different shades and thicknesses within each product, using one-way analysis of variance followed by Tukey's post hoc test.
There were significant differences in the color and translucency among the shades within each product ($P<0.001$). The specimens showed equal or lower L* with the higher shade numbers. The a* differed not much among the shades, whereas the b* distributed in a relatively wide range. The TP varied irrespective of the order of shade numbers.Color and translucency of RBCs differ among the shades within each product, but they do not always follow the order of shade numbers. When providing esthetic restorative treatments, clinicians should be aware of these optical characteristics of individual RBC product to achieve predictable results. Within the limitations of this study, the RBCs became darker and more yellowish as the shade number increased. The translucency demonstrated irregular change patterns among the shades depending on the products.

Operative Dentistry

Poster P.118

COLOR CHANGE OF BULK-FILL COMPOSITES AFTER ONE-MONTH VARIOUS TEA STORAGE

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The purpose of this study was to evaluate the influence of three different kinds of tea on the color stability of three nano composites and two bulk-filled composites.
A total of 120 composite disk specimens (10 mm in diameter and 2 mm in thickness) were fabricated using three different nano-composites (Kalore Universal Restorative, Filtek Ultimate Universal Restorative, Ceram-X Universal Nano-Ceramic Restorative) and two bulk-fill composites (Beautifil Bulk Restorative, Filtek Bulk Fill Posterior Restorative). Six specimens from each composite were used for color measurements. Color coordinates (L*a*b*, ΔL^*, Δa^*, Δb^*, and ΔE^*) were measured using a

VITA Easyshade Compact (VITA Zahnfabrik) after 24 hr of storage (baseline) and after 30 days of storage in different beverages of black tea, green tea, rosehip tea and water (control) (n=6). The data were analyzed using Kruskal-Wallis One-Way Analysis of Variance on Ranks.
The color difference (ΔE) of the resin materials ranged between 1.57 ±0.45 and 25.99±1.03 after 30 days of immersion in the staining solutions. Beautifil Bulk Restorative in rosehip tea (25.99±1.03) showed the highest mean ΔE value after 30 days, followed by Kalore Universal Restorative (10.93±4.60) in black tea ($p<0.05$). After one month, the lowest ΔE values were obtained from the specimens in water (control group). The specimens in black tea, green tea and rosehip tea had similar ΔE values for Filtek Ultimate Universal Restorative, Filtek Bulk Fill Posterior and Kalore Universal Restorative ($p>0.05$).
The ΔE values greater than 3.3 is clinically unacceptable. The Beautifil Bulk Fill Restorative displayed clinically unacceptable color changes at the end of 30 days in all beverages. Ceram-X Universal Nano-Ceramic Restorative exhibited the least color change in all groups.
Key words: Tea storage, Nano-composites, Bulk-fill composites

Operative Dentistry

Poster P.119

COMPARISON OF FRACTURE STRENGTH OF FIBER-REINFORCED-COMPOSITE AND BULK-FILLED-COMPOSITE ON ENDODONTICALLY TREATED TEETH

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The purpose of this study was to compare the fracture strength of fiber-reinforced composite and bulk-filled composite on endodontically treated teeth.
A total of 30 mandibular first premolar teeth were used for this study. The teeth were randomly divided into three groups (n=10). Group-1: intact teeth (control); The teeth in the remaining two groups were prepared with MOD box cavities (4-mm proximal depth and 3-mm occlusal width) and endodontically treated. Group-2: bulk-filled resin composite (Estelite Bulk Fill, Tokuyama) and posterior resin composite (Estelite Posterior, Tokuyama); Group-3: fiber-reinforced composite (everX posterior, GC) and posterior resin composite (G-Aenial Posterior, GC). Each restorative material was used with its respective adhesive system. Following the placement of the restorations, the fracture resistance of the specimens was measured. Data were analyzed by using one-way analysis of variance and Tukey's post-hoc test.
Group-1 (869,21), Group-2 (822,80 N) and Group-3 (841.13 N) exhibited statistically similar results ($p>0.05$).
Bulk-filled and fiber-reinforced composites had similar fracture strength values on endodontically treated premolars.

Operative Dentistry

Poster P.120

COMPARISON OF TEMPERATURE DEVELOPMENT IN TEETH USING DIFFERENT LED LIGHT CURING UNITS

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LED light curing units (LCU) cause a temperature increase and can be harmful for the pulp and surrounding tissue. There are indications that temperature development depends not only on irradiance, time and distance, but also on other factors possibly related to LED-LCU design. Using fixed time and distance settings, the main objective was to compare temperature development on the tooth surface and in the pulp chamber with different LED-LCU.
Four different LED-LCU brands were tested: Bluephase style®, Bluephase G2® (Ivoclar/Vivadent, AG, Liechtenstein), Elipar™ S10 and Elipar™ DeepCure (3M ESPE, Seefeld, Germany). LED-LCU irradiance was controlled before each test (MARC Resin Calibrator, BlueLight Analytics™, Halifax, Canada). An extracted human molar was mounted in a holder suspended in a thermostatically controlled water bath (36.8±0,2°C) with the root of the tooth immersed under water. Pulp chamber temperature (Tpc) was measured by a calibrated thermocouple. The tooth surface temperature (Ts) was measured by thermography (FLIR ThermocamS65HS thermal camera with a macro lens). Temperature measurements were carried out for a polymerization time of 20 seconds at 0mm distance from the tooth surface. One-way ANOVA test, Bonferroni correction, and Kruskal Wallis test were used for statistical analyses. Ethical permission was not required.
There was a significant difference in the mean temperature development in Tpc and Ts when different LED-LCU were used ($p<0.0001$). Tpc and Ts was highest using Bluephase style (41.5 °C and 52.5 °C, respectively), even though its irradiance was not the highest (1222 mW/cm2). The results indicate that variance in temperature development was not only caused by differences in irradiance.
When choosing LED-LCU clinicians should be aware that there might be additional factors other than irradiance that influence temperature development, such as variations in LED-LCU construction including light tip design, although in this study this was not investigated.
Acknowledgement:
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Operative Dentistry

Poster P.121

DCC INFLUENCE IN ETHANOL-WET BONDING TECHNIQUE ON BOND STRENGTH TO RADICULAR DENTIN

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The aim of this in vitro study was to evaluate the effect of the N,N'-Dicyclohexylcarbodiimide (DCC), a cross-linker agent used in addition to ethanol in ethanol-wet bonding technique for fiber post cementation to radicular dentin. The null hypothesis tested was that DCC do not influence fiber post bond strength, both immediately and after 12 months aging, when employed with ethanol.
36 single-root teeth were selected and endodontically treated.
After 7 days a 8 mm post-space was prepared with dedicated drills. Every sample was etched for 15 sec with 37 % H3PO4, rinsed and gently dried. Specimens were randomly divided into 3 groups (n=12) according to the dentin pre-treatment: water wet-bonding, ethanol wet-bonding, ethanol wetbonding with 0.5M DCC in ethanol. Adhesive system (AllBond3, Bisco) was, then, applied and fiber posts were luted with Duo-Link Universal (Bisco) and light-cured for 40sec. Samples were cut in 1mm thick slices using a low speed saw and pushed until failure with an Instron Machine, half of them immediately (t=0) and half of them after 12 months

of storage at 37°C in artificial saliva (t=12). Additionally, in situ zymographic assay was performed to investigate endogenous MMPs activity within the hybrid layer in accordance with Mazzoni et al., 2014. Results were statistically analyzed with ANOVA and Turkey post-hoc tests.
The null hypothesis at t=0 could not be rejected, while at t=12 only coronal region of water wet-bonding group has a significant decrease in bond strength. In situ zymography quantification analyses revealed that the adhesives tested seemed to activate MMPs gelatinolytic activity, while 0.5M DCC reduced fluorescence signal at the adhesive/dentin interface. DCC is able to reduce, as well as ethanol-wet bonding, the decrease in bond strength to radicular dentin in time.

Operative Dentistry

Poster P.122

DEEP CAVITY MARGINS ELEVATION: IN VIVO EVALUATION OF DIFFERENT COMPOSITE MATERIALS.

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The aim of this in vivo study was to evaluate the efficacy of different composite materials on deepcavity margins elevation.
26 patients with premolar and molar deep carious lesions, that didn't invade the biological width, were selected. Patients with systemic diseases, mobile and fixed orthodontic devices and prosthesis were excluded. Selected patients obtained a FMPS < 20% and were randomly divided into two groups according to the material employed:
- G1 Flowable deep cavity margin elevation;
- G2 Non-flowable deep cavity margin elevation.
After a pre-operative Rx with custom centering, the cavity was cleaned. In some cases, for a correct isolation with a rubber dam, marginal surgical exposure was needed. Operative field was then isolated with rubber dam and was executed a direct or indirect restoration with randomly relocation of cervical cavity margin performed with a 1 mm or of flowable or of non-flowable composite layer. Follow-up visit was performed at 1, 3 and 6 months and clinical and radiological follow-up was performed at 6 months and was used USPHS test to evaluate the restoration.
The statistical analysis was done with the chi-square test.
Clinical and Rx evaluation after 6 months showed the integrity of the restoration and the absence of infiltration of the cavity margins in both groups ($p < 0,05$).
Results obtained indicate how the effecacy of deep cavity margins elevation isn't initially influenced by the restorative material used. It is obviously necessary subsequent controls (programmed Up to 10 years) to confirm the results obtained.

Operative Dentistry

Poster P.123

DEGREE OF CONVERSION OF BULK FILL COMPOSITES CURED BY DIFFERENT PHOTOCURING UNITS

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The objective was to determine and compare the polimerization of three different bulk fill resin composites, namely Tetric Evo (Ivoclar Vivadent, EV), Filtek Bulk Fill (3M Espe, 3M) and Surefil SDR (Dentsply, SDR), cured using three different LED photocuring units, namely monowave bluephase (Ivoclar Vivadent, IM), polywave bluephase style (Ivoclar Vivadent, IP) and polywave Valo (Ultradent, V).
We analyzed and compared four specimens for each combination of bulk fill composite (EV, 3M, SDR) cured using the two polywave (IP, V) and the monowave (IM) photocuring units. The specimens were prepared in circular slots of a stainless steel mold with 3 mm diameter and 4 mm depth, and cured for 20 s in contact with a mylar strip placed over the material. We used Fourier transformed infrared spectroscopy, nanoindentation and atomic force microscopy to assess the degree of conversion (DC), stiffness and surface roughness before and after polishing, respectively.
EV showed the highest mean DC when cured with IP, and the second highest with IM. For the other composites, both 3M and EV showed highest conversion with V, while IP scored similar to IM. Stiffness values for each composite showed a positive correlation with the DC. Roughness after polishing did not correlate with the material hardness as it could be expected, and correlated negatively with the nominal size of the composite fillers.
In conclusion, not all polywave lamps work better for all composites than monowave lamps, as only 3M with V showed a significant increase in DC, while SDR with V scored even lower than with IM. All lamps guaranteed a DC higher than 50%, except IM and IP for 3M. High DC does not mean absolute highest values of elastic modulus. Overall, the best choice of the material has still to be made according to clinical experience and specific case.

Operative Dentistry

Poster P.124

DEMANDING DIRECT DIASTEMA CLOSURE IN THE ESTHETIC ZONE. MINIMIZING THE CLINICAL MISTAKES.

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To illustrate the key clinical steps and common mistakes of a minimal invasive diastema closure using a new direct composite resin system.
A 24-years-old female was referred to the postgraduate clinic of the operative dentistry department, dental school, Athens. Her chief complaint was dissatisfaction with the diastemas present in the anterior and premolar areas, as well as the color of her teeth. At first, a home-bleaching procedure (10% carbamide peroxide, White Dental Beauty, NOVON) was performed in order to ensure the desired transition from A3 to B1 value, measured with the classical VitaPan shade guide (VITA Zahnfabrik). Then, a digitally aided diagnostic wax-up was created measuring the optical width of the planned restorations in order for the clinical mock-up to be transferred correctly. The appropriate dentine chroma and enamel shades were selected using the Inspiro Direct Shade guide (Edelweiss DR

AG). After field isolation with rubber-dam and minimal buccal preparation of tooth 12, direct stratification of Inspiro Direct (Edelweiss DR AG) composite resin was performed accordingly.
Measuring the desired optical width from the waxed model with a metal caliper and digital rulers can aid the application of the composite in the ideal thicknesses. Putting glycerin between the Inspiro Direct Shade guide tabs can minimize shade selection errors. A combination of metal sectional and transparent matrices is important in order to achieve a proper emergence profile at the gingival level. Composite excesses should be carefully removed with a scalpel from the enamel-composite interface. Latch-type laminated cups dipped in diamond polishing paste can be used for improved luster in the interproximal surfaces.
The clinical success depends highly on the correct width measurements and desired final contours, the emergence profile as well as the composite-enamel transition and luster of the final restoration.

Operative Dentistry

Poster P.125

DENTIN BOND STRENGTH OF A MULTI-MODE ADHESIVE

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To compare the immediate microtensile bond strength (μTBS) of the Multi-mode Adhesive All-Bond UniversalTM Adhesive (ABU TE) (Bisco, Schaumburg, IL, USA) applied in Etch-and-rinse mode, with and without an additional hydrophobic resin coat.
Six recently extracted human third molars, intact and without macroscopic evidence of caries or restorations, were assigned to two groups: ABU TE Group – All-Bond UniversalTM Adhesive (Bisco) applied in Etch-and-rinse mode following manufacturer's instructions and ABU TE + Adhesive Group (ABU TE + A) – when applied with an additional hydrophobic resin coat - AdperTM ScotchbondTM Multi-Purpose (3M ESPE), following manufacturer's instructions. Resin composite build-ups (UD4 ENAMEL Plus HRi, Micerium S.p.A. Avegno, GE, Italy) were applied in three increments of 2 mm each, until a height of 6 mm: each layer was light cured for 20 seconds with an additional light polymerization performed on facial, lingual, mesial and distal surfaces for 10 seconds. The teeth were stored in distilled water in an incubator (24h/37°C). Specimens were sectioned to obtain sticks with 1mm2 of cross sectional area, that were tested to failure in a universal testing machine at a cross-head speed of 1mm/minute, to assess dentin (μTBS). A paired-sample t-test was performed when the assumption of normality was valid (α=0,05).
The mean μTBS to dentin of the ABU TE Group (38,4±1,92) was statistically significantly higher (p=0,03) than of the ABU TE + A Group (33,0 ±1,59).
It seems that the immediate microtensile bond strength of All-Bond UniversalTM Adhesive does not benefit from an additional hydrophobic resin coat, when applied in Etch-and-rinse technique mode.

Operative Dentistry

Poster P.126

DETERMINATION OF SUBJECTIVE MISTAKES DURING LIGHT POLYMERIZATION OF COMPOSITES USING THE MARC-PATIENT-SIMULATOR

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For adequate polymerization of light-curing resin-based composites (RBCs), a certain amount of energy delivered by light-curing-units (LCUs) is necessary. Under clinical conditions polymerization of RBCs is due to personal handling errors sometimes insufficient. The aim of the present study was to identify the influence of subjective mistakes in the polymerization regime of different user groups using the MARC Patient Simulator (MARC PS).
Thirty subjects (dentists, dental assistants, dental students in the 3rd, 4th and 5th year of study) were examined. Each subject performed a polymerization cycle by using the LCU Bluephase C8 without prior instructions. The applied light fluence was recorded by the MARC PS.During the polymerization cycle, the behavior of the subjects and the amount of applied light energy were recorded in a standardized manner. This was followed by an individual instruction with focus on the mistakes previously made. In a subsequent second polymerization cycle, the effect of the personal instruction on the amount of the delivered light fluence was assessed.
Among the tested groups, no significant difference was estimated in regard to the amount of the delivered light fluence. After instruction a significant improvement of the applied light fluence rate was found in each group. The most recent mistake which showed an influence on the applied light energy was caused by insufficient fixation of the light guide in position to the treated tooth. A lack of visual control accompanied with an omission of the safety goggles showed no significant effect.
The positioning of the light guide in correlation to the tooth surface was rated the most important issue. Thus, an optimal exposure of a cavity can be achieved by two-handed operation of the LCU with direct fixation of the light guide at the surface of the treated tooth. This regime ensures adequate polymerization of RBCs.

Operative Dentistry

Poster P.127

DIRECT ANTERIOR RESTORATIONS: EFFECTS ON CLINICAL LONGEVITY OF DIFFERENT COMPOSITES.

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The aim of this in vivo study is to evaluate the longevity of III/IV class restorations with two different composites (Clearfil Majesty ES 2, Kuraray and Filtek Supreme XTE, 3M). The null hypothesis is that there are no differences in clinical longevity of direct restorations on anterior teeth with different composites.
Patients who came to the department of Cariology and Operative dentistry of the University of Turin to treat caries and fractures on anterior teeth were considered for this study. The inclusion criteria were loss of tooth substance in anterior tooth to be traeated with direct restorative techniques, age between 15–65, no health problems, FMPS <20%. Patients were randomly divided in two groups according to the composite selected: (G1: Clearfill Majesty ES 2, Kuraray; G2: Filtek Supreme XTE, 3M) and then they were scheduled for follow-up visits after 6–12 - 24 months per each group. During follow-up, the clinical performance of the restorations was evaluated by 2 blind operators, following USPHS criteria. Data were analyzed with Chi Square test ($p<0.05$).

All patients enrolled were evaluated after 12 months. The statistical analysis showed that there is not a significant difference between the two composite (p= 0.784) tested. Among all the parameters, only the surface texture showed a significant deterioration at 12 month, but for both composites. After 24 month Filtek shows the following results: α= 57,14%, ß= 28,57%, C= 14,29%. After 24 month Clearfil Majesty ES 2 shows the following results: α= 47,61%, ß= 33,33%, C= 19,04%.
Results showed that direct adhesive restorations with composite on anterior tooth are a good therapeutic choice, but more long term follow up are necessary to evaluate their longevity.

Operative Dentistry

Poster P.128

DOES Q-MIX IMPROVE THE BOND DURABILITY OF A SELF-ETCH ADHESIVE?

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The aim of the study was to evaluate the effects of dentin pretreatment with 2% chlorhexidine (CHX), 17% ethylenediamine tetra-acetic acid (EDTA) and Q-Mix (Dentsply), an antibacterial root canal irrigant, upon bond durability of a two-step self-etching adhesive system (Optibond XTR) to dentin after aging for 2 years.
25 extracted third molars were used in this study. Dentine adhesive was applied to flat dentin surfaces in five different ways. Group 1: According to the manufacturer's instructions, Group 2: 17% EDTA was applied to the dry dentin surfaces for 60s and rinsed thoroughly, Group 3: The dry flat dentin surfaces were treated with an aqueous solution of 2% chlorhexidine for 60s (which was not rinsed off), Group 4: 17% EDTA was applied to the dry dentin surfaces for 60s and rinsed-dried thoroughly, after EDTA application 2% chlorhexidine was applied for 60s (which was not rinsed off) Group 5: Q-Mix was applied to the dry dentin surfaces for 60s and dried thoroughly. Following dentin pretreatments the dentin adhesive was applied according to the manufacturer's instructions. Half the specimens were subjected to microTBS tests at 24h, while half were subjected to the tests after 24months of water storage. For each group, storage, and their interaction effects were tested by two-way analysis of variance and Tukey post-hoc tests.
All groups displayed similar bond strength values at 24h and 24 months for OptiBond XTR. After 24 months of storage the microTBS values decreased significantly in all groups. At 24 h, the highest μTBS value was obtained for the EDTA+CHX group (50.3±4.9). However after 2 years water storage Q-Mix group showed the highest μTBS value (37.7±5.2).
The use of CHX, EDTA and Q-Mix on dentin did not preserve the microTBS of a self etch adhesive after two years aging. However Q-Mix might be useful instead of CHX and EDTA.

Operative Dentistry

Poster P.129

EDX AND IR ANALYSIS OF DENTINE DEMINERALIZATION BY EDTA AND CITRIC ACID

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To assess the mineralization degree of dentine surface after treatment with different chelating solutions and the remineralization in artificial saliva.
The coronal surface of dentine discs from caries-free human third molars with smear layer was treated with a chelating agent (1% EDTA solution, Tubuliclean 10%, Germ EDTA 17%, 10% citric acid solution).
ESEM/EDX and FT-IR analysis were performed to evaluate the mineralization degree (by Ca/N and P/N atomic ratios) immediately after treatment and after ageing in artificial saliva.
Permeability changes through dentinal tubules after treatment and artificial saliva exposure were also evaluated to investigate a possible correlation with mineralization degree.
EDX and FT-IR analysis showed the higher demineralizing effect by citric acid solution and Tubuliclean whilst the less effect by Germ EDTA. The fluid permeation results were in agreement for citric acid and Tubuliclean; Germ EDTA showed instead a contrasting result, being the one with greater permeability.
After ageing in artificial saliva for 24h or 2months the EDTA1%-treated samples showed the higher remineralization values, mainly at 2months. The main demineralization occurred on citric acid-treated samples. The fluid permeation results were in agreement.
ESEM analysis revealed the presence of open dentinal tubules after application of the treatments, mainly for citric acid solution, and the formation of rare small precipitates after 24h in artificial saliva, except for citric acid solution. After 2months the samples treated with 1% EDTA showed several precipitates while those treated with citric acid showed completely open tubules.
All the tested treatments removed the smear layer and opened the dentinal tubules showing the increase of dentine permeability and a different demineralizing effect.
The permeability increase continued after immersion in artificial saliva for 24h despite the increase in the degree of mineralization.
The clinical use as chelating agent of citric acid and concentrated EDTA solutions should be reconsidered.

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Poster P.130

EFFECT OF BLEACHING ON THE COLOR, MICROHARDNESS AND ROUGHNESS OF INFILTRATED ENAMEL

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The aim of this in-vitro study was to evaluate the effect of bleaching on color, microhardenss and roughness of human enamel treated with a resin infiltrant.
90 human third molars were embedded in self-curing acrylic resin and were demineralised for 6 days in order to obtain white spot lesions. Then they were treated with a resin infiltrant (Icon DMG) according to the

manufacturer's instructions, were subsequently distributed among three groups (n=30) and the respective treatment took place. Group 1: control group, group 2: bleaching with Opalescence Boost [40% hydrogen peroxide (H2O2), 3x20min] and group 3: bleaching with Opalescence PF 10% [10% carbamide peroxide (CP), 7x8h]. After bleaching the specimens were stored in human saliva. Color evaluation (L*a*b*-Values; CIELab-System; Vita Easyshade Compact), Knoop microhardness and surface roughness determination took place at: T_0: Baseline, T_1: after demineralisation, T_2: after resin infiltration, T_3: after bleaching and T_4: after 4 weeks storage in human saliva. The difference to baseline for troughness, microhardness, L*a*b* values and ΔE-values were calculated at each time point. Scheffe test and t-test were used for the statistical analysis.
After infiltration the initial L*a*b*-values were achieved, microhardness was lower ($p<0.05$) than the initial values, while roughness was higher ($p<0.05$). After bleaching, L-values significantly increased ($p<0.001$), while a- and b-values were significantly reduced ($p<0.001$). The effect caused by 10%CP was higher than the one by 40% H2O2. ΔE-value for 40% H2O2 was 7.56 and for 10%CP was 9.86. After 4 weeks storage in saliva, color and microhardness did not significantly chang ($p>0.05$). Both bleaching products caused no significant change of microhardness and roughness of the infiltrated enamel ($p>0.05$).
Bleaching seems to be able to cause clinical significant changes of the color of infiltrated enamel. Bleaching did not affect the surface properties of infiltrated enamel significantly.

Operative Dentistry

Poster P.131

EFFECT OF COMPOSITE LAYERING ON ITS COLOR AND TRANSLUCENCY

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The purpose of this study was to evaluate the color and translucency of multi-shade layered composites.
To simulate a class V restoration, 2 mm-thick disc-shaped (15 mm in diameter) specimens were prepared. Z350XT (A3E, A3B, and A3D) (3M ESPE, St. Paul, MN, USA) were single-layered and its CIELAB parameters (L*, a*, and b*) and translucency parameters (TP) were compared. Z350XT/A3E and A3.5B were double-layered, in which the thickness of A3E was increased from 0.5 mm to 1.5 mm with an increment of 0.5 mm while the thickness of A3.5B was decreased. Total thicknesses of the sandwiched specimens were maintained at 2 mm. The color and translucency of the double-layered composites were compared with the single-layered A3B. The CIELAB parameters of the specimens were measured using a spectrophotometer to estimate the color difference (ΔE) without background, and to calculate the TP on a white or black background. One-way ANOVA and post-hoc Tukey's test were employed for statistical analysis.
The CIELAB parameters (L*, a*, and b*) of Z350XT single-layered composites increased in order of A3E (64.26, 0.25, and 10.59), A3B (65.52, 1.06, and 13.60), and A3D (71.89, 2.59, and 18.29). All ΔEs between the single-layered A3B and the double-layered specimens with A3E and A3.5B were less than 3.3. A3D showed the lowest TP (2.87) among single-layered groups ($p<0.05$). The double-layered composite with A3E 0.5 mm + A3.5B 1.5 mm showed the lowest TP (6.64) among double-layered groups ($p<0.05$), which was similar to that (6.57) of the single-layered A3B.
Within the limitation of this in vitro study, A3D was the most opaque among A3E, A3B, and A3D of Z350XT. In order to increase translucency, the combined layering with Z350XT/A3E and A3.5B would be an alternative to a single-layering with A3B for the class V restoration.

Operative Dentistry

Poster P.132

EFFECT OF DRYING TIME WITH HELIUM PLASMA ON RESIN BOND TO DENTIN

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Non-thermal atmospheric pressure plasmas (NT-APP) using helium as processing gas have been shown to improve the bond strength and its durability of resin composites to dentin. Even with a drying effect from airflow of jet-type NT-APP, 'plasma-drying' using NT-APP jet has shown bond strength values which were comparable to that of the procedure with rewetting after plasma-drying and were higher than that of the air-drying technique. This study investigated the effect of plasma-drying time on the bond strength of an etch-and-rinse adhesive to dentin by comparing with the wet bonding technique.
Acid-etched dentin specimens were prepared from human third molars and divided into five groups according to the adhesion procedure: contemporary wet bonding as a control group and plasma-drying for 15s, 30s, 60s, and 120s (n = 20). In plasma-drying groups, the demineralized moist dentin surfaces were treated with a plasma plume generated using a pencil-type low-power helium plasma torch. After the adhesion procedures with Adper Single Bond 2 (3M ESPE), resin composite/dentin bonded specimens were subjected to a microtensile bond strength test. Fracture mode analysis and characterization of hybrid layer were performed using scanning electron microscopy and transmission electron microscopy.
Plasma-drying for 30s presented significantly higher bond strength (54.8 ± 11.2 MPa) than plasma-drying for 60s (37.0 ± 8.4 MPa) and 120s (39.5 ± 6.4 MPa) (ANOVA and Duncan test, $p < 0.05$). The groups of plasma-drying for 15s (50.6 ± 5.6 MPa) and wet bonding (47.9 ± 12.6 MPa) showed intermediary bond strength values, which were statistically not different from each other. Most fractures were adhesive ones, except four specimens. Microscopic analysis indicated that plasma-drying improved the penetration of the adhesive.
Improved bond strength with plasma-drying was ascribed to the improved penetration of the adhesive into demineralized dentin at adhesive/dentin interface However, excessive plasma-drying could decrease adhesion efficiency.
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Operative Dentistry

Poster P.133

EFFECT OF TWO OVERLAY PREPARATION DESIGNS ON FRACTURE RESISTANCE OF MOLAR TEETH

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To evaluate the resistance to fracture of molar teeth that were prepared either with a standard rounded 90° shoulder or a minimally invasive chamfer and restored with lithium disilicate overlays.
After sample size calculation (α=0.10, δ=250.0, σ=180.0, β=0.20), sixteen intact extracted molars were randomly assigned to two groups (n=8). In group 1 (G1), teeth received a standardised preparation for an indirect overlay restoration (1-mm reduction of the occlusal and axial surfaces) with a 90° rounded shoulder margin. In group 2 (G2), a 1-mm cusp reduction was performed in combination with a marginal chamfer, with the preparation thinning along its external perimeter (<1 mm). The exposed dentine surfaces were immediately sealed adhesively. Lithium disilicate (IPS e.max CAD) overlay restorations were obtained making use of the Cerec 3 CAD/CAM system. The intaglio surface of the restorations and the prepared tooth surfaces were conditioned for adhesive cementation (Clearfil SE Bond 2 with selective enamel etching) and the restorations were luted with Variolink II cement. The specimens were subjected to thermomechanical aging with a chewing machine (5±3–50 ±3°C, 80s; 50 N, 259200 cycles, 1Hz) and occlusally loaded to fracture with a round head stylus of a universal testing machine. The type of fracture was also analysed. The means of the maximum load to fracture registered in the two groups was compared with an independent sample t-test.
The mean of the maximum load to fracture was 2345.01±167.44N in G1 and 2445.89±58.27N in G2. The difference in fracture resistance between the two preparations was not statistically significant (p=0.130). The most predominant type of failure was the restoration crack above the cement-enamel junction, irrespective of the group.
A minimally invasive preparation with marginal chamfer exhibited similar resistance to fracture and fracture pattern in comparison with a less conservative preparation for the restoration of molars with lithium disilicate overlays.

Operative Dentistry

Poster P.134

EFFICACY OF PLASMA-ACTIVATED BLEACHING AGENTS

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This in vitro study aimed to evaluate the bleaching efficacy and color stability of nonthermal atmospheric pressure plasma (NAPP)-activated 40% hydrogen peroxide (HP) and deionized water (DW).
Two hundred-forty bovine enamel−dentin samples were stained with a coffee solution before bleaching. Samples were randomly divided into 12 (n = 20): (1) HP for 5 minute (HP-5), (2) HP-10, (3) HP-20, (4) Plasma-HP-5, (5) P-HP-10, (6) P-HP-5/HP-15, (7) P-HP-10/HP-10, (8) P-DW-5, (9) P-DW-10, (10) DW-5, (11) DW-10, and (12) DW-20. After bleaching, the samples were re-stained for 48 h using red wine. The color differences measured using a dental spectrophotometer after bleaching and after re-staining were reported as ΔE1 and ΔE2, respectively. The data were analyzed using Kruskal−Wallis and Mann–Whitney U tests ($p < 0.05$). Results: All plasma-activated groups revealed higher ΔE1 values than the control groups and similar or higher ΔE1 values than the nonactivated HP groups (p 0.05). The HP-5 and HP-10 groups showed lower ΔE2 value than the other groups ($p < 0.05$), and ΔE2 value of the HP-20 group was similar to the other plasma-activated groups.
Nonthermal atmospheric pressure plasma treatment increased the bleaching efficacy of HP and gave similar bleaching efficacy of HP to DW with similar color stability.
HP is an agent mostly used for dental bleaching but its safety is controversial. This in vitro study showed that plasma treatment may change the need for HP gel for dental bleaching.

Operative Dentistry

Poster P.135

EVALUATING TOOTH COLOR MATCHING ABILITY OF DENTAL STUDENTS

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The aim of this study was to assess the existing agreement between the subjective tooth color recording performed by dental students and the objective recording using a spectrophotometer and observe how their skill progress improved after one year.
A double blind clinical study was performed using a sample of 424 teeth. The color measurement was carried out by students belonging to the third, fourth, and fifth year of the Dental School of the University of Zaragoza using the shade guide VITA 3D-MASTER® Linearguide following manufacturer's instructions. Color registration was made identifying the unit tooth color and dividing the tooth surface in three areas. As objective reference, color records were obtained using the spectrophotometer SpectroShade™ Micro. After one year, the same procedure was carried out with the same students. To study the correlation between Vita 3D-Master Linearguide and student criterion, Cohen's kappa coefficient (κ) was calculated. Statistical analysis was performed using the SPSS22 package.
The third-year students were the ones who showed the largest improvement, improving their ability in measuring accurately the teeth color by 27% (k=0,36). The fifth-year students, already graduated and with half a year of work experience have worsened their ability in measuring teeth color by 19% (k=0,28). Poor congruity was evident when dealing with the third and cervical incisal third in all students. Women were 44% more accurate than men in measuring the teeth color.
Dental students are able to perceive more easily the overall color of the tooth and of the middle third, finding mayor difficulties in perceiving the incisal and cervical third tooth color. The sooner dental students are taught the importance of measuring the teeth color the more they improve in measuring it. When dental students start their work experience they tend to get worsened in measuring it.

Operative Dentistry

Poster P.136

EVALUATION OF ADHESIVE INTERFACE DEGRADATION ON BOND STRENGTH WITH DIFFERENT ADHESIVE APPLICATIONS

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The purpose of this study was to evaluate the influence of 2% Chlorhexidine (CHX), double adhesive layer (DA), extra hybrophobic resin layer (HL) applications proposed to decrease adhesive interface degradation on the microtensile dentin bond strength of simplified adhesive systems.
Two-step etch&rinse system Adper Single Bond2 [SB] and one-step self-etch system Clearfil S3 Bond [S3] were tested, two-step self-etch adhesive system Clearfil SE Bond [SE] was used as control. Seventy-two extracted human third molars dentin occlusal surfaces were exposed by grinding with 600-grit SiC paper. The adhesives were applied according to the manufacturer's directions [MD], or with 2% Chlorhexidine [CHX] application or double application of the adhesive layer [DA] or following the manufacturer's directions extra hydrophobic resin layer coating [HL]. After applying the adhesive resins, composite crowns were built up incrementally. After 24-h water storage, the specimens were serially sectioned in "x" and "y" directions to obtain bonded sticks of about 1.0 mm2 to be tested immediately [IM] or after 6 months of water storage [6M] at a crosshead speed of 0.5 mm/min. The data from each adhesive was analyzed by Three-way ANOVA (adhesive system, mode of application vs. storage time) and Tukey's test ($p = 0.05$).
After 6-months, all adhesives bond strength reduced significantly ($p<0.01$). SE showed the highest bond strength while no difference was found between SB-MD and S3-MD ($p>0,05$). Higher bond strengths values were observed for CHX, DA and HL applications, however HL and DA were significantly different from the manufacturer's directions ($p<0.01$) and HL bond strength was the highest ($p<0.01$). When compared the adhesive systems only DA and HL application for S3 was significantly higher ($p<0.01$).
The application of DA and HL can improve the resin-dentin bonds and decrease the adhesive interface degradation.

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Poster P.137

EVALUATION OF BACTERIAL ADHESION TO DIFFERENT ESTHETIC RESTORATIVE MATERIALS

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The aim of this in vitro study was to evaluate the affinity of bacterial biofilm to esthetic restorative materials after surface exposure to soft drink.
Five different esthetic restorative materials (Filtek Supreme XTE, Ceram X Universal, Essentia, Admira Fusion, Estelite Asteria) were polymerized for 40 seconds into silicone rubber rings (2 mm x 6 mm x 8 mm) to obtain 30 specimens identical in size for each material. Polymerization was performed using a Mylar strip to minimize the formation of an oxygen-inhibited layer. Three groups were created, 10 sample of each material for group: Group A (control group), Group B (24 hours in soft drink), Group C (7 days in soft drink). After the exposure all specimens were washed and stored in physiologic solution for 2 weeks. At the end of the two weeks all disks were sterilized using a solution of ethanol. Bacterial suspension of S. Mutans was cultured and deposited onto each material and the adhesion was evaluated trough the colony forming units (CFUs) determination. Bacterial adhesion data were subjected to Analysis of Variance (one-way ANOVA) followed by Bonferroni's post hoc test.
The highest amount of S. Mutans was recorded in Group C (7 days in acid soft drink), and the lowest in Group A (control group). Filtek Supreme XTE and Admira Fusion in group A were found to be less adhesive than the other materials.
Extended exposure to soft drink deteriorated and altered the surface of restorative esthetic materials and create a more suitable substrate for the formation and adhesion of bacterial plaque.

Operative Dentistry

Poster P.138

FLOWABLE COMPOSITES FOR RESTORATION OF NON-CARIOUS CERVICAL LESIONS: RESULTS AFTER FIVE YEARS

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To evaluate the clinical performance of two flowable composite materials for restoring class-V non-carious cervical lesions (NCCLs), one with novel (N'Durance® Dimer Flow, Septodont; ND) and one with modified conventional matrix composition (FiltekTM Supreme XTE Flow, 3M-ESPE; FS). The null hypothesis was that both flowable composite materials perform equally regarding clinical quality and survival.
50 patients received one ND and one FS restoration of NCCLs in premolars using Clearfil Protect Bond (Kuraray, Osaka, Japan) as an adhesive without selective enamel etching. Restorations were evaluated by two examiners at baseline (BL), 2.5 and 5 years employing selected FDI criteria (surface lustre, surface staining, marginal staining, esthetic anatomical form, fracture of material and retention, marginal adaptation). Non-parametric statistical analyses and $\chi 2$ tests were applied (α=0.05).
38 patients with both restorations under risk were available for the 5 year recall (76%). 81.6% of FS and 92.1% of ND restorations, respectively, were rated clinically acceptable at 5 years. No significant differences for all selected FDI criteria were recorded between ND and FS at each examination time-point except for loss of surface lustre at 5 years, where FS showed significantly better results. For each material, no significant differences over time could be detected.
Within the limitations of this study, the null hypothesis that materials perform equally could not be rejected. Both flowable composites performed similarly regarding survival and clinical performance within 5 years. Consequently, both materials can be recommended for restoration of NCCLs so far.

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Poster P.139

FRACTURE RESISTANCE AND MARGINAL INTEGRITY OF COMPOSITE VENEERS ON ENDODONTICALLY TREATED INCISORS

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To evaluate marginal integrity, fracture resistance and fracture pattern of endodontically treated incisors, restored with composite veneers and supported or not supported by fiber post.

32 extracted intact incisors were endodontically treated and obturated. Samples were divided in 4 groups (n=8) according to the restorative technique: composite veneer with vestibular preparation supported by fiber post (G1); composite veneer with vestibular preparation not supported by fiber post (G2); composite veneer with overlap preparation supported by fiber post (G3), composite veneer with overlap preparation not supported by fiber post (G4). Samples were then scanned with micro-CT (SkyScan 1172: Bruker- microCT, Kontich, Belgium), before and after fatigue artificial treatment with Ball Mill Machine, to evaluate marginal integrity maintenance.. Specimens were then loaded until fracture using a universal testing machine (Instron, Canton, MA, USA). The maximum breaking loads were recorded in Newton (N) and data were analysed with one-way ANOVA and post-hoc Bonferroni test ($p<0,05$). Fractured specimens were also analysed with SEM and fractography analysis was performed.
ANOVA test showed that fiber post insertion did not significantly improve marginal integrity of composite veneers ($p>0.05$) but it affected fracture resistance ($p<0.001$). After fatigue treatment, all groups showed a significant loss of marginal marginal integrity.
Composite veneers, reinforced or not with a fiber post, showed a poor protective effect towords the endodontically treated incisors. Further studies are necessary to validate this findings.

Operative Dentistry

Poster P.140

IMMEDIATE MICROTENSILE BOND STRENGTH OF A MULTI-MODE ADHESIVE

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To compare the immediate microtensile bond strength of a multi-mode Adhesive when applied to dentine in self-etch mode with or without an additional hydrophobic resin coat.
Six recently extracted human third molars, intact and without macroscopic evidence of caries or restorations, were assigned to two groups: ABU SE Group - All-Bond Universal TM Adhesive (Bisco) applied in self-etch mode following manufacturer's instructions and ABU SE+A Group - when applied with an additional hydrophobic resin coat - Adper TM Scotchbond TM Multi-Purpose (3M ESPE), following manufacturer's instructions (64 sticks).Resin composite build-ups (UD4 ENAMEL Plus HRi, Micerium S.p.A. Avegno, GE, Italy) were applied in three increments of 2 mm each, until a height of 6 mm: each layer was light cured for 20 seconds with an additional light polymerization performed on facial, lingual, mesial and distal surfaces for 10 seconds. The teeth were stored in distilled water in an incubator (24h/37°C). Teeth were sectioned to obtain sticks with 1mm2 of cross sectional area, that were tested to failure in a universal testing machine at a crosshead speed of 1mm/minute, to assess dentin microtensile bond strength (μTBS). A paired-sample t-test was performed when the assumption of normality was valid ($\alpha=0,05$).
The mean μTBS to dentin of ABU SE + A (26,1 ± 1,5 MPa) Group (n=68), was not statistically higher than ABU SE (24,6 ± 1,7MPa) (n=64) ($p=0,54$).
The benefit of an additional hydrophobic resin coat on immediate microtensile bond strength of All-Bond Universal TM Adhesive (Bisco) when applied in self-etch mode, was not clear in this study.

Keywords: Dental adhesives, universal adhesives, dentin bonding, microtensile bond strengths:

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Poster P.141

IN VITRO PENETRATION OF COLOURING AGENTS INTO RESIN COMPOSITES.

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To evaluate the gradient of penetration of colouring agents into nano-filled and inhomogeneous micro- filled resin composites.
Eighty disks of resin composite of about 8.4 mm in diameter and 2 mm in thickness were constructed using a nano-filled (Filtek Supreme XTE n=40) and an inhomogeneous micro-filled resin composites (Tetric EvoCeram n=40). Nail polish was applied on both flat surfaces of each specimen leaving the lateral surface uncovered. Thirty specimens prepared with each resin composite were stored in coffee solution for 15 days at 37°C whereas the remaining ten specimens were stored in NaCl solution for 15 days at 37°C. Successively each specimen was thinned up to half of its thickness using a lapping machine (LS2, Remet). Colour photographs of lapped surfaces were taken using a flat-bed scanner (Epson Perfection 2450). The images were acquired by means of an image-processing software (Photoshop 11.0) and a computer (Macintosh MacBook Air) as JPEG images with an input resolution of 2400 pixels per inch. On each scanned surface 14 areas were selected at 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.5, 2.0, 2.5, 3.0 mm from the lateral surface. In each area, CIELAB colour variables (L, a, b) were assessed by means of the sample colour tool. The whiteness index (W) was calculated for each area using the following formula: $W = 100 - [(100-L)2 + a2 + b2]$. Data were analyzed with ANOVA and Tukey-Kramer tests.
ANOVA analysis indicated significant differences between control and pigmented specimens ($p<0.001$). Post-hoc comparison revealed that the pigmented specimens prepared with Supreme showed a lower W than pigmented specimens prepared with EvoCeram.
Discolouration of the composite resins also occurs in the deep layers.

Operative Dentistry

Poster P.142

IN VIVO EVALUATION OF DIFFERENT DENTAL TRAUMA TREATMENT: 3-YEARS FOLLOW UP

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This in vivo study compared different treatments outcomes performed on adult patients who referred to the Department of Operative Dentistry, University of Turin, after dental trauma injury.
All adults patients (age range: 14–40) who referred to the Dental School of Turin after a dental dental trauma (including fractures with or without pulp exposure, tooth dislocations and avulsions) were enrolled in this study. After clinical and radiographical evaluation, personalized treatments were performed in order to solve the symptoms and the clinical consequences of the trauma following the IADT (International Association of Dental Traumatology) guidelines. All clinical and therapeutical records were registered, and patients were scheduled for follow-up visits over a period of 3 years. The clinical evaluation was performed by a single operator, concerning pulp vitality (if no endodontic treatment was previously performed), radiological evaluation and

USPHS criteria of teeth restored with direct resin composites. Chi-square statistical analysis was performed to evaluate if any significant difference was present in the treatment outcome ($p<0.05$).
80 patients were treated in the last 3-years. The records of 40 patients are presented in this study.
The most frequent complication was the loss of restoration, followed by pulp necrosis, abnormal mobility, and tooth loss. Every correlation between dental trauma and clinical complications was found ($p>0.05$). USPHS criteria showed good integration of direct resin composite restorations, with no complications over the 3-year follow-up.
This in vivo study showed that complication rates were significantly reduced if traumatized teeth were immediately treated according to the IADT guidelines. Moreover, pulp necrosis and tooth loss in the permanent dentition occurred within the first 6 months after trauma. These results indicate that early follow-up visits are essential to promptly treat complications. Further long term follow-up is necessary.

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Poster P.143

IN VIVO REAL-TIME TEMPERATURE ANALYSIS OF NATURAL TOOTH AND GOLD INLAY RESTORATION

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Teeth restored with metallic restoration materials show an increase incidence of the "cracked-tooth- syndrome." One proposed mechanism is that the thermal expansion of dental restoration material exerts harmful effect upon the remaining tooth structure. Therefore, the present study analyzed the in-vivo thermal behavior of gold restoration material compared to natural teeth.
The study sample included eight first molars with gold inlays and eight natural first molars from five male and five female volunteers with ages ranging from 25 to 31. A customized multi-channel electronic temperature recording device was attached to the buccal side of each sample tooth using 3mm thick flowable resin. The resting temperature was taken after having the volunteer's mouth closed for two minutes. During the recording period, each volunteer was given 10ml of 58.6°C hot water twice to hold in the mouth for 3 seconds before swallowing with two minute interval in between. After another two mintues the same procedure was repeated with 4.42°C cold water.
There was no significant difference in resting temperature of natural teeth and gold restored teeth ($p>0.05$). The maximum temperature after intake of the hot water was higher in gold restored teeth (44.7°C) than natural teeth (40.5°C) ($p<0.05$). The intake of the cold water made the temperature of gold restored teeth (25.0°C) lower than natural teeth (31.5°C) ($p<0.05$). Analysis of time required to reach the maximum and minimum temperature after each intake showed that the gold restored teeth took less time for maximum heating/cooling than the natural teeth ($p<0.05$). Overall, the rate of temperature change was higher in gold restored teeth than natural teeth ($p<0.05$)
The higher temperature change of intraoral gold inlay compared with natural teeth implies that the gold restoration could expand more than non-treated natural tooth in the same condition. Therefore, in case of intra-coronal gold restoration, careful use of gold is needed.

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Poster P.144

INCIDENCE OF REMINERALIZING AGENTS ON ENAMEL EROSION: AN IN VITRO STUDY

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To evaluate the impact of the composition, the galenic form and the protocol of application of remineralizing agents on the remineralization of artificially eroded enamel by measuring Vickers microhardness.
48 surface-polished bovine incisors were erosively challenged (90 s in 50 mL of 0.65% citric acid, pH = 3.6, 25 ° C). The remineralizing agents were then applied accordingly to 6 groups, following the manufacturer's instructions (n° 1: Witness, n°2: MI Varnish®, n° 3: Duraphat®, n° 4: Tooth mousse®, n° 5: MI Paste Plus®, n° 6: MI Varnish® then Tooth mousse®). The samples were then immersed for 4 hours in an artificial saliva (AS) solution and then two other cycles were performed. The Vickers microhardness (200g, 15s) was evaluated at different times: T0 after 1h in artificial saliva, T1 after the first erosive cycle, T2 after the application of the material (different according to the galenic form), T3 after the second erosive cycle, T4 after 4h in saliva, T5 after the third erosive cycle, T6 after 4h in saliva. The Student test was carried out in order to compare batches two by two.
All the products tested show an efficacy in terms of remineralization effect whatever the composition and galenic form. After the first erosive cycle and the product application, except for Duraphat® group, the microhardness values increases from 3.51 to 14.78 corresponding to an increased HVN percentage of 1 to 5%. The new protocol developed combining the varnish Mi Varnish® (containing CPP-ACP and Fluor) and the gel Tooth Mousse® (containing CPP-ACP) has shown early remineralization after the erosive challenge and a longer term protection. As erosion is a new important challenge in dentistry (alimentary disorders, sodas…), the use of remineralizing agents improves the enamel quality, either as ambulatory utilization or professional application. Therefore, the best treatment is the association of the two methods.

Operative Dentistry

Poster P.145

INFLUENCE OF ETCHING TIME ON RADICULAR BOND STRENGTH AND MMPS ACTIVITY

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The aim of this in vitro study was to evaluate the effect of different etching time and pretreatments of a novel multi-mode universal adhesive (Clearefil Universal Quick, Kuraray) on immediate push-out bond strength and MMPs gelatinolytic activity on radicular dentin.
48 single root teeth, were selected, endodontically treated and obturated. After 7 days, an 8 mm post space was prepared with dedicated drills. Samples were randomly divided into 4 groups according to the adhesive

protocol applied: G1) 15" H3PO4 application + Universal Quick; G2) 60" H3PO4 application + Universal Quick; G3) 15" H3PO4 application + Ethanol-wet bond + Universal Quick; G4) 60" H3PO4 + Ethanol-wet bond application + Universal Quick. All adhesives were applied following manufacturer's instructions, and fiber posts were luted into the post space with the same cement (DC Core, Kuraray). Specimens of each group were further cured for 40s. 1mm slices were prepared to perform push-out test and nanoleakage analyses of the coronal and apical region after 24h of storage in artificial saliva. Additionally, in situ zymographic assay was performed to investigate endogenous MMPs activity within the hybrid layer in accordance with Mazzoni et al., 2014. Results were statistically analyzed with ANOVA and Tukey post-hoc tests. Statistical significance was set for $p<0.05$.
ANOVA analyses showed a statistical significance in push-out bond strength of the pretreatment variable, but not of the etching time. In particular specimens pretreated with ethanol wet bond application showed higher bond strength ($p=0.0001$). In situ zymography quantification analyses revealed that all tested groups, independently from activate MMPs gelatinolytic activity.
The tested adhesive showed comparable results regardless the etching time protocol. MMPs gelatinolytic activity was detected in all groups. Further investigations and longer follow-ups are necessary to validate in vivo the results of the present study.

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Poster P.146

INFLUENCE OF INCREMENT THICKNESS ON DENTIN BOND STRENGTH OF BULK-FILL RESIN COMPOSITES

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To investigate the influence of increment thickness on shear bond strength (SBS) to dentin of a conventional and three bulk-fill resin composites by curing with mono and polywave light sources
Two hundred and fifty-two extracted sound human molars were prepared for SBS test. The teeth were divided into four groups (n=63) according to the resin composites used. Conventional resin composite: Tetric® N-Ceram (control); high-viscosity bulk-fill composites: Tetric® N-Ceram Bulk Fill, X-tra Fil, and SonicFill. Each group was subdivided according to increment thickness (2, 4, and 6 mm) and cured by standard mode of a monowave light-emitting diode (LED) light curing unit (LCU) (T-LED Moon, Stern Weber) or two different modes (standard and xtra power) of a polywave LED LCU (VALO, Ultradent). The failure mode was stereomicroscopically determined at 40× magnification. Data were analyzed using ANOVA and Tukey's post hoc test.
Although there was no significant difference in SBS values of Tetric® N-Ceram Bulk Fill in 2, 4 mm and 6 mm increments, in control and Sonic Fill groups a significant difference was detected in 6 mm increment ($p<0.05$). SBS decreased as the increment's height increased in SonicFill and Tetric N-Ceram Bulk Fill groups regardless of the type of curing units and modes. The predominant SBS failure mode was cohesive failure in dentin.
Based on the results of this study, the bulk fill composites can be applied safely in bulks of 4 mm increments, although in 2 mm thickness the investigated composites showed better performance. The performance of the composites in 6 mm increment may show differences related to the LCU type and mode.

Operative Dentistry

Poster P.147

INFLUENCE OF THE CLINICAL METHOD ON THE SEALING OF THE CAVITY FLOOR

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The aim of this study was to compare the influence on cavity-floor microleackage of two etching techniques (selective etching or self-etching technique) and two cavity-filling techniques (transformation of class II cavity into a class I or incremental oblique)
40 standardized class II cavities in the proximal surfaces of 20 human molars were prepared and divided into two groups: A: 20 Filled cavities by transforming class II cavities into class I and B: 20 Filled cavities filled with incremental oblique technique. In the mesial cavities of both groups selective acid etching enamel was applied (groups A-1 and B1) and in distal cavities, self-etching adhesive system was applied (groups A-2 and B-2). The adhesive system used was Xeno® Select (Dentsply), and the cavity filling materials were: SDR™ and Ceram X® A3 (Dentsply).
The prepared samples were introduced into the blue methylene for 24 hours. After we cleaned the samples with water, then we conducted a longitudinal-occluso-apical and a mesial-to-distal cut, dividing the cavity into two parts.The samples were observed under optic microscope, we gave three different grades of filtration: 0: No filtration, 1: blue filtration of enamel 2: blue filtration of dentine3: blue filtration in the angle between the gingival and axial cavity wall.
All groups showed filtration, being B-2 the group with highest filtration with 60% of filtered pieces. The marginal sealing was higher in fillings made with selective etching of enamel (groups A-1 and B-1), achieving a better result in group A-1.
With the limitations of this study, we can conclude that selective etching of enamel and the technique of transforming a class II cavity into a class I improve marginal sealing restoration in the floor of the proximal cavity.
Key words: composite resin, cavity-filling techniques and dental adhesive

Operative Dentistry

Poster P.148

INNOVATIVE METHODOLOGY TO PRECOCIOUSLY DETECT ADHESIVE RESTORATION FAILURE DUE TO COMPOSITE SHRINKAGE

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The aim of the study was to identify composite restoration interface failure due to polymerization by measuring coronal surface enamel strain state variation.
A strain gauge apparatus has been adopted to measure the coronal enamel surface strain state on the buccal aspects of extracted premolars crowns. 20 sound extracted premolars were prepared with standardized Black's class I cavity. Teeth were divided in two groups: Group A teeth were adopted to simulate an artificial composite debonding by spraying water on the adhesive layer prior to apply composite mass. Group B teeth were adopted to simulate a conventional restoration where interfacial

debonding is not expected to occur. The adopted composite material was Enamel plus, the adhesive Optibond FL, the light curing unit was the Swiss Master Light EMS. Premolars were cured for 20 s at 1000 mW/mm2 light intensity. The surface strain was recorded as function of time for the light curing interval and the subsequent 300 seconds.
The maximum recorded strain states during polymerization ranged from 0,000063 to 0,00016 ε. Although all samples showed an increase of the strain state during the curing intervals they differed in maximum reached strain. Group B samples reached a significantly higher strain state with respect to Group A. Samples from Group A reached their maximum strain state after 5 s from the curing interval while samples from Group B reached their maximum strain state after 15 s from the curing interval. Group A samples almost recover their undeformed configuration, while samples from Group B showed a slight reduction of the maximum strain state.
It could be hypothesized that difference among two groups are due to the artificial debonding occurring in samples out of group A. The presented method can represent a new path way to study composite shrinkage phenomena effect on dental restorations.

Operative Dentistry

Poster P.149

INTERNAL ADAPTATION OF COMPOSITE RESTORATION WITH OR WITHOUT AN INTERMEDIATE LINER: EFFECT OF POLYMERIZATION PARAMETERS OF LINER MATERIAL

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The purpose of this study was to compare internal adaptation of composite restoration with or without an intermediate liner and to identify the relationships between the internal adaptation and polymerization shrinkage parameters of liner material.
Class I cavities were prepared in human third molars. After adhesive application, the composite was placed in bulk or with a liner application. For the control group (TBFb), after one step self-etch adhesive (G-Premio Bond, GC) application and light-curing, Tetric N-Ceram Bulk Fill (TBF, Ivoclar Vivadent) was placed with bulk fill technique and light-cured. For experimental groups, six different lining materials, (TBF, Beautifil Flow (BFF), Estelite Flow Quick (EQF), Filtek Z350XT flowable (FTF), SDR bulk fill flowable (SDR), Fuji lining LC(GCL)) were applied in 1.5mm thickness and light-cured for each group. TBF was filled onto the intermediate liner and light-cured. After thermo-cycling, internal adaptation was measured as High Brightness percentage (HB%) parameter using swept-source optical coherence tomography (SS-OCT) imaging. The HB%s of each group was calculated and compared. Shrinkage strain (SS), flexural modulus (FM), and polymerization stress under compliance-allowed condition (PS) were measured with custom-made devices for each lining materials. The relationships among HB%, SS, FM, and PS were evaluated statistically.
HB% for TBFb, TBF, BFF, EQF, FTF, SDR, and GCL were 53.28 (10.35)d, 40.60 (8.96)a, 46.75 (9.46)b,c, 48.26 (8.64)c,d, 47.48 (9.83)b,c, 39.76 (9.56)a, 42.27 (10.4)a,b, respectively. In Class I cavity, composite restoration with an intermediate liner showed lower HB% (superior internal adaptation) than composite restoration without it. In the restoration, internal adaptation was correlated with the polymerization stress of the liner material (Pearson correlation: R2=0.883, p<0.05)
- In Class I cavity, composite restoration with an intermediate liner had better internal adaptation than that without it and internal adaptation was correlated with the polymerization stress of the liner material.- Polymerization stress of intermediate liner determine the internal adaptation of class I composite restoration

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Poster P.150

IN-VITRO COMPARISON OF ER:YAG LASER-BLEACHING WITH DIFFERENT LIGHT-ACTIVATED BLEACHING SYSTEMS

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To compare Er:YAG laser-bleaching system with different in-office systems in terms of surface roughness, color, and enamel bond strength.
Sixty-eight enamel slabs were prepared from the sound enamel of extracted bovine teeth. The teeth were randomly divided into four groups according to the different in-office bleaching systems (n=17): Diode laser (Epic), Er:YAG laser (Fotona LightWalker), UV light (ZOOM2) and light emitting diode (Radii Plus). All systems were used with their respective bleaching agents according to manufacturers' recommendations. The surface roughness (Ra) and color of the teeth were assessed at baseline and after the bleaching using a surface profilometer and a spectrophotometer, respectively. The degree of color change was determined by the CIE L*a*b* system. The roughness data were analyzed by Kruskal-Wallis and Wilcoxon tests. Kruskal-Wallis test was used for color change. For shear bond strength (SBS) test, composite cylinders were bonded on bleached enamel samples and stored in water (370C). Specimens were debonded with a universal testing machine at 1 mm/min. Data were analyzed by using Kruskal Wallis test($p<0.05$).
Significant differences were only found between UV light and Er:YAG laser for Ra ($p=0.017$). Comparing the baseline and post-bleaching, an increase in Ra was observed for all tested groups ($p<0.05$) except for UV light ($p=0.36$). Regarding color, no significant differences were observed among different bleaching systems ($p=0.25$). All bleaching systems produced similar tooth color improvement. The highest values for SBS were obtained in Er:YAG group. Significant differences in bond strength values were found between all systems ($p<0.05$) except diode laser versus UV light($p=1.00$).
Although Er:YAG laser bleaching did not differ from other bleaching systems concerning color improvement, Er:YAG laser appears to provide better results in terms of SBS. All bleaching systems except ZOOM2 altered surface roughness.

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Poster P.151

MARGINAL ADAPTATION TO CERVICAL MARGINS OF DIFFERENT VISCOSITY MATERIALS

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The aim of this in vitro study was to evaluate the effect of deep cavity margin relocation with different material on the interfacial sealing of II class cavities.
48 intact upper premolars, extracted for periodontal reasons, were selected. A mesial and a distal cavity with cervical margins placed 1mm below and 1mm above the CEJ were performed on each tooth. Samples were then all treated with SE Bond2 (Kuraray) after enamel pre-etching and then divided in groups according to the restoration technique: G1) 1mm relocation with flowable composite (Grandioso Heavy Flow). G2: 1mm relocation with flowable ormocer (Admira Fusion Flow); G3: 2mm relocation with flowable composite (Grandioso Heavy Flow); G4: 2mm relocation with flowable ormocer (Admira Fusion Flow); G5: nanohybrid composite (Filtek XTE); G6: bulk fill material (Filtek Bulk Posterior). All layers were cured for 20sec. Specimens were scanned with micro-CT (SkyScan 1172: Bruker- microCT, Kontich, Belgium), before and after 10000 thermocycles between 5–55 °C, to evaluate marginal integrity. Data were statistically analysed with ANOVA test and significance was set for $p<0.05$.
The ANOVA test showed that the relocation thickness significantly affected the marginal integrity ($p=0.001$), moreover on dentin-composite interfaces. No significant difference was found between different materials tested on enamel margins.
Deep cavity margin relocation is a common procedure. However, marginal integrity could be insufficient if thick horizontal layers are created with flowable materials. Further investigations are necessary to confirm these in vitro results.

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Poster P.152

MARGINAL AND INTERNAL 3D-FEA OF BULK AND BLOCK COMPOSITES IN CLASS II

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To investigate the displacements and shrinkage stresses of the adhesive materials combination in the restored posterior teeth under food chewing and polymerization shrinkage simulation by means of a 3D finite element analysis
The analysis of solid sound and restored tooth were carried out using HyperWork® 14.0 (Altair Engineering Inc) and OptiStruct® 14.0 solver. Class II MOD cavity models were modeled. Slide-type contact elements were used between tooth surface and food. Model A1, with 10 micron thick resin bonding layer and a direct composite bulk filling material (E=12 GPa), model A2, with a 10 micron thick resin bonding layer and a direct composite bulk filling material (E=20 GPa), model B, with a 70 micron thick resin cement and a block inlay (E=20 GPa) were modeled. To simulate shrinkage effect in model A1 and A2 for resin bonding and bulk composite and in model B resin cement layer shell elements were employed and the thermal expansion approach was used. An occlusal load of 600 N was applied, simulating a food chewing effect by contacting uniformly the occlusal surface while assigning fixed zero-displacements on the cutting surfaces below the crevices. Three analysis were carried out for model A1, A2 and B (loading shrinkage, loading and shrinkage). All the materials were assumed to be isotropic and elastic. A static linear analysis was carried out
The principal displacement and shrinkage stresses were mainly located in model A2. Under the combined occlusal loading and shrinkage effects Model A1 performed better than A2 because of less rigid bulk composite (E=12 GPa). Model B with a block indirect inlay (E=20 GPa) showed similar mechanical behavior to the sound tooth model.
The use of an indirect inlay composite restoration can successfully provide a mechanical behavior close to the sound tooth.

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Poster P.153

MECHANICAL BEHAVIOR OF CAD-CAM COMPOSITE OVERLAYS WITH DIFFERENT THICKNESS

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The aim of this in vitro study was to evaluate the mechanical and wear behavior of ultra-thin (<1mm) CAD-CAM composite occlusal veneers. The tested hypothesis was that resin thickness influences the mechanical and marginal stability of composite overlays.
Eight (n=8) caries-free, extracted human molars were collected. Occlusal surface of teeth was covered with powder (Optispray Cerec, Dentsply-Sirona) and scanned (Cerec Bluecam, Dentsply-Sirona). Enamel was reduced, maintaining a cuspal inclination using diamond burs, dentin was exposed and immediate dentin sealing (IDS) protocol was performed with phosphoric acid selective enamel etching (Ultra-Etch, Ultradent) followed by Scotchbond Universal Adhesive (3M ESPE) applied in accordance with manufacturer's instructions, self-etch mode.Specimens were then covered with powder (Optispray Cerec, Dentsply-Sirona) and re-scanned using Cerec Bluecam (Dentsply-Sirona), then restorations were realized with Cerec Software 4.4.2 and milled from composite resin blocks (Lava Ultimate Restorative, 3M ESPE). Two different thicknesses were evaluated: 0,5 mm and 0,8 mm measured at the central pit. Both tooth surface and restoration were sandblasted and luted with Scotchbond Universal Adhesive, (3M ESPE) and TetricEvoFlow (Ivoclair-Vivadent). Photo-polymerization was performed with an LED lamp (Valo, Ultradent) for 60 sec on each surface.A chewing simulator (Mechatronic) was used to simulate occlusal loading. Specimens were submitted to a thermal-cyclic load of 50 N at a frequency of 5 Hz for 1.200.000 cycles. After loading, digital and silicon impression were taken. SEM analysis was performed using epoxy resin replicas before and after loading to assess the mechanical performance wear patterns and marginal quality of interfaces.
SEM analysis showed defined substance wear areas in the contact point area. Continuous margin adaptation at the interfaces showed no differences in both groups.

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Poster P.154

MICROHARDNESS AND DISCOLORATION OF DIFFERENT ESTHETIC RESTORATIVE MATERIALS

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Two crucial properties of esthetic restorative materials are their long-term color stability and their resistance to erosion. The aim of this study was to evaluate their color stability after surface roughening with cola and exposure to different staining solutions, and to investigate their Vickers microhardness (VK) after exposure to acidic drink.
All materials (one nanofilled composite, one nanoceramic composite, one microfilled hybrid composite and one nanohybrid Ormocer based composite) were polymerized to obtain identical specimens. To analyze discoloration, Specimens of group A were first exposed to Cola (24h), and then immersed in coffee or red wine (28 days); group B was exposed only to coffee or red wine. A spectrophotometric evaluation was performed at 7-14-21-28 days. To analyze microhardness, Specimens of group 1 were used as control, group 2 and group 3 was immersed in an acidic drink respectively for 1 and 7 days. Then, their VK was determined with a microhardness tester.
Specimens of group A showed higher variations when compared with group B's specimens ($P < 0.05$). After 28 days the immersion protocols caused a clinically perceivable color change for all materials ($P < 0.05$). Each material showed lower micro-hardness values after immersion in acidic solution ($P < 0.05$), and significant changes after immersion in acidic solution for 1 day and 7 days ($P < 0.05$).
As regards discoloration, staining beverages caused significant discolorations for all materials. The first exposure to Cola enhanced the subsequent staining with coffee or red wine. Nanohybrid composites reported the lowest color variations. As regards microhardness, the nanofilled composite, and the nanohybrid Ormocer based composite, showed the best behavior. The nanoceramic composite resisted well to the 1 week immersion in soft-drink, but reached lower hardness values. The microfilled hybrid composite showed the lowest microhardness values.

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Poster P.155

MICROHARDNESS EVALUATION OF NEW BULK COMPOSITES AFTER USING TWO DIFFERENT POLISHING SYSTEMS

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This study was aimed to evaluate the surface hardness (Vickers Microhardness, VHM) of two new bulk composites before and after using two polishing systems, at different times.
FiltekTM Bulk Fill Posterior Restorative (3M,ESPE), and a newly developed bulk composite, Simplicity (3M, ESPE) were investigated.
Ten discs of each composite (0,4 cm diameter x 1 cm high) were prepared using Teflon molds. They were polymerized using Elipar S10 (3M,ESPE), in standard power conditions. All samples were treated with SofLex discs (3M,ESPE) and then they were polished using two systems: five samples were polished using Opti1Step and OccluBrush (Polish1; Kerr Corporation) and five samples using Spiral Wheels SofLex System (Polish2; 3M,ESPE). VHM was measured by means of a microhardness tester and measurements were performed at t0 (immediately after curing), pre and post-polishing, and after 24 hours. All data were analysed by ANOVA test ($p<0.05$) and Tukey's test ($p<0.05$) for post hoc comparisons, having verified that each data set met the requirements of normality of data distribution and homogeneity of group variances (Shapiro Test and Levene Test, respectively).
All samples recorded satisfactory VHM values. At t0, in both bulk composites, VHM post-polishing values were statistically higher than pre-polishing values. The values obtained by using the two polishing systems were not statistically different for Filtek; on the other hand, VHM values of Semplicity polished using the Polish2 were statistically higher than the ones obtained using Polish1. At t0, VHM values of Simplicity using Polish2 were statistically higher (78.06 +/−4.80) than the ones of Filtek (68.92 +/−6.30).After 24 hours, Simplicity specimens polished using Polish2 recorded the highest VHM values (78.02 +/− 1.13).
IIn conclusion, surface hardness increased when polishing was performed at t0 and VHM values were material and polishing system dependent. In Filtek samples, the highest VHM values were recorded when Polish1 was used; in Simplicity, when Polish2 was used. Further studies are ongoing in order to study the correlation between VHM and the degree of conversion and the consequential clinical implications. The knowledge of the performance of these two polishing systems could be helpful for clinicians in order to achieve the best microhardness values in restorations performed using the tested bulk fill composites, thus improving their physical properties and durability.

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Poster P.156

MICROLEAKAGE EVALUATION OF ATRAUMATIC RESTORATIVE TREATMENT IN PERMANENT MOLARS

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The aim of this in vitro study was to evaluate the performance of atraumatic restorative treatment (ART) with regard to microleakage in Class I restorations of permanent molars.
In the study group, 13 freshly extracted molars with occlusal dentin caries were selected. Occlusal dentin caries was removed with an excavator and the cavity dimensions were measured and recorded by using adigital caliper. Cavities were performed according to the ART and restored with glass ionomer cement (KetacTM Molar Easymix, 3M ESPE). Seven sound extracted molars served as control group and Class I cavity preparations, according the average size of the cavity in the study group (approximately 4-mm in length, 3-mm in width and depth), were prepared by using a diamond bur. Cavities restored with the same material by the same researcher. All molars were thermocycled 2000 times at 5–50 °C and subjected to 50.000 cycles of loading at 50 N. The teeth were isolated with two layers of colored nail varnish, except for 1 mm beyond the counter of the restoration edges. The teeth were immersed in 2% methylene blue for 24 hours and longitudinally sectioned at a thickness of 0.8 mm using a water-cooled diamond saw (Isomet, Buehler). The margins were observed for microleakage using a scoring system (0–3) in the stereomicroscope at 40× magnification. The degree of dye penetration was recorded and analyzed with the Chi-square test ($p<0.05$).
When compared with the control group, ART demonstrated significantly greater microleakage at the restoration and tooth interface ($p<0.01$). In the control group, the score 0 was significantly higher compared to the study group ($p<0.01$).
The in-vitro study indicated that the microleakage and gap formation range in ART restorations had been increased.

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Poster P.157

MICROLEAKAGE OF GLASS IONOMER RESTORATIONS AFTER CONVENTIONAL AND ER:YAG LASER IRRADIATION

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The aim of this study was to evaluate the microleakage of glass ionomer restorations (GIC) in class V cavities prepared with both conventional and Er:YAG laser techniques.
Twenty teeth were used in this study. Standard class V cavities (4 mm wide,3 mm high,3 mm deep) prepared on the buccal and lingual surfaces of teeth. Then, all teeth were randomly divided into four groups. In groups I and II, cavities were prepared by Er:YAG laser (Fotona,Slovenia) and in groups III and IV cavities were prepared with conventional rotary equipment using round diamond bur. Groups I and III were then restored with conventional GIC (Ketac,3M Espe,Germany). Groups II and IV were restored with high viscosity GIC with resin coating (Equia,GC,America). All specimens were then stored in distilled water at 37°C for 24 h. Teeth were then subjected to thermo-cycling (500 cycles, 5°C-55°C). All teeth were exposed to 50.000 cycles of loading in a chewing simulator. Specimens were stained with 0.5% basic fuchsin dye and sectioned bucco-lingually. Then, dye penetration was scored under a stereomicroscope at 40 magnification. The 0–3 scoring scale was used to assess the extent of dye penetration at the tooth-restoration interface.
The data were analyzed statistically using the Kruskal-Wallis and Mann Whitney tests.
The highest microleakage was observed in the group prepared with Er:YAG laser and restored with conventional GIC ($p=0.01$). There were no statistically significant differences between the other groups ($p>0.05$).

Operative Dentistry

Poster P.158

MULTI-MODE AND SELF-ETCH ADHESION SYSTEMS: CLINICAL TRIAL DESIGN, CHARACTERISTICS AND BASELINE REPORT

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Describing the randomized clinical trial (RCT) design and baseline report of Multi-Mode (MM) and Self-Etch (SE) adhesives applied by SE (with non-etched or etched enamel) and Etch-and-Rinse (ER) adhesion strategies, analysing non-carious cervical lesions (NCCL) restorations performance for two-years (2016–2018).
Prospective, double blind RCT approved by UFP Ethics Committee, National Clinical Trials Ethics Committee (NCTEC-20150305), Infarmed (EC/011/2015), NCT02698371, in 38 patients with 210 restorations (Admira Fusion®;nanohybrid-ormocer composite) randomly allocated according to six groups (Adhesive systems; adhesion strategies) of 35 restorations: G1-Control (Futurabond®DC; SE); G2-Control (Futurabond®DC; SE etched-enamel); G3 (Futurabond®U; ER); G4-(Futurabond®U; SE); G5 (Adhese®Universal; ER); G6 (Adhese®Universal; SE). All restorations done by one operator and evaluated (aesthetic, functional and biological parameters) at baseline (one month after restoration) by three calibrated examiners (ICC≥0.952) using USPHS and FDI criteria. RCT design included participant's and NCCL characteristics. Baseline reports the restorations/adhesion strategies efficacy (success rate); Statistical analysis with nonparametric tests (alpha=0.05).
Median age: 55.5years (24-63-years-old), 21(55.3%) male; 21(55.3%) with systemic pathologies, 27(73%) under pharmacotherapy and 6(15.8%) smokers; 25(65.8%) showed Good and 13(34.2%) Reasonable oral hygiene. NCCL in 176(83.8%) pre-molars and 34(16.2%) molar teeth; three to six restorations by patient; 210-NCCL restorations characteristics: Dentin sclerosis categories: 146(69.5%) One, 35(16.7%) Two, 8(3.8%) Three and 21(10%) Four, no significant differences by group ($p=0.353$); NCCL cavity dimensions: median HWD of 3x4x2milimeters, differences detected for width ($p=0.030$) between G3 and G4 (wider); NCCL-Cavity geometry: 84(40%) Acute, 60(28.6%) Severe and 60(31.4%) Obtuse, no significant differences by group ($p=0.903$). No differences in tooth type (pre-molar/molar) per RCT groups ($p=0.252$). At baseline all restorations showed 100% aesthetic, functional and biological success rates.
MM and SE adhesives applied by SE or ER adhesion strategies indicate baseline excellent clinical performance. The mean/long-term (one/two-years) evaluation of adhesive´s and restorations is mandatory to determine clinical performance outputs as designed on clinical trial.

Operative Dentistry

Poster P.159

PERCEPTION OF SMILE AESTHETICS AMONG GREEK DENTAL STUDENTS

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Assess the perception smile aesthetics among Greek dental students in accordance with their education
Four hundred undergraduate students (80 per year, from the 5-year study program, University of Athens Dental School, Greece) were randomly selected to participate in this study. An interview in person with all students was arranged for the completion of the questionnaire. The survey, aside from questions to characterize the sample individually, included 22 photos of frontal smiles with variability in smile components. The 22 different frontal smile images were produced after manipulation by Adobe Photoshop (CS6). Attractiveness of each smile was assessed using a Visual Analog Scale (VAS) for each image. This scale was ranged between 0–10 with the 10 being the most attractive. Data were statistically analyzed by linear regression ($a < 0.05$).
Students in the last year of studies found the smiles overall less attractive, compared to students from all other years, with a statistical significant difference ($p<0.05$). Male students assessed the smiles more attractive than female students did. Ideal smiles were identified by students of all years. Although some aesthetic alterations, such as tooth diastema, were identified by students from all years, other alterations (e.g., the discrepancy of the median line and increased gingival display) were primarily identified by students at the last years of their studies.

Tooth coloring influenced a greater distribution of students in the first year.
Perception of smile aesthetics seems to evolve during the students' dental studies. Clinical experience is the critical parameter that permits the observation of smile aesthetic problems. Dental education has to provide the appropriate background on the aesthetics of the smile primarily during clinical practice, in order to help future dentists properly calibrate their smile perception.

Operative Dentistry

Poster P.160

ROLE OF DICYCLOHEXYLCARBODIIMIDE (DCC) ON DENTIN BOND STRENGTH AND MMPS ACTIVITY

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Endogenous matrix-metalloproteinases of dentin (MMPs) are claimed to be responsible for the degradation of resin-dentin interface. Aim of the study was to evaluate the effect of dicyclohexylcarbodiimide (DCC) applied as a conditioning primer on immediate μTBS and MMPs activity within the hybrid layer (HL) created by an etch-and-rinse 2-step adhesive and a universal adhesive.
A standardized smear layer was created using a 180-grit silicon-carbide paper on 60 middle/deep human dentin surfaces. Specimens were assigned to the following groups (n=8) according to the adhesive procedure: G1) 15"etching with H3PO4 + 0.5M DCC/ethanol and Adper Scotchbond 1XT (3M ESPE); G2) 15"etching with H3PO4 + Adper Scotchbond 1XT; G3) 15"etching with H3PO4 + 0.5M DCC/ethanol and Scotchbond Universal (3M ESPE); G4) 15"etching with H3PO4 + Scotchbond Universal; G5) 0.5M DCC/ethanol + Scotchbond Universal; G6) Scotchbond Universal application. Specimens were light-cured for 20 s and the build-ups were produced, then cut, and submitted to microtensile bond strength test (μTBS) in accordance with the non-trimming technique after 24 h storage in artificial saliva at 37°C. Additionally, in situ zymographic assay was performed to investigate endogenous MMPs activity within the hybrid layer in accordance with Mazzoni et al., 2014.
Statistical analysis showed that the use of DCC-containing conditioner improves immediate μTBS results when employed with Scotchbond Universal. In situ zymography revealed reduced fluorescence signal at the adhesive/dentin interface in specimens pre-treated with 0.5M DCC indicating a lower collagenolytic activity compared to the control groups.
Based on these findings, DCC pre-treatment improves mechanical properties and inhibits dentinal endogenous enzymes at the adhesive interface. Future studies are needed to evaluate the efficacy of experimental DCC primer in dentin bonding procedures.

Operative Dentistry

Poster P.161

ROLE OF THICKNESS ON MECHANICAL BEHAVIOR OF RESIN COMPOSITE OVERLAYS

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The aim of this study was to evaluate the mechanical behavior of resin CAD-CAM composite overlays with different thickness after thermo-mechanical challenge. The tested hypothesis was that overlay thickness influences the mechanical and marginal stability of resin composite overlays.
Sound human molars were selected (N=8), cleaned, embedded on a silicon index, covered with powder (Optispray Cerec, Dentsply-Sirona) and scanned (Cerec Bluecam, Dentsply-Sirona). The occlusal surface was removed using diamond burs and immediate dentin sealing (IMS) protocol was applied by selective enamel etching with phosphoric acid (Ultra-Etch, Ultradent) followed by One Coat 7 Universal (Coltene) application in accordance with manufacturer's instructions, self-etch mode. Specimens were covered with powder (Optispray Cerec, Dentsply-Sirona) and re-scanned using Cerec Bluecam (Dentsply-Sirona). Overlays were designed with two different minimal thickness (0.5 or 0.8 mm) measured in the central fossa using Cerec Software 4.4.2. Brilliant Crios resin composite blocks were grinded using Cerec Sirona MC-XL (Dentsply-Sirona). Overlays were sandblasted and luted with One Coat 7 Universal and TetricEvoFlow (Ivoclar-Vivadent). Photopolymerization was performed with an LED lamp (Valo, Ultradent) for 60s on each surface.
Digital and silicon (to produce replicas for SEM analysis) impressions of the restored teeth were taken before and after thermo-mechanical loading using a Chewing Simulator (Mechatronic). Replicas were analyzed under SEM to investigate marginal stability and surface characteristics.
SEM analysis showed no differences in the marginal integrity between the groups with continuous margins along the adhesive interface. Minor defects were found along the luting interface and at the occlusal contact points.
The tested hypothesis was rejected since no difference was found between resin composite overlays of 0.5 and 0.8 mm thick. Additional studies are currently ongoing to test the longevity of composite overlays.

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Poster P.162

ROUGHNESS EVALUATION OF BULK-FILL RESIN COMPOSITES AFTER DIFFERENT FINISHING AND POLISHING PROCEDURES.

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The purpose of this in vitro study was to evaluate the effect of four different polishing systems on four current bulk fill composites through profilometry assessment and gloss analysis.

One hundred sixty disc-shaped specimens were prepared using four resin-based bulk fill composites and diveded in four main groups: Filtek Bulk-Fill (3M), Tetric Evoceram Bulk-Fill (Ivoclar), Fill-Up! (Coltene) and Sonicfill2 (Kerr). Specimens were polished 400-grit silicon carbide papers to have a baseline standard roughness for all composite. These were then divided into four sub-groups and polished following the manufacturers' instructions by a single operator using different polishing systems: 2-step Sof-Lex Spiral Wheels (3M), Opti-1-Step Polisher (Kerr), 3-step Astropol (Ivoclar) and Hiluster 2-Steps Polishing System (Kerr)..The average roughness was measured in triplicate on each single specimen with a contact profilometer Mitutoyo SJ-201 Rougness Tester (Mitutoyo). Gloss measurement was also performed for small areas (2mmx2mm) using a Glossmeter (MG6-SA, KSJ). Data were analysed using a two-way analysis of variance (ANOVA) to analyse whether the following factors affect the values of roughness and gloss: (i) material; (ii) polishing/finishing. Tukey HSD test was also conducted to evaluate any statistically significant differences between the material/procedure combinations (α=0.05).
Opti-1-step polishinh system produced the highest Ra and the lowest GU mean in all the tested composite ($p<0.05$);the other three polishing systems showed no significant differences ($p<0.05$) between them.The Spiral Wheels (3M) and Ivoclar Astropol (Ivoclar) created the smoothest surface ($p<0.05$)compared to the other two systems. The lowest significant gloss values were obtained with Fill-Up! (Coltene). Sof-Lex Spiral Wheels (3M) obtained the highest gloss values.
Either the tested materials or the finishing/polishing procedure affected the resulting surface quality and the gloss. Lower Ra values were obtained with Filtek Bulk-Fill (3M) and Tetric Evoceram Bulk-Fill (Ivoclar) and when using the finishing/polishing method Spiral Wheels (3M) or Ivoclar Astropol (Ivoclar).

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Poster P.163

SHEAR BOND STRENGTH OF COMPOSITE RESTORATIONS REPAIRED WITH AN UNIVERSAL INJECTABLE COMPOSITE

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The study aimed to analyze the shear bond strength of a universal injectable composite when used as a repair material for aged resin-based composites
One hundred disc shaped specimens (8x2mm) were prepared of five different commercially available composites (n=20) (Filtek Bulk Fill Posterior, Filtek Z250, Tetric N-Ceram, Gradia Direct Posterior and SonicFill). After the surfaces of the samples were roughened with grinding papers (600μm and 1000μm grit), they were stored at a temperature of 37 °C for 3 weeks in distilled water. The surfaces were covered in 37% phosphoric acid gel for 15s, thoroughly rinsed with water, and dried with compressed air. Prior the application of the adhesive, a silane coupling agent (GC Ceramic Primer II) was applied to the surfaces and dried for 10 s. An universal adhesive G-Premio BOND was applied according to the manufacturer instructions and light cured with a polywave LED light curing unit (VALO, Ultradent) for 10s. The composite groups were randomly divided into two subgroups to be repaired with their own substrates or a universal injectable composite (G-aenial Universal Flo). The repair materials were inserted in a silicone tube (2 mm internal diameter × 2 mm height) on the bonded areas of the samples and light cured for 10 s. After the specimens were aged by thermocycling (500 cycles, 5-55°C), shear bond strength (SBS) was tested and failure modes were assessed. Data were analyzed by ANOVA with TUKEY HSD tests ($p<0.05$).
All the tested composite groups either repaired with the same substrate or an universal injectable composite did not show significantly different SBS values except SonicFill group ($p>0,05$). SonicFill group repaired with G-aenial Universal Flo showed significantly lowest shear bond strength values ($p<0,05$).
The repair of SonicFill restorations with universal injectable composite may not be recommended for clinical use.

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Poster P.164

STRUCTURAL INTEGRITY EVALUATION OF DIRECT AND CAD/CAM LARGE MOD COMPOSITE RESIN RESTORATIONS

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Tooth fracture is a major concern in the field of restorative dentistry. The use of resin-based composite restorative materials is more frequently extended to large and deep cavities in order to reinforce remaining tooth structures. The aim of this study was to evaluate the fracture resistance and mode of fracture of large MOD cavities restored with two different resin composite materials and two different restorative techniques, direct and CAD/CAM.
Fifty-one (51) extracted human mandibular third molars were divided into three groups. Group 1 and 2 had sandardized MOD slot-type preparations (4mm depth and 5 mm occlusal isthmus width). Seventeen were restored with direct composite resin restoration (Filtek Bulk fill, Filtek TM Bulk-fill, 3M ESPE) (Group 1), and seventeen were restore with composite resin CAD/CAM inlays (Lava ultimate, LavaTM Ultimate, 3M ESPE) (Group 2). The third group served as control. Restorations in groups 1 and 2 were subjected into thermocycling for artificial aging (50C, 370C, 550C, 370C) for a number of 8000 cycles. A compressive loading test (0.5mm/min) was performed. The mode of fracture was classified according to Burke's classification under standardized macro photography. One-Way ANOVA was used to statistically analyze the fracture load data at significance level 5%.
The statistical analysis showed significant differences among the restored groups as well as the restored and the control group. Teeth in Group 1 fractured at an average load of 1285N, while teeth in Group 2 fractured at an average load of 1869N. Mode of fracture had the same distribution among groups 1 and 2.
CAD/CAM composite resin restorations seem to be a promising restorative modality for large MOD defects. They increased the fracture strength of restored molars when compared to composite resin restorations. The majority of fracture types was deemed intraoraly restorable for both materials.

Operative Dentistry

Poster P.165

SURFACE ALTERATIONS OF WHITE SPOTS TREATED WITH MICRO-INVASIVE RESIN INFILTRATION AND MICROABRASION

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The aim of this in vitro study was to determine the alterations on the surface hardness and the surface roughness of white spot lesions after resin infiltration and microabrasion treatments, as well as the alterations of treated lesion surfaces when subjected to secondary demineralization. Eighty artificially-induced white spot lesions were randomly divided into five groups (n=16): Group 1; lesions were treated with resin infiltration using adhesive resin (Excite-F, Ivoclar/Vivadent), Group 2; lesions were treated with resin infiltration using resin infiltrant (Icon, DMG), Group 3; lesions were treated with microabrasion using 6.6% hydrochloric acid (Opalustre, Ultradent), Group 4; lesions were treated with microabrasion using 6.6% hydrochloric acid (Opalustre, Ultradent) and diamond paste (Diamond Excel, FGM), Group 5; demineralized teeth were soaked in distilled water and served as control. Then, all specimens were subjected to secondary demineralization. The micro-hardness and surface roughness evaluations were performed after preparation of specimens, after formation of white spot lesions, after application of micro-invasive treatments, and after secondary demineralization consecutively.
Compared to controlled specimens, micro-hardness was increased and surface roughness was decreased in both infiltrated and microabraded lesions. Group 2, Group 3 and Group 4 were demonstrated similar micro-hardness values which were higher than Group 1. Lesions treated with resin infiltration showed lower surface roughness values than lesions treated with microabrasion. Polishing after microabrasion led to a decrease in surface roughness. Secondary demineralization did not influence on micro-hardness but increased the surface roughness values in all treatment groups.
Icon infiltration and both microabrasion techniques presented similar performance regarding micro-hardness assessment and they were protective against secondary demineralization. Lesions treated with resin infiltration showed better surface roughness measurement than microabrasion, however, all the techniques were not protective against secondary demineralization.

Operative Dentistry

Poster P.166

SURFACE ROUGHNESS OF COMPOSITE MATERIALS WITH DIFFERENT POLISHING SYSTEMS AND OPERATOR ABILITIES

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The purpose of this in vitro study was to compare the surface roughness of two different composite materials using single-step and multi-step polishing systems performed by dental undergraduate and doctoral students.
A nano-hybrid (Filtek Bulk Fill, 3M Espe) and a nano-ceramic (Ceram.x One Universal, Dentsply) composites were polished using one-step (OneGloss Set, Shofu) and multi-step (Sof-Lex System, 3M Espe) systems.A total of 80 cylindrical samples of the test materials were prepared using teflon molds (10 x 4mm and 10 x 2mm). They were polymerized with a halogen light device (Optilux 501, Kerr) at distance of 1 mm. Two main groups according to the composite types (n=40) were divided into two subgroups according to the polishing systems (n=20). Polishing was applied by operators with different levels of experiences. Samples were kept in distilled water for 24 hours at 37 °C. Surface roughness values were measured using a profilometer (Surtronic 25). Data were analyzed by oneway ANOVA and Tukey's HSD test.
There were no statistically significant differences in mean roughness values between the operators with different levels of experiences ($p > 0.05$). But, roughness was significantly higher in the single-step technique than the multi-stage system for both the materials ($p < 0.05$). No significant differences were obtained between the different composite materials when using the same polishing system ($p>0.05$). The roughest surfaces were found for the nano-hybrid composite polished with one-step system by undergraduate students (Ra=0.4869). The nano-ceramic composite that was polished with a multi-step system indicated the best surface roughness results performed by the undergraduate students (Ra = 0.2118).
Operator ability does not affect the surface roughness of the composite restorations after polishing. Single-step polishing system tested, produces rougher surfaces than the multi-step system, regardless of the type of the composite used.

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Poster P.167

TEMPERATURE RISE IN THE PULPAL CHAMBER WITH MULTI-LED CURING LIGHTS

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to evaluate the temperature reached inside the pulp chamber with an irradiation by multi- LED curing lights.
40 first lower molars, extracted for periodontal reasons, without any decays or previous restorations, were selected. A class I cavity (4x3x4 cm) was prepared and roots were removed in order to obtain an apical access to the pulp chamber. The specimen was placed in a device which could create and maintain 37°C and a thermocouple probe was inserted in the pulp chamber to measure the temperature increase. The specimens were divided in 3 groups according to the curing lights: 1) VALO LED lamp, 2) Bluephase Style LED lamp, 3) Halogen lamp. For each curing light different Energy Densities (ED) were tested. Temperature rise and the time necessary to regain 37°C were evaluated. Results were statistically analyzed with two-way ANOVA test.
The ANOVA Test showed a significant increase of the temperature inside the pulp chamber related to both the curing light ($p=0.0001$) and the ED provided ($p=0.000001$). The post-hoc Turkey Test showed no statistically significant difference between the halogen and Valo, and between an ED of 5600 J/cm3 and of 9600 J/cm3.
The increase of temperature inside the pulp chamber is closely related to the type of the curing light and to the ED provided. Further studies are necessary to confirm these findings.

Operative Dentistry

Poster P.168

THE EFFECT OF MOUTHRINSES ON SORPTION AND SOLUBILITY OF COMPOSITE RESINS

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To investigate the effect of two different mouthrinses on the sorption and solubility of a microhybrid and a nano-ceramic composite.
Two dental composites (microhybrid-Dynamic Plus, nanoceramic-Zenit) were chosen. 30 disc-shaped specimens (10mmx2mm) for each material were prepared, dessicated for 24h and masses of specimens were measured using analytic balance (m1). After the

thickness and the diameter of each disc were measured with a digital caliper and volume of each specimen was calculated, specimens were randomly assigned to 3 groups (n=10). Specimens of each group were individually immersed in 10ml of solutions: mouthrinses alcohol-free Signal White Now mouthrinse, alcohol-containing Listerine Cool Mint mouthrinse and distilled water(control) for 7 days at 37°C. Weight of the specimens were remeasured (m2), then, they were placed in dessicator (7 days, 37°C) and mass measurements were made again (m3). The sorption and solubility were calculated based on BS EN ISO 4049:2000. The data were analyzed with One-Way ANOVA and Mann Whitney U tests (p=0.05).
Zenit nano-ceramic composite resin exposed to Signal White Now mouthrinse presented the highest soption ($p<0.05$). The sorption values of microhybrid-Dynamic Plus composite exposed to Listerine mouthrinse were significantly higher than Signal White Now mouthrinse and control ($p<0.05$). The highest solubility for Zenit composite was presented after immersion in Listerine mouthrinse ($p<0.05$). The solubility values of Dynamic Plus exposed to Listerine and Signal mouthrinses were similar and statistically higher than that of control group ($p<0.05$).
Mouthrinses may have negative effects on pysical properties of composite resins and may increase water sorption and solubility of composite resins. Mouthrinses may affect clinical longevity of restorations.

Operative Dentistry

Poster P.169

THE EFFECT OF NIGHT-GUARD VITAL BLEACHING AGENTS ON POSTERIOR RESTORATIVE:ONE-WEEK RESULTS

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The aim of this study was to examine the effects of night-guard vital bleaching agents in different times on the surface roughness of three posterior restoratives.
A total of 90 composite disc specimens (8 mm in diameter, 2 mm in thickness) were prepared from three different types of restoratives: a giomer bulk-fill (Beautiful Bulk Restotative[BBR],Shofu), a giomer (Beatiful II,Shofu), and a hybrid composite (Aelite™ LS Posterior,Bisco,USA). Each group was divided into three subgroups according to carbamide peroxide bleaching agent Opalescence PF 16% application procedures (n=10). Group-1: Baseline measurements; Group-2: 4 hours/day for 7-day; Group-3: 6 hours/day for 7-day. Initial measurements (Ra measured in micron) were conducted after 1.200 SiC paper at 24 hours and after that other measurements were realized at 7-day with a profilometer. The values were statistically analyzed with two ANOVA and Tukey's HSD post-hoc test ($p<0,05$).
At baseline, surface roughness values of Aelite™ LS Posterior composite (0.87 Ra), BBR composite (0.70 Ra) and Beatiful II (0.65 Ra) were found statistically similar to ($p<0.05$). In Group-2 and Group-3, surface roughness results didn't change significantly according to Group-1. However, for Beautiful II, the values increased slightly (0.65 Ra to 0.94 Ra and 0.95 Ra) after bleaching agent application ($p<0.05$).
No significant difference was found between different hours per day. The products tested were relatively stable in the following test periods. No significant change in the surface roughness of posterior dental composite materials after Opalescence PF 16% application for one week.

Operative Dentistry

Poster P.170

THE EFFECT OF SANDBLASTING AND GLAZE ON SURFACE ROUGHNESS OF CAD/CAM BLOCKS

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To investigate the effect of sandblasting and characterization material (glaze) on surface roughness of CAD/CAM blocks.
Three types of CAD/CAM restorative materials (Cerasmart (GC), VITA Enamic (VITA Zahnfabrik), and LAVA Ultimate (3M ESPE)) were cut in 2-mm thick slabs and divided into three groups (n=15): group 1 (G1): baseline (the specimens were polished with 1.200 grit SCI paper); group 2 (G2): the specimens were sandblasted with 50-m Al2O3; group 3 (G3): the specimens were glazed with Optiglaze Color (GC). After sandblasting, all specimens were silanized with G-Multi PRIMER (GC) for 30 s and air-dried. Following this procedure, Optiglaze Color was applied on all specimens according to the manufacturer's instructions. Surface roughness measurements were performed at 24h (after 1.200 grit SCI paper), following sandblasting, and Optiglaze Color applications. The values were statistically analyzed with ANOVA and Tukey's HSD post-hoc test.
At baseline (G1), all CAD/CAM blocks exhibited similar surface roughness values ($p>0.05$). Sandblasting (G2) significantly increased surface roughness values of each CAD/CAM restoratives ($p<0.05$). Following Optiglaze Color application, the specimens in G3 exhibited statistically similar results with G1 for each CAD/CAM restorative ($p>0.05$).
The sandblasting and silanization processes were used to improve the bonding glaze material to CAD/CAM restoratives. Sandblasting is a confirmed method for increasing the bonding surface on CAD/CAM resin restoratives. Increased surface roughness values after sandblasting return to the initial values again with Optiglaze Color application.

Operative Dentistry

Poster P.171

THE EFFECT OF THERMAL DEGRADATION OF NEW HYBRID RESIN BLOCKS

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Hybrid resin blocks for CAD/CAM are known as useful materials clinically. However, hybrid resin blocks are assumed to degrade more easily as compared with ceramics. In addition, we should consider the performance degraded after thermal cycles. The aim of this study was to evaluate the flexural strength of the new hybrid resin blocks (CTS-02, GC corp.).
Four materials were selected for analysis, 1) CTS-02 (CTS, GC corp.), 2) KZR-CAD HR2 (KZ, Yamamoto Precious Metal), 3) KATANA Avencia block (KA, Kuraray Noritake) and 4) HC(HC, SHOHU). After cutting the blocks for three-point bending test, polished specimens 1.2mm-thick and 4.0mm in width were prepared. The bending test was conducted with a crosshead speed of 1mm/min (AG-IS, SHIMADZU) under two conditions i) dry storage (control, n=5) and ii) 10,000 thermal cycles (5 °C to 55°C,dwelling time 30sec.) (TC10,000, n=5). The data was analyzed by one-way ANOVA ($p<0.01$).

Flexural strength of CTS was 243 MPa (control), 198 MPa (TC10,000) and KZ was 223 MPa (control), 159 MPa (TC10,000) and KA was 195 MPa (control), 138 MPa (TC10,000) and HC was 142 MPa (control),105 MPa (TC10,000). Falling rate of flexural strength before and after TC10,000 of CTS was 18.5% and KZ was 28.7% and KA was 29.2% and HC was 26.1%.In all materials, flexural strength after thermal cycles was decreased compared to control and there was significant difference between control and after thermal cycles.
Flexural strength of CTS was highest and maintained nearly 200 MPa after thermal cycles. Falling rate of CTS was lowest than that of the other materials.
These results suggest that flexural strength after thermal cycles of hybrid resin blocks are decreased to nearly 30% as compared to the control. CTS had higher durability against thermal degradation than other hybrid resin blocks.

Operative Dentistry

Poster P.172

THE EFFECT OF VISCOSITY OF COMPOSITES ON FRACTURE STRENGTH OF PREMOLARS

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The purpose of this study was to compare the fracture strength of the high-flow composite and the paste (posterior) composite on endodontically treated premolars.
A total of 20 mandibular first premolar teeth were used for this study. The teeth were randomly divided into two groups (n=10). The teeth in the two groups were prepared with MOD box cavities (4-mm proximal depth and 3-mm occlusal width) and root canal treatment was conducted. In Group-1: posterior resin composite (Estelite Posterior, Tokuyama) was placed in 2-mm incrementally. In Group-2: high-flow composite Estelite Flow Quick High Flow + Estelite Posterior was used. Tokuyama Bond Force II adhesive system was applied to cavities according to manufacturer's instructions. Following the placement of the restorations the fracture resistance of the specimens was measured. Data were analyzed by using one-way analysis of variance and Tukey's post-hoc test ($p<0.05$).
Group-1 (739.33 N) and Group-2 (741.75 N) exhibited statistically similar fracture strength results ($p>0.05$).
High-flow and paste resin composites had similar fracture strength values on endodontically treated premolars.
Key words: Posterior resin composite, High flow composite, Fracture strength

Operative Dentistry

Poster P.173

THE FDI EVALUATION CRITERIA: A SYSTEMATIC REVIEW OF THEIR USE

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In 2007, new criteria for the clinical analysis of direct and indirect restorations were suggested to succeed to Ryge criteria. New criteria, grouping aesthetic, functional and biological categories have been proposed for a more discriminative scale analysis of failures and were approved by the World Dental Federation (FDI). The aim of this study was to take stock of their use in clinical studies 10 years after their introduction.
An electronic search was performed using PubMed database by independent reviewers. Data were collected using the keyword "FDI criteria" and the time interval was 2007–2017. Papers were selected after a review of their title, abstract and full text. The following data were recorded: the objective and the type of the study, the number of patients (and teeth) enrolled, the procedure for the calibration of examiners and the FDI criteria used (as primary or secondary criterion).
On the 166 eligible papers from the initial search, 28 studies have applied FDI criteria since 2007 and were included. Except two, all of them were well-designed prospective studies. All examiners were calibrated and they were at least two in 71.4% of the studies. Only one study used all the 16 existing FDI criteria. The average number of criteria used were 8.5. The most used were: caries recurrence (92.6% of the studies), surface and marginal staining (89.3%), fracture and retention (89.3%), marginal adaptation (89.3%) and postoperative sensitivity and tooth vitality (89.3%). The less used were: radiographic examination (17.9%), patient's view (25.0%) and oral and general health (25.0%).
The FDI criteria are still little used. Yet, they are reported as practical (various and freely selectable criteria), pertinent (sensitive as well as adapted to actual restorative materials and clinical studies design) and standardized (facilitating comparisons between different investigations).

Operative Dentistry

Poster P.174

WEAR AND LONGEVITY OF GIC WITH AND WITHOUT HYDROPHOBIC COATING APPLICATION

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Glass Ionomer Cements (GIC), are widely employed materials in different clinical situations. However, as most restorative materials, GIC are subjected to mechanical wear over time. The aim of this in vitro study is to test the surface wear and marginal adaptation of two different GIC employed in molar I class cavities with or without the application of an hydrophobic coating on the occlusal surface before and after chewing simulation and thermocycling.
20 intact molars were selected, and a standardized cavity (2x3x2 mm) was prepared on each specimen. Teeth were further divided into two groups according to the material employed for the restoration: G1) Iono Star Molar (Voco); G2) Chemfil Rock Advanced Ionomer Restorative (Dentsply). Both

materials were applied following manufacturer instructions. Specimens of the two groups were divided into two subgroups according to the application of a coating protective layer: SG1) application of a thin layer of hydrophobic coating (Easy Glaze, Voco); SG2) no coating. Restored specimens were then scanned with an oral scanner and surface roughness was evaluated before and after wear test with chewing simulator and thermocycling. Images obtained were compared to evaluate surface loss. Further, micro CT images were used to assess marginal adaptation of the different groups to the cavity wall. Results obtained were statistically analysed with Kruskal Wallis test and statistical significance was set for $p<0.05$.
No differences were detected among groups over time ($p>0,05$). Chewing simulator and termocycling affected the quality of the restoration. Further, roughness is only initially improved by the coating application, but not over time.
GIC are subjected to surface ware and loss of marginal adaptation after aging. However, further analyses are necessary to better investigate the implication of a coating layer application on the surface of a restoration.

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Poster P.175

EFFECTS OF DIFFERENT POST SPACE IRRIGATION SYSTEMS ON FIBERGLASS POSTS

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The aim of this in-vitro study was to evaluate the effect of different post-space treatments on the push-out bond strength of glass fiber posts.
Thirty single-rooted teeth were sectioned and endodontically treated. Post spaces were prepared and roots were divided into three groups respect to irrigation (n = 10). In group 1, 5 ml NaOCl 5.25% + 18% EDTA irrigation; in group 2, 5 ml NaOCl 5.25% + 7% maleic acid and group 3, 5 ml 2% chlorhexidine (CHX) + 18% EDTA irrigation.Fiber posts (X post, Dentsply DeTrey, Konstanz, Germany) were luted with resin cement (Core X flow, Dentsply DeTrey, Konstanz, Germany). Each root was prepared push-out test. Data was stasitically analyzed using 2-way analysis of variance (ANOVA). Post hoc Bonferroni test was applied in order to indentify the groups that were significantly different from others. Statistical significance was set at P value less than 5%.
There were statistically significant differences between Group 1 ($P<0.05$) and Group 3 ($P < 0.001$). Coronal root segments showed higher bond strengths than middle and apical groups ($P < 0.001$). The highest bond strength values were obtained for NaOCl/EDTA group ($P<0.05$), While the lowest bond strength values were obtained for CHX/EDTA group < 0.001) in all root segments.
Based on the results of this in-vitro study concluded that irrigation with 18% EDTA combined with 5.25% NaOCl significantly increased the bond strength of post.

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Poster P.176

A NEW SILVER FIBER POST: EVALUATION OF ANTIBACTERIAL ACTIVITY AND CYTOTOXICITY EFFECTS

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Nano silver particles could improve antibacterial properties of dental materials and reach the goal of microorganism's eradication. The objective of this study was to compare the antibacterial activity and the cytotoxicity effects of different fiber posts: glass fiber post, quartz fiber post, nano fiber post and silver fiber post.
The antibacterial activity was evaluated by Agar Diffusion Test (ADT) using Streptococcus mutans, Streptococcus salivarius, Streptococcus sanguis, 0,1 mL of bacterial suspension in every plates. Four wells, one for each material, were made by removing the agar and filled immediately by posts, then plates were incubated at 37°C for 48h. Inhibition zones were measured with a millimeter ruler with accuracy of 0.5 mm. The cytotoxicity effects were tested using Human Periodontal Ligament Fibroblasts cells seeded in a 96-well plate and incubated for 24 h at 37 °C and then exposed to 100 μL of the extracts medium made by eluting the fiber post in cell culture medium (surface area-to-volume ratio of approximately 1.25cm^2/ml). Cell viability was determined by using the MTT assay reading the absorbance of dissolved formazan dye at 545 nm.
Silver fiber Post showed antibacterial effect against all streptococcal strains, higher ($P<0.05$) on S. mutans (8,65 mm inhibition halo). No antimicrobial activity for others posts. The level of cytotoxicity of all fiber posts was higher than 90%, therefore no cytotoxic.
The hypothesis that all materials present similar values of antibacterial activity has been rejected. All the fiber posts proved to be non cytotoxic, so their application may not cause a toxic reaction in humans.

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Poster P.177

ANTIMICROBIAL EFFECTIVENESS OF PHOTON-INDUCED PHOTOACUSTIC STREAMING (PIPS) DISINFECTION PROTOCOL

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The purpose of this study was to evaluate the antimicrobial effectiveness of photon-induced photoacustic streaming (PIPS) by comparison with traditional irrigation with endodontic needle and laser-activated irrigation with diode laser.
Extracted single-rooted human teeth were selected (n=42), shaped, sterilized and infected with Enterococcus faecalis. After incubation for 2 weeks, they were assigned to 3 groups (n=14): Group I (2.5% NaOCl), Group II (2.5% NaOCl + diode laser), Group III (2.5% NaOCl + PIPS). Two teeth in each group were used as positive controls and two as negative controls. After disinfection the remaining alive bacteria were collected from each specimen with sterile paper points at full working length and counting of the colony-forming units (CFUs) was performed. Moreover root canal surfaces were examined with the confocal laser scanning microscope (CLSM). Kolmogorov-Smirnov test, Kruskal-Wallis test and Dunn's (post-hoc) test were used to compare scores from the three groups.
Mean bacterial load reduction (BLR) and dead ratio (DR) were calculated from the CFUs analysis obtaining the following results: Group I, BLR= 1.68*103 cfu, DR= 98.32%; Group II, BLR= 0.83*103 cfu, DR= 99.17%; Group III, BLR= 0.77*103 cfu, DR= 99.22%. Group I had significantly more CFUs than the other two groups, but no statistical difference was found between Group II and Group III. Mean depth of disinfection inside dentinal tubules was measured at the CLSM analysis: Group I= (273 ± 60)μm ; Group II= (292 ± 34)μm; Group III= (320 ± 20)μm. No statistical difference between the groups was observed

Laser activated irrigation protocols reached an higher level of disinfection compared to traditional irrigation. They could be beneficial for modern, simplified, fast and minimally-invasive endodontic treatments.

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Poster P.178

BOND STRENGTH OF FIBER POSTS USING DUAL CURE BULK FILL RESIN-BASED COMPOSITE

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The purpose of this study was to evaluate the push-out bond strength of fiber posts bonded with five different materials.
A total of 60 recently extracted human maxillary central decoronated teeth were used. All root canals were instrumented up to size Reciproc#40, obturated with resin based root canal sealer and gutta percha, and stored at 37°C and 100% humidity for a week.Then, the post cavities were prepared with the drill of the post system and the fiber posts (Dr Robert's, Germany, EU, Lot#EV0501L) were bonded with 5 different materials (1; Ionofil U, Voco GmbH, Cuxhoven, Germany, Lot#1522052, 2; Maxcem Elite, Kerr, Orange, CA, USA, Lot#4975854, 3; RelyX, 3M ESPE, Neuss, Germany, Lot#598363, 4; Panavia F, Kuraray, Osaka, Japan, Lot#000031, 5; Fill Up, Coltene/Whaledent Inc, Ohio, USA, Lot#G32310). After 48 hours, dentin discs with a thickness of 2mm were obtained from the coronal, middle and apical regions. The specimens were placed in an universal test machine and a force with apico-coronal direction was applied at a crosshead speed of 1mm/min. The maximum push-out force was recorded and the bond strength (MPa) was calculated by dividing force by the area of the bonded interface. In the evaluation of statistical data Two-way ANOVA test was used ($p<0.5$).
When the groups were compared according to the regions with in themselves, the bonding strengths decreased from the coronal region to the apical region (Coronal (8.39±4.11MPa), Middle (6.25±3.18MPa), Apical (4.59±3.13MPa)).The average bonding strenght values of the materials were respectively Panavia F (10.39±1.71MPa), FillUp (9.03±2.35MPa), RelyX (6.43±3.61MPa), Maxcem Elite (4.62±1.54MPa), Glass Ionomer cement (1.59±0.31MPa).
The most common type of failure when using fiber posts is post debonding and it is generally agreed that achieving stable adhesion to dentine is challenging. Post type, type of surface treatment and resin cement were significant factors for adhesion. Luting with a new dual cure bulk fill resin-based composite material can be considered as an alternative in terms of luting materials and significantly increased the bond strength. Longer term clinical trials are expected to further strengthen this evidence.

Endodontics & Pulp Biology

Poster P.179

COMPARISON OF REMAINING FILLING MATERIALS AMONG VARIOUS SEALERS AFTER RETREATMENT

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The purpose of this study was to evaluate residual filling material following removal of two newly developed root canal sealers in comparison with widely used sealer, AH Plus, using micro-computed tomography(micro-CT) imaging.
Twenty-three single-rooted samples with one canal, twenty-three samples were double-rooted with two canals and seventeen molar teeth samples having C-shaped root canals were used in this study. After the old filling material was removed with GG drill #2,3 and Profile(Dentsply Maillerfer, Ballaigues, Switzerland) 30/06, the root canals were instrumented with ProFile to master apical file size 40/06 in single-rooted teeth and 35/06 in multi-rooted teeth. The size was one more size up than initial treatment. Each tooth was scanned by μCT scanner(SkyScan 1172, SkyScan b.y.b.a, Artsealar, Belgium) and cross-sectional 2D images were obtained at the coronal, middle, and apical points. The percentage of remaining sealer area was determined using μCT software, CTAn(cer1.14.4.1, SkyScan). Percentage area of remaining filling material showed the lowest value in case of single-rooted teeth (9.1%), BC sealer(12.11%) and top position(6.84%); the highest value in case of C-shaped root canal(26.53%), Endoseal MTA(20%), and apical position(29.27%). Teeth using Endoseal MTA showed the highest value of percentage area of remaining filling material except single-rooted teeth. But no statistically significant differences were found. Apical position showed the highest percentage area of remaining filling material in case of all sealers (29.27%), but no statistically significant differences were found. Percentage area of remaining filling material in each tooth showed the highest value in apical position of all sealers. The values of Endoseal MTA showed relatively higher values (20%). Percentage area of remaining filling material of C-shaped root canal showed the highest value (26.53%). Comparison of double or less and C-shaped root canal showed statistically significant difference.
All filling materials could not be completely removed during retreatment. Root canal re-treatment must be strictly performed through filling material removal, canal enlargement and further evaluation according to different type of root canal sealers.

Endodontics & Pulp Biology

Poster P.180

CONFORMATION OF ROOT CANALS USING PTG AND WOG IN DENTALIKE REPLICAS

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The aim of the study was to compare the formability of ProTaper Gold (PTG) and WaveOne Gold (WOG) files in molar replicates simulating tooth morphology of 2.6.
We used 60 upper second molar replicates (Dentalike 3D tooth model, Dentsply Maillefer, Ballaigues, Switzerland) and mesiobuccal root canals (MB1) were randomly assigned (n=30) for PTG and WOG. Periapical buccal and lateral radiographs were performed, placing the replicates on a Protrain support.MB1 root canals were permeabilized with K-files #10. The length of the work was established with K-files #15. After performing the glide path with ProGlider files (16–02) two groups were established according to the instrumentation system: 1)WOG Group: WOG Primary (25/07); 2)PTG group: F2 (25/08); Irrigating between each file with 5ml of EDTA to 18% and a final irrigation of 5ml of distilled water.For the evaluation of the apical transport and the conformation of the root canal, the initial and final radiographs were superimposed with the Adobe Photoshop program; The angle and radius of the curve was measured with AutoCAD (V2016, AUTODESK). The data was analyzed using the SHAPIRO-WILK test and t-test independent samples were also used for the radius samples of the curve. The level of significance was set at p-value less than 5%.

During the preparation of the root canal both systems maintained the original position of the apical third (no apical transport) ($p>0.05$). In relation to the radius there were significant differences ($p<0.001$) between both systems; PTG decreased the radius of curvature ($p<0.001$), while WOG increased the radius ($p=0.032$), causing a slight straightening of the root canal.
The ProTaper Gold and WaveOne Gold systems were able to maintain the apical third of the root canal MB1 in Dentalike replicates, allowing adequate conformation of the curved root canals.

Endodontics & Pulp Biology

Poster P.181

EFFECT OF CALCIUM-SILICATE CEMENTS ON LIPOTEICHOIC ACID-INFECTED AND HEALTHY DPSCS

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This study aimed to understand the effect of calcium-silicate cements on Lipoteichoic acid (LTA) inactivation and cell death mechanism of dental pulp stem cells (DPSCs).
Samples of Dycal, Proroot MTA and Biodentine (6 mm diameter-1 mm thick) were applied on the LTA-infected and healthy DPSCs. The cells were plated at a density of 1×105 cells per well into 24-well plates containing 1 mL of DMEM medium. All experiments were performed at third passage cells. After 24 and 72 h, cell proliferation, cell viability, cell cycle and cell death signaling pathways were analyzed. Ultrastructure and morphology of cells were evaluated by Scanning (SEM) and Transmission electron microscopy (TEM). The results were analyzed using IBM SPSS Statistics 22 computer program.
Proroot MTA and Biodentine groups demonstrated increased cell numbers of 822867.70 ± 12586.05, $p = 0.004$ and 839841.92 ± 17279.39, $p = 0.004$, respectively, compared with the Dycal group (300642.61 ± 13505.6). The cell proliferation was significantly inhibited in Dycal and LTA+Dycal groups ($p = 0.004$). The cell cycle results showed a significant increase in the G0/G1 phase population, in relation to decreased cell proliferation. Early apoptotic cells were highly determined in all material groups by flow cytometry. The highest apoptotic cell rates were detected in Dycal and LTA+Dycal groups ($p < 0.05$). The quantitative determinations of Caspase-3, −8, −9 activities by colorimetric assays showed that the intrinsic and extrinsic apoptotic pathways were active in all material groups. LTA infected DPSCs showed features of autophagy.
Calcium-silicate cements was found highly effective in LTA inactivation than calcium hydroxide. The apoptotic and antiapoptotic protein levels (Bcl-2, Bax, Total Akt, p-Akt, Midkine, NF-κB, RIPK and MLKL) confirmed the induction of early apoptosis in DPSCs treated with calcium-silicate cements and autophagy in LTA-infected cells.
Key words: Human dental pulp stem cells, Lipoteichoic acid, cell death, calcium silicate cement
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Endodontics & Pulp Biology

Poster P.182

EFFECT OF DUAL-CURE ACTIVATOR AND FIBER-POST BOND STRENGTH WITH UNIVERSAL ADHESIVE

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The aim of this in vitro study was to evaluate the effect of a dualized adhesive on the fiber post bond strength.
44 freshly extracted human single-root teeth were selected for this study. Teeth were endodontically treated and obturated. After 7 days, an 8 mm post space was prepared with dedicated drills. Samples were randomly divided into 4 groups (n=8 each) according to the adhesive protocol applied: G1) Clearfil SE Bond with dual curing activator (DCA); G2) Clearfil SE Bond without DCA; G3 FuturaBond U with DCA; G4) FuturaBond U without DCA. All adhesives were applied according to manufacturer's instructions, and fiber posts were luted into the post space with the same luting cement (Rebilda DC, Voco). 1mm slices were prepared to perform push-out test and nanoleakage analyses of the coronal and apical region after 24h of storage in artificial saliva. Results were statistically analyzed with ANOVA and Bonferroni post-hoc tests. Statistical significance was set for $p<0.05$.
Two-way ANOVA showed that the application of the DCA significant affected the bond strength of fiber post to radicular dentin ($p= 0.0001$): mean group of bond strength were in G1: 18.2111 3.182941(apical) and 19.05 2.428992 (coronal); G2: 14.025 4.89949 (apical) and 20.4375 4.221692 (coronal); G3: 18.3375 4.118231(apical) and 19.18375 6.577763 (coronal); G4: 12.9 3.286842 (apical) and 15.825 3.145405 (coronal). However, the interaction between post space region and adhesive system was not statistically significant.
Because of difficulties in light curing of the post space, the application of dualized adhesives is fundamental to reach higher bond strength. Further follow-up controls and an increased number of investigations are necessary to confirm in vivo the results of the present study.

Endodontics & Pulp Biology

Poster P.183

IN VITRO CYTOTOXICITY EVALUATION OF SIX ROOT CANAL SEALERS

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The aim of the present study is to evaluate and compare the cytotoxic effects of six root canal sealers (BioRoot RCS, TotalFill BC Sealer, MTA Fillapex, AH Plus, EasySeal, Pulp Canal Sealer EWT) on immortalized human gingival fibroblasts over a period of 24, 48 and 72 hours.
Immortalized human gingival fibroblast-1 HGF-1 (ATCC CRL-2014) were incubated at 37°C in 5% CO2 atmosphere. Root canal sealers were prepared according to the manufacturer's recommendation and placed

into sterile, cylindrical Teflon moulds (4 mm diameter and 2 mm height). They were exposed to UV light for 24 hours after manipulation to prevent contamination. The extraction was made eluting the sealers in cell culture medium using the surface area-to-volume ratio of approximately 1.25cm^2/ml between the surface of the samples and the volume of medium. Cells (1 × 104) were seeded in each well of a 96-well plate. Cell cultures with supplemented DMEM (FBS and antibiotics solution) were used as controls. Cultures were then exposed to 100 μL of the extracts medium. The percentage of viable cells in each well was calculated relative to control cells set to 100%. Cytotoxicity responses were rated as severe (30%), moderate (30-60%), mild (60-90%) or noncytotoxic (>90%).
The extractions at 24h showed that BioRoot RCS and TotalFill BC Sealer had no cytotoxic effect, while it was mild (60-70% of viable cells) by using 48 and 72 h extracts. Same results were measured by using AH Plus medium eluted for 24 h, while its cytotoxicity has increased at 48h (40% of viable cells) and 72h (25% of viable cells). Pulp Canal Sealer EWT showed moderately cytotoxic activity for all the extraction times while EasySeal and MTA Fillapex remained severely cytotoxic for all the extraction times.
Only BioRoot RCS, TotalFill BC Sealer and AH Plus showed no cytotoxic effects at least in the first 24h. All the other sealers, especially EasySeal and MTA Fillapex were moderately or severely cytotoxic during all the extraction times.

Endodontics & Pulp Biology

Poster P.184

IN-VITRO CYCLING FATIGUE STRENGTH COMPARISON OF PROTAPER GOLD AND WAVEONE GOLD

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The aim of this study was compare the cyclic fatigue resistance of Protaper Gold (PTG) and Wave One Gold (WOG).
Cyclic fatigue testing was conducted by operating instrumemnts from PTG F2 and WOG primary 25.07 . A total of 60 instruments (n = 30) were rotated in 1 curved artificial Canal; an angle of 60 and 5 mm radius of curvature, inserted into a methacrylate surface where the hand piece was also fixed. The canal was 20 mm long with a tip diameter of 0.40 mm and a taper of 09. PTG instruments rotated with electric motor WO in a continuous rotary motion with a reduction of 16:1 and a maximum torque (5,2 ncm) at speeds recommended by the manufacturer. WOG instruments rotated with WO electric motor allowing reciprocating movement, with a reduction of 6:1. The time and cycles to failure were calculated. The data were compared for differences by using 2-way analysis of variance ($p > 0.05$).
In general, concluding that there is not enough statistical evidence to say that one system is more resistant than another; a strong trend towards greater resistance of Wave One Gold ($p > 0.05$).
The 2 instruments exhibit a similar behavior. The reciprocating movement was associated with an extended cyclic fatigue life of the WOG instruments in comparison with conventional rotation.

Endodontics & Pulp Biology

Poster P.185

MICRO-CT EVALUATION OF THREE DIFFERENT SHAPING SYSTEMS

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The aim of this study was to compare the root canal shaping efficacy of three different NiTi systems: ProTaper Next, WaveOne Gold, HyFlex EDM; using Micro-CT analysis.
Twenty-one teeth (nine incisors, nine premolars, three lower first molars) were selected after scanning using Micro-CT (SkyScan 1072; SkyScan, Kartuizersweg, Belgium) and assigned to three experimental groups (n = 7) according to the canal preparation technique: ProTaper Next (Dentsply Sirona, Ballaigues, Switzerland), WaveOne Gold (Dentsply Sirona, Ballaigues, Switzerland), HyFlex EDM (Coltene/Whaledent AG, Altstatten, Switzerland). A second scan was performed after shaping. The data obtained, were analyzed and compared with Resolve RT Amira (Visage imaging; Mercury computer system, Berlin, Germany) to evaluate the percentage of touched canal surface (PTCS), the volume of removed dentin (VRD) and the canal transportation (CT) at coronal, medium and apical levels.Statistical data were compared using one-way ANOVA test. The significance level was set at $p<0.05$.
Statistically significant differences were not found concerning the VRD, PTCS and CT with the exception of the resulting VRD and PTCS on the coronal third, where the ProTaper Next removed more dentin ($P < 0.05$). All three systems showed root canal shaping efficacy in terms of maintaining root canal axis geometry, of dentinal area contacted by the instrument and in roundness of the preparation. ProTaper Next showed an higher amount of dentine removed in the coronal third, this can be due with the geometry of the files. Generally, during the shaping of the root canal was achieved an enlarging of the canal shape without preparation errors. However, no one of the analyzed systems was capable to contact the entire dentinal surface of the root canal, especially in presence of medium/severe curves. This remarks the great influence of the original anatomy of the root canals over the quality and success of the canal shaping.

Endodontics & Pulp Biology

Poster P.186

ROLE OF MMPS ACTIVITY ON A NOVEL UNIVERSAL ADHESIVE ON RADICULAR BOND-STRENGTH

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The aim of this in vitro study was the first attempt to investigate the role of MMPs gelatinolytic activity on radicular dentin immediate push-out bond strength. A novel multi-mode universal adhesive (Prime&Bond Active, Dentsply) employed in etch-and-rinse (ER) or self-etch (SE) mode, was compared to an etch-and-rinse adhesive (Prime&Bond XP, Dentsply) employed together with a self cure activator (SCA).
48 single root teeth, were selected, endodontically treated and obturated. After 7 days, an 8mm post space was prepared with dedicated drills. Specimens were randomly divided into 3 groups according to the adhesive protocol applied: G1) Prime&Bond XP +SCA in ER mode; G2) Prime&Bond Active + SCA in ER mode; G3) Prime&Bond Active +SCA in SE mode. Specimens of each group were further cured for 20s. All adhesives were applied following manufacturer instructions,

and fiber posts were luted into the post space with the same cement (Core-X flow, Dentsply). 1mm slices were prepared to perform micro push-out test and interfacial nanoleakage analysis of the coronal and apical region after 24h of storage in artificial saliva. Additionally, in situ zymographic assay was performed to investigate endogenous MMPs activity within the hybrid layer in accordance with Mazzoni et al., 2014. Results were statistically analyzed with ANOVA and Bonferroni post-hoc tests. Statistical significance was set for $p<0.05$.
One-way ANOVA showed no statistically significant differences between the adhesive systems employed on immediate bond strength G1)9,63 3,20; G2)7,76 3,17; G3)9,76 3,69. In situ zymography quantification analysis revealed that all the adhesives tested, independently from the application mode (ER or SE), activate MMPs gelatinolytic activity.
The novel universal adhesive showed comparable results to the control 2-step etch-and-rinse adhesive tested. MMPs gelatinolytic activity was detected regardless of the application mode. Further investigations and longer follow-ups are necessary to validate in vivo the results of the present study.

Endodontics & Pulp Biology

Poster P.187

ROOT RESORPTIONS FOLLOWING TRAUMA TO PERMANENT TEETH

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Whatever the type of dental trauma, luxation injury or fracture injury, periodontal ligament is always involved, at least affected by concussion. The more severe the trauma, the more difficult the healing will be. The aim of this study was to take stock of the various repercussions on the periodontal ligament following trauma.
An extensive literature review was performed to collect all current data regarding the various affections of the periodontal ligament: their classification, their mechanism of formation, their prevalence, their risk factors, their treatment and their prognostic. Case reports also illustrated these points.
The response time, the root development, the emergency treatment, the follow-up quality and the patient compliance have an impact on ligament healing. Three types of external resorptions can be distinguished. Only external surface resorptions are self-repaired. External inflammatory resorptions require intracanalar medication followed by root canal therapy. Replacement resorptions, with far-reaching implications on the growth, imply tooth extraction or decoronation. Besides, an early management allow to prevent resorptions resulting from endodontic complications.
Root resorptions may occur after trauma directly affecting the periodontal ligament (luxation injury) or after pulp affections (such as necrosis or pulp canal obliteration). In the absence of screening and/or treatment, they can lead to tooth loss.

Preventive Dentistry

Poster P.188

ASSESSMENT OF VISUALLY IMPAIRED CHILDREN IN TERMS OF CARIES AND TRAUMA

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Visual impairment is a partial or complete loss of vision due to a congenital condition, birth trauma, a medical condition such as a disease or an accident that causes the function to fail in a normal way. The aim of this study is to assess oral health in visually impaired children.
Caries experience, oral hygiene status and trauma history of 130 students (64 females, 66 males) examined in a private school in Istanbul/Turkey were recorded with questionnaire forms.
The average age of the population aged between 6 and 21 was determined as 9.9. The ratios of the DMFT and DMFT scores of the students were 2.42 and 2.04, respectively. It was found that the student (6.15%) had a history of trauma.
The most striking difficulty in the care of visually impaired children is ensuring the continuity of oral hygiene. The frequency of caries is increases because of lack of hygiene. Visually impaired patients should benefit from the sense of touch when instructing oral hygiene methods.

Preventive Dentistry

Poster P.189

CARIES RISK AND QUALITY OF DENTAL RESTORATIONS

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To examine the association between the quality of restorations and behavioural caries risk factors in individuals with different caries risk groups.
A total of 386 restorations were examined in 114 adults according to the United States Public Health Service (USPHS)/Ryge criteria. Patients aged 20 to 60 years were placed into low caries risk (DMFT≤5; n=50) and high caries risk (DMFT≥14; n=64) groups. Data regarding demographic and behavioural caries risk factors such as locality, tooth brushing, use of dental floss, sugar intake between meals and dental visit were also assessed. The difference in mean age and mean scores of DMFT between caries risk groups was compared with the independent-samples t-test. The differences in low and high caries risk groups across the quality ratings for restorations and categories of demographic and behavioural risk factors were compared with chi-square test.
In total, the patients had 104 (27.0%) and 282 (73.0%) restorations in the low and high caries risk groups, respectively. There were significant differences between the low and high caries risk groups in DMFT scores, tooth type, restorative material and all USPHS/Ryge criteria, except for retention ($p=0.000$). The restorations in high caries risk group showed a higher percentage of unacceptable scores than low caries risk group, with regard to marginal integrity, marginal discolouration, anatomic form, surface texture and recurrent caries. There were significant differences between the different scores of behavioural caries risk factors, except for locality. The tooth brushing, use of dental floss and dental visit were less frequent and sweet intake between meals was more frequent in high caries risk group than in low caries risk group ($p=0.000$).
Caries risk profile may play an important role in restoration failures. Good oral health behaviours of the individuals may also increase longevity of the restorations.

Preventive Dentistry

Poster P.190

CARIOUS LESION ACTIVITY ASSESSMENT IN CLINICAL PRACTICE: A SYSTEMATIC REVIEW

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It is often accepted that caries diagnosis considered at the lesion level encompasses, detection, severity and activity.. The main purpose of this systematic review is to present the different techniques (concepts/tools and their validation when available) developed for carious lesion activity assessment (CLAA) in the clinical setting.
The PubMed database was searched (January 2017) for articles related to activity assessment at the lesion level. The keywords used were, dental caries, activity assessment OR dental caries, activity assessment, criteria OR caries lesions, activity assessment OR caries lesions, activity assessment, criteria OR caries lesions, activity assessment, validation OR carious lesions, activity assessment OR carious lesions, activity assessment, criteria OR carious lesions, activity assessment, validation with the 'English language' filter activated. Among the 295 articles identified on PubMed, only 20 were included for this review. Three additional articles identified in the bibliography of the originally selected articles were also included.
The different techniques for CLAA described in the literature (23 articles; 1962–2016) can be separated into three groups: 1) systems based on visual and tactile criteria (Ekstrand criteria; ICDAS-LAA; Maltz criteria; Miller and Massler criteria; Nyvad criteria), 2) devices based on optics/light (DiagnoDent®; DiagnoDent Pen®; QLF; SoproLife®), 3) devices based on pH assessment (ClinPro®). For example, Nyvad system has been subject to solid validation among calibrated practitioners (active non-cavitated lesions have a greater risk of progression then the inactive (risk ratio: 1.24; permanent teeth) (Nyvad et al., 2003) with good intra and inter-examiner agreements (respectively 0.68-0.80 and 0.74-0.79; primary teeth) (Nyvad et al., 1999). Tools based on optics/light or pH suffer from a lack of validation.
There is a need for an instrument that offers the possibility of an objective and/or quantitative measurement in everyday busy dental practice in contrast to the visual decision that might be calibration-dependent.

Preventive Dentistry

Poster P.191

COMPATIBILITY OF FLUORECAM SISTEM WITH MICROSCOPIC EVALUATION ACCORDING TO ICDAS SCORES

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Purpose to evaluate FluoreCam system on enamel caries clinically scored by ICDAS system (1–4) and compare with microscopic data.
200 extracted teeth were cleaned and stored in refrigerator in saline solution containing 0.1% thymol. Following ICDAS evaluation, Initial measurements of each tooth were revealed for mineral loss and lesion area by FluoreCam. Finally, all teeth were examined by histological section evaluation.
There was statistical difference of the mean FluoreCam size datas between ICDAS codes ($p<0.001$). ICDAS 1 showed 1.75 mm3 while ICDAS 4 had 7.64 mm3 being compatible with the probability result. FluoreCam intensity also demonstrated significant differences between the scores with increasing mean data from ICDAS 1 to 4. Control method, microscope was recorded with increasing depth of caries being statistically important ($p<0.001$). FluoreCam size and intensity measurements of ICDAS 1–3 were compatible with gold standard microscope method but ICDAS 4.
As a result, a very high level of agreement was found between histological diagnosis and FluoreCam system on lesion size and fluorescence loss amount. FluoreCam is suggested to be used on detection of early enamel caries lesion even with small cavitation clinically.

Preventive Dentistry

Poster P.192

EFFECT OF SUSBSTRATE AND PRETREATMENT TECHNIQUE ON RESIN INFILTRATION METHODOLOGY

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The aim of this study was to evaluate the effects of different substrates (bovine/enamel) and resin infiltration pretreatment techniques on the microhardness of an artificial lesion in vitro.
20 enamel samples were prepared with human third molars and bovine central incisors. (60 samples of each were prepared). Following artificial carious lesion procedure samples were either etched with 37% phosphoric acid gel (H3PO4) or 15% hydrochloric acid gel(HCl) for 5,30,and120 sec (n=10). Micro-hardness (VHN) was evaluated at baseline and after pretreating the enamel at each time interval.
Pretreating the bovine enamel surface both with H3PO4 and HCl resulted in lower microhardness values compared to human enamel tissue respectively regarding the time applied ($p<0,001$) Human enamel lesions revealed similar demineralised pattern when pretreated with both acids used ($p>0,001$).
the resin infiltration methodology substrate type may play critical role on the microhardness evaluation of the lesion characteristics when different acids were used.

Preventive Dentistry

Poster P.193

EVALUATION OF CARIOLOGY'S TEACHING BY STUDENT IN DENTISTRY DEPARTMENT (SENEGAL)

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The evaluation of teaching by students is a step of quality assurance in tertiary education. The objectives of this study were to measure the differences between the training objectives and achievements of students in Cariology through a questionnaire and to analyze the perception of students on the teaching of Cariology.
A cross-sectional descriptive study was conducted among students regularly enrolled at Dentistry Department at the University Cheikh Anta Diop of Dakar. The data collection form used was is an adaptation of the evaluation questionnaire created by European Organisation for Caries Research (ORCA) for conversative dentristry's education program in European union.
The response rate was 86.24% with a 53.19% male to 46.81% female response ratio. The majority of students (66%) found the curriculum available either in paper or electronic version and found the objectives of the lessons were clearly laid out. 58% of students found the program content helped them achieve all of the clinical and practical training objectives in Conservative Dentistry. 21.30% stated that having the curriculum in either format would not affect them achieve the clinical objectives. The responses were significantly associated with the level of education ($p = 0.03$).

The results have shown the necessity to change the traditional teaching by integrating innovative methods and ICTs (e- learning).

Preventive Dentistry

Poster P.194

ICDAS - CARIES AND CONSERVATIVE TREATMENT ASSESSMENT OF PARTICIPANTS OF A RCT

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To evaluate the extension of sound surfaces (ICDAS 0), enamel (ICDAS 1–3) and dentine (ICDAS 4–6) carious lesions, filled, missing tooth surfaces by ICDAS of participants of a randomized clinical trial (NCT02698371).
Cross-sectional observation of 38 voluntary participants of the double blind RCT approved by UFP Ethics Committee, National Clinical Trials Ethics Committee (NCTEC-20150305), Informed (EC/011/2015) between November/2015-April/2016 at the FHS-UFP dentistry clinic. Teeth surfaces were scored according to ICDAS-II, by the same calibrated operator. Statistical analysis performed using nonparametric tests (alpha=0.05).
Thirty-eight participants, median age of 55.5 years (24 to 63-years-old), 21(55.3%) male. Of the 5565 accounted surfaces (4664 present and 901 missing), 3876(69.65%) were registered as sound: carious surface evaluation: 2.21% (dentin), 2.86% (enamel) and 1.64% recurrent caries; 7.95% surfaces extracted due to caries and 7.24% for other reasons; Regarding fillings: 4.65% composite, 2.43% amalgam and 0.07% provisional restorations; 0.75% crowns/veneers. A significant higher frequency of sound surfaces was detected for men (Mann–Whitney T, p=0.026). Median occlusal sound surfaces were in significant lower number when compared to other surfaces (Friedman T., p<0.001). Regarding age, a significant lower number of composite restoration's surfaces was found (Kruskal-Wallis T, p=0.005) for the ≥59years participants compared with those ≤48years (p=0.016) and 49-58years (p=0.009). The median amount of provisional restorations, crowns or veneers, lost or broken restorations, surfaces extracted due to caries and for other reasons were not significant different by surface type. No differences were detected for participants' systemic pathologies, smoking or oral hygiene status.
Evaluation by ICDAS revealed a lower prevalence of dental caries and no significant difference in disease severity between non-cavitated and cavitated carious lesions. Men showed higher frequency of sound surfaces, but participants with at least 59 years-old revealed lower frequency of conservative restoration than other age groups.

Preventive Dentistry

Poster P.195

IN VITRO ACTIVITY OF CITRUS LEMON VAR POMPIA AND THYMUS HERBA-BARONA

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To assess the biocompatibility and anti-bacterial activity of phytocomplex of Citrus lemon var. pompia (CLP) and essential oil of Thyme herba-barona Loisel (THB) in innovative phospholipid vesicles.
CLP was obtained by the rind of fresh fruits using an ethanol/water mixture. THB was obtained by the aerial part of the plant by hydro distillation. They were loaded into phospholipid vesicles prepared with 60 mg/ml of soy phosphatidylcholine in water/propylene glycol 1/1 (PG-liposomes) or water/glycerol 1/1 (glycerosomes). The size and zeta potential were misused using a Zetasizer Nano. The potential safety of the agents was assessed using human primary gingival fibroblasts (HGF) for 48 h of exposure using the MTT colorimetric assay, added to 200 μl of MTT reagent to each well. Results were calculated in term of cell viability in comparison to non-treated controls. Anti-bacterial activity was carried out using the bacterial inhibition halo test using a 0,5 Mc Farland suspension of planktonic Streptococcus mutans (ATCC 35668), Lactobacillus acidophilus (ATTC 4356) and Candida albicans (ATTC 10231) in contact to 0,15 μl of each cell for 24 hours at 37°.
The vesicles dispersion appeared yellow-transparent, homogeneous and stabile. The vesicles were spherical, unilamellar, small in size and negatively charged. The size of liposomes ranged to 90–140 um and the addition of phospholipid vesicles caused a slight size reduction. None of the agents expressed cytotoxicity in term of proliferation inhibition or viability reduction of the HGF in comparison to the controls. The inhibition halo test demonstrated the efficiency of the agents against Streptococcus mutans and Lactobacillus acidophilus independently by the addition to phospholipid vesicles. Moreover, THB in the different formulations was able to inhibit Candida albicans.
The biocompatibility and anti-bacterial activity of CLP and THB suggest a possible use as natural antimicrobial agents in the oral cavity.

Preventive Dentistry

Poster P.196

EFFECT OF P11-4, FLUORIDES AND INFILTRATION ON ARTIFICIAL ENAMEL CARIES LESIONS

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Application of a self-assembling peptide on non-cavitated caries lesions is considered to be a feasible approach to facilitate remineralization and mask their unfavorable appearance. However, demineralizing conditions are common in the oral environment, so the aim of this pH-cycling study was to compare recommended and novel treatment methods regarding their ability to hamper demineralization.
Bovine enamel specimens each with one artificial caries lesion were prepared and randomly allocated to eleven groups (n=22). Treatments before pH-cycling were: application of a product containing self-assembling peptides (Curodont [C]); a low-viscosity resin (Icon [I]); two fluoride solutions (52,000ppm F-; Tiefenfluorid [T] and 10,000ppm F-; Elmex fluid [E]) and no intervention [N]. Specimens were pH-cycled for 28 days with 6 demineralization periods (6x60min) per day and stored in remineralization solution in the meantime. Half of the specimens in each group were brushed with either fluoride-free (FF) (group name e.g.:C0) or NaF (1,100ppm F-) (e.g.:C1) dentifrice slurry (10s; 2x/day). In another subgroup specimens were pH-cycled but not brushed (NNB). Differences in integrated mineral loss (ΔΔZ) and lesion depth (ΔLD) were calculated between values after pre-demineralization (ΔZbaseline/

LDbaseline) and pH-cycling (ΔZpH-cycle/LDpH-cycle) using transversal microradiography.
After pre-demineralization treatment groups did not significantly differ in mineral loss (p=0.211; ANOVA) and lesion depth (p=0.164; ANOVA). Specimens of C0,C1,NNB,N0,N1,T0,E0 showed significant increased ΔZ and LD values, indicating further demineralization, after pH-cycling (p<0.001; two tailed paired t-test). C0,C1,NNB,N0 [ΔΔZ: C0: −2233 (−2602;-1864); C1: −1668 (−2078;-1257); NNB: −1745 (−2284;-1205); N0: −1266 (−1511;-1022)] showed significantly higher changes in ΔΔZ than E1,I0,I1,T1 [ΔΔZ: E1: −731 (−939;-523); I0: −61 (−286;-163); I1: −109 (−296;78); T1: −354 (−726;17)] (p≤0.002; ANOVA).
Under the conditions chosen, the highly concentrated fluorides that were used inhibited further lesion progression, whereas self-assembling peptides could not inhibit lesion progression. Furthermore, caries infiltration could arrest the lesion.

Preventive Dentistry

Poster P.197

PREVENTIVE EFFECTS OF DIFFERENT REMINERALIZATION AGENTS COMBINED WITH LASER AND OZONE THERAPY

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Dental caries is still considered the most prevalent disease during childhood and adolescence. It has been clinically proven that newly-emerged caries can be remineralized. Despite the fact that fluoride is the most powerful treatment method in prevention, different remineralization agents are used for this purpose. The presence of newly developed methods such as laser and ozone is crucial in controlling this disease. The aim of this study is to evaluate the remineralization efficacy of fluoride, casein phosphopeptide amorphous calcium phosphate(CPP-ACP), novamin, laser and ozone application on initial caries.
165 enamel blocks (9x4x2mm) were obtained from bovine teeth. Initial carious lesions were prepared on the 6mm of each block surfaces; 3mm were separated as control. The blocks were randomly divided into 11 groups (n=15) and 3mm of the demineralised surfaces treated with the following materials: Fluoride, CPP-ACP, Novamin, Laser, Laser+ Fluoride, Laser+CPP-ACP, Laser+Novamin, Ozone, Ozone+Fluoride, Ozone+CPP-ACP, Ozone+Novamin. Effectiveness of treatment was evaluated by micro-hardness measurement, scanning electron microscopy (SEM) images and energy dispersive X-ray spectroscopy (EDX). Statistical analysis of the resulting data was performed (p<0.05).
When compared microhardness data, the Laser+Fluoride group showed the highest value and the ozone group showed the lowest. When compared the EDX analysis of calcium(Ca) and phosphate(P) ratio, the highest Ca value was observed in the Laser+Novamin group, the highest P values were observed in the Novamin, the Laser+CPP-ACP, the Laser+ Novamin and the Ozone+Novamin groups. As a result of SEM evaluation, enamel surfaces of all treatment groups showed morphological changes.
Remineralization agents applications combined with laser were found to be an effective method for the remineralization of initial caries. Remineralization effectiveness of ozone should be investigated in the future studies. Development of caries prevention strategies will allow clinicians to shed light on the improvement of community oral health.

Preventive Dentistry

Poster P.198

RETENTION OF ANTI-EROSION RESIN-COATINGS ON ENAMEL AFTER THERMO-CHEMICAL AGEING AND SN-PRE-TREATMENTS

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Adhesives are usable for the symptomatic therapy of dentine erosion as resin-based polymer coatings. Indications exist that the stability or retention of coatings with an MDP-containing adhesive can be increased by a pre-treatment with tin-containing solutions. The retention of enamel coatings was, however, seldom subject of research and was investigated in the present study using a thermo-chemical in-vitro aging model.
Human enamel specimens (four groups, n=16 each) were mounted on holders, pre-treated (15s) with elmex enamel protection mouth rinse (EP, CP-GABA, Germany), AmF/SnCl2-solution (both 500ppm F-, 800ppm Sn2+, pH 4.5), or H3PO4 (35%, pH 0.3) and rinsed with water (30s); none-treated specimens served as control. All specimens were air-dried and individually covered with ClearfilTMSE Bond (Kuraray). Specimens were cyclically demineralized. One cycle consisted of demineralization (0.5% citric acid, 2min) and rinsing (water, 30s); acid temperature was alternatingly 5°C or 55°C simulating cold/hot acidic drinks. In-between erosion-cycles, specimens were additionally thermo-cycled in water (5°C/55°C) simulating non-erosive temperature challenges and intermittently stored in a wet chamber, simulating aging periods. A total of 700 erosion-thermo-, 2'840 water-thermo-cycles over a total time of 24 months were performed. Step height between an external reference-area and specimens' surfaces was measured profilometrically prior (baseline) and after coverage, and after 20, 180, 540, 620, 700 of erosion-thermo-cycles. Results are given as adhesive thickness (baseline measurement subtracted from value after defined cycle numbers; µm±SD).
Initial adhesive thickness was 67.7±28.0, 98.4±33.7, 78.1±29.8 and 77.8 ±25.1 in control, H3PO4, AmF/SnCl2 and EP (n.s.). After the total cycle number adhesive thickness was similar: 62.5±25.7 (control), 89.7±34.1 (H3PO4), 65.9±29.2 (AmF/SnCl2) and 56.0±68.1 (EP); coatings were lost only in two cases (one specimen in EP and AmF/SnCl2, each).
Only small changes were found in all groups, indicating that pre-treatment prior to application of adhesive has no impact on coating retention under erosion-/thermo-cycling.

Preventive Dentistry

Poster P.199

RETENTION OF ANTI-EROSION RESIN-COATINGS UNDER PHYSICAL STRESS AFTER THERMO-CHEMICAL AGEING AND SN-PRETREATMENTS

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An essential requirement for clinical efficacy of resin-based protective coatings against erosive wear is long-term retention under thermo-chemical-physical stress. First evidence from short-term experiments suggests that pretreatments with Sn-containing solutions may be beneficial in this context. The aim was to investigate (1) the retention of coatings with ClearfilTMSE Bond (Kuraray) on enamel aged under thermo-chemical stress when exposed to physical impacts and (2) whether pretreatments with Sn-containing solutions improve retention.

Human enamel (n=16/group) was pre-treated (15s) with H3PO4 (35%, pH 0.3), elmex enamel protection mouth rinse (EP; CP-GABA; 500ppm F-, 800ppm Sn2+, pH 4.5), or self-made AmF/SnCl2-solution (same composition as EP), or were left untreated (control). Specimens were covered with ClearfilTMSE Bond (Kuraray) and aged under thermo-chemical stress simulating various hot/cold drinks (700 erosion-thermocycles 0.5% citric acid, 2840 water-thermocycles; 2min, 5/55°C; for 24 months). Specimens were then brushed in a brushing machine in toothpaste slurry (Dentagard, Colgate-Palmolive; ADA reference brush, 200g weight) for 4, 6, 9, 12, 6x24 and 48h (total 223h h). Wear was determined profilometrically (μm; mean±SD).

Coating thickness after thermo-chemical ageing was 89.7±34.1 for H3PO4, which was significantly higher than in all other groups (EP: 71.6±28.4; AmF/SnCl2: 71.8±18.7; control: 62.5±25.7; all n.s.). Significant wear occurred after each time point (n.s. between groups); coatings were retained in all groups up to a brushing time of 158h. Afterwards, wear increased significantly in the AmF/SnCl2 group compared to all other groups. At the end of the experiment, cumulative wear was 25.3±10.6, 29.5±30.5, 66.0±40.0 and 22.9±6.5 resp. After AmF/SnCl2 pre-treatment, 50% of coatings were lost, whereas all coatings were retained in the other groups.

Clearfil coatings were remarkably stable under long-term thermo-chemical-physical stress thus providing a promising new strategy against erosive wear. Sn-pretreatment with EP had no effect but pretreatment with AmF/SnCl2 led to increased loss rates emphasizing the importance of formulation issues.

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