Clin Oral Invest (2013) 17:1029–1111
DOI 10.1007/s00784-013-0943-1

ABSTRACTS

Poster abstracts of the 6th biennial meeting of the European Federation of Conservative Dentistry (EFCD) held in association with the 33th national congress of the College National des Enseignants en Odontologie Conservatrice (CNEOC), France, 9–11 May 2013, Paris, France

Pierre Colon

The sixth biennial meeting of the European Federation of Conservative Dentistry (EFCD) held in association with the national congress of the College National des Enseignants en Odontologie Conservatrice (CNEOC) with concurrent meetings of member associations of EFCD, Academy of Operative Dentistry European Section (AODES), and Sociedad Española de Odontologica Conservadora (SEOC) and annual meeting of the Société Française des Biomatériaux Dentaires (SFBD), provides the opportunity to scientists and practitioners working on prevention, restoration and aesthetics in conservative dentistry but also in endodontics, pulp biology and dental education to come together in Paris, France. The joint meeting called "Conseuro Paris 2013" is of 3 days duration.

In the morning of the first day of Conseuro Paris 2013, there will be meetings of AODES, CNEOC, SFBD, and SEOC. The scientific programme of Conseuro 2013 begins in the afternoon. One session focused on "composite resins" and a symposium on tooth wear held in a parallel session are scheduled. One poster session is organized in the same time. In the evening, the opening ceremony will be the opportunity to give to Prof G Schmalz and to prof. G Bergenholtz the 2011 and 2012 EFCD award of Excellence for their outstanding contributions to conservative dentistry. Each of them will give a short lecture in a close relationship with their scientific career. Furthermore, Dr A.K. Lührs from Hannover, elected at the scientific foundation of the EFCD will give a short presentation about her research in Leuven. These lectures will be followed by the welcome reception.

Four different sessions, one poster session are scheduled on Friday. Twelve invited international lecturers will participate to the scientific sessions: Pulp and biomaterials, new trends in cariology, dental adhesion, new trends in endodontics. Two parallel sessions allow this variety of topics in the same day. The poster presentations are organized in seven sessions: Dental materials, prevention, operative dentistry, endodontics and pulp biology, clinical cases, student session, dental education. There are 206 posters presented as poster display or poster discussion. Poster presenters entered into the poster prize competitions are eligible to win "the Best Poster Prize of Conseuro Paris 2013" of each poster category. Scientific programme on the third day include two sessions: CAD CAM Restorations and "Learning from mistake in adhesive dentistry".

The closing ceremony will be the opportunity to give poster prizes in each category. The end of Conseuro Paris 2013 will be the sentence: "See you at Conseuro London 2015"

Pierre Colon
President of the EFCD and Conseuro Paris 2013
e-mail: pierre.colon@univ-paris-diderot.fr

012

Category: Biomaterials

POLISHED *VS* GLAZED SURFACE PROPERTIES OF LITHIUM DISILICATE CERAMIC (IPS E.MAX®, IVOCLAR VIVADENT): A PHYSICO-CHEMICAL AND BIOLOGICAL STUDY

E-E. Azogui[1], J-L. Duval[2], R. Jannetta[1], I. Pezron[3], C. Egles[24], C. Brunot-Gohin[1256]

[1]UFR d'Odontologie, Université de Reims Champagne Ardenne, 2 rue du Général Köenig, 51100 Reims, France

[2]Laboratoire de BioMécanique et BioIngénierie (BMBI), UMR CNRS 7338, Université de Technologie de Compiègne, Centre de Recherches de Royallieu, BP 20529, rue Personne de Roberval, 60205 Compiègne Cedex, France

[3]Laboratoire des Transformations Intégrées de la Matière Renouvelable (TIMR), EA 4297 Université de Technologie de Compiègne, Centre de Recherches de Royallieu, BP 20529, rue Personne de Roberval, 60205 Compiègne Cedex, France

[4]Department of Oral and Maxillofacial Pathology, Tufts University, School of Dental Medicine, 1 Kneeland Street, Boston MA 02111 USA

[5]Laboratoire des Biomatériaux et Inflammation en Site Osseux (BIOS), EA 4691, SFR CAP-Santé (FED 4231), Université Reims Champagne-Ardenne, 1 rue du Maréchal Juin, 51 000 Reims, France

[6]Pôle Odontologie, CHU de Reims, Service de Prothèses, 48 rue Cognacq-Jay, 51100 Reims, France

Objectives: Lithium disilicate ceramics are widely used materials in aesthetic dentistry and fixed prosthesis. Moreover, IPS e.max® Press or CAD was recently reported as the most robust and durable all-ceramic system tested to date. Despite multiple biomedical applications, little is known about ceramic surface modifications and the resulting cell behaviour at its contact. The aim of this study was to analyze surface properties and biological response of two different surfaces: glazed *vs* manual polished surface treatment.

Methods: Our study was realized with lithium disilicate ceramic samples (IPS e-max® Press, Ivoclar Vivadent, France) with 3 different surface treatments: raw, hand polished, and glazed surface treatment (control samples were Thermanox®). Surface characterizations were analysed by water-drop method, interferometry, and scanning electronmicroscopy. Moreover, we compared cell response between polished and glazed surfaces using an organotypic culture model of chicken epithelium.

Results: Results demonstrated that the surface roughness is not modified as shown by equivalent Ra measurements. On the contrary, the contact angle θ in water is very different between polished (82°) and glazed (32°) samples. The culture of epithelial tissues allowed a very precise assessment of histocompatibility of these interfaces and showed that polished samples increased cell adhesion and proliferation as compared to glazed samples. Finally, we demonstrated that lithium disilicate dental ceramic is not cytotoxic *in vitro*.

Conclusion: Lithium disilicate polished ceramic provided better adhesion and proliferation than lithium disilicate glazed ceramic. Taken together, our results demonstrated for the first time, how it is possible to use simple surface modifications to finely modulate the adhesion of tissues. Our results will help dental surgeon to choose the most appropriate surface treatment for a specific clinical application, in particular for the CAD/CAM skills or for aesthetic ceramic implant collar. We conclude therefore that polished lithium disilicate ceramic is promising to be used to improve aesthetic collar implant and to tight the perio-implant junction without decreasing physical properties of oral rehabilitation.

016

Category: Biomaterials

CHEMICAL IMAGERY OF DENTAL COMPOSITES USING A CONFOCAL RAMAN MICROSCOPE

Arroyo Bote Sebastiana[1], Martínez Osorio Javier[1], Jawhari Tariq[2], BrauAguadéEsteban[1]

[1]Odonto e stomatology Department, University of Barcelona

[2]Scientific and Technological Center, University of Barcelona

Objective: The objective of the study is to describe the possible applications of a Confocal Raman Microscope in the study of composite materials for dental restauration.

Methods: Extracted human molars without caries, dental Xeno V adhesive, Flow SDR composite and Ceram Duo (Dentsply) composite have been used. An occlusal cavity has been performed in each of the molars (Class I), of about 3 mm diameter by 4 mm deep, then the samples were washed and slightly dried to proceed to the sealing of the cavities, with the selected materials, following the manufacturer's instructions. Subsequently, samples were resin included and each of them was cut following longitudinal-coronoapical direction and mesio-distal direction, obtaining two inner halves of dental fillings. The samples were placed on a slide and observed under a Confocal Raman Miscroscope WITec GmbH.

Results: Raman images of different regions (20 μm×20 μm and 5 μm×5 μm) of the samples surface compositions were obtained. The chemometric study with an algorithm for Cluster Analysis of Raman images can separate these different regions that, in addition, can be well correlated with the optical images obtained with traditional light microscope. Thus type of analysis allows determining the distribution, size and concentration of some of the particles such as titanium dioxide. Furthermore, differences in the intensities of the spectrum of the organic resin allow distinguishing two types of areas rich in resin: one richer and one less rich. These intensity variations can be related with regions rich and poor on particles or other elements (other than titanium dioxide). The percentage composition of these areas can also be statistically quantified. Furthermore, it was found that these two types of regions agree very well with the morphological differences observed under light microscopy.

Conclusion: The use of Confocal Raman Microscope is a research technique that provides information on the composition and distribution of the various elements making up a material, allowing us to make a statistical calculation of the materials' composition, so it can be considered a research method that provides complementary information to other research techniques such as Electron Microscopy.

019

Category: Biomaterials

A NEW TESTING PROTOCOL FOR ZIRCONIA DENTAL IMPLANTS

Sanon Clarisse [1,2], Chevalier Jérôme[1], Gremillard Laurent[1], Douillard Thierry[1], Scherrer Susanne[3]

[1]Mateis, INSA Lyon, CNRS UMR 5510, 69621 Villeurbanne, France

[2]Dental Faculty Department of Biomaterials, University of Lyon, France

[3]Department of Prosthodontics, School of Dental Medicine, University of Geneva, Switzerland

Objective: Dental zirconia is mainly found in the form of yttria-stabilized zirconia crowns, bridges and abutments, and several companies are developing zirconia implants as an alternative to the standard biomedical grade titanium. Yttria-stabilized zirconia (3Y-TZP) presents several

advantages compared to other ceramics owing to its mechanical properties (high toughness and strength), biocompatibility and perfect aesthetic. In order to favor bone in-growth and osseointegration of zirconia implants, several strategies are now being explored to process rough and/or porous surfaces. If surface modification surely improves bone in-growth, it could impact the stability of the tetragonal phase under humid atmosphere (Low Temperature Degradation) and reduce the lifetime of zirconia implant.
Our goal is to evaluate the reliability of dental implants with different surface treatments on the basis of a protocol based on in vitro laboratory tests. We therefore developed a new protocol able to take into account both the risk of delayed rupture of the implant and the long-term degradation. This protocol could be applied to any new implant placed on the market and provide the basis for new standards in the field.
Methods: 2 types of implants with a porous coating were tested. The resistance to failure was done by performing load to failure in bending. Stability was assessed via accelerated aging tests in autoclave and follow-up of tetragonal-monoclinic transformation by XRD. Microstructural analysis was done with SEM and FIB, enabling 3D reconstruction of the implant near the surface. Finally, a fractographic analysis was performed in order to investigate the origin of failure of the implants after bending tests.
Results: Our results clearly demonstrate that surface treatments might be detrimental for the mechanical properties and/or for LTD.
Conclusion: All these results led us to warn the dental community about the risk of decreasing the mechanical performance of zirconia implants with uncontrolled surface modifications.

023

Category: Biomaterials

SPATIAL-TIME DOMAIN ANALYSIS OF SHRINKAGE VECTORS DURING PHOTO-POLYMERIZATION OF COMPOSITES

Ryan Jin-Young Kim[1], Hyun-Jeong Kweon[1], In-Bog Lee[1]
[1]Department of Conservative Dentistry and Dental Research Institute, School of Dentistry, Seoul National University, South Korea

Objective: The purpose of this study was to develop a new method to investigate the polymerization shrinkage vectors of composites during initial light curing and to evaluate the overall utility and significance of the technique.
Methods: An optical instrument to measure the polymerization shrinkage strain vectors of composites during light curing using a particle tracking method with computer vision was developed. The measurement system consisted of a CCD color camera, a lens and filter, an image storage device, and software for multi-particles tracking. A silorane-based composite (P90, 3 M ESPE, St. Paul, MN, USA) and a methacrylate-based composite (Z250, 3 M ESPE) were investigated. The composites were prepared into thin disc-shaped specimens or filled into a cavity of tooth slab. Fluorescent particles were applied onto the specimen surface and light cured for 20s. The images of fluorescent particles were stored at 2 frame rate/s for 40s. The movements of the particles on the specimen were tracked with computer vision. The polymerization shrinkage strain vectors vs. time on the composite surface were analyzed.
Results: The mean (sd) linear shrinkage values for the silorane-based composite (P90) and methacrylate-based composites (Z250) were 0.38 (0.02) % and 0.71 (0.09) %, respectively. The polymerization shrinkage vectors of the composites directed to the center of the specimen when light cured without bonding, however, the shrinkage vectors were directed toward the bonding surface when the composite was bonded to a fixed wall.
Conclusion: The new instrument was able to measure the linear shrinkage strain (vectors) for all surfaces of composite specimens as a function of time. Therefore, this instrument can be used to characterize the shrinkage kinetics for a wide range of commercial and experimental visible-light-cure materials in relation to the composition and cavity geometry.

036

Category: Biomaterials

WATER SORPTION, SOLUBILITY AND COLOR STABILITY OF SELF-ETCHING AND SELF-ADHESIVE RESIN CEMENTS

Aikaterini Petropoulou[1], Areti Vrochari[2], Suzanne Stampf[3], Elmar Hellwig[1], Olga Polydorou[1]
[1]Department of Operative Dentistry and Periodontology, Dental School and Hospital, University Medical Centre Freiburg, Germany
[2]Department of Restorative Dentistry, School of Dentistry and Dentistry and Oral Health, Griffith University, QLD, Australia
[3]Institute of Medical Biometry and Medical Informatics, Department of Medical Biometry and Statistics, University Medical Centre Freiburg, Germany

Objective: The purpose of the study was to investigate the water sorption (WSR), solubility (WSL) and color stability (CS) of self-etching, self-adhesive resin cements compared to conventional resin cements.
Methods: One conventional (Calibra), one self-etching (Panavia F) and two self-adhesive (Clearfil SA, G-Cem Automix) dual-cured resin cements were used. For WSR and WSL evaluation, according to ISO 4049:2009 specification, 14 discs (8×1.7 mm) of each material were prepared. For CS evaluation, 36 other specimens of each material were prepared and divided randomly in three groups (n=12) according to staining solutions (distilled water, coffee and red wine). The color of all specimens was measured using a spectrophotometer according to the CIE L*a*b* system, before and after 1, 7, 15 and 30 days of staining. After staining, the color change (ΔE^*) was calculated for each tested time period. Analysis of variance was carried out and the multiple testing problems were controlled with Tukey test.
Results: All materials were found to interact with water. No statistically significant difference was found between WSR of Panavia F and Clearfil SA. The above cements exhibited higher WSR values compared to the other materials, while Calibra exhibited the lowest values. A statistically significant difference was found among all materials regarding their WSL. However, all WSR and WSL values were below the threshold values proposed by the ISO Standard. Color changes ($\Delta E>0$) were observed to all materials, for each tested time period and staining solution. G-Cem Automix was the only material found with clinically acceptable color change ($\Delta E<3.3$) after immersion in distilled water; Among the staining solutions used, coffee was found to have the highest staining potential.
Conclusion: It can be concluded that all resin cement groups comply with ISO requirement regarding WSR and WSL. Furthermore, all resin cements tested are susceptible to discoloration.

061

Category: Biomaterials

INFLUENCE OF EQUIAXIAL TENSILE STRIAN ON THE OSTEOGENIC DIFFERENTIATION OF ENDOMETRIAL STEM CELLS AND DENTAL PULP STEM CELLS

Fahimeh sadat Tabatabaei[*] [1], Nooshin Haghighipour [2], Elaheh Vahid Dastjerdi [3], Maryam Jazayeri [2]
[1]Department of Dental Materials, Dental School, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[2]National Cell Bank of Iran, Pasteur Institute Of Iran, Tehran, Iran
[3]Department of Orthodontics, Dental School, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Objective: Mechanotransduction plays a crucial role in remodelling and repair of skeletal tissues. This mechanism has been widely used in bone tissue engineering especially under in-vitro conditions. To date, various stem cells have been used for this purpose. This study aimed at comparing the effect of equiaxial static mechanical strain on differentiation of endometrial stem cells and dental pulp stem cells to osteoblasts.
Methods: Twenty-four hours after cell culture on the medical grade silicone membrane and ensuring appropriate cell adhesion, the two mentioned groups of stem cells in a conventional culture medium received 3 % static equiaxial strain. The endometrial and dental pulp stem cells in control groups were placed in conventional medium and received no strain. Two weeks later, cultured stem cells were evaluated for expression of osteogenic markers, alkaline phosphatise (ALP) and osteocalcin (OCN), using real-time PCR.
Results: Real-time PCR results showed increased expression of ALP and OCN in pulp stem cells in comparison to endometrial stem cells while both cell types were stretched equiaxially. Of note is that late expression of OCN gene was significantly higher in pulp stem cells than in endometrial stem cells ($P<0.01$).
Conclusion: In summary, this study showed that equiaxial stretch is much more effective on pulp stem cells and these cells have better potential for osteogenic differentiation. The current study enhanced our knowledge about the mechanical conditioning of stem cells.

067

Category: Biomaterials

REPAIR BOND STRENGTH OF FIBRE REINFORCED COMPOSITES IN VITRO

Diana Wolff, Christian Decker, Johanna Rebholz, Cornelia Frese
University Hospital Heidelberg, Department of Conservative Dentistry, Dental School, Im Neuenheimer Feld 400, 69120 Heidelberg, Germany

Objective: The clinical application of restorations made of fibre-reinforced-composites (FRCs) increases steadily. One of the great benefits of the FRC technology is that restorations with minor failures can be repaired intraorally. The FRC materials available on the market, however, show differences concerning their matrix composition which might affect their behaviour when being repaired. The aim of this investigation was to measure bond strength of different FRC materials to composite resin while simulating a standard adhesive procedure (control) and a repair situation (test).
Methods: Five fully preimpregnated-unidirectional FRCs (one semi-Interpenetrating-Polymer-Network (IPN) FRC and four cross-linked-polymer (CLP) FRCs) were included. For each FRC type a control group ($n=30$) (polymerized FRC with oxygen-inhibition-layer (OIL)) and a test group ($n=30$) (polymerized FRC with removed OIL and subsequent infiltration of fresh monomers) were investigated. Evaluation of shear bond strength was performed by universal testing machine with a crosshead speed of 1 mm/min (ISO/TS 11405).
Results: Mean shear bond strength between FRC and composite resin ranged from [MPa] 7.99±3.41 to 12.40±5.43 (control group) and from 7.48±3.44 to 14.64±5.80 (test group). Paired t-test was performed to compare groups. A significant increase in shear bond strength was seen for the semi-IPN FRC in the test group ($p=0.01$). The CLP FRC showed no significantly different shear bond strengths between control and test groups, except for one material which yielded significantly lower values in the test group ($p=0.03$).
Conclusion: The variations in composition of resin matrices seem to influence the repair bond strength between FRCs and composite resin. While all types of FRC materials showed good bond strength to composite resin in the control group, the semi-IPN FRC was superior in the test group which might be advantageous when in case of clinical failure intraoral repair becomes necessary.

073

Category: Biomaterials

BIOCERAMIC TOOTH MODEL FOR CARIES

Stevanovic Sabrina[1], AlainWuethrich [1], Lucy Kind [1], Uwe Pieles, Michael Hug [2] Dominikus Lysek [2]
[1]University of Applied Sciences and Arts Northwestern Switzerland (FHNW)
[2]Credentis ag

Objective: This project involves the development of an *in vitro* model simulating the characteristics of enamel and dentin in human teeth with regard to hardness and porosity. Based on this artificial tooth model the study of demineralization and remineralization of white spot lesions in enamel will be simplified. Because of the limited availability and difficult access to usable human teeth and their great structural variability, shape and composition, a bioceramic tooth model will help to standardize the test systems and support the comparability of results.
Methods: Hydroxyapatite specimens were compressed and thermal treated to achieve the characteristics of tooth enamel and dentin. The analysis was performed by mercury intrusion porosimetry (MIP), Brunauer, Emmett, Teller (BET) gas adsorption, x-ray diffraction (XRD), Vickers hardness (VH) and scanning electron microscopy (SEM). The data of the hydroxyapatite specimens were compared with human molar tooth sample as well as with literature data.
Results: The process of developing and optimizing the production technology of *in vitro* models led to 14 hydroxyapatite specimens which were analysed by the above mentioned methods. 2 hydroxyapatite specimens were selected which displayed the most suitable characteristics for an artificial tooth i.e. as a replacement for enamel and dentin. The selected specimens were assembled to represent an artificial tooth.
Conclusion: A suitable technology was developed to process raw ceramic material into an artificial tooth model with similar mechanical and chemical properties compared to human teeth. The tooth model provides a standardized test system to study new compounds to cure caries. The development of artificially subsurface acid induced caries like demineralization in the *in vitro* tooth model is ongoing. Furthermore studies on restorative remineralization therapy by 3D-self-assembled peptide supramolecular networks, either in natural teeth or in artificial tooth models are in process.

076

Category: Biomaterials

A COMPARISON BETWEEN THE BEHAVIOR OF MATERIALS USED IN RESTORING DENTAL ABFRACTIONS BY MEANS OF FEM

Anamaria Florescu[1], Cornelia Florentina Biclesanu[1], Stefan Cristian Castravete[2], Andreea Dana Tudose[1], Fabian Boiangiu[3]
[1]TITU MAIORESCU University Bucharest
[2]CAELYNX Europe Craiova
[3]FM Medident Bucharest

Objective: The aim of this study is to compare, by means of finite element method, tensile strength distribution and behavior of some restoration materials, applied on abfraction lesion, using the same cavity, force (direction, size) and adhesive system.
Methods: In this study, a lower premolar with an abfraction lesion on its buccal aspect, extracted for periodontal reason, was used.
After dentin surface roughening, the tooth was restored using two different material combinations: 1) composites SDR and Estelite Sigma Quick; 2) giomers Beautifil FO2 and Beautifil II.

The premolar was then scanned by μCT machine and sections of 0,5 mm, perpendicular to the long axis of the tooth, were taken and processed using DICOM program.
A 3-D model of the tooth, that includes 3 parts (tooth and abfraction, alveolar bone and restoration), was created using MIMIC program. The 3D model has tetrahedral elements of second order. The adhesive layer was designed using cohesive elements. We considered all materials as being linear elastic and by means of FEM, material's tensile strength has been compared with admissible tensile strength.
A variable force of 0-150 N was applied on the upper side of the tooth. This force causes tensile strength within lesion and that's why main maximum tensile was quantified and compared with admissible tensile strength.
Results: The adhesive system reached admissible tensile strength at 100 N Force. Over 100 N, adhesive's detachment is possible and the enamel may crack. Admissible tensile strength of restoration materials exceeds 100 MPa and it is higher than those of dentine (90 MPa) and enamel (24 MPa). Adhesive tensile strength is about 25 MPa.
Conclusion: The restoration's retention is not influenced by the combination of materials of different stiffness. The only strain producing loss of restoration seems to appear at tooth-adhesive interface, maybe due to adhesive system or dentin structure. More studies are needed in this field.

080

Category: Biomaterials

A SELF-ASSEMBLING PEPTIDE WITH THE POTENTIAL OF NON-INVASIVE REGENERATION OF EARLY CARIES LESIONS

Lucy Kind[1], Alain Wuethrich[1], Stevanovic Sabrina[1], Uwe Pieles[1], Michael Hug[2], Dominikus A. Lysek[2]
[1]University of Applied Sciences and Arts Northwestern Switzerland (FHNW)
[2]Credentis ag

Objective: The main focus of this project is a non-invasive regeneration of white spot lesions/ early caries in enamel by a self-assembling peptide (SAP). The fully synthetic peptide forms a 3D supramolecular network in situ with the ability to trigger nucleation of calcium phosphate. It is assumed, that this network inside the carious lesion initiates the growth of hydroxyapatite nanocrystals, resulting in a remineralization of demineralized cavities. The diffusion, assembly and remineralization process of this peptide in artificially demineralized cavities on natural human teeth were studied.
Methods: Supramolecular peptide network structures were detected by transmission electron microscopy (TEM). To stabilize the self-as sembled peptide in artificially generated white spot lesions of human teeth, Critical Point Drying (CPD) was performed and after that the cavities were visualized by scanning electron microscopy (SEM). Furthermore matrix-assisted laser desorption/ionization (MALDI-TOF) and LC-MS measurement was performed on peptide treated white spot lesions
Results: TEM pictures represented self-assembled fibrillar protein structures. SEM pictures of the CPD process showed, that the peptide completely diffused into the enamel cavity of natural teeth, and remained inside the artificial lesions. Additional experiments with MALDI-TOF showed, that the peptide remained in artificial white spot lesion in a stable and unimpaired state.
Conclusion: Based on the successful diffusion and stabilization of the SAP into enamel lesions of human teeth the remineralization process will be studied by further methods like small angle X-ray scattering (SAXS), Raman spectroscopy, confocal microscopy and by enzyme-linked immunosorbent assay (ELISA).spectroscopy, Confocal microscopy and enzyme-linked immunosorbent assay (ELISA).

085

Category: Biomaterials

MARGINAL QUALITY, WEAR AND FRACTURE BEHAVIOR OF DIFFERENT GICS *IN VITRO*

Vera E. Vosen[1], Michael Krech[1], Nils Schmidt[1], Maria Lison[1], Andreas Braun[1], Roland Frankenberger[1]
[1]Department of Operative Dentistry and Endodontics, Dental School, University Medical Center Giessen and Marburg, Campus Marburg, Germany
[2]Private Practice, Singen, Germany,
[3]Private Practice, Geislingen, Germany

Objective: Due to their high fluoride release and rather easy application characteristics, glass ionomer cements (GIC) are interesting amalgam replacement materials. Compared to clinically suitable direct dental restorative biomaterials such as amalgam or resin-based composites, GIC still have a limited indication spectrum being attributed to inacceptably high wear and poor flexural fatigue behavior, both initially and over time. Aim of this in vitro study was to investigate a novel GIC material (ChemFil Rock) regarding marginal quality in enamel and dentin, occlusal contact wear, and fracture behavior before and after thermomechanical loading (TML), and to compare it to three already marketed glass ionomer cements.
Methods: Fifty-six caries-free third molars were used within one month of extraction. They received MOD cavities with one box ending below the cementoenamel junction in dentin. Cavities were restored with different GICs (n=8 / Ketac Molar quick with and Ketac Molar without Conditioner/Glaze, Fuji IX, Equia Fil, Ionofil Molar, Fuji II LC bulk and layering). Before and after TML (100,000 @ 50 N and 2,500 thermocycles between +5 and +55 °C after 24 h of water storage), epoxy replicas were made and investigated regarding marginal quality (SEM, 200× magnification), two-body OCA wear depth (CLSM), and fractures (magnifying glasses x3.5).
Results: ChemFil Rock generally showed promising results compared to the other GIC materials, being significantly superior regarding enamel margins (90.5±11.3 %), wear (129±27 μm) and fracture rate (p<0.05) and being similar compared to groups with additional coating. There was a huge difference in performance of Fuji II LC when used as per manufacturer's instructions compared to a bulk-fill approach (p<0.05).
Conclusion: From the present in vitro results in can be concluded that ChemFil Rock gave a promising preclinical performance being clearly superior to the other tested materials regarding the parameters fracture, wear, and enamel margin integrity. However, these tendencies have to be confirmed by clinical results. Resin-modified GIC should be layered as recommended by the manufacturers.
Supported by Dentsply.

088

Category: Biomaterials

ION-RELEASING, POROSITY, SOLUBILITY AND BIO ACTIVITY OF BIODENTINE

Gandolfi Maria Giovanna [1], Prati Carlo [2]
[1]Laboratory of Biomaterials and Oral Pathology - Unit of Odontostomatological Sciences, Dept. of Biomedical and NeuroMotor Sciences, University of Bologna, Bologna, Italy
[2]Endodontic Clinical Section - Unit of Odontostomatological Sciences, Dept. of Biomedical and NeuroMotor Sciences, University of Bologna, Bologna, Italy

Objectives: The clinical success of pulp capping procedure is interlinked with the ability of the material to provide epigenetic chemical signals for odontoblast differentiation and dentin bridge formation. Our aim was to evaluate the chemical (calcium and hydroxyl ions release,

apatite-forming ability) and physical (solubility, water sorption, porosity) properties and the morphology after immersion in simulated body fluid of Biodentine, a novel tri-calcium silicate material for pulp capping and root repair.

Methods: Calcium silicate materials namely Biodentine (Septodont, France; lot. B01767) and ProRoot MTA (Dentsply, USA; lot.09003850) used as reference were prepared accordingly to the manufacturer directions. Disks were made and placed at 37 °C and 99 % relative humidity for 70 % of their own setting time.

Calcium and hydroxyl release in deionized water (pH6.8) was tested after 3 hours-28 days.

Water sorption, interconnected open pores, apparent porosity (by gravimetric Archimedes method, according to ASTM C373-88) and solubility were tested after 24 h-immersion in deionized water.

Morphological, elemental analysis and apatite-forming ability of the materials surface were performed by ESEM/EDX after 1–28 days-immersion in simulated body fluid (ISO 23317).

Results: Biodentine showed higher values of cumulative calcium release (240 ppm) compared to ProRoot MTA (120 ppm) as well as higher alkalinizing activity. Biodentine showed high values of apparent porosity (23 %), even tough markedly lower than ProRoot MTA (30 %), and similar values of water sorption (13 %) and solubility (11 %). Ca/P deposits were noticed on the surface of Biodentine after short ageing times.

Conclusion: Biodentine showed to be a biointeractive (ion-releasing) bioactive (apatite-forming) material. Its solubility is interlinked with the pronounced ion-release. The large open pores volume and water sorption provided a high wet biointeractive surface available for the release with the calcium and hydroxyl ions. Biodentine as well as ProRoot MTA are functional materials able to provide epigenetic signals towards dental pulpal cells for reparative dentin formation.

103

Category: Biomaterials

OSTEOBLASTIC DIFFERENTIATION OF HUMAN DENTAL PULP STEM CELLS ON DEXAMETHASONE LOADED PLGA MICROSPHERES AS INJECTABLE CELL AND DRUG CARRIERS

Hanieh Nojedehian[1], Hamid Nazarian[2]

[1]Dental Biomaterials, Dental School of Shahid Beheshti University of Medical Sciences, Tehran, Iran

[2]Biology and Anatomical Sciences, Faculty of medicine, Shahid Beheshti University of medical sciences, Tehran, Iran

Objective: The multipotent nature and self renewal capacity of human dental pulp stem cells in addition to more ease of extraction makes them an attractive cell source for tissue engineering. Dexamethasone can induce osteoblastic differentiation of stem cells. PLGA microspheres as injectable cell and drug carriers are one of the best scaffolds for tissue engineering and cell therapy provide a suitable surface for cell attachment and a controlled drug and growth factor release system. Kinetic of dexamethasone release from PLGA microsphere and osteoblastic differentiation of dental pulp stem cells were evaluated in this study.

Methods: PLGA microspheres which contain dexamethasone were prepared using emulsion/solvent evaporation technique. Size and surface morphology of PLGA microspheres were evaluated by scanning electron microscope (SEM). The in vitro release profile was obtained by measurement of UV absorbance at 241 nm. For in vitro examinations, dental pulp stem cells were seeded on them. SEM and reverse transcriptase-polymerase chain reaction (RT-PCR) analyses for ostegenic specific genes were carried out.

Results: SEM micrographs of the scaffolds showed a diameter in range of 13–100 μm. Based on the release profiles obtained, the concentration of dexamethasone released from microspheres reached 10^{-8} to 10^{-9} μg/ml. RT-PCR analyses for Osteopontin, Osteocalcin, Osteonectin and Alkaline phosphatase indicated differentiation of dental pulp stem cells into osteoblasts on the microspheres.

Conclusion: Controlled degradation and following prolonged and continuous drug delivery in addition to its injectability makes PLGA microspheres effective tools for tissue engineering and cell therapy.

111

Category: Biomaterials

EFFECT OF 2-PROPYL-2-PROPANOL APPLICATION ON IMMEDIATE FIBER POST BOND STRENGTH WITH DIFFERENT ADHESIVE APPROACHES

Pezzana Alessandro [1], Rota Riccardo [1], Alovisi Mario [1], Pasqualini Damiano[1], Berutti Elio[1], Scotti Nicola [1]

[1]Dept. Surgical Sciences, Dental School, University of Turin, Italy

Objective: This study evaluated the effect of 2-propyl-2-propanol on fiber posts luted at different time intervals with several adhesive approaches.

Methods: Forty-eight single-root human extracted teeth were endodontically treated. Endodontic obturation was performed with guttapercha and a eugenol based sealer (Pulp Canal Sealer EWT, Kerr). Specimens were then divided into 2 groups according to the different time of post space preparation and cementation after root canal filling: A) immediate; B) one week. Specimens were then divided into 3 subgroups and randomly assigned to one of the tested adhesive system: 1) All Bond 3 (Bisco); 2) Liner Bond 2 V (Kuraray); C) Rely-X Unicem 2 (3 M ESPE). Before fiber posts lutingwith a dual-cure resin-based cement (Core-X-Flow, Dentsply), a 2-propyl-2-propanol-based solution was applied in the post space trough one-minute brushing. Teeth were cut in 1 mm-thick slices and pushed until failure with a universal machine. The maximum failure load was recorded in Newton (N) and converted into megapascals (MPa) by dividing it by the interfacial area of the post fragment, which corresponds to the bonded area. Failure modes were analysed with stereomicroscope. Results were statistically analysed with Two-Way ANOVA and Bonferroni test. Statistical significance was set at $p=0.05$.

Results: Means and standard deviations of push-out bond strength (in MPa) of the different groups are presented in table 1.The statistical analysis revealed a non-statistically significant difference between the bond strength of different adhesive systems applied at different time intervals ($p=0.0935$). More than 85 % of the failures in each group were adhesive failures between dentin and resin cement, or were mixed failures.

Adhesive	Post Space Region	Immediate Cementation	One week Cementation
All Bond 3	CORONAL	12.739 (±3.037)	13.872 (±3.221)
	APICAL	10.976 (±3.754)	12.231 (±3.659)
Liner Bond 2V	CORONAL	9.215 (±3.242)	9.313 (±3.457)
	APICAL	8.262 (±3.286)	8.672 (±3.517)
Rely-X Unicem 2	CORONAL	10.005 (±3.456)	10.210 (±3.585)
	APICAL	9.764 (±3.721)	9.987 (±3.927)

Conclusion: Within the limitations of this study it can be affirmed that 2-propyl-2-propanol application could avoid eugenol-induced inhibition of adhesive systems polymerization, thus allowing an immediate post-endodontic restoration.

122

Category: Biomaterials

DEGRADATION MECHANISMS OF MODERN SELF-ETCHING ADHESIVES

E. Chatel[2], P. Colon[1&2], B. Grosgogeat[1& 3], N. Pradelle-Plasse[1&2]
[1]Laboratoire des Multimatériaux et Interfaces. UMR CNRS 5615, Université Lyon 1, Villeurbanne, France
[2]UFR Odontologie, Université Paris Diderot ; Hôpital Garancière Rothschild, Paris Assistance Publique-Hôpitaux de Paris, France
[3]UFR Odontologie, Université Lyon 1;Service de Consultations et de Traitements Dentaires, Hospices Civils de Lyon, France

Objectives: The success of adhesive dentistry requires good adhesion. Degradation mechanisms have been reported with the use of a self-etching adhesive, as they react as a semi-permeable membrane. The objective of this experiment was to study two degradation causes in recently commercialized self-etching adhesives, using two different methodologies that analyzemicroleakageand nanoleakage.
Methods: Four self-etching adhesives (SEA)were used:Adper Easy Bond® (ADP) 3 M, G-aenial Bond® (GB) GC andOptiBond XTR® (OPB) Kerr, Clearfil SE Bond® (SEB) Kuraray.
For the microleakage evaluation, Class V cavities were prepared, filled with SEA and the Z100® 3 M composite.They were then thermocycled, immersed in silver nitrate dye solution, sectioned and observed with an optical microscope.Enamel and dentinal microleakageswere quantified and statistically analyzed. For the nanoleakage evaluation, flat dentinal surfaces were made, obturated with the SEA and the Z100® 3 M composite. They were thenthermocycled, immersed in an ammoniacal silver nitrate dye solution, sectioned and observed with SEM.
Results: The SEB presented good enamel and dentinal results: the 10-MDP was able to create a chemical bond with the hydroxyapatite. There was no significant difference between the three adhesive systems at the enamel margin,except with the ADP. At the cervical dentinal margin, the SEB presented good results with significant differences with the OPB and the GB.
The SEM observations showed that whatever the adhesive system, degradation mechanisms such as «water trees » are observed at the adhesive interface, but the extent and the quantity are different. The origins are the phase separation, the incomplete polymerization of the adhesive resin layer or the formation of HEMA hydrogels.
Conclusion: This study shows that all self-etching adhesives present some degradation mechanisms but the extent of these phenomena are directly linked to their composition and handling. In vivo evaluation is now required for better understanding.

124

Category: Biomaterials

CHARACTERISATION OF A NEW RESTORATIVE CONCEPT : SONICFILL®

M. Bloch[2], C. Ribeyron[1&2], P. Colon[1&2],B. Grosgogeat[1&3], N. Pradelle-Plasse[1&2]
[1]Laboratoire des Multimatériaux et Interfaces. UMR CNRS 5615, Université Lyon 1, Villeurbanne, France
[2]UFR Odontologie, Université Paris Diderot; Hôpital Garancière Rothschild, Paris Assistance Publique-Hôpitaux de Paris, France
[3]UFR Odontologie, Université Lyon 1 ; Service de Consultations et de Traitements Dentaires, Hospices Civils

Objectives: The Sonicfill®concept combines a new composite and a specific handpiece. The objectives were to characterize mechanical and physical properties.
Methods: For the experiments, the curing time was 20 seconds (Demetron LED).
Vickers Microhardness: 15 specimens were prepared in 3 groups (6×2, 6×4, 6×6 mm). Five measurements were made at the top and the bottom of the samples.
Three point bending test: 10 samples (24×2×2 mm) were prepared. Specimens were positioned in a three-point testing bending apparatus and loaded until fracture at a crosshead speed of 1 mm/min.
Polymerization contraction: 10 spheres(diameter 5 mm) were weighed with a scale in dry air and in the auxiliary liquid. The sample was suspended in the auxiliary liquid. The weight was monitored every second for 480 seconds
Porosity evaluation: 30 filledartificial teeth were sectioned (five sections). Each interface was observed with an optic microscope. A ratio between the sum of the porosity surfaces and the sum of the composite surface was calculated for each tooth.
Results: Microhardness measurement is a good method for evaluating the mechanical properties of a composite. The exposed Sonicfill® surface was appropriate to posterior use (71.58HVN±3.026). 4 mm thickness seems to be the correct thickness to preserve the properties (60.3 HVN±2.9).
Flexural strength was clinically relevant for class II. Sonicfill®exhibits a high level of resistance (133.8 MPa±12.56), in relation to the fillers. The contraction rate obtained with Sonicfill® was very low (1.81 %±0.1).

The porosity percentage varied between 0 to 2.94 %.
Conclusion: High mechanical properties, low rate of porosity and very low shrinkage were demonstrated. This in vitro experiment demonstrates that Sonicfill can be used as a bulk technique, in a posterior restorative situation.

129

Category: Biomaterials

ANTIBACTERIAL FUNCTIONALIZATION OF A MINERAL CEMENT (BIODENTINE™) FOR DENTAL USE

Lieven Robberecht[1,2,3], Feng Chai[2,3], Etienne Deveaux[1,2,3]
[1]Faculté de Chirurgie-Dentaire. Université de Lille 2
[2]INSERM U1008: Médicaments et biomatériaux à libération prolongée: mécanismes et optimisation, Lille
[3]Laboratoire de bactériologie clinique - Faculté de Pharmacie, Université de Lille 2

Objective: The aim of this study was to add a long term antibacterial activity to a mineral cement: the Biodentine™; without decreasing neither physico-chemical and mechanical properties, nor biocompatibility.
Methods: Several antibacterial agents were selected: nanometric zinc oxide (0.5 and 0.2 %/weight) and silver sulphate (1 and 2 %/weight). After blending powder/liquid (0.6 g/137 μl) the samples (disks of 15× 1.5 mm) were stored in humid environment at 37 °C, 100 % humidity. The parameters studied were: initial setting time, tensile strength, viability of exposed epithelial cells (L132) to the cements, vitality of osteoblastic cells (MG63), MIC's of the antibacterial agents on *Staphylococcus aureus*, and antibacterial activity on *S. aureus* (colony forming unit).
The data were analyzed with non-parametric Mann-Whitney tests ($p \leq 0.05$).
Results: Initial setting time was increased for the cements functionalized with zinc oxide; a reduction of tensile strength for zinc oxide and silver sulphate ($p > 0.05$) was observed. The cytotoxicity of silver sulphate was higher than zinc oxide ($p < 0.05$) and Biodentine™ ($p < 0.01$). The cytotoxicity of the functionalized cements was not higher than the control samples ($p > 0.05$), except silver sulphate concentrated at 2 % ($p < 0.01$). A decrease of *S. aureus* adhesion on the surface of the the samples funtionalized by silver sulphate was observed compared to the control group ($p > 0.05$).
Conclusion: The addition of zinc oxide to the cement slows down its hydration without altering the mechanical properties and biocompatibility, but does not show any antibacterial effect. The addition of silver sulphate into the cement does not influence the setting time, but decreases its mechanical properties and trends to an antibacterial activity.

130

Category: Biomaterials

NEW METHACRYLIC MONOMERS FOR DENTAL APPLICATIONS

Kun Zhang[1], Wilms Baille[1], Marc Gauthier[1], X. X. Zhu[1], Sophie Lerouge[2], Daniel Fortin[3]
[1]Département de chimie, [2]CHUM, [3]Faculté de médecine dentaire, Université de Montréal, C.P. 6128, Succ. Centre-ville, Montréal, QC, H3C 3 J7, Canada
[2]Département de génie mécanique, École de Technologie Supérieure, 1100 Notre-Dame Ouest, Montréal, QC, H3C 1 K3, Canada

Objective: The organic matrix of dental composites is typically a mix of two or more dimethacrylate monomers, of which the most common are BisGMA, UDMA and TEGDMA. The polymerization shrinkage and the release of organic leachates remain concerns in their uses. The objective of our work is to compare methacrylate derivatives of natural compounds with BisGMA and UDMA in dental composites, including the polymerization behavior in the presence of TEGDMA and the thermo-mechanical properties of the resulting polymers and composites.
Methods: The methacrylate derivatives of natural compounds were prepared. Composites were prepared by incorporating the monomer mixture to the silinated filler (1:3 w/w), followed by the addition of the photo-initiator and photo-irradiation. The degree of conversion was obtained from the near-IR spectra. Polymerization shrinkage was measured by axiosymmetric drop analysis using a dynamic contact angle analyzer.
Results: After visible light curing, the conversion of the commercial model systems is higher than those containing the new methacrylic monomers. Post-curing by heat increased conversion significantly for all systems, with a greater effect on those containing the new monomers. The results showed that the materials had reduced polymerization shrinkage, leaching and cytotoxicity, while retaining comparable mechanical properties, demonstrating advantages of such materials as new dental composites. The new polymers have a more complex thermo-mechanical spectrum, likely resulting from their significantly more complex structure. The new polymers despite their lower crosslinking density showed greater thermal stability, demonstrating greater rigidity within the polymer network.
Conclusion: The polymers and composites made from the new monomers demonstrated comparable mechanical properties, lower cytotoxicity, higher hydrophobicity and lower polymerization shrinkage than BisGMA and UDMA, making them good candidates as starting materials for dental monomers.
Financial support from the CHRP program of NSERC and CIHR of Canada, FQRNT of Quebec and the Canada Research Chair program is gratefully acknowledged.

132

Category: Biomaterials

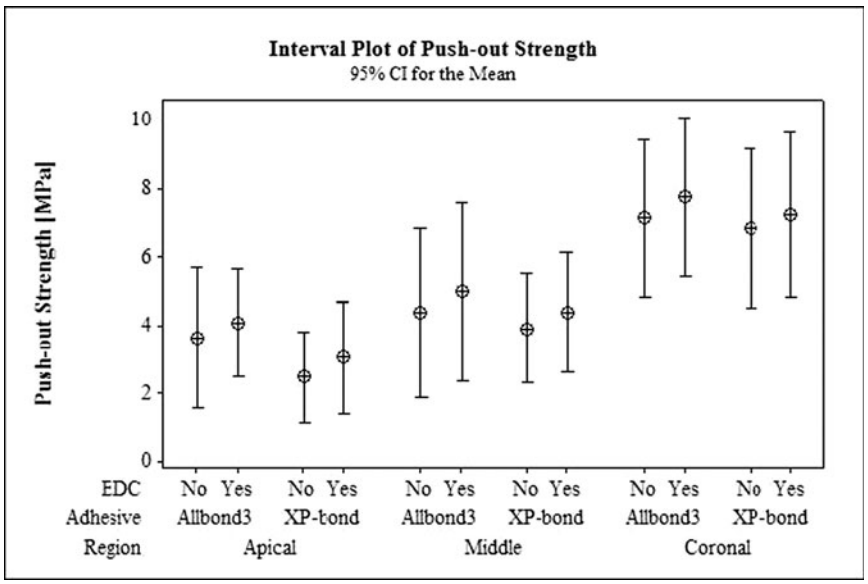
INFLUENCE OF CARBODIIMIDE CROSS-LINKING ON BOND STRENGTH TO RADICULAR DENTIN

Guido Gregori[1], Riccardo Rota[1], Annalisa Mazzoni[2], Lorenzo Breschi[2], Davide Paolino[3], Elio Berutti[1], Nicola Scotti[1]
[1]University of Turin, Department of Surgical Sciences, Dental School
[2]Department of Medical Sciences, University of Trieste
[3]Politecnical School of Turin, Department of Mechanics

Objective: Etching of dentin and bond application can activate matrix metalloproteinases (MMPs), contributing in the deterioration of the dentin collagen network of the hybrid layer. Recent studies demonstrated that collagen cross-linking agents strengthen the collagen network and inhibit MMPs activity. The aim of this *in vitro* study was to evaluate the effect of a cross-linker agent (carbodiimide, EDC) used as additional therapeutic primer in luting fiber posts to radicular dentin. The null hypothesis tested was that EDC improves the fiber post bond strength.

Methods: 52 extracted intact single-root teeth were selected for this study. Samples were endodontically treated and a 10 mm post space was prepared in each sample. 40 specimens were selected and equally and randomly divided into four groups (n=10) according to the adhesive protocol: 1) All Bond 3 (3-steps etch-and-rinse; Bisco); 2) All Bond 3+0.3 M EDC; 3) XP-Bond (2-steps etch-and-rinse; Dentsply); 4) XP-Bond+0.3 M EDC. EDC was applied after phosphoric acid etching for 1 min and prior bonding application. Fiber posts (RelyX Fiber Post) were luted with a dual-cure resin cement (Core-X Flow) and cured. Teeth were cut in 1 mm-thick slices and pushed until failure with an Instron Machine. Results were statistically analyzed with one-way ANOVA test. Statistical significance was set at p=0.05. 12 specimens were prepared for the SEM analysis.
Results: Means and standard deviations of push-out bond strength (expressed in MPa) of the tested groups are expressed in table 1. No influence was revealed by either EDC (p=0.332) or adhesive system (p=0.216) in affecting the bond strength to radicular dentin. No differences were observed with SEM with or without EDC application.

		BOND STRENGTH		
	ADHESIVE PROTOCOL	CORONAL	MIDDLE	APICAL
GROUP 1	AllBond 3	7.3 (±3.6)	4.5 (±3.9)	3.7 (±3.2)
GROUP 2	AllBond 3 + EDC	7.5 (±3.5)	4.7 (±4.0)	3,9 (±2.4)
GROUP 3	XP Bond	7.0 (±3.2)	4.0 (±2.4)	2.5 (±2.0)
GROUP 4	XP Bond + EDC	7.2 (±3.6)	4.1 (±2.4)	2.8 (±2.0)



Conclusions: Despite a slight improvement in bond strength, EDC-treated specimens showed no difference in bond strength when luting fiber posts to endodontically treated dentin. Further studies should evaluate if collagen cross-linking could stabilize the bond over time inhibiting dentin bound MMPs.

136

Category: Biomaterials

FIBER POST BOND STRENGTH IN CANALS OBTURATED WITH A CROSS-LINKED GUTTA-PERCHA CORE OBTURATOR

Coero Borga Francesco[1], Alovisi Mario[1], Paqualini Damiano[1], Bergantin Emanuele[1], Marchionni Silvia[2], Berutti Elio[1], Scotti Nicola[1]
[1]University of Turin, Department of Surgical Sciences, Dental School
[2]Alma Mater Studiorum, University of Bologna

Objectives: This aim of this study was to compare the bond strength of fiber posts cemented in root canal filled with different root canal obturation techniques.

Methods: 33 single-root teeth were endodontically treated and assigned to three groups (n=8) according to the endodontic obturation technique employed. G1: continuous wave technique; G2: plastic core obturator technique (Thermafill, Maillefer); G3: cross-linked gutta-percha core obturator technique (Guttacore, Maillefer). Fiber posts (Radix, Densply) with a etch-and-rinse adhesive system (All Bond 3, Bisco) and a dual-cure resin cement (Core-X Flow) and cured. Teeth were cut in 1 mm-thick slices and pushed until failure with an Instron Machine. 3 samples per group were prepared for the SEM analysis. The presence of debris particle and open dentinal tubules was evaluated with a 0 to 3 score scale. The final results were statistically analyzed with one-way ANOVA test. Statistical significance was set at p=0.05.
Results: Means and standard deviations of push-out bond strength (expressed in MPa) of the tested groups are expressed in table 1. The ANOVA test of bond strength values reveals a p value of 0.0051, considered very significant. The Bonferroni's test showed a significant difference between Group 1 and other groups only related to apical section of the post space (p=0.004). Open tubule and debris scores revealed that the use of a plastic or cross-linked guttapercha obturator significantly influenced the debris score but not the open tubule score.

Bond Strength Results

	GROUP 1	GROUP 2	GROUP 3
CORONAL	14,346 [a]±2,970	12,854 [a]±4,925	14,331 [a]±3,860
APICAL	13,406 [a]±3,740	6,130 [b]±3,930	9,184 [b]±3,920

Table 1: Mean bond strength values and standard deviations, expressed in MPa, obtained in different groups. The same letters indicate statistically insignificant differences ($p>0.05$).

Conclusion: Within the limitations of an in vitro study we can affirm that the use of thermoplasticized alpha guttapercha, either with Thermafil or Guttacore, seemed to contrast the cleaning capability of post space root canal walls in order to enhance fiber post bond strength, above all in apical regions.

138

Category: Biomaterials

COMPARISION OF CROWN-ROOT FRACTURED INCISORS RESTORED WITH REATTACHMENT AND RESIN COMPOSITE USING GLASS FIBER POST AND SHORT FIBER POST

Pelin Celik, Yücel Yilmaz, Sera Simsek
Derelioglu Ataturk University, Erzurum Turkey

The aim of this study was to compare the fracture strength, failure types, and dye penetration on fracture line of reattachment and resin composite restoration with respect to restorative procedure of crown-root fractured teeth using glass fiber post and short fiber post.
This study was conducted on 60 extracted upper central incisors. The root of each tooth was embedded in acrylic resin block. All blocks were numbered. A complicated crown-root fracture was created. The teeth were divided equally into four groups: Group I- Glass fiber post + reattachment of original crown; Group II- Glass fiber post + complete crown of composite resin; Group III- Short fiber post + reattachment of original crown; Group IV- Short fiber post + complete crown of composite resin. Specimens were then subjected to thermocycling procedures and soaked in the 0.5 % basic-fuchsin dye for 24 hours. Specimens were re-fractured. All data were analyzed statistically. Failure modes and dye penetration were microscopically examined.
Significant differences were observed between study groups ($P<0.05$). The comparison of load values of Group I and Group IV revealed significant differences between the groups ($P<0.05$). The fracture resistance forces of restored teeth ranged from 32.4 % to 53.4 % of those of the original teeth. Specimens revealed no statistically difference in both fracture pattern and dye penetration ($P>0.05$).
Within the limitations of this study, fragment reattachment can be used to treat crown-root fractured teeth.

145

Category: Biomaterials

THE EFFECT OF BULK-FILL FLOWABLE COMPOSITES ON FRACTURE RESISTANCE AND CUSPAL DEFLECTION OF ENDODONTICALLY TREATED PREMOLARS

***Tuğba Toz[1], Safa Tuncer[2], Funda Öztürk Bozkurt[1], Aysun Kara Tuncer[2], Harika Gözükara Bağ[4]**
[1]DDS Phd, Assistant Professor, Istanbul Medipol University, School Of Dentistry, Department of Restorative Dentistry
[2]DDS Phd, Istanbul University, School Of Dentistry, Department of Restorative Dentistry
[3]DDS Phd, Private Practise
[4]DDS Phd, Inonu university, Faculty of Medicine Department of Biostatistics

Objective: The aim of this study was to evaluate the effect of bulkfill flowable composites on cuspal deflection and fracture resistance of endodontically treated teeth.
Methods: Forty-two noncarious maxillary premolars were selected, received endodontic treatment followed by preparation of mesioocclusodistal (MOD) cavities, with gingival cavosurface margin 1 mm coronal to the cementoenamel junction (CEJ). The teeth randomly divided into six groups according to the restorative materials . Group 1: Clearfil Majesty Flow and Clearfil Majesty Posterior; Group 2: Venus Bulk Fill and Clearfil Majesty Posterior, Group 3: Clearfil Majesty Posterior; Group 4: Vertise Flow and Clearfil Majesty Posterior; Group 5: SDR and Clearfil Majesty Posterior; Group 6: x-trabase and Clearfil Majesty Posterior. A single step self-etch adhesive (OptiBond All-in-One) was applied to all groups except group 4. The cavities restored with centripetal incremental insertion technique and flowable composites used in 2 mm thickness as a base material except group 3. The teeth were then subjected to 500 thermal cycles, each with a dwell time of 20 seconds at $5C^0$ and $55C^0$. The distance between cusp tips was measured before and after cavity preparations, after restorations and thermal cyclus with a digital micrometer. After measuring, each tooth was subjected to compressive loading perpendicular to the occlusal surface at a crosshead speed of 1 mm/minute and the mean loads necessary to fracture were recorded in Newtons. The data were statistically analyzed.
Results: No statistically significant differences were found between the groups in fracture strength and cuspal deflections ($P>0.05$).
Conclusion: During the application of centripetal incremental insertion technique, bulk-fill flowable composite bases did not change the cuspal deflection or fracture resistance of endodontically treated teeth compared with a conventional flowable base and conventional resin composite.

152

Category: Biomaterials

AGEING OF DENTAL COMPOSITES: 1-YEAR MECHANICAL PROPERTIES FOLLOW-UP

Fabienne Jordana[1], Jérémy Guitard[2], Julien Jumel[2] Martin Shanahan[2], Jacques Colat-Parros[3,4]
[1]Hôpital d'Instruction des Armées Robert Picqué, 351 route de Toulouse, CS 80002, 33882 Villenave d'Ornon cedex, France
[2]Université de Bordeaux, Institut de Mécanique et d'Ingénierie - Bordeaux (I2M) UMR 5295, 351 cours de la Libération, 33405 Talence Cedex, France
[3]C.H.U. de Bordeaux, Pôle d'odontologie et de santé buccale, Place Amélie Raba-Léon, 33076 Bordeaux Cedex, France
[4]Université Bordeaux Segalen, 146 rue Léo-Saignat, 33076 Bordeaux Cedex, France

Objective: To understand lifetime limitations of mechanical and viscoelastic properties of direct composite resins, we evaluated the consequences of ageing of dental composite resins on glass transition temperature (Tg) and mechanical properties (rigidity, viscoelasticity).
Methods: A dynamic mechanical analyser was used to study the evolution of the physicochemical characteristics of Filtek Supreme XTE™ (3 M) dental posterior composite resin. The resin matrix contains bis-GMA, UDMA, TEGDMA, PEGDMA and bis-EMA. Fillers are fixed at 72.5 % by weight for the A2 shade used. Polymerisation was carried out according to the manufacturer's instructions with an Elipar™ LED curing light (3 M). The samples were aged at 37 °C for 6 months and 1 year in artificial saliva after polymerisation. Tensile tests were performed on samples of dimensions 6×2×2 mm (L × W × T), with an applied frequency of 1 Hz. The rate of rise in temperature was set at 1 °C/min, under a nitrogen atmosphere, with temperatures in the range

from −50 to +250 °C. Measurements were performed three times on each sample.
Results: The initial Tg is 100+/−1.We observed a statistically significant decrease in Tg after 6 months ($p<10^{-7}$). The Tg value stabilizes after between 6 months and 1 year (p=0,12). At 37 °C (oral cavity temperature), the changes in mechanical parameters, tan δ (loss factor or damping coefficient), E′ (real modulus or storage modulus), and E″ (loss modulus), were not statistically significant between 6 months and 1 year.
Conclusion: The glass-rubber transition is the reversible change occurring in materials at a certain temperature, Tg, from a hard and relatively brittle state (lower temperatures) into a rubber-like state (above Tg) .The Tg of Filtek Supreme XTE™ (3 M) decreases with time of ageing. The Tg, measured under 3 conditions, was found to present values slightly higher than the extreme intraoral temperatures, e.g. 0–60 °C, reported in the literature.

154

Category: Biomaterials

QUALITY OF CURE IN DEPTH OF ALL COMMERCIALLY AVAILABLE BULK-FILL COMPOSITES

Julian G Leprince[1], Gaetane Leloup[2]
[1]School of Dentistry and Stomatology, Université catholique de Louvain, Bruxelles, BELGIUM
[2]Institute of Condensed Matter and Nanosciences, Bio- and Soft-Matter, Université catholique de Louvain, Louvain-la-Neuve, BELGIUM

Objective: Bulk-fill composites (BFs) are an emerging class of resin-based composites, claimed to enable the restoration build up in thick layers (≤4 mm). The work objective was to compare quality of cure in depth of all currently available BFs to two conventional composite materials: GrandioFlow (VOCO) and Grandio (VOCO).
Methods: TetricEvoCeramBulkFill (Ivoclar-Vivadent), VenusBulkFill (Heraeus-Kuzer), SDR (Dentsply), X-traFil (VOCO), X-traBase (VOCO), SonicFill (Kerr), FiltekBulkFill (3 M-Espe), Xenius (GC), and both reference materials were light-cured during 20s in a Teflon mold of 5×5 mm aperture and 10 mm depth. Degree of conversion (DC) and Microhardness (MHdry) were measured at every millimeter along the sample side (n=3) using Raman Spectrometry and Vickers microindentation. MH measurement was repeated after 24 hours ethanol storage (MHeth), to evaluate crosslinking density. Data were analyzed by one-way ANOVA and Tukey's test (p=0.05).
Results: Upper-surface MH of BFs (dry or eth) are all significantly lower than Grandio, and also lower than GrandioFlow except for SonicFill and X-traFil. DC is relatively stable for all materials within the first 4 mm (≥ 80 % of upper-surface value), then decreases at different magnitudes for all materials, except X-traBase, VenusBulkFill, SDR and FiltekBulkFill. However, even for the latter, the influence of depth on MHdry is more pronounced and even more so on MHeth, also within the first 4 mm. In that area, MH (dry or eth) of all materials except X-traFil, Grandio and SonicFill are either comparable to GrandioFlow or lower.
Conclusion: Even though DC values seem to confirm the capacity of BFs to be cured in thick layers (≤4 mm), it is questioned by MH data. Ethanol storage highlights that BFs are subject to important softening, probably due to different crosslinking densities. Hence, this work highlights not only intrinsic differences in DC and crosslinking between materials, but also that BFs quality of cure in depth is subject to caution.

170

Category: Biomaterials

THE EFFECT OF TOOTHBRUSHING ON SURFACE GLOSS OF CERAMICS AND COMPOSITE RESINS

Lefever D, Perakis N, Mignani G, Krejci I, Ardu S
University of Geneva, Geneva, Switzerland

Abstract
Objective: The purpose of this study is to determine the changes in surface gloss of different ceramic and composite materials after in vitro toothbrushing simulation.
Methods: Twenty-four specimens were fabricated for each material and polished with 120-, 220-, 500-, 1200-, 2400- and 4000-grit SiC abrasive paper, respectively. Gloss measurements were made with a glossmeter (Novocurve Gloss-Meters, NY, USA) prior to testing procedures and then subjected to simulated toothbrushing for 5, 15, 30 and 60 minutes by means of an electrical toothbrush with a pressure of 2 N while being immersed in a 50 RDA toothpaste slurry. Four supplementary samples per group were analyzed under SEM immediately after polishing procedures and four samples after 60 min simulated toothbrushing in order to evaluate the causes of the gloss decrease. The tested materials were two veneering ceramics for ZrO_2 (Cerabien ZR, Kuraray Noritake Dental Inc and IPS E.max Ceram, Ivoclar Vivadent), two feldspathic veneering ceramics that are recommended for metal ceramics (EX-3, Kuraray Noritake Dental Inc and IPS d.SIGN, Ivoclar Vivadent) and one resin composite material (Filtek Supreme XTE, 3 M ESPE). Natural enamel represented the control group. Statistical analysis was performed using One-Way ANOVA and Tukey post-hoc test, with a level of significance set at 0.05.
Results: Gloss values of the tested materials ranged from 100.3 to 106.5 at baseline to 63.5 to 100.6 after one hour of brushing. Highest gloss values after 60 min of brushing were obtained by d.SIGN and EX-3, followed by IPS E.max Ceram. Lowest values were obtained by Filtek Supreme XTE. Natural enamel was the only substrate which performed best and maintained its gloss throughout the brushing procedure (110.4 after 60 min). SEM analysis revealed different patterns of surface degradation dependant onto the material.
Conclusion: None of the tested materials performed as well as natural enamel. Some restorative materials exhibit a decreased gloss due to tooth brushing, which might result in an esthetic problem.

174

Category: Biomaterials

DETECTION OF BISPHENOL A IN COMMERCIAL BIS-GMA AND HEMA-BASED RESINS USING CHEMICAL DEGRADATION AND INFRARED SPECTROGRAPHY

Azevedo Christophe[1], Ducharne Jacques[2], Cenedese Pierre[3], Dubot Pierre[4]
[1]UFR odontologie Paris 7, Rothschild
[2]UFR odontologie Paris 7, Rothschild
[3]laboratoire MCMC, CNRS, THIAIS
[4]laboratoire MCMC, CNRS, THIAIS

Objectives: The scientific world has recently communicated to the highly toxic Bisphenol A. This compound is present in a bound form in the majority of dental resins composite used in particular in pediatric dentistry whereas is a known xenobiotic. In vitro studies on the degradation of composite resins show conflicting conclusions about the presence of BPA in isolated form. In our study, using a new methodology to Infrared spectrographic, complementary chromatography, allows a fine discrimination of the presence of BPA.

Methods: HEMA contents in the RMGIC, Fuji II LC®(GC,Japan), and Bis-GMA contents in a dental resin composite, Herculite XRV® (kerr, USA), were processed with acetonitrile and worn on a metal surface titanium coated nanotubes to increase the quantity and therefore the detectability of elements by using an infrared spectrometry (FTIR) analysis performed to discriminate Bisphenol A. Identification of BPA is made by looking for very intense absorption bands in the region 1500–1600 cm^{-1} corresponding to the stretching mode of the CH bonds of aromatic C_6H_5.
Results: FTIR analysis clearly shows the presence of BPA in the composition of the dental resin composite studied before and after polymerization, but can not reveal the presence of BPA isolated after high chemical degradation. Degradation of the HEMA containing in the RMGIC shows no trace of benzene group characteristics of BPA.
Conclusion: Our results are consistent with recent studies references, highlighting the presence of BPA in the composition of dental resin composite before and after curing, but no BPA was formed from Bis-GMA by chemical-induced hydrolysis.

179

Category: Biomaterials

COMPOSITE SHRINKAGE VECTOR PATTERNS IN NON-ADHESIVE TEFLON CAVITIES

Dalia Kaisarly[1,3], Peter Roesch[2], Reinhard Hickel[3], Karl-Heinz Kunzelmann[3]
[1]Biomaterials Department, Faculty of Oral and Dental Medicine, Cairo University, Cairo, Egypt
[2]Faculty of Computer Science, University of Applied Sciences, Augsburg, Germany
[3]Dept of Rest Dent, Period & Pedodont, University of Munich, Munich, Germany

Objective: The direction of polymerization shrinkage for self-cured materials is generally toward the center of the mass, while light-cured composites are believed to shrink toward the light source. The aim of this study was to visualize the polymerization shrinkage of a light-initiated flowable resin composite in form of displacement vector fields (DVF) and to detect the shrinkage direction in a non-adhesive cavity in relation to the light-source.
Methods: A cylindrical cavity (diameter 6 mm, depth 3 mm, $n=8$) was prepared into a teflon block and filled with a flowable resin composite (Tetric EvoFlow, Ivoclar Vivadent) to which 2 wt% traceable glass-beads were added. Two micro-CT scans were performed of each specimen (uncured, cured), subjected to image segmentation for extraction of glass beads and followed by registration based on a block-matching algorithm. The DVF exhibited the distribution of shrinkage vectors three-dimensionally. Additionally, shrinkage vectors were analyzed in the vertical dimension (related to the light source).
Results: Mean vector lengths (23.0 μm; SD=5.2) were computed irrespective of their direction. Analyzing the shrinkage direction in relation to the light-source, the filler movement (FM) was investigated in the z-direction only, where negative values denoted an upward movement towards the light-source and positive ones meant downward shrinkage. The mean FM (−1.1 μm; SD=10.6) moved away from light. DVF clearly showed shrinkage to the center, where the downward movement was slightly greater than the upward movement toward the light source, while the lateral movement was slightly deviated toward one side.
Conclusion: The composite shrank centrally, although it was a light-cured type, concluding that this pattern was related to the fact that it was unbonded. Shrinkage in lateral direction was greater at one side, which is possibly the site of least resistance to adaptation and first detachment due to shrinkage. Shrinkage pattern is related to bonding conditions and not type of activation.

186

Category: Biomaterials

RMGI'S SETTING REACTION: HEMA RELEASE WITH VARIOUS DELAYS BEFORE LIGHT-ACTIVATION

Elisabeth Dursun[1,2], Mie-Leng Tang[1], N Dorin Ruse[3], Jean-Pierre Attal[1,4], Michael Sadoun[1,2]
[1]Biomaterials and Interfaces Research Unit , Faculty of Dental Surgery, University of Paris Descartes, France
[2]Mondor-Chenevier Hospital Complex, Créteil, France
[3]Faculty of Dentistry, University of British Columbia, Vancouver, Canada
[4]Charles Foix Hospital, Ivry-sur-Seine, France

Objective: The setting of resin-modified glass ionomers (RMGI) involves two mechanisms: the acid-base reaction between polyalkenoic acid and fluoro-alumino-silicate glass particles, and the polymerization of HEMA monomers. Each reaction may rely on and/or compete with the other. The moment of light-activation after RMGI mixing could determine the extent of resin polymerization and also impact on the amount of residual monomer released. The aim of this study was to investigate, with high performance liquid chromatography (HPLC), the release of HEMA from a RMGI set with various time delays before light-activation.
Methods: Forty five specimens of Fuji II LC RMGI were prepared in (25×2×2) mm silicone moulds. Five groups ($n=3$/group) were investigated: a) control group with no light-curing (LC); b) LC delayed 1 min after mixing; c) LC delayed 5 min after mixing; d) LC delayed 10 min after mixing; and e) LC delayed 15 min after mixing. The specimens were removed from the moulds 15 min after mixing. Thereafter, they were immersed in 10 mL of 25 % deionized water-75 % ethanol. 20 μL solution was taken from each container at 1 h, 6 h, 24 h, 7 d, 14 d, and 28 d intervals and HEMA release was analyzed with HPLC. This experiment was performed 3 times. The data were subjected to two-way ANOVA and Tukey tests at a 0.05 significance level.
Results: A delay in LC after RMGI mixing caused a significant increase in the cumulative HEMA release. The highest HEMA release was determined for the group without LC.
Conclusion: Delayed LC reduced the extent of resin polymerization and increase the HEMA release. This also may be relevant both to the risk of adverse pulpal responses and/or local and systemic allergic-related reactions.

198

Category: Biomaterials

EFFECT OF ADHESIVE APPLICATION ON COMPOSITE INLAYS IN MICROTENSILE BOND STRENGTH USING A SELF-ADHESIVE RESIN CEMENT IN CLASS II CAVITIES

Maria Cura[1], Dayana Da Silva[2], M[a] Victoria Fuentes[3], Laura Ceballos[4]
Health Sciences Faculty, Rey Juan Carlos University, Alcorcón (Madrid)

Objective: To evaluate the influence of the application of adhesive on the inlay intaglio surface in the microtensile bond strength (MTBS) of composite inlays luted with a self-adhesive resin cement.
Methods: Sixteen molars were selected and an expulsive Class II OM (inlay) cavity preparation was performed in each tooth, with the gingival margin located 1 mm below cementoenamel junction. Composite inlays (Gradia Indirect,GC) were prepared and their intaglio surfaces were sand-blasted, and randomly divided into

two experimental groups according to the treatment applied on their intaglio surface: (1) No treatment, (2) Adhesive application with Scotchbond 1XT (3 M-ESPE). Composite inlays were luted with the self-adhesive resin cement G-Cem (GC). After one week of storage, the samples were prepared for MTBS testing (Instron 3345). The results were analyzed using Mann-Whitney U Test for umpaired samples in the proximal and occlusal box ($p<0.05$).
Results: Means (standard deviation) in MPa are showed in the table below. For both proximal and occlusal boxes of class II restorations, the MTBS to dentine of composite inlays luted with the self-adhesive G-Cem, was higher when the adhesive was applied on the inlay intaglio surface.
Conclusion: Adhesive application of composite inlays significantly improved the MTBS in class II indirect restorations when the self-adhesive resin cement G-CEM was used for luting.

PROXIMAL BOX				OCCLUSAL BOX			
GROUP 1		GROUP 2		GROUP 1		GROUP 2	
x (sd)	n	x (sd)	n	x (sd)	n	x (sd)	n
23.63 (13.03)	15	12.1 (13.52)	22	31.11 (12.8)	16	11.55 (10.34)	34

204

Category: Biomaterials

PROPERTIES OF FOUR CAD-CAM MATERIALS: FLEXURAL STRENGTH, HARDNESS AND ADHERENCE TO THREE CEMENTS

Hélène Fron Chabouis[1,2,3*], Mie Leng Tang[1], Stéphane Le Goff[1], Jean-Pierre Attal[1,2]
[1]Dental materials department, Faculté de chirurgie dentaire, Université Paris Descartes, Sorbonne Paris Cité, Montrouge, France
[2]Dental department, Hopital Charles Foix, AP-HP, Ivry-sur-Seine, France
[3]Ecole doctorale Galilée, Université Paris 13, Villetaneuse, France

Objectives: Inlays and onlays can be CAD-CAM manufactured. Vita Mark II (MK), Empress CAD (EMP), eMax CAD (EM) and Lava Ultimate (LU) are among the most frequently milled blocks. Our objective was to compare some characteristics of these materials in vitro, to understand how they will perform clinically.
Methods: Flexural strength and Vickers hardness were measured. The influence of a heat treatment and of the block's colour (with colour gradient: Multi; of plain colour: Pl) was investigated. Slices of each material were embedded in resin, polished and their surface treated. A composite cylinder was luted to the surface with one of three adhesive resins (NX3, NX; Panavia F2, PF; RelyX Unicem, RX). Specimens were stored in water. Shear bond strength was recorded. Stata 12 was used to perform analyses and tests at $\alpha=0.05$.
Results: Flexural strength in MPa was 102±7 for MK, 105±8 for MK heat-treated; 123±15 for EMP Multi, 140±23 for EMP Multi heat-treated; 141±33 for EMP Pl, 130±23 for EMP Pl heat-treated; 330±46 for EM; 220±7 for UL. Except for UL and EM, the flexural strength of all materials was not significantly different. Vickers hardness was 621±35 for MK, 514±35 for EMP, 616±15 for EM and 106±3 for UL. Vickers hardness was lowest for UL, not significantly different in all EMP groups, and highest for EM and MK. Adherence in MPa for UL after 24 h was 19±5 for NX, 20±2 for PF and 30±7 for RX. The adherence obtained with RX was significantly higher.
Conclusion: Block's colour and heat-treatment after milling did not modify mechanical properties. UL and EM were more resistant to flexural stress, which could result in better long-term resistance. Antagonist wear could be higher for EM and MK, whereas UL restorations could wear through time. Cements behaved differently, which could influence long term adhesion.

207

Category: Biomaterials

COLOR STABILITY OF TWO CALCIUM SILICATE-BASED MATERIALS, WHITE MINERAL TRIOXIDE AGGREGATE AND BIODENTINE

Marta Vallés[1], Montserrat Mercadé[1], Fernando Duran-Sindreu[1], José Luis Bourdelande[2] & Miguel Roig[1]
[1]Department of Restorative Dentistry and Endodontics, Universitat Internacional de Catalunya, Sant Cugat del Vallès, Barcelona, Spain
[2]Department of Chemistry, Universitat Autònoma de Barcelona, Bellaterra, Barcelona, Spain

Objective: Difficult handling, long setting time, and potential discoloration are important drawbacks of white mineral trioxide aggregate (WMTA). The development of Biodentine, a recently developed calcium silicate-based material, has overcome some of these shortcomings; however, there are no available data on its color stability. A previous study showed that WMTA discolors under light irradiation in an oxygen-free environment. The aim of this study is to evaluate the color stability of ProRoot WMTA and Biodentine.
Methods: Fifteen samples of ProRoot WMTA and fifteen of Biodentine were divided into five groups. Each group was exposed to different oxygen and light conditions. A spectrophotometer was used to determine the color of each specimen at 0, 120 seconds, and 5 days. Data were analyzed using analysis of variance and Tukey's honestly significant difference test.
Results: The ProRoot WMTA showed dark discoloration after light irradiation in an oxygen-free environment, statistically significantly different from Biodentine. In groups that were exposed to no light irradiation or to an oxygen atmosphere, the two materials showed color stability over time and no significant differences were observed among them. Biodentine maintained color stability in all conditions over time.
Conclusion: The clinical application of ProRoot WMTA in an aesthetically sensitive area should be avoided because of the risk of discoloration, the use of Biodentine could offer a viable alternative.

215

Category: Biomaterials

COLOR STABILITY OF INDIRECT CAD-CAM COMPOSITES VERSUS LABORATORY-PROCESSED INDIRECT COMPOSITES AFTER IMMERSION IN STAINING SOLUTIONS

Mariana Arocha[1], Full Juan Basilio[1], Miguel Roig[1], Dorien Lefever[2], Stefano Ardu[2], Juan R Mayoral[1]
[1]Department of Restorative Dentistry, International University of Catalonia, Barcelona, Spain
[2]Division of Cariology and Endodontology, School of Dentistry, University of Geneva, Switzerland

Objective: The aim of this study was to determine, by using a spectrophotometer device, the color stability of two indirect CAD/CAM composites in comparison with two indirect laboratory-processed composites after being immersed in different

staining solutions such as coffee, black tea, and red wine, using distilled water as control group.
Methods: Two indirect CAD/CAM composites (Lava Ultimate and Paradigm MZ100) and two indirect laboratory-processed composites (SR Adoro and Premise Indirect) of shade A2 were selected to measure their color stability (160 disk samples) after 4 weeks of immersion in three staining solutions (black tea, coffee, red wine) and distilled water. The specimen's color was measured each week by means of a spectrophotometer (CIE L*a*b* system). Statistical analysis was carried out performing an ANOVA and LSD Test in order to statistically analyze differences in L*a*b*and ΔE values.
Results: All materials showed significant discoloration ($p<0.05$) when compared to the control group (immersed in distilled water). The highest ΔE observed was with red wine, whereas black tea led to the lowest one. Indirect laboratory-processed resin composites showed highest color stability compared with CAD/CAM resin blocks.
Conclusion: CAD/CAM resin composites immersed in staining solutions showed lower color stability when compared with indirect laboratory-processed resin composites.

220

Category: Biomaterials

PORTUGUESE CLINICIAN'S CHOICES OF RESTORATIVE MATERIALS FOR CHILDREN

Sofia Arantes-Oliveira [1], Joana Frois [1], Henrique Luis [1], Mario Bernardo [1], Jaime Portugal[1]
[1]Faculty of Dental Medicine, University of Lisbon, Portugal

Objective: To survey Portuguese dentists on their restorative materials choice for children, in particular to understand their knowledge and usage of a colored compomer (Twinky Star, VOCO).
Methods: A questionnaire was developed in Portuguese and tested by a focus group. Questionnaire was distributed to the participants ($n=88$) of the 2nd meeting of the Portuguese Society of Pediatric Dentistry (Lisbon-2012). These were dentists (41), students (10) and dental hygienists (37). Data were treated with SPSS (SPSS v.19.0 IBM) using non-parametric statistics (Pearson's Chi Square).
Results: The overall response rate was 69 % for all the participants. 92 % of the dentist responded and of these, 28,9 % were pediatric dentists. 82 % of all participants knew Twinky Star and 63,9 % considered it a good material to achieve children cooperation. Composite resin (55,3 %) and glass ionomer (50 %) were the most materials for deciduous teeth restorations. Dimension of the cavity (31,6 %) and fluoride release (15,8 %) were the items that most influenced dentists materials choice. 94,7 % of the dentists knew Twinky Star and 68,4 % thought it is efficient to restore deciduous teeth. The materials most chosen by dentists according to each clinical scenario were composite resin, glass ionomer and compomer. 80 % of the dentists that answer to the question (92,1 %) would use Twinky Star in one of these scenarios, preferentially in an occlusal restoration. Children behaviour would preferentially influence a paediatric dentist choice of material (fisher's exact test $p=0,047$). No other differences were found between pediatric and general dentists.
Conclusion: Most of the participants knew about Twinky Star but fewer use it in daily practice, although they consider using it in the clinical scenarios presented. Portuguese dental clinicians favor the use of resin-based materials in deciduous teeth restorations.
Work developed at UICOB, R&D unit nº4062 of the Portuguese foundation for science and technology (FCT)

222

Category: Biomaterials

CHARACTERIZATION OF TOOTH TISSUE PROPERTIES BY COMBINING RADIOGRAPHIC WITH ULTRASONIC COMPUTED DATA

Christoph John[1], Ashraf El-Ayouti[1], Michael Aschenbrenner[1,2], Claus Löst[1]
[1]Department of Conservative Dentistry, School of Dental Medicine, University of Tübingen
[2]Private Dental Practice, Southern Germany

Over the past 40 years, increasing efforts were made to (in-) directly characterize the mechanical properties of biological tissues and the changes thereof. Since dental treatments may cause alterations of internal structures, knowledge about their involvement and the mechanical properties are important. However, hidden structures can't be easily diagnosed for hard tissues by any non-invasive *in vivo*- method.
Objective: To evaluate the feasibility of a dually non-invasive prototype concept and to determine its frequency of success during simultaneous acquisitions of quantitative diagnostic data.
Methods: $N=20$ single rooted, wet premolars with fully developed roots were selected. All teeth were embedded into brass sockets that fit into two mounting platforms. The platforms were specially constructed for radiographic [r_] and acoustical [a_] surveys with/without replacement of specimens. Initial pass (p)/fail (f) criteria of detection were formulated. Radiographic data were digitized and stored. All runtimes and events of acoustical waves propagating twice through the cementum layer [C] were stored. The frequency of success was counted up, provided that (p) is fulfilled [C(p)]. The relative success rate was calculated utilizing r(C) =100 %·C(p)/N. Analogously, data of waves propagating deeper into teeth (*i.e.* through dentin [D], the endodontic system [ES]) were captured with proper phase distinctions, too. Two specimens were fabricated from PMMA serving as controls [P1, P2].
Results: Half of the data described the mechano-acoustical behaviour of hidden structures near an interface. The relative a_success rates for a(C), a(D), a(ES), a(P1), and a(P2) were 60 %, 0,95 %, 20…35 %, 100 %, and <5 %, respectively. Using r_values of tooth wall geometries, the mechano-acoustical behaviour was related to tissue elasticity.
Conclusion: The combined usage of ultrasonic and radiographic data served as a promising attempt for evaluating the mechanical properties of individual root tissue layers and helped to clarify whether a certain tissue portion did alter or not.

235

Category: Biomaterials

CORRELATION BETWEEN THE COLORIMETRIC PARAMETERS AND THE OPACITY OF "DENTIN BASE" SHADES OF AN INDIRECT RESIN COMPOSITE: VITA VM LC

A. Merg[1], J.L. Ferracane[2], P. Zyman[3], P. Jonas[3], J.-P. Salomon[2,4]
[1]Vita Company, Germany
[2]OHSU, Portland, Oregon, USA
[3]Private Practice, Paris, France
[4]Dental Biomaterials Department, Dental Surgery Faculty, Nancy, France

Objective: To assess the correlation between the colorimetric parameters (CP) and the opacity parameters (OP) of the 27 "dentin base" shades of an indirect resin composite: Vita VM LC (Vita Company).

Methods: Five 1 mm thick samples were prepared for each color according to the manufacturer's recommandations, stored for one week after the light curing at 37 °C in dry and dark air before the colorimetric evaluation. One reading per sample was performed on a white and a black background using a color guide (Byk Gardner, illuminant A/2°, illuminating/viewing geometry 45°/0°). Ten CP were measured on a white background: L*, a*, b*, C*, h °, X, Y, Z, x, y. Opacity was calculated using 5 OP: Delta L*- ΔL*, Contrast Ratio L*- CR L*, Delta Y- ΔY, Contrast Ratio Y- CR Y, Translucency Parameter- TP. Linear correlations were calculated between the CP and the OP. The R^2 data are given in the following table.
Results:

	CP									
OP	L*	a*	b*	C*	h°	X	Y	Z	x	y
Δ L*	0,8267	0,8901	0,6370	0,6814	0,2244	0,7545	0,8143	0,8379	0,8136	0,1069
CR L*	0,7156	0,8602	0,6518	0,6931	0,2071	0,6331	0,7013	0,7787	0,8023	0,1281
Δ Y	0,8966	0,8957	0,6178	0,6618	0,2597	0,8598	0,9093	0,8866	0,8106	0,0958
CR Y	0,7130	0,8732	0,6657	0,7061	0,2313	0,6511	0,7204	0,8010	0,8186	0,1350
TP	0,7334	0,6000	0,2624	0,3064	0,0627	0,6953	0,7062	0,5033	0,4561	0,0006

Conclusion: Within the limitations of this *in vitro* study we can conclude that:
1. The "dentin base" shades exhibit different levels of opacity,
2. The correlation between Y and Δ Y was the highest (R^2=0.9093) and should be used as a standard for further investigations.

236

Category: Biomaterials

COLORIMETRIC COMPARISON AMONGST VARIOUS COMPOSITE BRANDS WITH IDENTICAL SHADE CODE

L. Moreau[1], J.L. Ferracane[2], P. Zyman[3], P. Jonas[3], J.-P. Salomon[2,4]
[1]GC Company, French Division
[2]OHSU, Portland, Oregon, USA
[3]Private Practice, Paris, France
[4]Dental Biomaterials Department, Dental Surgery Faculty, Nancy, France

Objective: To assess the colorimetric differences between various resin composite brands (G-aenial Anterior, G-aenial Flo and G-aenial Universal Flo; all products from GC company) with identical shade code (A1, A2, A3, A3.5, A4).
Materials and Methods: Five 1 mm thick, disk-shaped samples were prepared for each color were prepared according to the manufacturer's recommandations. Samples were stored for one week after the light curing at 37 °C in dry and dark air before the colorimetric evaluation. One reading per sample was performed on a white background a color guide (Byk Gardner): illuminant D65/2°, illuminating/viewing geometry 45°/0°. Three colorimetric parameters were measured: L*, a*, b*. Colorimetric differences were assessed using ΔE^*_{ab} G-aenial Anterior / G-aenial Flo, ΔE^*_{ab} G-aenial Anterior/G-aenial Universal Flo and ΔE^*_{ab} G-aenial Flo/G-aenial Universal Flo.
Results: Mean (standard deviations) of ΔE^*_{ab} are given in the table.

Shades	ΔE^*_{ab} G-aenial Anterior / G-aenial Flo	ΔE^*_{ab} G-aenial Anterior/G-aenial Universal Flo	ΔE^*_{ab} G-aenial Flo/G-aenial Universal Flo
A1	1.79 (0.17)	1.63 (0.16)	2.83 (0.36)
A2	2.57 (0.36)	1.78 (0.06)	3.23 (0.29)
A3	2.20 (0.22)	2.31 (0.09)	3.12 (0.19)
A3.5	3.93 (0.35)	1.34 (0.20)	2.99 (0.19)
A4	3.24 (0.08)	1.02 (0.05)	3.31 (0.13)

Conclusions: Within the limitations of this in vitro study we can conclude:
1. Colorimetric differences were always higher than 1.00,
2. Differences between resin composite brands with identical shade can be easily clinically detected,
3. Differences should be known by the practitioner before their clinical use mainly in the case of the restoration of resin composite fractures

237

Category: Biomaterials

CORRELATION BETWEEN THE THICKNESS OF THE SAMPLES AND THE OPACITY OF THE ENAMEL SHADES OF A MICRO-HYBRID NANO-FILLED REINFORCED RESIN COMPOSITE

J.-P. Salomon[1,3], P. Zyman[2], P. Jonas[2], J.L. Ferracane[3]
[1]Dental Biomaterials Department, Dental Surgery Faculty, Nancy, France
[2]Private Practice, Paris, France
[3]OHSU, Portland, Oregon, USA

Objectives: To assess the correlation between the thickness and the opacity of the 6 enamel shades (Adult-AE, Cervical-CV, Incisal-IE, Junior-JE, Senior-SE, Translucent Enamel-TE) of a micro-hybrid nano-filled resin composite: G-aenial Anterior (GC Company).
Materials and Methods: Five 0.2, 0.4, 0.6, 0.8, 1.0, 1.2, 1.4, 1.8, 2.0 mm thick samples were prepared for each color according to the manufacturer's recommandations, stored for one week after the light curing at 37 ° C in dry and dark air before the colorimetric evaluation. One reading per sample was performed on a white and a black background using a color guide (illuminant D55/10°, illuminating/viewing geometry 45°/0°) to obtain L*, a*, b* and Y parameters. Opacity was calculated using Contrast Ratio Y- CR Y, and Translucency Parameter- TP. Correlations were calculated between the thicknesses of the samples (x) and their opacity (y) using different formulas ($y=a.x+b$; $y=a.Ln(x)+b$; $y=a.x^b$; $y=a.e^{b.x}$; $y=a.x^2+b.x+c$). The R^2 data are given in the following table.
Results:

shades	opacity	$y=a.x+b$	$y=a.Ln(x)+b$	$y=a.x^b$	$y=a.e^{b.x}$	$y=a.x^2+b.x+c$
AE	CR Y	0,9827	0,9610	0,9963	0,8695	0,9991
	TP	0,8796	0,9973	0,9517	0,9908	0,9865
CVE	CR Y	0,9944	0,9408	0,9976	0,8779	0,9992
	TP	0,9047	0,9994	0,9589	0,9869	0,9871
IE	CR Y	0,9960	0,9309	0,9990	0,9018	0,9989
	TP	0,9192	0,9970	0,9535	0,9889	0,9945
JE	CR Y	0,9824	0,9586	0,9973	0,8831	0,9988
	TP	0,8900	0,9970	0,9512	0,9895	0,9916
SE	CR Y	0,9958	0,9262	0,9985	0,8948	0,9975
	TP	0,9137	0,9981	0,9463	0,9919	0,9895
TE	CR Y	0,9963	0,8979	0,9984	0,9127	0,9967
	TP	0,9465	0,9917	0,9508	0,9890	0,9922

Conclusions: Within the limitations of this in vitro study we can conclude that:

1. Opacity of the samples was always significantly correlated with their thickness whatever the shade,
2. No significantly difference was observed between the five formulas.

238

Category: Biomaterials

INFLUENCE OF THE USE OF AN ENAMEL PALATAL WALL ON THE COLORIMETRIC PARAMETERS OF LAYERED RESTORATIONS USING CERAM'X DUO+: AN *IN VITRO* EVALUATION

P. Zyman[1], J.L. Ferracane[2], P. Jonas[3], J.-P. Salomon[2,4]
[1]Private Practice, Paris, France
[2]OHSU, Portland, Oregon, USA
[3]Dental Biomaterials Department, Dental Surgery Faculty, Nancy, France

Objectives: To assess the usefullness of an enamel palatal wall during the layering procedure of a resin composite.
Materials and Methods: Dentin shades (DB,D1,D2,D3,D4) were used in combination with enamel shades (E1,E2,E3) to simulate 9 clinically relevant situations (DB,D1,D2 layered with E1; D1,D2, D3 layered with E2; D2,D3,D4 layered with E3): dentin and enamel shades from Ceram'X Duo + resin composite (Dentsply company).
Layered restorations controls were made of 1 mm labial enamel layer (LEL)+2 mm dentin layer (DL)+0 mm palatal enamel layer (PEL): 1-2-0 and compared with different combinations: 1 mm LEL+1.8 mm DL+ 0.2 mm PEL: 1-1.8-0.2; 1 mm LEL+1.6 mm DL+0.4 mm PEL: 1-1.6-0.4 ; 1 mm LEL+1.4 mm DL+0.6 mm PEL: 1-1.4-0.6; 1 mm LEL+ 1.2 mm DL+0.8 mm PEL: 1-1.2-0.8) using the 5 following ΔE^*_{ab} values: ΔE^*_{ab} 1-1-1/1-2-0; ΔE^*_{ab} 1-1-1/1-1.8-0.2; ΔE^*_{ab} 1-1-1/1-1.6-0.4; ΔE^*_{ab} 1-1-1/1-1.4-0.6; ΔE^*_{ab} 1-1-1/1-1.2-0.8). Colorimetric readings (n=5) were performed using a spectrocolorimeter (illuminant D65/10°; illuminating/viewing geometry 45°/0°) with layered combinations placed on a black background to obtain L*,a*,b* parameters.
Results: Mean (standard deviations) of ΔE^*_{ab} are given in the table.

	Layered resin composites restorations:								
	DB +	D1 +	D2 +	D1 +	D2 +	D3 +	D2 +	D3 +	D4 +
ΔE^*_{ab}	E1			E2			E3		
ΔE^*_{ab} 1-2-0/1-1-1	0.56 (0.35)	0.58 (0.08)	0.92 (0.19)	0.56 (0.42)	0.81 (0.33)	1.34 (0.12)	0.51 (0.22)	1.19 (0.28)	1.65 (0.28)
ΔE^*_{ab} 1-2-0/1-1.2-0.8	0.54 (0.22)	0.20 (0.05)	0.58 (0.23)	0.49 (0.43)	0.53 (0.17)	0.88 (0.13)	1.09 (0.22)	1.23 (0.20)	1.04 (0.17)
ΔE^*_{ab} 1-2-0/1-1.4-0.6	0.46 (0.28)	0.38 (0.21)	0.56 (0.16)	0.47 (0.31)	0.54 (0.13)	0.48 (0.17)	0.36 (0.12)	0.78 (0.17)	1.45 (0.26)
ΔE^*_{ab} 1-2-0/1-1.6-0.4	0.31 (0.15)	0.27 (0.14)	0.54 (0.20)	0.45 (0.27)	0.54 (0.18)	0.58 (0.22)	0.33 (0.21)	0.45 (0.23)	0.73 (0.18)
ΔE^*_{ab} 1-2-0/1-1.8-0.2	0.20 (0.03)	0.39 (0.13)	0.25 (0.15)	0.61 (0.35)	0.76 (0.20)	0.35 (0.11)	0.36 (0.19)	0.98 (0.22)	0.30 (0.13)

Conclusions: Within the limitations of this in vitro study and taking into account the threshold level of the perception of a colorimetric difference fixed to 1, we can conclude:
1. layering procedures are sensitive to the use of an enamel palatal wall for the E2/D3, E3/D2, E3/D3, E3/D4 combinations,
2. layering procedures are not sensitive to the use of an enamel palatal wall for the E1/DB, E1/D1, E1/D2, E2/D1, E2/D2 combinations,

241

Category: Biomaterials

BIOACTIVATION OF BACTERIAL CELLULOSE WITH HYDROXYAPATITE FOR TISSUE ENGINEERING

Neftaha Tazi[1,3], Ze Zhang[2], Younès Messaddeq[3] and Mahmoud Rouabhia[1]
[1]Groupe de Recherche en Écologie Buccale, Faculté de Médecine Dentaire, Université Laval, Québec, QC, Canada
[2]Département de chirurgie, Faculté de médecine, Université Laval, Centre de recherche de l'Hôpital Saint-François d'Assise, CHUQ, Québec, QC, Canada
[3] Département de physique, génie physique et d'optique, Faculté de Sciences et génie, Université Laval, Québec, QC, Canada

Objectives: Bone loss caused by trauma, neoplasia, reconstructive surgery, congenital defects, or periodontal disease is a major worldwide health problem. The regeneration of complex bone structures such as joints, craniofacial structures will involve vastly more complex challenges including appropriate scaffold. One of the materials that can be used to design bone scaffold can be BC. This is produced from *Ax,* and is a biocompatible polymer with excellent physical and chemical properties characterized by high tensile strength, elastic modulus and hydrophilicity. The fibrous structure of BC is similar to the collagenous fibers of bone. These characteristics support BC as a useful scaffolding material in regenerative medicine. The purpose of this study was to investigate if whether BC and BC-HA can promote osteoblast growth and bone nodule formation.
Methods: *Ax* was cultivated in static culture. BC pellicles were harvested and cleaned, then activated by the addition of HA. The mixture was then vigorously stirred, poured into rectangular molds. BC polymer with and without HA was subjected to XPS analysis, and used for in vitro osteoblasts cultures.
Results: XPS analysis revealed the presence of both calcium and phosphate at the surface of the BC/HA membrane. Osteoblast culture showed that BC alone was not toxic and could sustain osteoblast adhesion. Furthermore, osteoblast adhesion and growth were significantly increased on BC/HA membranes as compared to BC alone. Both BC and BC/HA membranes improved osteoconductivity, as confirmed by the level of ALP activity. BC/HA membranes also showed greater nodule formation and mineralization than the BC membrane alone. This was confirmed by ARS and EDX.
Conclusion: Together, these data suggest that BC could be an appropriate support for bone tissue engineering. With the incorporation of active molecules such as HA, BMP2, the osteogenic potential of bacterial cellulose polymers may be optimized for multiple tissue engineering tools.

001

Category: Clinical Cases

RESTORATION OF SINGLE TOOTH LOSS WITH FIBER REINFORCED RESIN BONDED COMPOSITE : TWO CASE REPORT

Zeynep ÖNCEL TORUN[1], Alper AKGÜRBÜZ[2]
[1]Gulhane Military Medical Academy, Department of Restorative Dentistry and Endodontics, Ankara/TURKEY
[2]Mevki Military Hospital, Ankara/TURKEY

Objective: As an alternative to the traditional restorations in single tooth loss, fiber reinforced adhesive bridges which are more preventive, timesaving and economical methods have been developed.
Case Report: In the first case, a 40-year-old female patient has applied to the hospital in order to eliminate the aesthetic problem occured because of the previously extracted right upper canine and left lateral incisor teeth due to excessive decay. In the second case, a 19-year-old male patient was referred to the clinic for the rehabilitation of his missing lower left second premolar tooth. This case report describes restorative procedure using Ribbond for teeth replacement fiber-reinforced composite.
Discussion: In the treatment of single tooth loss, Fiber-reinforced composite (FRC) bridges can be a good alternative to conventional prosthetic techniques This technique offers a conservative, esthetic, and noninvasive treatment. Moreover, economically more acceptable. FRC substructure provides hardness and durability under composite structure, so that this hardness and durability combines with the aesthetic feature of composite material.
Conclusion: FRC prostheses appear to have a worthwhile role in the conservative treatment of short, edentulous spaces. These restorations remained intact, with no discoloration or deterioration at the recall visits during the one year period.

002

Category: Clinical Cases

EVALUATION RADIX PARAMOLARIS AND ENTOMOLARIS: A CLINICAL CHALLENGE

Diego Barreto Andrade [1], Hashim Al Hassany [2], Amr Radwan[3], Tatiana Rocha Oliveira 4[4], Sahng Gyoon Kim[5]
[1]Columbia University College of Dental Medicine - Division of Endodontics, NYC, USA, Columbia University College of Dental Medicine - Division of Endodontics, NYC, USA
[3]Columbia University College of Dental Medicine - Division of Endodontics, NYC, USA
[4]Columbia University College of Dental Medicine - Division of Endodontics, NYC, USA
[5]Columbia University College of Dental Medicine - Division of Endodontics, NYC, USA

Objective: It is well known that in a daily practice, it is common for endodontists to face challenges related to the unusual anatomical variations of teeth and root canal morphology. For example, an additional root located lingually (Radix Entomolaris) or buccally (Radix Paramolaris) can be found in mandibular molars, and if not diagnosed correctly, it may lead to a failure of the root canal treatment. Both variations are not common in Caucasians (incidence ~3 %), but happen more frequently in Asians and Eurasians (incidence ~5 %–30 %). With the recent increase of race miscegenation and Asian immigration to Europe and United States, it is expected that more and more radix molaris and paramolaris will be presented. Therefore, it becomes more important to understand how to appreciate and manage this root anatomy due to a great range of anatomical variations, which may not be identified easily with a periapical radiograph. The aim of this presentation is to expose clinicians thorough a review about these anatomic variations such as external and internal morphological variations and degrees of separation, the prevalence as well as the clinical management. Three representative clinical cases will be presented to best comprehend the anatomical complexity as well as their clinical implications. With this knowledge, clinicians will be able to understand how to diagnose these variations and avoid procedural errors during endodontic therapy in order to deliver the best treatment when those structures are present.
Key-words: Tooth morphology, paramolaris, entomolaris.

017

Category: Clinical Cases

ASEPTIC NECROSIS OF AN UPPER 2.1 INCISOR BY VASCULAR COMPRESSION OF SUPERNUMERARY. CLINICAL CASE

Martínez Osorio Javier[1], ArroyoBote Sebastiana[2], ManzanaresCespedes Mª Cristina[3]
[1,2]Odontostomatology Department,Faculty of Dentistry, University of Barcelona
[3]Anatomy Department, Faculty of Dentistry, University of Barcelona

Objective: We report a case of a 17 year old patient presented at the dental clinic because she noticed a color change of the upper-left central incisor (2.1) since 48 hours. During clinical inspection the 2.1 incisor presented a darker color than the rest of teeth. After performing a complete exploration and obtaining no response to vitality tests a pulp necrosis of the 2.1 incisor is diagnosed. The goal is the differential diagnosis of possible causes for the necrosis of the 2.1 incisor.
Methods: Differential diagnosis begins with the completion of the medical record, which highlights that the patient had received orthodontic treatment and that she had been operated to extract a supernumerary tooth in the anterior region of the upper maxilla. The patient does not remember having suffered injuries or traumatisms in the incisal region. An oral orthopantomography is requested, where a high-density area is observed at periapical level in the 2.1 area. A three-dimensional CAT (Computed Axial Tomography) is requested, which shows the presence of a supernumerary in the periapical 2.1 region, located in palatine and upwards oriented.
Results: Necrosis by compression of the neurovascular pedicle of 2.1 due to the eruption-follicule growth of the supernumerary is diagnosed. Endodontic treatment and surgical removal of the supernumerary are performed. During surgical removal of the supernumerary the 2.1 neurovascular pedicle is located edematizod-congestive and cause of the 2.1 pulp necrosis.
Conclusion: The presence of supernumerary teeth in the permanent dentition has a frequency of between 0.1 and 3.8 %, one of the possible complications being necrosis of adjacent teeth, so we must take into account the possibility of supernumerary teeth existence during diagnosis, especially in patients with pulp necrosis without previous traumatic dental pathology.

020

Category: Clinical Cases

EVALUATION OF A MODIFIED GLASS IONOMER RESIN AS A FINAL RESTORATION IN ADULT DENTITION AT 6 MONTHS OF PLACEMENT

P. Saorin, J.A. Moreno, J.F. Martinez, F. Chiva, J.C. Baguena
Murcia University PTD department (Spain)

Objective: To evaluate the clinical properties of a resin-modified glass-ionomer (RMGI) used as definitive restorations on posterior adult teeth, 6 months after their placement.

Methods: A resin-modified glass-ionomer was used to restore 12 class I cavities on posterior teeth of adult patients. The restorations were evaluated 6 months after their placement using the modified Ryge criteria for direct evaluation. Color matching, marginal stains and adaptation, wear, restoration stain, secondary caries, postoperative sensitivity, anatomical form, and surface texture were evaluated. Ranging from best to the worst, the ratings were Alpha, Bravo and Charlie.
Results: Colour match scores were 84 % Alpha and 16 % Charlie. Marginal staining were 84 % Alpha. Restoration staining were 92 % Alpha. Marginal adaptation was 75 % Alpha. Anatomical form scores were 84 % Alpha. Bravo scores for surface texture were 16 % and 8 % Charlie. Alpha scores for postoperative sensitivity were 100 %. Secondary caries scores were 8 % Charlie. Wear scores were 75 % Alpha.
Conclusion: The RMGI used as final restoration in adult teeth presented as the main default, color alteration in addition to the existence of other disorders that require a longer-term study for evaluation.

021

Category: Clinical Cases

USE OF ULTRASOUND DOPPLER FOR BETTER DIAGNOSIS OF TOOTH VITALITY

Yongwok Cho*, Sungho Park

Use of ultrasound Doppler for better diagnosis of tooth vitality

Objective: Ultrasound Doppler has been recently introduced in dentistry to detect the blood flow in the pulp spaces. In previous in vitro and in vivo studies, it has been reported that it successfully recorded the blood flow in the pulp spaces. The purpose of this presentation is to explain how it can be applied in clinical dentistry for better diagnosis of tooth vitality.
Methods: Ultrasound Doppler was applied to teeth of patients who had traumatic injury in their anterior teeth. Their vitality was also evaluated using ice test and electric pulp test. Patients with incomplete root formation or nerve injury were also evaluated. Patients, who did not response to ice test or electric pulp test (EPT) but response to ultrasound Doppler, were followed up for about 1 year and their clinical results were evaluated.
Results : Patients, who showed crown discoloration, ice test (−) and EPT(−), but Doppler test (+), recovered tooth vitality and tooth shade. In addition, patients who had nerve injury did not present any complications and patients with incomplete root also did not show any problem and their root development continued.
Conclusion : Ultrasound Doppler is very useful tools to evaluate pulp vitality especially when the application of other tests, such as ice test and EPT are inappropriate.
This research was supported by Basic Science Research Program through the National Research Foundation of Korea(NRF) funded by the Ministry of Education, Science and Technology(2011-0021235)

032

Category: Clinical Cases

MEGA-ABRASION: A LOW COST TECHNIQUE FOR MANAGING FLUOROSIS'S ESTHETIC DEFECTS

S Ardu, I. Krejci
Department of Cariology & Endodontology, Dental School, University of Geneva, Geneva, Switzerland

Objective: The aim of this poster is to describe an easy and reproducible technique for managing medium to severe defects in enamel such as can be seen in patients affected by fluorosis.

Methods The proposed technique is based on the partial abrasion of the superficial enamel[5] and the re-creation of the superficial macro and micro morphology by mean of diamond burs and silicon points[6].
The esthetic appearance can be, successively, enhanced by a microabrasion and home bleaching.
Results: The presented technique is able to manage enamel defects which are confined to the external enamel surface with satisfactory esthetic results.
Conclusion: This approach, which implies the sacrifice of only the external part of enamel, may be considered an interesting alternative to more invasive prosthetic techniques based on composite reconstructions or ceramic veneers. This technique minimizes invasivity, chair side time and can be considered a low cost technique for managing fluorosis' esthetic defects.

034

Category: Clinical Cases

THREE-YEARS FOLLOW-UP OF THE SANDWICH TECHNIQUE. SERIES OF THREE CASES

Laura Fenellós-Aldea 1[1], Vicente Faus-Matoses 2[3], Ana Salom-Fontana 3[2], Teresa Alegre-Domingo 4[3], Vicente J. Faus-LLácer 54
[1]Postgraduate Student
[2]Collaborator Professor
[3]Associate Professor
[4]Professor and Director of the Master
Master of Restorative Dentistry and Endodontics. Department of Stomatology. Medicine and Dental School. Valencia University. Spain. fausvj@uv.es

Objective: To evaluate the follow up of three patients treated with the "sandwich technique" three years ago. Three patients affected by severe dental erosion have been treated. This is a non invasive restorative technique, carried out thanks to the improvement of adhesive technology. In this poster, the details about the treatment and the follow-up are described.
Methods: All the three patients were treated with the « sandwich technique ». Follow-up of the three patients were performed after 2 days, 15 days, 6 months and 1, 2 and 3 years. Patients were controlled clinically and radiographically.
Results: After approximatively three years, one patient reported a discolorationof the upper left central incisor(1.1) after eating cherries. This problem appeared because of the leakage between the palatal composite restoration and the feldspathic veneer. It was solved removing a part of the palatal composite restoration and it was restored with a new one. Up to now, the other two patients have not suffered any problems to be considered.
Conclusion: The "sandwich technique" after three years seems to be predictable, but we should wait longer and test on more patients to insure that it is a reliable technique.

039

Category: Clinical Cases

EFFECT OF CURODONT™ IN PATIENTS WITH PROXIMAL CARIOUS LESIONS: UNCONTROLLED, NON-INTER VENTIONAL STUDY—INTERIM REPORT

Markus Schlee[1], Till Schad[1], Florian Rathe[1], Claudine Bommer[2]
[1]32 Schöne Zähne, D-91301 Forchheim, Germany
[2]credentis ag, CH-5210 Windisch, Switzerland

Objective: The prevalence of caries on the interproximal tooth surface is high and the interdental location of the lesion a

challenging site for treatment. In this study patients with early interproximal caries (E1 and E2) are treated with the promising, regenerative product Curodont™. Curodont™ contains P11-4, a self-assembling-peptide (SAP) that is applied as a liquid solution onto the tooth surface. P11-4 then diffuses into the subsurface body of the early carious lesion to form a 3-dimensional fibril network. In the process of a few months Ca^{2+} and PO_4^{2-} ions, excessively present in the patient's saliva, attach to the nucleation sites of the P11-4-network and form de novo hydroxyapatite (HA) crystals. The aim of the present study is to evaluate the efficacy of Curodont™ in respect to regenerate proximal enamel in patients with early proximal caries.
Method: 25 patients with an early, untreated, proximal carious lesion (E1 and E2) are enrolled in this prospective study and treated with Curodont™. Patients are followed up on D180 and D365 after treatment. At baseline and on each follow-up visit a standardised x-ray of the test lesions are taken. A questionnaire and VAS scores for evaluation of change in progression and size are used.
Result: the study is fully recruited; D180 follow-up visits for 10 patients have been performed. Presented will be the change in respect to the difference of opaqueness assessed by x-ray, change of size and progression both assessed by VAS from D0 to D180.
Conclusion: Preliminary data of the first 10 follow-ups at D180 imply regeneration of the carious lesion due to the treatment with Curodont™ by calcification of the lesion. In respect to the challenging interdental treatment site Curodont™ seems to be a very convenient product to use.

044

Category: Clinical Cases

MORPHOLOGIC VARIATIONS OF THE MAXILLARY MOLARS

Joan Bernardo-Clari, Vicente Faus-Matoses, Teresa Alegre-Domingo, René D. Botello-Torres, Vicente J. Faus-Llácer
Master of Restorative Dentistry and Endodontics, Department of Stomatology, Medecine and Dental School, Valencia University, Spain

Objective: To report anatomical variations in the root canal configurations of maxillary molars. Unusual root and root canal morphologies associated with both buccal roots of upper molars have been recorded in several studies in the literature. However, scientific information focusing on variations of the palatal root is rare. Some authors have reported that maxillary second molar has two palatal canals in 2.08 % (ex vivo assessment) and two palatal roots in 1.4 %.
Methods: Four cases are presented involving the root canal treatment of maxillary second molars with unusual morphologic configurations of the palatal root canals.
Results: Two second maxillary molars with palatal canal type V Vertucci configuration and two second maxillary molars with two palatal roots and two palatal canals were identified under operating microscope. Root canal treatment was performed using mechanical instrumentation with Protaper® (Dentsply Maillefer, Balaigues, Switzeland). Then, the canals were obturated with Thermafil® (Dentsply Maillefer, Balaigues, Switzeland).
Conclusion: Treatment of the entire root-canal system is essential for the success of the endodontic therapy. Thus, it is necessary for the clinician to have knowledge of dental anatomy and its variations. Unusual root canal anatomy can occur in palatal roots of maxillary molars. Therefore, careful examination of radiographs taken from different angles and the use of the operating microscope can help us to find these anatomic variations.

045

Category: Clinical Cases

SEVERELY STAINED TEETH: A NEW MASKING TECHNIQUE WITH FELDSPATHIC VENEERS. A 3 YEARS FOLLOW-UP CASE REPORT

Ángel Torres-Nebril, Vicente Faus-Matoses, Ignacio Faus-Matoses, Teresa Alegre-Domingo, Vicente J. Faus-Llácer
Master of Restorative Dentistry and Endodontics, Department of Stomatology, Medicine and Dental School, Valencia University, Spain. fausvj@uv.es

Objective: to evaluate the clinical results of a tetracycline-stained type IV case report corrected with no core felspathic veneers, in order to preserve maximum tooth structure.
Methods: after orthodontic treatment, a wax-up was performed for the treatment planning. Internal bevel gi ngivectomy was carried out to reduce gummy smile. Two months later, a clinical bleaching with Norblanc Office (Laboratorios Normon, S.A. Madrid, Spain) activated with plasma light was carried out and reinforced for 6 weeks with Whitening Polanight 16 % carbamide peroxide (SDI Limited, Baywater Victoria, Australia) at home.
After the conservative veneer preparation an immediate dentine sealing was performed and final impressions were done. The laboratory drew up the veneers with parallel stratification masking technique. Veneers were luted by using a light-cured (RelyX Veneer, 3 M) adhesive system.
Patient was recalled after 1 week, 1 month and once a year during 3 years respectively. Modified Ryge criteria was used to evaluate the restorations state.
Results: the results obtained by the modified Ryge test were favorable after three years follow-up.
Conclusion: no-core feldspathic veneers using "the parallel stratification masking technique" probed to be a reliable choice for the correction of tetracycline-stained teeth over a 3 years period.

053

Category: Clinical Cases

INTRINSIC EROSIVE TOOTH WEAR: MANAGEMENT BY MINIMUM INVASIVE INTERVENTION

Céline Gaucher[1], Aurélia Guerrieri[2], Dianath Husain[2] et Jean-Jacques Lasfargues[2]
[1]Faculté de chirurgie dentaire, Université Paris Descartes, France; Hôpital Albert Chenevier, AP-HP, France
[2]Faculté de chirurgie dentaire, Université Paris Descartes, France; Hôpital Bretonneau, AP-HP, France

Objective: Erosive tooth wear is still often diagnosed and taken into account at late stages. However a preventive and minimally invasive approach is always the best choice, whether for the stabilisation or restorative phase. Management of severe erosive tooth wear following the minimally invasive approach is described step by step through two clinical cases.
Methods: Two patients consulting respectively for pain and for hard tissue loss have been addressed to the restorative and conservative consultation of Bretonneau's Hospital. One, aged 66 y.o., suffered from terminal erosive wear due to a gastroeosophageal reflux. The other, aged 21 y.o., suffered from mild erosive wear due to idiopathic vomiting, surprisingly associated with hyperactive cervical caries lesions. For both patients treatment planning passed through following phases: pain/discomfort relief, assessment of aetiological and risk factors, prophylaxis, stabilisation and restoration.

Results: Gain of occlusal dimension, posterior teeth replacement and anterior composite veneers allowed a global oral rehabilitation for the elder patient at a minimal tissue cost. For the younger patient the major challenge was to deal simultaneously with erosive wear and carious disease. As a first step to success, an assiduous etiological phase, combined with pain decrease by using remineralisation agents, help the patient understand his diseases and adhere the treatment plan. The second was to preserve tooth vitality, compromised on numerous teeth due to deep active carious lesions. Direct adhesive restorations were placed on all the teeth, either to correct the erosive wear or carious lesions.
Conclusion: Striving for the best cost/benefit and risk/benefit ratios must guide practitioners within their therapeutic choices. A 'minimum intervention' treatment plan managed to restore aesthetic and function for both patients despite two strongly different clinical pictures. Regardless the severity of the disease or its sequels, adhesives procedures nowadays answer patients needs at minimal tissue cost.

056

Category: Clinical Cases

BULK-FILL TECHNIQUE WITH A POSTERIOR COMPOSITE. CLINICAL CASE PRESENTATION

J. Manhart[1]
[1]Dept. of Restorative Dentistry, Ludwig-Maximilians-University, Munich, Germany

Objective: Bulk-fill composite materials with improved depth of cure and reduced shrinkage stress are gaining in importance rapidly among private practitioners for a more economic and time-saving restoration procedure of decayed posterior teeth. Two different type of bulk-fill composite materials are available: 1. high-viscosity composites which can be inserted up to the occlusal surface or 2. low-viscosity bulk-fill composites which need a 2 mm occlusal cover layer by a traditional posterior hybrid composite. The aim of this presentation is to assess the usefulness of the bulk-fill technique for the direct restoration of posterior teeth and demonstrate the differences in the clinical procedure compared to traditional composite restorations.
Methods: A clinical case of a patient with need for replacement of insufficient old composite restorations is presented. The flowable bulk-fill composite x-tra base (VOCO) was syringed in 4 mm max. increments into adhesively pretreated (Futurabond DC, VOCO) large class II cavities and light-cured for 10s. With a subsequent 2 mm increment of the sculptable composite GrandioSO (VOCO) the less abrasive composite was protected occlusally and final tooth anatomy was shaped.
Results: The flowable consistency of x-tra base provided excellent adaptation of the first 4 mm increment even to sharp line and point angles of the cavities without need for mechanical adaptation by hand instruments. Posterior bulk-fill composite technique showed good functional (marginal adaptation, proximal contacts) and esthetic results.
Conclusion: The application of bulk-fill composites seems to be an effective method to restore even large load-bearing posterior cavities. The combination of the low-viscosity bulk-fill composite x-tra base with the regular-viscosity composite GrandioSO allows an easy application procedure and provides predictable and esthetically pleasing posterior composite restorations.
This presentation was supported in part by VOCO, Germany.

060

Category: Clinical Cases

FULL MOUTH REHABILITATION WITH DIRECT COMPOSITES IN A PATIENT AFFECTED BY SEVERE ATTRITION. A THREE-YEARS FOLLOW UP CASE REPORT.

Matías Moreno-Aroca, Vicente Faus-Matoses, Teresa Alegre-Domingo, Ignacio Faus-Matoses, Vicente J. Faus-Llácer
Master of Restorative Dentistry and Endodontics, Department of Stomatology, Medicine and Dental School, Valencia University, Spain.
fausvj@uv.es

Objective: To evaluate the long-term clinical performance of full mouth rehabilitation with direct composites in a patient with severe attrition at a 3 years period.
Methods: A 38 year old male wearing an occlusal guard for 8 years presented at our dental office complaining for severe dental attrition. Clinically, lesions in occlusal surfaces of posterior teeth and in anterior incisal edges were observed, with reduced vertical dimension.
A diagnostic wax-up of the occlusal surfaces was performed. Then an impression with translucent silicone (Elite® transparent, Zhermack SpA, Rome, Italy) was prepared duplicating the wax-up. Vertical dimension was increased by restoring the posterior teeth with resin composite (Spectrum® TPH3®, Dentsply DeTrey, Konstanz, Germany). The translucent key was loaded with composite and positioned in the mouth. The composite was light-cured through the translucent silicone. Though Anterior teeth were not restored an anterior open bite remained for three weeks. Then the anterior guide was rebuilt with composite (Ceram-X Duo, DeTrey Dentsply, Konstanz, Germany). The patient was controlled once a year during 3 years.
Results: Resin composites presented a successful clinical performance after a period of 3 years.
Conclusion: Adhesive techniques permitted a more conservative approach than complete crowns coverage. However there is a lack of long-term data on full-mouth adhesive restorations and more studies are necessary.

062

Category: Clinical Cases

RECONSTRUCTION OF UPPER MOLAR WITH COMPLETE TOOTH FRACTURE IN FURCA: CASE REPORT

Dr. Golsa Akbarian[1], Dr. Sahar Akbarian[2]
[1]Dentist
[2]Assistant Professor, Dept of Operative Dentistry, Shiraz University of Medical Sciences, Shiraz, Iran

Objective: Complete tooth fracture, with the mesiodistal crack line in furca, may occur in endodontically treated teeth. The prognosis of root fracture is usually poor and these teeth are usually condemned to extraction because of periodontal defects.
This report describes an adhesive technique for the management of a complete cusp fracture of tooth.
Methods: A 23 years old patient was referred to our restorative department for treatment of his upper left first molar which was endodontically treated 2 weeks ago. The palatal cusps were semi-mobile and he reported pain following chewing. A meisodistal crack in pulp chamber floor was observed. There was no radiographic lesion.
At first, two Clamps were used to splint cusps together during cavity preparation and filling. A composite build up with full cuspal coverage

was applied for this tooth after placement of prefabricated metal posts in palatal and mesiobuccal canals. One year follow up showed no clinical and radiographic signs of failures.
Results & Conclusion: Bonding technique may be an appropriate treatment for repairing a fractured cusp in tooth with fracture in furca. Therefore this treatment can be observed as a way for keeping a tooth in function, rather than extracting.

063

Category: Clinical Cases

TREATMENT OF PEG-SHAPED LATERAL INCISORS. CLINICAL CASE PRESENTATION

H. Chen[1], J. Manhart[2]
[1]Private Practice, Munich, Germany
[2]Dept. of Restorative Dentistry, Ludwig-Maximilians-University, Munich, Germany

Objective: Peg-shaped lateral incisors usually constitute esthetic problems for the affected patients because of the negative effects on smile design. Different direct and indirect treatment protocols exist which differ significantly concerning structural involvement of hard and soft tissues, necessary treatment time and costs. Direct composite restorations, indirect composite veneers, ceramic veneers and full crowns are among the different treatment options, in special cases accompanied by orthodontic pretreatment or periodontal surgery.
Methods: A clinical case of a conservative treatment with a direct composite restoration of a patient with a peg-shaped lateral incisor is presented. After an esthetic and functional wax-up of the affected tooth, a silicone index was fabricated to transform the three-dimensional contours of the wax-up into the oral situation using a polychromatic stratification technique with an esthetic composite system. A least-invasive direct bonding treatment protocol (etch&rinse adhesive) was used without prior mechanical preparation of tooth surface.
Results: The directly placed bonded composite restored the peg-shaped lateral incisor perfectly with regard to function and esthetics. Using a wax-up based silicone index increases predictability of the clinical outcome.
Conclusion: Treatment of peg-shaped lateral incisors with direct bonded composite restorations is a minimal-invasive, cost-effective, fast and esthetic way to change the smile appearance positively.

070

Category: Clinical Cases

DIRECT RESIN COMPOSITE RESTORATIONS AS A CONSERVATIVE APPROACH FOR AMELOGENESIS IMPERFECTA: A CASE REPORT

R Eira[1], C Coito[1], A Pequeno[1], B Sousa[1], AL Silva[1], R Mexia[1], A Amorim[1], A Cavalheiro[2]
[1]Assistant Professor, Conservative Dentistry Department Faculty of Dental Medicine, University of Lisbon, Portugal
[2]Professor and Chairman, Conservative Dentistry Department Faculty of Dental Medicine, University of Lisbon, Portugal

Objective: To describe the treatment of an Amelogenesis Imperfecta case with direct resin composite restorations. A step-by-step technique will be presented.
Methods: A 29 year-old male patient, with good health condition presented with Amelogenesis Imperfecta on all teeth from the second and fifth sextant (13–23 and 33–43). A correct and early diagnosis based on the clinical, radiographic and laboratory data was essential for the treatment success. Especial attention was taken to verify the number, shape, shade and sensitivity of the affected teeth. Likewise, the size of the pulp chambers and the quantity and quality of the available enamel for the adhesion was checked. After clinical and radiographic diagnosis, 12 resin composite restorations were included in the final treatment plan. A wax-up diagnosis was performed and after the patient's approval, silicon lingual matrixes were made to facilitate the anatomy control during the application of the direct resin composites, especially the lingual surface and the incisal edge. The polychromatic restorations were performed with a layering technique, consisting on the replication the natural teeth substrates both in terms of strength and esthetics using a biomimetic resin composite material.
Results: After 1 year of clinical service, the restored teeth present an excellent clinical appearance with intact integrity of the restorations and healthy periodontal tissues.
Conclusion: The treatment of these defects is important not only to restore esthetics and function, but it also represents a positive psychological impact for the patient. This type of restoration preserves tooth structure, preserves pulp vitality and does not irritate soft tissue if carefully diagnosed and performed. Due to the advances on dental adhesion and resin composites, it is now possible to restore function and esthetics with durable and conservative treatments.

071

Category: Clinical Cases

CONSERVATIVE APPROACH TO SEVERE CORONAL INCISORS FRACTURES: A BIOMIMETIC DIRECT RESIN COMPOSITE STRATIFICATION TECHNIQUE

A Cavalheiro[1*], M Vargas[2]
[1]Professor and Chairman, Conservative Dentistry Department Faculty of Dental Medicine, University of Lisbon, Portugal
[2]Professor, Family Dentistry Department School of Dentistry, University of Iowa, USA

Objective: To describe the treatment of a severe anterior upper central incisors fracture with direct resin composite restorations. A step-by-step polychromatic stratification technique will be presented.
Methods: A 16 year-old male patient, with good health condition presented with two severe Class II coronal fractures (Ellis classification) on teeth 11 and 21. After clinical and radiographic diagnosis, two polychromatic resin composite restorations were included in the final treatment plan along with external dental whitening. Two interim resin composite restorations were performed to seal dentin, recover some esthetics, allowing the soft tissues to heal completely, before the execution of the final restorations. After 6 weeks of healing and removal of interim restorations, the polychromatic restorations were performed and a silicon lingual matrix was used to facilitate the layering technique. This technique consists on replicating the natural teeth substrates both in terms of strength and esthetics using biomimetic composite materials with optical characteristics—value, chroma, hue, opalescence and fluorescence—similar to dentin and enamel.

Results: After 10 years of clinical service, the restored teeth present an excellent clinical appearance and required only minor repair and polishing. This type of restoration preserves tooth structure, preserves pulp vitality and does not irritate soft tissue. Furthermore, not only esthetics is not compromise but, in fact, it is, probably, one of the most esthetic treatment option, provided that the clinician knows and controls 4 aspects: 1) resin-composites optical properties, handling and mechanical properties, 2) enamel and dentin optical properties, 3) a biomimetic layering technique, and 4) clinical skills.
Conclusion: Direct resin composites are more conservative of the tooth structure than conventional prosthodontics and should be considered more often because of their increasing simplification of placement and predictability, both in terms of long-term esthetics and biomechanical performance.

078

Category: Clinical Cases

INDIRECT TECHNICAL APPROACH WITH COMPOSITE INLAYS/ONLAYS BY THE DENTIST IN-OFFICE: TWO CLINICAL REPORTS

Patrícia Manarte-Monteiro[1*], Sandra Gavinha[1], Aurea Ribeiro[1], Maria Conceição Manso[2], Sandra Faria[1],Tiago Martins[1]
[1]Department of Dental Medical Sciences, Faculty of Health Sciences, University Fernando Pessoa, Porto, Portugal
[2]Faculty of Health Sciences, University Fernando Pessoa, Porto, Portugal & Requimte-University of Porto, Portugal

Objective: Indirect composite restorations are alternative technical approaches of posterior teeth rehabilitation, in certain clinical conditions. The aim of this report is to describe two clinical cases in which composite inlay/onlay, made by the dentist in-office, were used to rehabilitate posterior tooth structures considering two strategies, such as large and multi-surface restorations. Clinical/radiographic findings and treatment are presented and discussed with the literature evidence.
Methods: Two patients presenting different restorative problems were selected. Two clinical conditions are reported: (1) the 2.6 tooth showed a large extension composite restoration with loss of marginal integrity and cusp involvement (2) the 2.6 and 2.5 teeth with secondary caries/amalgam restorations (ICDAS 44 code) and proximal contact. Coronal rehabilitation with composite inlay/onlay made indirectly by the dentist was proposed for both clinical conditions. Cavity preparation and alginate impression were done. A silicone cast was performed to apply the nanostructured composite GrandioSO (Inlay System; Voco) that was incrementally applied and light-cured (1200 mW/cm^2, 20 seconds). Inlays/onlays were bonded with self-etch adhesive strategy (Futurabond DC) with enamel pre-etching and Bifix SE resin cement. Inlays/onlays occlusal/proximal adjustments, finishing and polishing were performed.
Results: This indirect technique approach with composite provided an easy, convenient and efficient method to restore neighbouring teeth, to create adequate proximal contacts without having to use the time-consuming and expensive matrix systems and to better perform occlusal/proximal anatomy by extraoral modelling.
Conclusion: The indirect application of a composite is a predictable and economic approach to perform stress-free fabrication of tooth-coloured and durable restorations even in patients who are low- or non-compliant. This indirect rehabilitation is an aesthetic, functional and biological alternative face to direct techniques in coronal extensively weakened and multisurface restorations of posterior teeth, providing a refreshing alternative that can be processed in dental office by the dentist.

092

Category: Clinical Cases

RECOVERY OF THE FULLNESS OF THE UPPER LIP AFTER LAMINATE VENEER POSITIONING: A CASE REPORT

Pinna Roberto[1], Colonna Anna [1], Prandi Gianpiero[2], Milia Egle[1]
[1]Department of Surgery, Microsurgery and Medical Science, School of Dentistry and Dental Institute, University of Sassari, Italy
[2]Dental technician in private practice

Objective: Through adhesive laminate veneers, the dentist can control the shape, proportion and total volume of the tooth by adding or taking away dental structure with an improvement of the smile arc characteristics and the framework of the upper lip. A clinical case will be briefly described to illustrate the effect of the inadequate volume of an upper right central incisor, 11, which dramatically affected the support and fullness of the upper lip and the recovery of smile harmony and attractiveness of the lip after restoration of this tooth using a veneer.
Case description. A 40-year-old woman underwent a poor IV class composite restoration of tooth 11, which led to a different shape and incisal edge position when compared with 21. Tooth 11 also had a slightly different axial inclination with respect to the other upper maxillary teeth composing the smile arc. A deep wrinkle crossed the vermillion of the upper lip from the white roll towards the vestibular surface of tooth 11. After evaluation of the patient's goals, occlusion, Rufenacht parameters, and volume of tooth 11 in the smile arc and of the upper lip position and fullness, the restoration of 11 using an adhesive laminate veneer was decided on.
Methods: A diagnostic wax pattern created freehand by the technician served as a diagnostic arrangement to perform a resin provisional and finally the veneer in tooth 11.
Results: The use of the veneer allowed establishment of appropriate volume and position of tooth 11 and the recovery of the adequate support to the upper lip with disappearance of the wrinkle.
Conclusion: Porcelain veneer improved the morphology deficits of tooth 11 leading to the achievement of the final outcome in terms of aesthetics of the smile and the fullness and attractiveness of the upper lip.

094

Category: Clinical Cases

TWO YEARS CLINICAL EVALUATION OF DIRECT VENEERS IPS EMPRESS (IVOCLAR VIVADENT) ACCORDING TO USPHS CRITERIA

Tudose Andreea Dana
Bucharest, Hungaria

Objective: Clinical evaluation using criteria United States Public Health Service modified of clinical performance of direct veeners with IPS Empress Direct (Ivoclar) to six months, one year and two years .
Methods: 56 patients with ages between the 20–45 years were selected for study, who have realized of 224 direct veneers in frontal area using IPS Empress Direct (Ivoclar). Clinical evaluation was made at six months, one year and two years, given parameters resulting of modified USPHS criteria. Restorations were evaluated about marginal colorations, microleakage, secondary cavities, keeping anatomical shape, postoperative sensitivity, gingival reactions and retention. Results were noted using score A (alpha) Ideal, B (bravo) Acceptable and C (charlie) Inacceptable.
Criteria for selection in study were adequate oral hygiene, absence of periodontal disease, parafunction , presence of cavities, diastemas, malposition and incisal edge defects, discoloration of teeth after endodontic treatment. Preparation was only in enamel . Was used for adhesion Adhes-One F (Ivoclar) , 7th generation. To restore contact point using

celluloid matrix Striproll (Kerrhawe, Bioggio, Switzerland).Light curing was made with lamp Elipar ™ (3 M ESPE). Composite resin was applied with Compothixo (Kerr).Finishing-polishing was performed with Sof-Lex discs (3 M ESPE).
Results : Atfter two years, 224 direct veeners obtained 100 % Alpha score for good texture, absence of sensibility postoperative, absence of secondary caries and 97,77 % for keeping anatomical shape. Marginal adaptation obtained 100 % scor Alpha after six months, respectively 91,08 % at one year and at two years 87,5 % scor A and 12,5 % scor B. Stability of color obtained 85,72 % in the end of study.
Conclusion: IPS Empress Direct (Ivoclar) is an excellent material for direct veneers. Can obtain an esthetic result with minimal cost. It is a minimal invasive method and it can precedes a treatment plan for indirect veneers.

095

Category: Clinical Cases

DIRECT RESIN COMPOSITE STRATIFICATION TECHNIQUE: CASE REPORT OF AN ANTERIOR CLASS IV RESTORATION
Marianna Ribeiro
Lisbon, Portugal

Objective: The aim of this article is to describe a simplified layering technique based on a biomimetic approach for large anterior Class IV restorations. A step-by-step polychromatic stratification protocol will be presented.
Methods: A 28 year-old female patient, with good health condition, presented with one Class IV unaesthetic restoration on tooth 11. Clinical and radiographic examination did not reveal any pulpal damage. After discussing various treatment options with the patient, conservative restoration using direct resin composite was selected. A polychromatic restoration was performed and a silicon lingual matrix was used to facilitate the layering technique. This technique consists on replicating the natural teeth substrates both in terms of strength and esthetics using biomimetic composite materials with optical characteristics—value, chroma, hue, opalescence and fluorescence—similar to dentin and enamel.
Results: After 2-years, the restored tooth present an excellent appereance. This procedure preserves the natural tooth structure while allowing us to control the anatomy, color and optical effects of the teeth.
Conclusion: The biomimetics composite restorations are growing in popularity as conservative and predictable restorative treatment alternatives to ceramics, minimizing invasiveness, chair time, and costs for patients. An understanding of the fundamental layering, contouring, and polishing principles is paramount to the success of any direct resin composite restoration.

104

Category: Clinical Cases

TREATMENT OF DENTAL DISCOLORATIONS: A FUNDAMENTAL STEP IMPROVING AESTHETIC RESULTS IN FIXED PROSTHESIS
M. Guigand[a,c,d], C. Compère[b], C. Brunot-Gohin[b,c,d]
[a]UFR d'Odontologie, Département d'Odontologie Conservatrice-Endodontie, Université de Reims Champagne Ardenne, 2 rue du Général Köenig, 51100 Reims, France
[b]UFR d'Odontologie, Département de Prothèses, Université de Reims Champagne Ardenne, 2 rue du Général Köenig, 51100 Reims, France
[c]Pôle Odontologie, CHU de Reims, 48 rue Cognacq-Jay, 51100 Reims, France
[d]Laboratoire des Biomatériaux et Inflammation en Site Osseux (BIOS), EA 4691, SFR CAP-Santé (FED 4231), Université Reims Champagne-Ardenne, 1 rue du Maréchal Juin, 51 000 Reims, France

Objective: The aim of an aesthetic oral rehabilitation is to obtain a natural and harmonious smile. The aesthetic goal is reached when both prosthetic skills and new aesthetic biomaterials are combined with respect of a minimal invasive dentistry.
Methods: Throughout a clinical case report, our work describes a multi-field aesthetic approach combining recent restorative and new prosthetic therapeutics. First, vital-teeth were bleached using carbamide peroxide 10 % (Opalescence® PF, Ultradent). In the same time, non-vital bleaching of endodontically treated teeth was realized using sodium perborate/distilled water. Then, new lithium disilicate ceramics restorations (IPS e.max® Press and Ceram, Ivoclar Vivadent) were manufactured using indirect CAD/CAM techniques and placed in the oral cavity.
Results: Chemical treatments of dental discolorations homogenized the color of natural teeth before the prosthetic rehabilitation. This step allowed to keep all cosmetic properties of ceramic. In this way, it was possible to select the best treatment plan according to a minimal invasive concept.
Conclusion: The patients' aesthetic demand compels the practitioner to take into account the intrinsic value of each tooth and the advances in minimal invasive dentistry. However, a tooth can not be restored without integrating maxillary arches, smile and face shape. Thus, the aesthetic oral rehabilitation has to be in accordance with the patient's physical and psychical personality as well.

112

Category: Clinical Cases

MANAGEMENT OF A SYMPTOMATIC IMMATURE PERMANENT TOOTH USING A TRICALCIUM SILICATE CEMENT (BIODENTINE™): A CLINICAL CASE
D. Seux[1], C. Villat[1,2], B. Grosgogeat[1,2], P. Farge[1]
[1]UFR Odontologie, Université Lyon 1 ; Service de Consultations et de Traitements Dentaires, Hospices Civils de Lyon, France
[2]Laboratoire des Multimatériaux et Interfaces. UMR CNRS 5615, Université Lyon 1, Villeurbanne, France

Introduction: The preservation of pulp vitality is a clinical challenge in restorative dentistry in the treatment of permanent immature teeth. Here we report the use of a tricalcium silicate cement as a pulpotomy agent in the pulpitis treatment of an immature premolar.
Clinical Case: A 12-year-old female patient presented at the dental clinic for referred pain on a mandibular immature right second premolar. The diagnosis procedures revealed an extensive occlusal carious lesion and highlighted symptoms of an irreversible pulpitis. A conservative pulpal procedure was undertaken. Following anesthesia and rubber dam isolation, the carious lesion was removed and a partial pulpotomy was performed. Following hemostasis, the amputated pulp was covered with a tricalcium silicate cement (Biodentine™, Septodont, Saint-Maur-des-Fossés, France) and a coronal restoration was provided with a conventional glass ionomer cement. On the 7-day recall examination, the tooth was asymptomatic and no pain had occurred in the meanwhile. At 3 and 6 months follow-ups, the tooth was vital with normal responses to thermic tests and the radiographic examination displayed a dentin-bridge formation and the continuous edification of the root.
Conclusion: The preservation of pulp vitality is an important topic in the common practice and tricalcium silicate cements are reliable compounds to conduct these treatments. Similarly to Mineral Trioxide Aggregate™, the Biodentine™ tricalcium silicate cement appears as an effective therapeutic agent for pulp capping in immature permanent teeth with acute pulpitis. Moreover, its handling and mechanical properties as well as its short setting time, allow its clinical use as a conventional dentin substitute.

115

Category: Clinical Cases

IMMEDIATE SOFT RELINING IN DENTAL REHABILITATION: A CLINICAL CASE

Sandra Gavinha[1*], Cláudia Barbosa[1], Ana Nóbrega[1], Maria Conceição Manso[2], Patrícia Manarte-Monteiro[1]
[1]Department of Dental Medical Sciences, Faculty of Health Sciences, University Fernando Pessoa, Porto, Portugal
[2]Faculty of Health Sciences, University Fernando Pessoa, Porto, Portugal & REQUIMTE-University of Porto, Portugal

Objective: The immediate soft relining (ISR) is a clinical procedure that restores the denture base contact with the oral mucosa, allowing an adaptation of the prosthesis. It improves the biomechanical properties, occlusion, patient comfort and enables to treat mechanical irritation of oral mucosa surface, by providing a soft coating process in alveolar irregularities, helping the wound and inflammation of mucosa or of the alveolar bone healing. This work aims to describe and illustrate an ISR technique by presenting a clinical case.
Methods: Permanent soft A-silicone (Ufi Gel P, Voco) was used for ISR of two immediate dentures. This self curing material ensures a simple, efficient and quick basecoat direct procedure for dental prosthesis adaptation in oral mucosa. The use of an adhesive allows to obtain a good bond strength between the prosthesis and the catalyst coating. This direct technique is similar to that employed in the functional impressions.
Results: A female patient, 59 years old, edentulous, having held extractions on the last 10 days, showed irregularity of the upper and lower residual ridges and difficulty of use of immediate dentures that had been placed on the day the extractions were performed. These prostheses were rebased using silicone (Ufi Gel P, Voco) whose purpose is to facilitate the subsequent final prosthesis rehabilitation and promote oral mucosa wound healing. This clinical procedure enables a protection of residual ridges, so that they undergo a process of uniform atraumatic resorption.
Conclusion: The application of this ISR silicone, applied in a single appointment fits outstandingly to all the details of the residual ridges that have suffered recent tooth extraction and allows a precise adaptation of the removable prosthesis immediately and in intermediate conditions. It is an inexpensive technique, simple and very convenient both for the dentist and patient.

147

Category: Clinical Cases

PREPLESS VENEERS. A CASE REPORT

Erika Aguirre-Parra, Vicente Faus-Matoses, Ignacio FausMatoses, Vicente.J.Faus-Llácer
Master of Restorative Dentistry and Endodontics, Department of Stomatology, Medicine and Dental School, Valencia University, Spain

Objective: To solve diastemas through a minimally invasive treatment with prepless veneers
Methods: A 26-year-old female patient presented at the clinic, her chief complaint was the dissatisfaction of her smile. During the first visit, photos, radiographs, and full-arch impressions were taken.
The waxed-up preliminary cast was transferred to the mouth for clinical evaluation in terms of shape, size, and length. Then visit the material was loaded into a silicone guide made on the wax-up and positioned in the patient's mouth.
All information was collected from the mock-up using digital photography and impression to obtain a cast. The mock-up was then removed from the mouth, and the teeth were cleaned and pumiced for impression procedures with silicone and sent to the laboratory. Feldspathic ceramic veneers were obtained, and prepared for bonding. Initially the intaglio surfaces of veneers were etched with 5 % hydrofluoric acid, after washing to remove the acid, with distilled water and cleaned ultrasonically to remove any residual material. The surface was air dried, and a silane coupling agent was applied the adhesive was left uncured, and previously selected resin cement was injected carefully into veneer.
The surface of each tooth was etched with 37%phosphoric acid for 60 seconds, washed, and dried. The same adhesive used for the intaglio surface of the ceramic was applied an also left uncured. Each restoration was positioned on the specific tooth; excess resin cement was remove, light source was use for curing for 40 seconds, sharp scalpel was used to remove excess adhesive and resin cement, final justments were made with polishing system.
Results: It is able to achieve a full mouth rehabilitation with minimally invasive techniques.
Conclusion: No preparation veneers achieved satisfactory esthetic technique maximizing tooth conservation.

150

Category: Clinical Cases

MINIMALLY INVASIVE REHABILITATION OF FOUR UPPER INCISORS

José Fausto Carracho[1], Maria Inês Espinha[2]
[1]Director of Graduate Program Prosthodontics, Faculdade de Medicina Dentária da Universidade de Lisboa, Portugal
[2] Student of Graduate Program Prosthodontics, Faculdade de Medicina Dentária da Universidade de Lisboa, Portugal

Objective: Esthetic demands and expectations are increasing on a daily basis. This increasing desire for optimal esthetics has made all-ceramic restorations the most adequate to meet the expectations of both clinicians and patients. Lithium disilicate shows higher strength, about of 360–400 MPa when compared to alumina. Moreover, when compared to zirconia, lithium disilicate has the advantage of allowing adhesive, self-adhesive or conventional cementation. The aim of this clinical case is to illustrate a minimally invasive treatment, using ceramic crown, ceramic veneer and direct composite restoration on the four upper incisors.
Methods : A healthy 26-year-old female patient was referred to private practice concerned about poor esthetic of upper incisors. The intraoral and radiograph examination showed a previous endodontic treatment on tooth 21 with a large misfit nonesthetic composite restoration; an incomplete fracture on tooth 11; a composite restoration on tooth 12 and a composite restoration with secondary carious lesion and shape alteration on tooth 22. An endodontic retreatment was performed on tooth 21 followed by post and core build up and ceramic crown. The tooth 11 was rehabilitated with a ceramic veneer. The crowns of tooth 21 and the veneer of tooth 11 were both made of lithium disilicate and cemented with resin based cement. Direct composite restorations were performed on teeth 12 and 22.
Results: This clinical case had a good outcome in terms of what were the expectations and requests of the patient. Furthermore the shape, size, color and texture of the four rehabilitated teeth matched the rest of the dentition.
Conclusion: Minimally invasive dentistry is a trend theory which is concerned about the preservation of tooth structure. This concept is possible because we have strength ceramic restorations that can mimic very well natural dentition and be cemented with adhesive cements.

149

Category: Clinical Cases

A CONSERVATIVE TREATMENT APPROACH TO THE ESTHETIC REHABILITATION OF AMELOGENESIS IMPERFECTA WITH DIRECT COMPOSITE RESIN RESTORATIONS: A CLINICAL CASE

Murat Tiryaki[1], Isil Bayrak[2]
[1]Istanbul University, Faculty of Dentistry, Department of Operative Dentistry, DDS, PhD
[2]Bezmialem Vakif University, Faculty of Dentistry, Department of Operative Dentistry, DDS, PhD

Objective: Amelogenesis Imperfecta (AI) represents a restorative challenge for the clinician thus it reduces oral-health related quality of life in terms of esthetic and functional standpoints. Even though several treatment options have been proposed for management of AI, with advances in optical (esthetic) and mechanical properties resin composites and adhesive systems, direct-bonded composite restorations have gained popularity among other treatment options to restore defective teeth as the technique is still the most conservative. In this case, esthetic rehabilitation of AI with direct-bonded composite veneers was presented.
Methods: A 19-year-old female patient was referred to the Clinic of Operative Dentistry Department, Faculty of Dentistry, Istanbul University with a complain of discoloured teeth and dissatisfying dental appearance. The family medical history revealed that the patient's all four sisters and mother were affected by similar disease. Clinical and radiographic features were consistent with possible diagnosis of local autosomal dominant hypocalcified AI. Treatment was included oral prophylaxis, restoration of carious teeth and direct-bonded composite veneering of labial surfaces. Before veneering, minimum chamfer was obtained; incisal preparation was unnecessary. The upper and lower incisors, premolars and first molars were restored using a nano-hybrid resin composite (Aelite Aesthetic Enamel; Bisco) with a total-etch bonding system (One-Step; Bisco). Finishing and polishing procedures were achieved with abrasive discs (Sof-Lex; 3 M ESPE). The patients's and the clinician's esthetic expectations were satisfied at the end of restorative treatment. The patient had been under periodic follow-up since five years.
Results: In the 5-year recall, neither debonding nor notable discoloration of the restorations was observed. The patient was satisfied with her apperance.
Conclusion: In such cases, provided that composite restoration procedures are strictly followed and the patient performs oral hygiene procedures properly, satisfying long-term clinical results can be achieved with direct-bonded composite veneers.

162

Category: Clinical Cases

MANAGEMENT OF A FACIAL TALON CUSP (RUGAE ADAMANTINEAE) ON MAXILLARY PERMANENT CENTRAL INCISOR: A CASE REPORT

Oktay Yazıcıoğlu [1], Haşmet Ulukapı [1]
[1]Istanbul University Faculty of Dentistry Department of Restorative Dentistry PhD,DDS

Objective: Talon cusp is a morphologically well delineated accessory cusp. It is an anomalous structure projecting from the cingulum area or the cemento enamel junction, and extending to at least half the distance to the incisal edge of the maxillary or the mandibular anterior teeth in both the primary and permanent dentitions. It consists of enamel, dentine and a variable amount of pulp tissue. Lingual location is usually considered pathognomic. When the talon cusp occurs on the facial aspect of the teeth, the effects are mainly aesthetic and functional. This case report discuss about the unusual appearance of talon cusp on the facial surface of the maxillary right permanent central incisor, which was conservatively treated and followed up for a period of 6 months.
Methods: A 21-year old female was referred to the treatment of maxillary right central incisor which caused aesthetic problem. Intraoral examination revealed facial talon cusp on maxillary right central incisor and an accessory cusp was separated from rest of the crown. Radiographic and computerized tomographic investigation indicated there was no connection between pulp chamber, 'V' shaped radio-opaque structure and 3 radio-lucent globe area. It was decided to carry out the accessory cusp by selective cuspal grinding, followed by composite veneer placement. The restoration was clinically evaluated 1 week after placement as baseline and after 6 months post-operatively using modified USPHS criteria by two previously calibrated operators.
Results: Restoration did not exhibit post-operative sensitivity at the 6 months evaluation period. No difference was observed in the colour match, marginal discolouration, marginal adaptation or anatomic form when compared to baseline evaluation.
Conclusion: The management and treatment outcome of talon cusp depends on the size, presenting complications and patient cooperation. The present case report outlines the conservative management of a talon cusp.

187

Category: Clinical Cases

A NEW BIOMIMETIC ENDOCROWN DESIGN FOR THE RESTORATION OF ENDODONTICALLY TREATED TEETH

Filip Keulemans[1], Michael Leconte[1], Geert Hommez[1], Mieke De Bruyne[1], Peter De Coster[1], Roeland De Moor[1]
[1]Department of Restorative Dentistry and Endodontology, BIOMAD, Dental School, Ghent University, Ghent University Hospital, Ghent, Belgium

Objective: Endocrowns are a possible treatment alternative for the restoration of endodontically treated teeth with severe loss of coronal tooth tissue. Today, such restorations are most likely fabricated out of monolithic ceramic blocks through a CAD/CAM workflow. This clinical case report describes a method to fabricate a semidirect endocrown with a new biomimetic design.
Methods: A 44-year-old female presented at the staff clinic of the department of Restorative Dentistry and Endodontology for endodontic treatment of a second mandibular molar (FDI #37). In consultation with the patient it was decided to restore the tooth with an endocrown. After isolation of the work field by dental dam, the endodontic access opening was sealed with a 2-step self-etch adhesive and flowable composite. Undercuts were filled-up with resin composite in order to guarantee adequate tissue preservation. Subsequently, the tooth was prepared with a circular butt-joint margin and a central cavity inside the pulp chamber. An impression was taken with a medium viscosity polyether material and poured in gypsum. A biomimetic restorative approach was adopted for the fabrication of an endocrown. Dentine was replaced by short randomly oriented fibre-reinforced composite (everX Posterior, GC Europe) and covered by particulate filler composite (Clearfil Majesty Esthetic, Kuraray Europe) serving as enamel replacement. The restoration was postpolymerised and luted with a resin luting cement during a second appointment at the same day.
Results: Restoration of endodontically treated teeth with a biomimetic endocrown design can be obtained by a semidirect workflow. The presented case shows the potential of biomimetic endocrowns to restore the biomechanical integrity and to provide adequate function and aesthetics of endodontically treated posterior teeth with severe coronal tooth loss.
Conclusion: The use of biomimetic endocrown restorations represents a promising and tissue preserving alternative to full crowns in combination with post-and-core restoration

196

Category: Clinical Cases

1-YEAR CLINICAL EVALUATION OF A SONIC-ACTIVATED BULK-FILL COMPOSITE SYSTEM

Roxana ILICI *[1], Ruxandra SFEATCU [2], Andreea DIDILESCU [3], Eduard GATIN [4], Ion PATRASCU [5]

[1]Prosthetics Technology and Dental Materials Dept., Faculty of Dental Medicine, University of Medicine and Pharmacy "Carol Davila", Bucharest, Romania

[2]Oral Health and Behavioural Sciences Dept., Faculty of Dental Medicine, University of Medicine and Pharmacy "Carol Davila", Bucharest, Romania

[3]Anatomy and Embryology Dept., Faculty of Dental Medicine, University of Medicine and Pharmacy "Carol Davila", Bucharest, Romania

[4]Faculty of Physics, University of Bucharest, Bucharest, Romania

[5]Prosthetics Technology and Dental Materials Dept., Faculty of Dental Medicine, University of Medicine and Pharmacy "Carol Davila", Bucharest, Romania

Objective: SonicFill System is a new bulk fill composite for posterior restorations (Kerr) that is clinically placed using sonic activation from a specially designed hand piece (Kavo), which radically lowers the viscosity for effortless placement and superior adaptation. The aim of this study was to clinically evaluate restorations placed using SonicFill System in Class II and MOD restorations.
Methods: A 56-years old female patient with esthetic problems in the first quadrant was enrolled in this study for replacement of three amalgam fillings. Class II (teeth nr. 1.4., 1.6.) and MOD (tooth nr 1.5.) restorations were prepared and restored using SonicFill composite (shade A2, speed setting 3) in one bulk increment of up to 5 mm depth, associated with a two-steps self-etch adhesive system OptiBond XTR/Kerr. The clinical situation and each restoration was evaluated according to the new evaluation criteria of Hickel et al. (Clin Oral Invest 2010;14:349–366) establishing a new score-range of 1–5 (1 = excellent/very good, 2 = good, 3 = sufficient/satisfactory, 4 = unsatisfactory, 5 = poor) for the esthetic, functional and biological properties of the restorations. Bitewing radiographs were used to evaluate the restorations at the baseline and 3, 6, 9 and 12 months later. Digital photographs were taken at each step of the restorative protocol and each recall session.
Results: After one year of clinical performance all the restorations were clinically acceptable with no significant change in color match, luster, secondary caries, anatomical form, proximal contacts, post operative sensitivity and periodontal response as compared to the baseline data. Also the patient was entirely satisfied with esthetics and function of her composite restorations.
Conclusion: SonicFill's unique delivery system and composite properties assures the clinician that the restoration will be filled in the most expedient manner, without sacrificing quality.

199

Category: Clinical Cases

ORAL REHABILITATION OF A YOUNG ADULT WITH ROUGH AUTOSOMAL DOMINANT HYPOPLASTIC AMELOGENESIS IMPERFECTA: CASE REPORT

Meltem Mert Eren[1], Murat Tiryaki[1], Cigdem Cabukusta[1], Burcu Senol Kutlu[1], Batu Can Yaman[2], Fatma Koray[1]

[1]Department of Operative Dentistry, Faculty of Dentistry, Istanbul University

[2]Department of Operative Dentistry, Faculty of Dentistry, Osmangazi University

Objective: Amelogenesis imperfecta (AI) is a heridetary disorder that demonstrate developmental alterations in the structure of the enamel in the absence of a systemic disorder. Treatment planning of patient with AI is related to many factors: the age, severity of the disorder, the intraoral conditions and socioeconomic status of patient. This case report presented a treatment of patient that has rough autosomal dominant hypoplastic amelogenesis imperfecta.
Methods: Clinical examination of the patient revealed rough and pitted hypoplastic enamel and discoloration of the teeth varying from yellow to dark brown. Severe attrition and loss of vertical dimension of the face was also seen in both maxillary and mandibular teeth. The treatment plan was developed that would include esthetic rehabilitation and restoration of masticatory function. A facebow record of the cranomaxillary relationship was made and transferred to a semi adjustable articulator. Because of socioeconomic status of the patient, we decided to restore teeth with conservative esthetic treatment. Initially, maxillary and mandibular posterior teeth restored with composite onlay (Filtek Supreme, 3 M ESPE, Germany) luted with adhesive cement (Variolink II, Ivoclar Vivadent, Liechtenstein) to increase occlusal vertical dimension by 3 mm. Later, direct composite laminate veneers (Filtek Supreme, 3 M ESPE, Germany) were used to improve the esthetics of maxillary and mandibular anterior teeth .
Results: This clinical report describes the conservative rehabilitation of a patient with hypoplastic-type AI based on patient's socioeconomic status. Evaluations of composite restorations were done regularly and a three-year follow-up period showed that these materials were still in satisfactory esthetical and functional condition.
Conclusion: Management of severely affected patients can be challenging for the dentist. More cases involving new materials and patients follow-up need to be reported in order to increase over knowledge of the clinical behaviour of these materials in patient with amelogenesis imperfecta.

206

Category: Clinical Cases

AESTHETIC REHABILITATION BY STRATIFICATION WITH DIRECT COMPOSITE RESIN: A CASE REPORT

Romain Ceinos[1,2], Mir-Payam Gandjizadeh[1,2], Marie-France Bertrand[1,2], Etienne Médioni[1,2]

[1]Nice Sophia Antipolis University, UFR Odontologie, Department of Conservative Dentistry and Endodontics, Nice, France

[2]Nice University Hospital, Pôle Odontologie, Nice, France

Objective: A 27-year-old patient presented at the consultation of the public university hospital of Nice for a cosmetic opinion. The functional and aesthetic problems were complex with anterior open bite, midline diastema and left canine crossbite. Maxillary central incisors were misshapen. The best option to improve function and aesthetics was orthodontic treatment and then indirect restorations. The patient rejected this high cost option and desired smile enhancement in the most minimally invasive manner.
Methods: Study casts were taken and mounted on a semi-adjustable articulator to realise an occlusal and aesthetic analysis. The case was studied with particular respect to the proposed space closure and the maintenance of the correct crown width to length ratio of 75 %. A diagnostic wax-up was carried out with opaque wax to simulate the teeth's shape and volume modifications, while ensuring that the theoretical demands of the Golden proportion were met. The patient accepted the treatment plan. Direct anterior restorations were made using a stratification technique and special attention was given to occlusal adjustment.
Results: The restorations achieved an aesthetic configuration with acceptable function as the final result and the occlusion showed a satisfactory stability. They met the requirements of form, function and phonetics. This approach had the advantages of presenting good predictability, load resistance, acceptable longevity, preservation of healthy dental tissues,

and lower cost when compared with indirect restoration. This conservative procedure was well accepted by the patient.
Conclusion: The use of direct intraoral applications of stratification techniques to solve aesthetic problems requires skill and practice but allows the obtaining of sophisticated effects. This case report presents an anterior direct rehabilitation approach not only as an alternative option, but also as viable and less expensive treatment option with an optimally aesthetic and functional result.

218

Category: Clinical Cases

SUCCESSFUL RE-ATTACHMENT OF ANTERIOR FRACTURED TEETH: A CASE REPORT

Bilal YAŞA[1], Burak ÇELİK[2], Esra UZER ÇELİK[1]
[1]Department of Restorative Dentistry, Faculty of Dentistry, İzmir Katip Çelebi University, İzmir, Turkey
[2]Department of Endodontics, Faculty of Dentistry, İzmir Katip Çelebi University, İzmir, Turkey

Objective: Re-establishing the original form and aesthetics in the treatment of fractured traumatized teeth is a challenging process. In case of fractured coronal pieces to be present at hand, the adhesion of fractured pieces back in place may give better aesthetic results instead of applying a composite resin restoration. The aim of this case report was to restore a crown fracture in the right and left central incisors by re-bonding their original fractured fragments.
Methods: After a comprehensive oral examination of the patient, who referred to our clinic with a trauma history, the crown fractures were restored by a multidisciplinary approach including pulp-capping, a single-visit endodontic therapy, and re-attachment of the fractured fragments using a dual-cure resin luting cement (Variolink N, Ivoclar-Vivadent, Schaan, Liechtenstein). As the size of the fractured sections was large, retentive areas were prepared inside both fractured parts and intact crowns to increase the retention and durability of the restored teeth. After 6 months, the success of the re-attached teeth was re-evaluated.
Results: The re-attached fragments were stable at the follow-up session. In addition, no alteration was observed in the appearance of both re-bonded and intact sections.
Conclusion: If the fractured piece of a traumatized tooth is available, it is a decent option to re-attach the fragment to the crown in order to restore the impaired function of tooth as well as to provide the best aesthetic and natural appearance.

219

Category: Clinical Cases

EFFECT OF CURODONT™ IN PATIENTS WITH BUCCAL CARIOUS LESIONS: A MONO-CENTRE, SINGLE-BLINDED, RANDOMISED, CONTROLLED SPLIT-MOUTH STUDY—AN INTERMEDIATE REPORT

Bröseler, Frank, Dr. med. dent.[1] Tietmann, Christina, Dr. med. dent.[1] Drechsel, Teresa, cand. med. dent.[2] Bommer, Claudine[3]
[1]Zahnärztliche Praxis für Parodontologie, D-52070 Aachen, Germany
[2]Universität Bonn, Poliklinik für Parodontologie, Zahnerhaltung und Präventive Zahnheilkunde (Dir. Prof. Dr. S. Jepsen), D-53111 Bonn, Germany
[3]credentis ag, CH-5210 Windisch, Switzerland

Objective: Fluoride containing agents are universally accepted for treatment of early carious lesions. However, the mechanism of fluoride action is only topical within a reach of a few μm into enamel respectively into the subsurface of the carious lesion. Non-cavitated enamel carious lesions extent up to 400 μm in depth. Curodont™ contains the self-assembling-peptide (SAP) P11-4 that diffuses deeply into the subsurface body of the carious lesion to form a three-dimensional matrix. Ca^{2+} and PO_4^{2-} ions, the components of enamel, are sufficiently available from the patients' saliva and attach to the P11-4 matrix, inducing new formation and growth of hydroxyapatite (HAP) crystals. The aim of the present study is to evaluate the efficacy of the enamel and dentin regenerative product Curodont™ in respect to a fluoride varnish in patients with early buccal carious lesions.
Method: 25 patients with two early buccal carious lesions are enrolled in this prospective, randomised, controlled split-mouth study. In each individual one lesion is treated with Curodont™, another one with fluoride varnish (Duraphat®) as control. Patients are followed up on D30, D90, D180 and D365 after treatment. For efficacy evaluation standardized photographs of test and control lesions are used for morphometric analyses. Moreover, VAS scores for visual inspection of treated sites and questionnaires are used for investigation.
Result: Preliminary data of 5 patients with D30 and D90 follow-up visits in regard to the change of lesion's size and progression between the Curodont™ and fluoride varnish group and investigator's clinical evaluation are presented.
Conclusion: Preliminary data of the first 5 follow-ups at D30 and D90 indicate an in-depth regenerative potential of Curodont™ with respect to fluoride varnish after treatment of white spot lesions (WSL).

014

Category: Dental Education

AN EXPLORATION OF STUDENT EXPECTATIONS OF A MASTERS PROGRAMME IN DENTISTRY

Hussain Fariha, Leinonen Eeva, Millar Brian
King's College, London, UK

Objective: To explore whether a blended learning Masters programme in Dentistry is meeting learner expectations.
Methods: A quantitative questionnaire was developed for an online survey as part of King's College London Dental Institute's Unit of Distance Learning quality assurance of teaching programmes. The participants were students and graduates of the blended learning Master of Clinical Dentistry (Prosthodontics) Degree. Three separate samples were included: all new students embarking on the programme; all current students in years 2, 3 and 4 of the programme; graduates of the programme of the past 3 years. The rationale was to gain some longitudinal perspective over the 4-year duration of the degree. The Unit of Distance Learning was responsible for data gathering, recording and storage electronically using Survey Monkey. Statistical analyses tested for differences between the groups and for differences within the groups correlating to variables such as gender and age.
Results: Response rates were: 69 % for new students, 81 % for current students; 66 % for graduates and 94 % new students, 87 % current students and 100 % of graduates reported satisfaction. The majority of respondents agreed that they gained academic, clinical and career benefits through the programme and that blended learning enabled them to study effectively at a distance while maintaining other commitments. Difficulties in time management, rigorous demands of the course, perceived feelings of isolation and insufficient feedback were identified as issues for concern.
Conclusion: Interpretation of the data demonstrates that this blended Masters programme in Dentistry is meeting learner expectations and provides a positive, meaningful learning experience for students. Measures have been brought in to address the recorded concerns.

The learner view is essential for continued course evaluation and enhancement.

022

Category: Dental Education

RIGHT AND LEFT DISCRIMINATION ABILITY AMONG DENTAL STUDENTS

Manuel S. Thomas[1], Sandya Kini[1]
[1]Department of Conservative dentistry & Endodontics, Manipal College of Dental College Sciences, Manipal University, Mangalore, Karnataka, India

Objective: Confusion in discriminating right and left can result in various complications in our day to day life. Similarly in dental practice, right-left confusion can be of serious concern with respect to patient care. Hence the purpose of this study was to assess the right-left discrimination (RLD) ability among dental students. The study also aims at determining the various factors that can affect the students' discriminating ability.
Methods: All consented students of the dental college from first year to final year (n=310) were asked to mention their gender, course year, and handedness. They were also asked to record their perceived discriminatory ability on a five-point Likert scale and to mention the use of any method to aid in RLD. Modified Bergen test (paper and pen test using cartoon figures) was used to determine the ability of the participants to differentiate right from left. The test had three subsections—all figures viewed from front, all from back, and alternating views. The maximum score possible was 48 and a minimum score 0. The values obtained were statistically analysed.
Results: There was no significant difference in the RLD ability between males (43.25±4.52) and females (42.12±4.53). Even the discriminatory ability had no significant association with students' clinical exposure. Students who used learnt technique for differentiation had significantly lower scores (41.95±4.58) than those without any technique (43.40±4.30). Furthermore, there was a significant correlation between the perceived ability and the test scores (P=.000). The degree of difficulty in discrimination was mostly in the alternate view (13.14±1.98) followed by the front view (14.57±1.74) than the backward view (14.66±1.86).
Conclusion: Right-left confusion was observed more in situations where mental rotation was required. All students, especially those who consider themselves to have inferior discriminating ability need to be extra cautious to prevent errors in clinical practice.

075

Category: Dental Education

POTENTIAL SYSTEMATIC ERROR IN EXPERIMENTS ON VISUAL CARIES DETECTION SYSTEMS

Klaus W. Neuhaus[1], Philippe Perrin[1], Martina Eichenberger[1], Patrick Sequeira Byron[1], Adrian Lussi[1]
[1]Department of Preventive, Restorative and Pediatric Dentistry,School of Dental Medicine, University of Bern

Objective: Visual caries detection is *by definition* dependent on the vision of the examiner. According to previous studies the inter-individual visual acuity varies considerably. Most visual caries detection studies have failed to report either the visual acuity of the examiners, or the use of any optical aids. It appears that examiners undertaking visual caries detection studies have assumed, by self-assessment, to possess an accurate near visual acuity. We report on two new experiments that may have the potential to affect the design and reporting of future experiments on visual caries detection systems and the interpretation of former studies in this domain.
Methods: First, we asked 132 dentists to judge their near visual acuity using a VAS and objectively assessed their near visual acuity. Second, we objectively tested the physical properties of commonly used dental loupes (Galilean and Keplerian systems).
Results: We found a marked difference between their self-reported visual acuity and the related, independent and objective, measurements of their natural vision. One third of all dentists overestimated its near vision and in fact had a poor near vision (Fig. 1). Second, we found clear variability in the physical properties of similar dental loupes when compared. Commonly produced Galilean loupes (n=6) with declared 2.5X magnification in fact varied between 2.0X–2.7X depending on the manufacturer. Similarly, field of vision and image quality also differed according to objective measurements.
Conclusion: For these reasons, we suggest that the interpretation of previously published reports of visual caries detection studies be treated with appropriate consideration. In addition we propose that in future, investigations where examiner vision is a variable, the assessment and reporting of the examiner near vision acuity and the specification of eventual optical aids, should be taken into account, to prevent its confounding effect on the study validity.

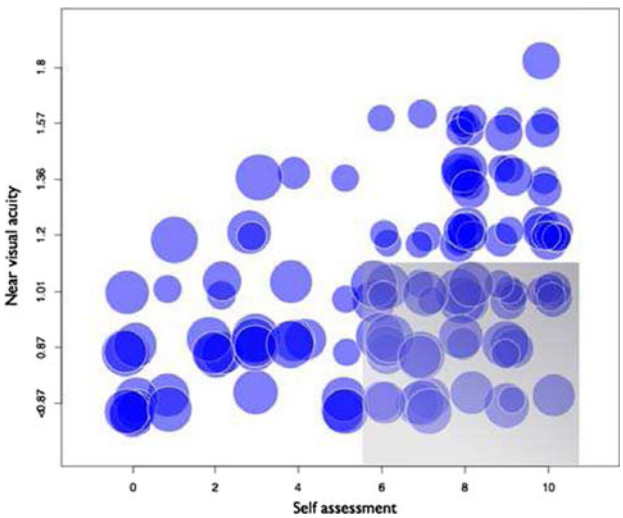


Fig. 1 Bubble plot showing self-assessment of vision (VAS), measured near vision and age (the bigger the bubbles the older the dentist). They grey area indicates those forty-four dentists who severely overestimated their vision. Note: y-axis is non-linear due to gradational measurements of near visual acuity.

093

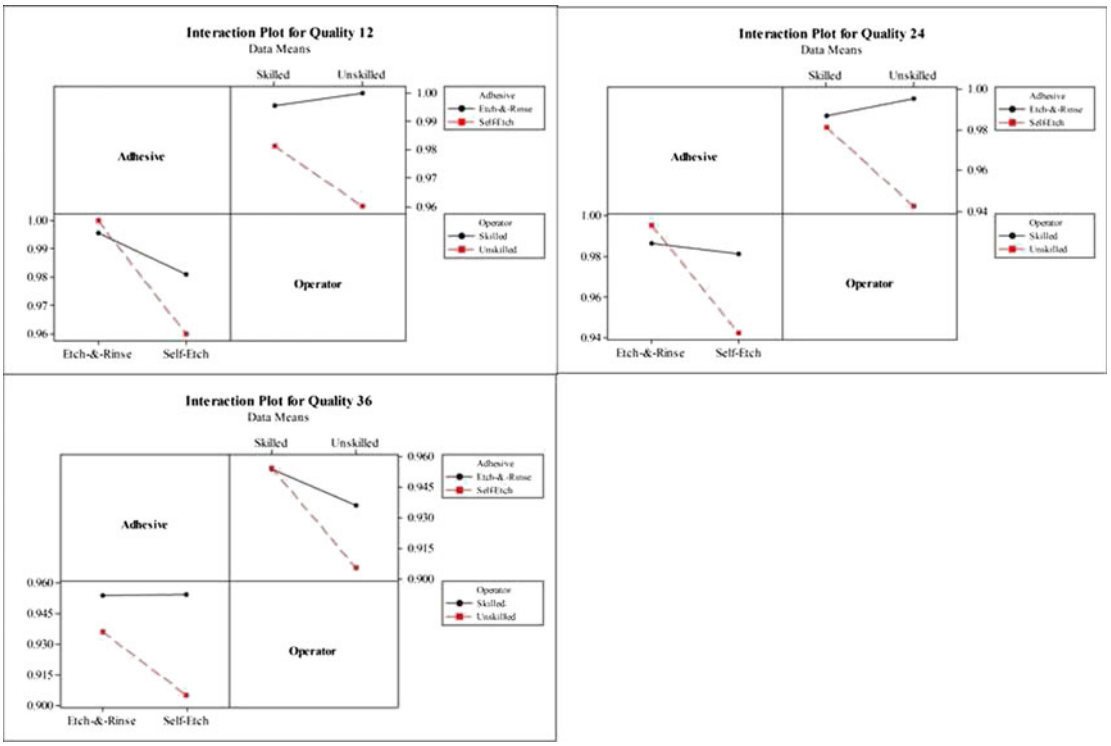
Category: Dental Education

COULD OPERATOR SKILL INFLUENCE THE EFFECTIVENESS OF A THREE-STEP ETCH-AND-RINSE AND A ONE-STEP SELF-ETCH ADHESIVE SYSTEM IN THE RESTORATION OF NON-CARIOUS CERVICAL LESIONS?

Giorgis Eleonora[1], Gambino Alberto[1], Comba Allegra[1], Breschi Lorenzo[2], Berutti Elio[1], Scotti Nicola[1]
[1]University of Turin, Department of Surgical Sciences, Dental School
[2]University of Trieste

Objective: The aims of this *in vivo* study were (1) to evaluate the influence of the operator experience in affecting the adhesive system clinical performances and (2) to assess differences in the clinical performances between 3-step etch-and-rinse and one-step self-etch adhesive systems in the restorations of non-carious cervical lesions (NCCLs).

Methods: Fifty patients who met the inclusion criteria and with at least 2 NCCLs were recruited for this study. Totally, 112 NCCLs were treated. Cervical lesions included were not retentive, with enamel incisal margin and dentin/cement cervical margin. The same experimented operator performed all NCCLs restorations, except for adhesive system application. NCCLs were divided in 2 groups according to the adhesive system employed: a 3-step etch-and-rinse (Optibond FL, Kerr) and one-step self-etch (G-Bond, GC). Each adhesive was applied either by an experimented operator or by an undergraduate student in accordance with manufacturers' instructions. Patients underwent a strict follow-up at 12, 24 and 36 months. Restoration retention, marginal integrity, discoloration, sensitivity and caries incidence were evaluated by two different calibrated operators using the criteria Ryge/USPHS for NCCLs. Statistical analysis was performed through a two-way ANOVA test (interaction between operator experience and adhesive systems were assayed).
Results: A significant difference between expert and inexperienced operators at 12, 24 and 36 months ($p<0,05$) was found. No statistical difference was found between the adhesive systems employed, independently of the operator experience.



Conclusion: Up to our knowledge, this is the first time that the influence of operator experience on clinical performance of dentin bonding systems belonging to different classes was in vivo evaluated. Skilled operator obtained better clinical outcome both for etch-and-rinse and self-etch adhesives, while no difference between adhesive systems tested was found.

108

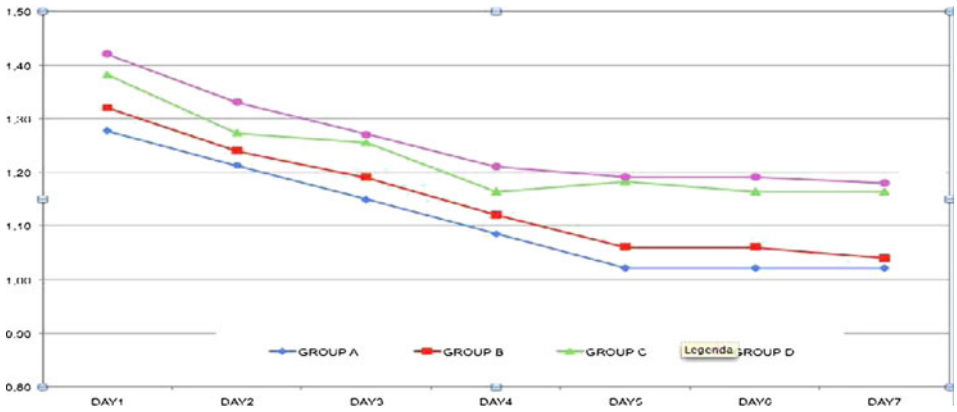
Category: Dental Education

THE EFFECT OF THEORETICAL AND PRACTICAL TRAININGS TO UNDERGRADUATE STUDENTS ON MULTISTEP ADHESIVE TECHNIQUES IN CLINICAL PRACTICE: AN IN VIVO STUDY

Giuliano Carlotta[1], Bergantin Emanuele[1], Delbosco Laura[1], Giovannini Roberta[1], Pasqualini Damiano[1], Berutti Elio[1], Scotti Nicola[1]
[1]University of Turin, Department of Surgical Sciences, Dental School

Objective: The aim of this clinical trial was to evaluate the effectiveness of theoretical and practical trainings on multistep adhesive systems in clinical practice by undergraduate students.
Methods: 384 patients with one posterior tooth affected by a primary carious lesion were recruited. The patients were randomly divided into four groups based on the two multistep adhesive systems employed and the operator clinical experience: group A (All Bond 3, skilled operator); group B (All Bond 3, unskilled operator); group C (Protect Bond, skilled operator); group D (Protect Bond, unskilled operator). The same skilled operator carried out restorations using a nano-hybrid composite (Venus Diamond, Haereus) in oblique stratification. Each increment was light cured for 20 s with a polywave LED lamp (Valo, Ultradent). Patients received a 3-level thermal sensitivity scale form for post-operative sensitivity rating. This evaluation was recorded daily for 7 days. Follow-up was scheduled after 7 days to evaluate sensitivity to air and cold and after 12 months in accordance with USPHS modified criteria. Vas scores were analyzed through McNemar test and postoperative trends were analyzed with Friedman test ($p<0.05$).
Results: 100 % of enrolled patients presented at the follow-up visits. There was no statistically significant difference either among

the four groups in the 7-days-follow-ups, and in the 1-year-follow-ups. The DAY1-to-DAY7 curves are showed in graph 1. For all groups, there is an increase in post-operatory sensitivity in T1 that significantly decreased during the observation period.



Conclusion: The results of this clinical trial bring to state the effectiveness of theoretical and practical trainings on multistep adhesive techniques in clinical practice. The respect of application times and modalities of each adhesive step brings to well-performing adhesive restorations, independently of the adhesive system and the operator experience.

110

Category: Dental Education

HOW OPERATOR'S EXPERIENCE CAN INFLUENCE EFFICIENCY AND EFFECTIVENESS OF TWO DIFFERENT FIBER POSTS REMOVAL?

Emanuele Bergantin [1], Mario Alovisi [1], Damiano Pasqualini [1], Elio Berutti [1], Nicola Scotti [1]
[1]University of Turin, Department of Surgical Sciences, Dental School

Objective: This in vitro study evaluated the influence of clinical experience in relation to removal time and effectiveness of two different fiber posts. The null hypothesis is that clinical experience significantly influences the fiber post removal.
Methods: 48 single-rooted teeth were endodontically treated and obturated. Post spaces were prepared for the following post systems: Group 1 (n=24) D.T. Light Post® #1; Group 2 (n=24) Hi-Rem Prosthetic Post® #2. After luting procedures, 8 samples per group were selected for pull-out test until failure with a universal machine. 32 samples were selected for fiber post removal evaluation. Post removal was performed by: subgroup A, a dentist specialized in endodontic (Subgroup A, n=12) or an undergraduate student (Subgroup B). In Group 1 fiber posts were removed with a Start-X® number 3 ultrasonic tip; in Group 2 a ProFile® 25.04 was used to remove the central soft polymer macro-fiber and a Largo®#2 to remove remnants. Efficiency evaluation was done through removal time recording. Effectiveness was evaluated in two methods: comparison before post luting and after post removal; post space walls evaluation with stereomicroscope, based on a 0 to 5 point scale. A statistical analysis is realized.

MEAN POST REMOVAL TIMES (seconds)							
GROUP 1				GROUP 2			
EXPERT		UNEXPERT		EXPERT		UNEXPERT	
201.03[a]±13.18		256.54[b]± 14.96		37.29[c]±4.19		41.32[c]±2.47	
WEIGHT DECREASE (grams)				**REMOVAL EFFICIENCY (MEAN ± S.D.)**			
RTD		HIREM		RTD		HIREM	
EXPERT	UNEXPERT	EXPERT	UNEXPERT	EXPER	UNEXPERT	EXPERT	UNEXPERT
0.0032[a]± 0.0013	0.0176[b]± 0.0113	0.0034[a]± 0.0011	0.0186[b]± 0.0082	1.25[a]± 0.46	1.375[a]±0.52	1.375[a]± 0.52	1.5[a]± 0.53

Results: Bond strength of tested posts was comparable. Mean and standard deviations obtained of efficiency and effectiveness results are expressed in table 1. Different superscript letters indicate statistical difference.
Conclusion: The null hypothesis is partially accepted since operator experience only influences the weight change, thus the quantity of sound dentin removed. Hi-Rem® posts generally required less time to be removed from either skilled or unskilled operator. According to this study this procedure has proven to be extremely fast, especially if compared to the use of an ultrasonic device alone.

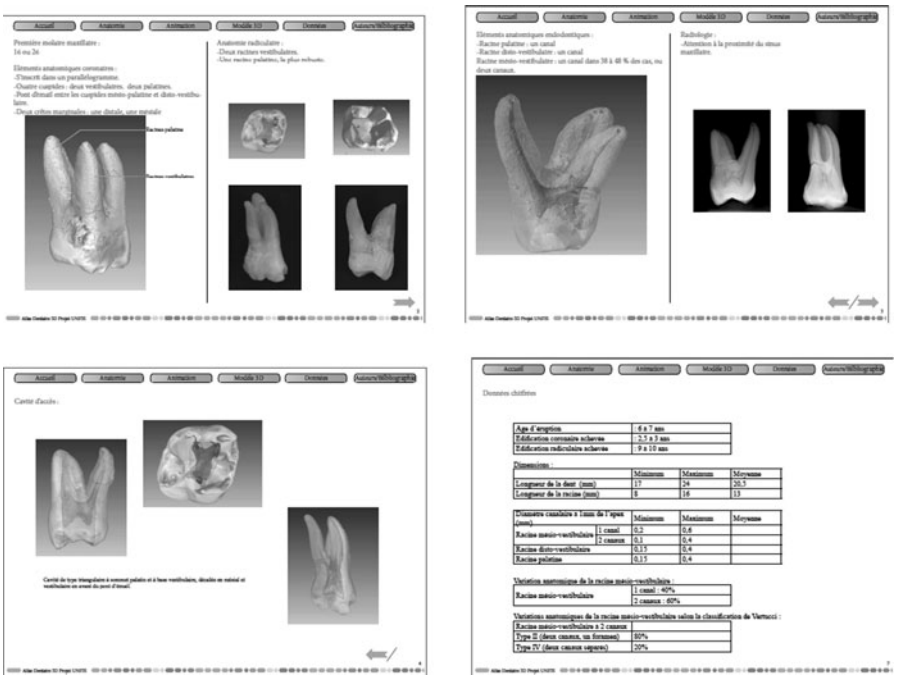
126

Category: Dental Education

3-D TOOTH ATLAS: PEDAGOGICAL PROJECT IN ENDODONTICS

K.Vallaeys[1,2,3], V. Chevalier-Herisset[1,2], M.Guillerme[2], Y. Patinoc[4], G. Bourbouze[5], R. Arbab-Chirani[1,2,3]
[1]CHRU-Service d'odontologie du CHRU, Brest
[2]UBO-Faculté d'odontologie, Brest
[3]Laboratoire de Traitement de l'Information Médicale INSERM-UMR 1101, Brest
[4]UBO-Systèmes d'Ingénierie d'Appui à la Médiatisation pour l'Enseignement, Brest
[5]Centre de Ressources Technologiques Morlaix

Objective: New technologic advances in educational field have transformed the way students access content and the methods by which educators teach content. The aim of this project was to create a new 3-D tooth atlas in order to facilitate understanding, knowledge and teaching of the endodontic anatomy for French undergraduate dental students.
Methods: Each permanent dental type (maxillary and mandibular incisor, canine, premolar and molar) is imaged by a high-resolution micro-computed tomography (resolution of 20 μm). Acrobat Reader Pro software (Adobe Systems Complex, San Jose, California, US) was used to create PDF interactive files that integrate 3D acquisitions. On each file, corresponding dental photos, radiography exams, 3D images et videos reconstructions were integrated. An interactive tool was integrated too. A review of the literature helped to compile the anatomical relevant data to each dental type (size, age of eruption, anatomical variations…).
Results: Fourteen interactive French PDF Files were created, seven for maxillary teeth and seven for mandibular teeth. For each type of tooth, a file has 8 colour plates.



Conclusion: This atlas, supported by UNF3S (Université Numérique Francophone des Sciences de la Santé et du Sport), organizes complex anatomical information in an easy-to-learn-use format ideal for review and study. It constitutes a helpful learning and teaching tool, accessible to dental students and teachers.

127

Category: Dental Education

ENDODONTICS OR IMPLANTS: PEDAGOGIC APPROACH IN TREATMENT-PLANNING DECISION APPLIED TO UNDER-GRADUATE STUDENTS

Azziza Touti [1], Florian Bouaziz [1], François Bayet [1], Laurent Pierrisnard [1], Eric Bonte [1], Jean-Jacques Lasfargues[1]
[1]UFR d'Odontologie, Université Paris Descartes, Hôpital Bretonneau, AP-HP, Paris, France

Objective: Implant-supported prosthetics have become the gold standard for the treatment of partial edentulism. Many practitioners have considered an implant-supported prosthesis as an alternative to the preservation of the natural dentition. Moreover, students are confronted with complex choices regarding a compromised tooth : it should be endodontically treated or extracted and replaced by an implant. Studies comparing endodontic treatment versus implant-supported prosthesis have shown similar clinical outcome and survival rates. The aim of this study is to evaluate a proposal of academic decision tree to assist students in undergraduate dental clinic.
Methods: This decision tree has been submitted to students and assessed in a prospective way to judge its reliability. A case series of single tooth concerned are selected during the consultations of endodontic and implantology in Dental Clinic of Bretonneau Hospital. Clinical data of each case are collected following the proposed decision tree.
Results: The decision tree to be proved efficient to determine after multidisciplinary considerations whether to perform endodontic therapy or extract and place an implant. Four factors require careful consideration in planning the most appropriate treatment for a particular patient: patient variables, tooth variables, implant variables and operator variables. This approach has been verified in clinically relevant illustrated cases.
Conclusion: This clinical approach solved the treatment decision dilemma between endodontic and implantology. By this project, students understand endodontic involvement in the treatment planning process

and keep in mind that the preservation of a patient's natural dentition remains an important goal in our practice.

173

Category: Dental Education

ORAL HEALTH RELATED QUALITY OF LIFE IN ELDERLY, IN TWO PUBLIC LISBON'S HEALTH CENTRES—A COMPARATIVE STUDY

Ana Manso[1], Duarte Durão[1], Carla Nunes[2], Ana Escoval[2], Francisco Salvado[1]
[1]Instituto Superior de Ciências da Saúde Egas Moniz - Ciiem - Almada - Portugal
[2]Escola Nacional de Saúde Pública - Universidade Nova de Lisboa - Portugal

Objective: To identify the perception that older people have about their oral health, to characterize socio-demography of the elderly people of the Centro de Saúde de Alvalade e Pontinha and to identify the main socio demographic factors associated with variable self-perception.
Methods: Sample of 35 elderly patients of Centro de Saúde de Alvalade and 30 elderly patients of Centro de Saúde da Pontinha, aged 65 years or above. The subjective conditions related to the individual characteristics of each person were analysed using a specific questionnaire. The self-assessment of quality of life related to oral health was measured with general questions. In order to measure the perception of each individual the Geriatric Oral Health Assessment Index (GOHAI) was used. The data was statistically analysed by SPSS software. They used frequency measures (absolute and relative) and other descriptive statistics (mean, standard deviation, maximum and minimum values). We used the chi-square test, Spearman and independent t test for correlation of variables with reference to either accept or reject the null hypothesis with significance level $p \leq 0{,}05$.
Results: The average age of the elderly population was 74,74 in Alvalade and 71,70 in Pontinha. The variable marital status shows statistically significant differences between the two health centers ($p=0{,}004$). The difficulty in chewing interferes with oral health, quality of life both in Alvalade ($p=0{,}002$) and in Pontinha ($p<0{,}001$). The pain in the oral cavity interferes with oral health, the quality of life and the social level, both in Alvalade ($p=0{,}002$) and in Pontinha ($p=0{,}003$). GOHAI was high both in Alvalade and in Pontinha.
Conclusion: GOHAI has shown that the perception of different factors may be different with regards to the social demographic level.

175

Category: Dental Education

DESIGN AND EVALUATION OF TWO TRAININGS TO IMPROVE STUDENTS' DENTAL WORK PERFORMANCE

Bruno Baracco[1], Antonio Crego[2], Victoria Fuentes[1], Laura Ceballos[1]
[1]Department of Stomatology, Health Sciences Faculty, Rey Juan Carlos University, Madrid, Spain
[2]Department of Psychology, Health Sciences Faculty, Rey Juan Carlos University, Madrid, Spain

Objective: A twofold objective was established. First, to design and carry out two simple visual-motor trainings aiming to improve the quality of dental work performed by dental students; and second, to assess and compare the trainings' efficacy.
Methods: 86 dental students with no experience in rotatory instrumentation participated in this study. They received notions about dental anatomy and cavity principles before performing an occlusal Class I cavity (with standardized dimensions) in a plastic model of a 46 tooth, using diamond burs mounted on a dental turbine (pre-test measure). Afterwards, students were randomly assigned to 3 groups: training by scratching tracings over wax plates with a bur mounted on a non-activated dental turbine (G1; $n=29$), training by threading a needle (G2; $n=29$), and control group with no training (G3; $n=28$). Two weeks later, all the students performed again the same dental task (post-test measure). Two dentists evaluated blindly all the cavities from pre- and post-test moments. The results were analyzed using two-way mixed ANOVA, one-way ANOVA and Bonferroni tests, and paired-samples t-test ($p<0.05$).
Results: At pre-test time, the outputs of all the students were statistically similar. On the contrary, at post-test time, participants in the "wax tracing" training group (G1) obtained scores significantly higher in comparison with students in the "threading needles" training (G2) and control (G3) groups. Furthermore, those in the "threading needles" group (G2) significantly scored higher, as compared with those in the control group (G3). Although all the participants improved their dental performance from pre- to post-test, the improvement was clearly larger for students in G1.
Conclusion: The improvement of the quality of students' dental performance was higher for the ones that underwent the most specific training ("wax tracing" group).

193

Category: Dental Education

COMPUTER ASSISTED LEARNING IN AN UNDER GRADUATE PROGRAM : THE DENTSIM® PROJECT

C. Villat[1,2*], F. Virard[2,3], G. Viguié[2], D. Bourgeois[2], D. Seux[2]
[1]LMI, UMR CNRS 5615, Université Lyon 1, France
[2]UFR Odontologie, Université Lyon 1 ; Hospices Civils de Lyon, France
[3]Centre de Recherche en Cancérologie de Lyon, INSERM UMR 1052/Centre National de la Recherche Scientifique 5286, Lyon, France

Objective: Virtual reality-based systems are used in many sectors for the training of personnel required to perform highly specialized procedures. Medicine and dentistry have introduced these systems to improve clinical teaching over the last decade. The dental faculty of Lyon implemented a virtual reality-based training programme to assist dental undergraduate students with cavity preparation. The training platform combines two technologies; a simulation unit (Smily, Saratoga Dental, Pordenone, Italy) alongside a computerized training system (DentSim, Image Navigation Ltd, New York, USA). Students work on typodont and their movements are tracked by 2 cameras. Software then constructs a virtual cavity, which is compared to the "ideal" preparation. According to the evaluation criteria (wall incline, depth, roughness…), a score on 100 points was attributed to the student's work. This system allows self-evaluation by students, while the teacher observes and corrects the work position. The aim of this study is to describe the pedagogical objective of this new course and present preliminary results.
Methods: Ninety eight second year dental undergraduate students received three sessions of virtual reality-based training in a dedicated simulation room (duration 2.5 hr/session). At the 4th session, they were asked to perform an exam (30 minutes). The values obtained from the training sessions and the exam session were compared. In addition, the teachers evaluated the students working position during the training session (0 = bad ; 1 = good).
Results: The values obtained for the training sessions were 33.86±27.09 points and 47.07±35.13 points for the exam session. The work position evaluation indicated that 55 % of the students adopted a good position.
Conclusion: Virtual reality based training technologies are interesting devices with regard to improving the working positions (with the support of the teacher) and the manual skills (with the assistance of the computer) of undergraduate students. More pedagogical evaluation should be undertaken to assess the potential of this new technology in preclinical teaching.

213

Category: Dental Education

TEACHING THERAPEUTIC EDUCATION TO SENIOR DENTAL STUDENTS: A PEDAGOGICAL PILOT PROGRAM

Sylvie Azogui-Lévy[1], Mélanie Nasseripour[2]
[1]Paris 7 Denis-Diderot University, Odontology, Department of Public Health
[2]Paris 7 Denis-Diderot University, Odontology, Department of Conservative Dentistry and Endodontics

Objectives: This program has for objectives to teach senior dental students:
• the principles of patient oral health literacy intended to help patients acquire and maintain skills needed to optimally manage living with chronic oral disease
• to conduct an educational diagnosis and a patient risk appropriate treatment plan
Methods: A Patient Therapeutic Education (PTE) chart with a visual aid (cariogram) is reviewed with students prior to the consultation.
There are three sessions in a PTE consultation :
• the first session is dedicated to patient interview, clinical exam, oral health questionnaire and salivary diagnostic tests necessary for the cariogram. The educational diagnosis and treatment plan are developed with the patient.
• the second session is dedicated to evaluating patient knowledge, attitude, behavior and practices.
• the third session is conducted 6 months later reviewing all periodontal and caries parameters evaluated in the first two sessions.
An anonymous evaluation questionnaire is given to students having completed the first two sessions, evaluating educational experience, acquired knowledge, and the impact on patient's oral health.
Results: Four groups of students will be answering the questionnaire. Preliminary results based on the first groups of students who have completed the two sessions are as follows: the educational process and the patient interview have been assimilated (70 % of responses). The caries risk evaluation has been well integrated (80 %), well perceived (100 %). Students had no prior knowledge of this tool. Efforts are still needed as far as students' perception of patients with poor oral health (50 % little convinced of the necessity for change).
Conclusion: This program underlines the importance of apprehending students' therapeutic education, prevention and patient specific oral health risk management knowledge and practice.

239

Category: Dental Education

CONTRIBUTION OF VIRTUAL REALITY IN A PRE-CLINICAL OPERATIVE DENTISTRY EDUCATION PROGRAM

Mickaël Zerbib[1], Jérémy Cormier[1], Aline Hartmann[1]
[1]UFR d'Odontologie - Université Paris Diderot - Paris 7, France
Pôle d'Odontologie Garancière Rothschild

Objective: Virtual Reality (VR) represents an innovative and promising pedagogic tool in many fields (aeronautics, veterinary, laparoscopy, implantology…). In order to assess if VR is useful in a preclinical operative dentistry education program, an "experts" versus "novices" study was conducted.
Methods: 44 subjects were splitted in two groups: 21"experts" (certificates but not boarded undergraduate students) and 23 "novices" (first year undergraduate students) matched for age. After a period of training with the dental simulator (VirTeaSy, Fish Tank version, Didhaptic®), all the subjects were asked to perform the same task twice, consisting in virtually drilling a key shape cavity inside a virtual block. Three types of data were collected: performance speed (Time), percentage of material correctly eliminated inside the pattern (Good), or outside of it (Bad).
Results: For the two groups, there were no significant difference for Good and Time data. The "expert" group performed significantly better ($p<0,001$) than the other group concerning the variable Bad. The two groups did not significantly perform better ($p > 0, 05$) comparing the first try and the second one.
Conclusion: This study shows the ability of the haptic simulator to discriminate the two groups ("novices" versus "experts") while performing a preclinical act in restorative dentistry. This preliminary study is going to be followed by another one to analyze the cross training before the pedagogic application of this new method of learning.

007

Category: Endodontics and Pulp Biology

NEW INTELLIGENT PIEZON SYSTEM IN THE REMOVAL OF DENTIN DEBRIS: *IN VITRO* STUDY

Ibrahim Ethem YAYLALI[1], Yasar Meric TUNCA[1]
[1]GATA Medical Academy, School of Dentistry, Department of Endodontics, Ankara, Turkey

Objective: To assess the efficacy of novel ultrasonic system i.piezon versus traditional piezon system in removing dentin debris from the curved root canal system.
Methods: Sixty recently extracted human teeth with curved root and canal were decoronated at cemento-enamel junction. The pulp tissue was removed. Working length was determined by inserting #10 K-file until visible at the apical foramen. By subtracting 1 mm, real working lenght was determined. After instrumentation by using crown-down technique, the teeth were randomly allocated in two groups (n=30). The roots were split longitudinally into 2 halves by chisel. A standard hemispherical-shaped cavity was prepared into the one side of the root halves. The cavity was filled with dentin debris. The roots were reassambled and embeded in eppendorf tubes with silicon material. In all groups two irrigation procedures were performed with traditional piezo device (Group I) and i.piezon (Group II). The amount of residuel debris was evaluated numerically by using ImageJ software. Since the variables were numeric and showed normal distribution, t-test for independent samples was used for statistical analysis.
Results: There was a statistically significant difference between the Group I and Group II. New i.piezon system (Group II) removed debris from the artifical cavities better than traditional piezo device (p=0,027)
Conclusion: Oscillation with stabile movement of file in i.piezon system better removed dentin debris than agressive oscillation movement of file in traditional piezo system. This might be attributed to the more smooth oscillation movement of the i.piezon system. Because oscillation amplitude is more narrow in i.piezon system, the contact between file and dentin wall is less. This effect might result in more debris elimination.

008

Category: Endodontics and Pulp Biology

EFFECT OF DIFFERENT POST SYSTEMS ON DENTIN: AN *IN VITRO* STUDY

Yasar Meric Tunca , Ibrahim Ethem Yaylali
GATA Medical Academy, School of Dentistry, Department of Endodontics, Ankara, Turkey

Objective: The aim of the study was to compare effect of two different post systems on dentin.
Methods: Twenty newly (n=20) extracted teeth with single root and single canal were selected. The teeth were decoronated at cemento-enamel junction and shaped and obturated endodontically. The roots were randomly divided in two groups. Screw postcore system was performed

to Group I, Carbon fiber post core system was performed to Group II. The roots were sectioned horizontally at 3 and 6 mm below cemento-enamel junction; dentin discs were examined under 40x stereomicroscope in terms of dentinal defects. Defects were categorized as: "no defect", "defect". Because the dependent variables were binominal, Chi Square test was performed to compare the groups.
Results: Difference was statistically significant between the two groups (p=0,018). The defects number and severity were lower in Group II than Group I. Group I showed more destructive surface than Group II.
Conclusion: Screwed post core system might result in more dentinal defects. This result might derive from the drilling motion of the screw post. Drilling motion might transmit the drilling pressure to the peripheral dentin layer. Non-screwed systems is less destructive to dentin.

009

Category: Endodontics and Pulp Biology

IN VITRO COMPARISON OF CYCLIC FATIGUE RESISTANCE OF ENDO-EZE TILOS, WAVEONE, AND PROTAPER

María Martínez-Viñarta 1[1], Ramiro MontenegroSantillán 2[2], Vicente Faus-Matoses 3[3], Teresa AlegreDomingo 4[3], Vicente J. Faus-Llácer 5[4]
[1]Postgraduate Student
[2]Collaborator Professor
[3]Associate Professor
[4]Professor and Director of the Master
Master of Restorative Dentristy and Endodontics, Department of Stomatology, Medicine and Dental School, Valencia University, Spain. fausvj@uv.es

Objectives: The aim of this study was to compare the cyclic fatigue resistance of 3 nickel-titanium (NiTi) endodontic instruments with reciprocating movement, ENDO-EZE TiLOS Transitional File (TL; Ultradent Products Inc, South Jordan, UT) and WaveOne (WO; Denstply Maillefer, Ballaigues, Switzerland), with conventional continuous rotary movement, ProTaper Universal (Denstply Maillefer, Ballaigues, Switzerland).
Methods: Cyclic fatigue testing was conducted by operating instruments from TL 25 .08, WO 25 .08 and ProTaper F2. A total of 210 instruments were rotated in 4 curved artificial canals with different angles (45e and 60°) and radius of curvature (2 and 5 mm). The time and cycles to failure were calculated. The data were compared for differences by using 2-way analysis of variance (P<.05).
Results: In general, WO was the most resistant to fatigue failure of the tested instruments, and TL showed a higher number of cycles to failure than ProTaper.
Conclusion: Reciprocating movement of WO and TL showed a longer cyclic fatigue life than conventional continuous rotary movement of ProTaper.

010

Category: Endodontics and Pulp Biology

EVALUATION OF THE HYDROGEN PEROXIDE PENETRATION INTO THE PULP CHAMBER

Tatiana Rocha Oliveira [1], Diego Barreto Andrade [2], Carlos Camargo [3], Gleyce Oliveira 4[4], Samira Camargo [5]
[1]Columbia University College of Dental Medicine - Division of Endodontics, NYC, USA, Columbia University College of Dental Medicine - Division of Endodontics, NYC, USA
[3]São Paulo State University - Department of Endodontics, SP, Brazil
[4] São Paulo State University - Department of Endodontics, SP, Brazil
[5] São Paulo State University - Department of Endodontics, SP, Brazil

Objective: The aim of this study was to evaluate the amount of hydrogen peroxide (HP) that penetrate into the pulp chamber of bovine teeth submitted to dental whitening using 3 different whitening agents with and without light activation: Whiteness HP 35 % (FGM, Joinville, SC, Brazil), Opalescence Xtra Boost 38 % (Ultradent, Utah, EUA) and manipulated hydrogen peroxide (Biofórmula - Pharmacy of Manipulation - Sao Jose dos Campos - Brazil).
Methods: 120 bovine teeth were selected, without cleavages. Crowns were sectioned 3 mm below the enamel-cement junction and their pulps were removed. Pulp chamber access was performed and the volumes of the chambers were standardized in approximately 100 μL and filled with a 2 M acetate buffer solution. The teeth were divided into 8 experimental groups (n= 15): A1 - Whiteness HP 35 %, without light activation (WSA); A2 - Whiteness HP 35 % + halogen light (WLH); A3 - Whiteness HP 35 % + LED (WLED); B1- manipulated 35 % HP, without activation (MSA); B2 - manipulated 35 % HP + HL (MLH); B3 - manipulated 35 % HP + LED (MLED); C - Opalescence Xtra Boost 38 % without activation (OP); D - control (deionized water). Subsequently, the whitening agents were applied into the buccal surface delimited on the crown and remained there for 30 minutes. The quantification values of the peroxide inside pulp chamber were obtained for absorbance analysis in spectrophotometer and data were submitted to both ANOVA and Tukey statistical tests (p<5 %).
Results: The results showed peroxide penetration into the pulp chamber, regardless its concentration and activation source. The ranking of the amount of peroxide that penetrated into the pulp chamber was: OP > WLED > WLH > MLED > WSA > MSA > MLH > Control.
Conclusion: The peroxide penetration was directly proportional to its concentration. The manipulated product obtained lower values of peroxide penetration compared to the commercial product.

011

Category: Endodontics and Pulp Biology

EFFICIENCY AND EFFECTIVENESS OF FIBER POST REMOTION: DT LIGHT POST ILLUSION XRO VERSUS FRC POSTEC PLUS WITH ULTRASOUNDS

Estefan'a Herrero-Hernández 1[1], Amparo FeltrerGavara 2[2], Vicente Faus-Matoses 3[2], Teresa AlegreDomingo 4[2], Vicente J. Faus-Ll‡cer 53
Master of Restorative Dentistry and Endodontics, Department of Stomatology, Medicine and Dental School, Valencia University, Spain fausvj@uv.es

Objective: Evaluate the efficiency and effectiveness of two fiber post remotion: DT Light Post Illusion XRO versus FRC Postec Plus with ultrasounds.
Methods: Fiber Post DT Light Post Illusion XRO (group A) and FRC Postec Plus (group B) were cemented into 66 singlerooted teeth previously TF preparation and Beefill 2 and 1 obturation. Fiber post were removed with Start-X n[1]/[4]3 ultrasonic tips with 2,5X optic microscope asses. Using a stopwatch, each removal procedure was timed-out. The effectiveness of fiber post removal was graded on a 5-point ordinal scale by Lindemann.
Results: The time to remove either fiber post was significantly lower in FRC post but the effectiveness was higher in DT Light Post Illusion XRO. The differences between the teeth and the post color allowed easier post removal.
Conclusion: The time required in the removal of the DT Light Post Illusion XRO was higher due to the difference of the color between the teeth and the post. The number of fibers removed was superior in the DT Light Post Illusion XRO group.

018

Category: Endodontics and Pulp Biology

PATHOHISTOLOGICAL INVESTIGATION OF THE INFLUENCE OF INTRACANAL MEDICATION ON THE REGENERATION OF JAW BONE

A. Borysenko, S. Palamarchuk*
Bogomolets national medical university ; Kiev Ukraine

Objective: To stimulate regeneration of periapical tissues in the treatment of chronic apical periodontitis it was proposed to use a paste for temporal placement into root canals. This material contains Metronidazole, Enterosgel and a drug that stimulates regeneration of bone tissue—Aflutop.
Methods: With the aim of investigation of stimulation effect of proposed medicamental composition on the regeneration of bone tissue the experiments on rats were conducted. The drug Collapan ("Intermedapatit", Russia) was used as a comparison remedy.
Experimental investigation were conducted on 35 white rats of the Vistar line. They were divided into 7 groups: rats with intact bone, nontreated mandible bone defect, filled with proposed composition and filled with Collapan.
Bone defect (0.3–0.5 cm in diameter) was reproduced in the mandible under thiopental anesthesia. Proposed composition was introduced into bone defect of the rats. Euthanasia in all rats group on the 10^{th} day and on the 30^{th} day.
Results: In the histological specimens of the mandible bone defects of the 2^{nd} group rats (bone defect without treatment, 10^{th} day) the zones of bone tissue in a state of fragmentation were revealed.
In the histological specimens of the mandible bone defects of the 4^{th} group rats (bone defect was filled with the proposed composition) in 30-day period in the histological specimens of the mandible there were observed the signs of reparation expressed in the formation of big number of new form blood vessels. Moreover, connective tissues formations were closely attached to the bone tissue. The results was similar to action of Collapan (control group).
Conclusion: Our histological investigations have proved the osteoregenerative abilities of the proposed medicamental composition, similar to those of the material used as a control—Collapan.

026

Category: Endodontics and Pulp Biology

EFFECT OF CROSS SECTION ON THE BEHAVIOR OF THREE ROOT CANAL INSTRUMENTS

Diemer Franck [1,2], Calas Paul † [1], Piquet Robert[3]
[1]Faculté de Chirurgie dentaire de Toulouse, CHU de Toulouse,
[2]LPCNO-INSA Toulouse - France,
[3]Institut Clément Ader, Université de Toulouse

Objective: The cross section of the instrument and the design of blades affect the distribution and intensity of constraints. The aim of this study was to assess the role of three different cross sections on the behavior of the instrument, by measuring the stresses generated during the preparation of a simulated canal,.
Methods: Three 25-mm-long NiTi files were tested (HeroShaper®, Protaper® and K3®). They were size 30, 0.06 taper excepted for the ProTaper F2 (25, 0.08 to 0.055 variable taper). Their behavior was evaluated during the preparation of simulated root canal in polyurethane resin blocks (Cibatool BM 5450) without lubricant. The instruments were mounted on a machining center (CV 800, GSP) providing a constant rotational speed (350 rpm) and a constant feed rate (100 mm/min). Six canals were prepared using each instrument. A dynamometer with a sensitivity of 0.1 N recorded the stresses transmitted by the file. An analysis of variance and a PLSD Fisher's test for a 5 % αrisk with the null hypothesis that the instruments generate the same stress levels were performed.
Results: Axial stresses (Fz) and torque (Mz) increased proportionally to deepness preparation.

	Fz5mm	SDev	**Fz10mm**	SDev	**Fz15mm**	SDev	**Mz5mm**	SDev	**Mz10mm**	SDev	**Mz15mm**	SDev
HeroShaper®	**3.400**	0.537	**6.000**	1.334	**7.883**	1.493	**0.458**	0.049	**0.767**	0.183	**0.992**	0.120
K 3®	**3.233**	0.494	**4.592**	0.506	**6.850**	1.062	**0.667**	0.093	**1.058**	0.220	**1.742**	0.375
Protaper®	**2.850**	0.138	**4.133**	0.280	**5.717**	0.454	**0.467**	0.125	**0.900**	0.217	**1.575**	0.256

Table 1: Average value and standard deviation of axial constraint Fz (N) and torque Mz (N.cm) at three levels of penetration (5, 10 and 15 mm).

The analysis of variance showed some significant differences for each level of penetration (p=0.0006 to 0.1073). The PLSD Fischer's test confirmed those differences (tab. 2).

	Fz 5 mm	Fz 10 mm	Fz 15 mm	Mz 5 mm	Mz 10 mm	Mz 15 mm
HeroShaper® / K 3®	0.5107	**0.0109** *	0.1213	**0.0017** *	**0.0278** *	**0.0002** *
HeroShaper® / Protaper®	**0.0420** *	**0.0016** *	**0.0036** *	0.8806	0.2831	**0.0020** *
K 3® / Protaper®	0.1420	0.3594	0.0918	**0.0023** *	0.2059	0.3039

* : statistically significant
Table 2: PLSD Fischer's test for of axial constraint Fz (N) and torque Mz (N.cm) at three levels of penetration (5, 10 and 15 mm).

Conclusion: Despite the radial lands, the K3® system showed a behavior close to HeroShaper® or ProTaper® behavior. Finally, in the condition of this study, axial stresses and torque are linked to cross-section.

027

Category: Endodontics and Pulp Biology

SEM STUDY OF ROOT CANAL CLEANING PERFORMED BY TWO NICKEL-TITANIUM ROTARY RETREATMENT INSTRUMENTS

Diemer Franck [1,2], Khalil Issam [3], Vallaeys Karen[4], Mallet Jean-Philippe[1]
[1] Faculté de Chirurgie dentaire de Toulouse, CHU de Toulouse - France,
[2] LPCNO-INSA Toulouse - France
[3] Saint Joseph University Dental School, Beyrouth - Lebanon
[4] Université de Bretagne Occidentale, UFR d'Odontologie, Brest - France

Objective: Two rotary systems are currently used for endodontic retreatment: R-Endo® (RE) (Micro-Mega®) and ProTaper Universal® (PTU) (Maillefer®). The aim of this study is to compare the cleaning ability of these two systems in terms of removal of debris and smear layer using SEM examination.
Methods: 24 single-canal teeth are selected, initially shaped ("step-back" technique), filled (single cone technique), and randomly divided in two groups (RE®, PTU®). Retreatments are performed and final shape is done with specific instruments (F2 for PTU group, SU—cleaning instrument from Revo-S® system, in place of RS—for RE group). Samples are split and a double blind observation is performed with a SEM (x100, x500). The Ahmad's[1] scoring scale is used to quantify debris (D) and smear layer (SL). ANOVA, completed by a PLSD Fisher's test, is done with a 5 % alpha risk.
Results: the ANOVA between the both ER systems shows a significant difference for each evaluated parameter. Teeth treated with RE® show less debris and smear layer (Fig. 1).

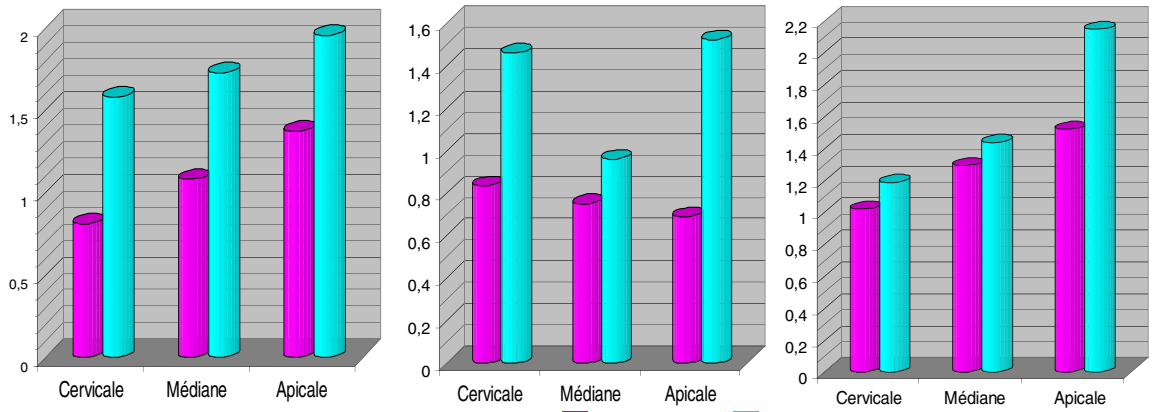


Figure 1: scoring diagrams (from left to right D_{x100}, D_{x500}, et SL_{x500}) ■ *= RE® group;* ■ *= PTU® group.*

The operative time for retreatment is statistically shorter for PTU® (137,5 s) than RE (379,6 s) ($p<0,0001$).
PTU® group samples: ANOVA between the different thirds shows a significant difference ($p=0.01$) for D_{x500}. The PLSD Fisher's test shows a significant difference between all thirds for debris and smear-layer
RE® group samples: ANOVA between the different thirds shows no statistically significant difference ($p=0.63$) for D_{x500}. The PLSD Fisher's test shows a significant difference between cervical and apical third ($p=0.003$) for debris, between cervical and apical third ($p<0.0001$) and cervical and median third ($p=0.03$) for smear-layer.
Conclusion: In these conditions, instruments of RE® system, used without solvent, are more efficient refer to cleaning ability, than PTU® instruments. This conclusion underlines the fundamental role of profile instruments and their dynamic or way of use.

028

Category: Endodontics and Pulp Biology

STUDY OF THE RESISTANCE OF NICKEL TITANIUM ENDODONTIC FILES TO DISENGAGING

Diemer Franck [1,2], Georgelin-Gurgel Marie [1,3]
[1]Faculté de Chirurgie dentaire de Toulouse, CHU de Toulouse - France,
[2]LPCNO-INSA Toulouse - France,
[3]EA-3847, Clermont-Ferrand - France

Objective: To limit the risks of rupture of nickel-titanium files, the manufacturers propose disengageable engines. A reverse movement can associate this disengaging as soon as a threshold of stress is reached. The objective of this study is to assess the effectiveness of these processes.

Methods: A serie of HeroShaper® files (30/.04) are mounted on X' Smart® motor (400 rpm). The disengaging modes tested are either a simple stop or a stop followed by a reverse movement occurring for three torque values (10, 20 and 30 N.cm). Six instruments are used for each disengaging mode and for each torque value.
The tip of the instrument is fixed on a powder brake (EBU 250®) stimulating the constraints induced by the blocking of the blades in the last three millimetres of the canal. Connection corresponds to standard protocol ANSI specification n°28. The brake is coupled with a force sensor (CY01BM®) and a numerical controller (DGT 2000®) allowing for a measurement from 1 to 50 N.cm. The pressure applied by the brake increases of 1 N.cm every 5 seconds. The value of the braking constraint inducing the disengaging of the engine or the fracture is recorded. ANOVA and χ^2 tests are interpreted at the 5 % significance level.
Results: The number of fractures increases proportionally on the level of preset torque.

Level of torque on X'Smart®	Level 1 10 N.cm	Level 2 20 N.cm	Level 3 30 N.cm
Average value of torque when disengage or brake	9,5	18,5	22,9
Number of rupture	4	7	10
Number of disengaging	12	9	6

Table 1: average torque values (N.cm), number of disengaging and number of fracture.

The disengaging mode influences the rupture (p of the χ^2=0,0008) regardless the torque settings. The opposite rotation increases the risk of fracture.
Conclusion: The rupture occurs without disengaging for the values ranging from 16 to 27 N.cm. In these study conditions, the system of disengaging coupled with a reverse rotation does not reduce the risks of rupture.

029

Category: Endodontics and Pulp Biology

THE PULP CHAMBER: ANALYSIS OF THE MINERAL COMPOSITION BY ENERGY DISPERSIVE SPECTROMETRY

Vallaeys Karen[1], Balguerie Eric[2], Bonnemaison Alexandre[2], Gauffier Jean-Luc[3], Diemer Franck [2,4]
[1] Université de Bretagne Occidentale, UFR d'Odontologie, Brest - France
[2] Faculté de Chirurgie dentaire de Toulouse, CHU de Toulouse - France,
[3] INSA - Toulouse
[4] LPCNO-INSA Toulouse - France

Objective: Bonding quality can differ according to the dentinal substratum. The literature describing the mineral composition of the pulp chamber is poor. Thus, the purpose of this study is to assess the mineral composition in three different zones: wall, floor and canal orifice.
Methods: Twenty human mandibular molars freshly extracted were selected and cleaned. Teeth were horizontally cut: 2 mm above the amélocemental junction and mid-root. Pulp fragments were eliminated by three successive ultrasound bath of NaOCl 5 %. The calcium and phosphor atoms were quantified by energy dispersive sprectrometry in three zones: wall, floor and canal orifice. Statistical analysis of the variance and correlation tests with an α risk fixed at 5 % were performed.
Results: The highest rate of Calcium was found in the pulp wall, superior to the canal orifice (p=0.03, S) and the pulp floor (p= 0.009, S). This rate was higher in the canal orifice than in the pulp floor (p=0.139, NS). The same results were observed for the phosphorus levels.

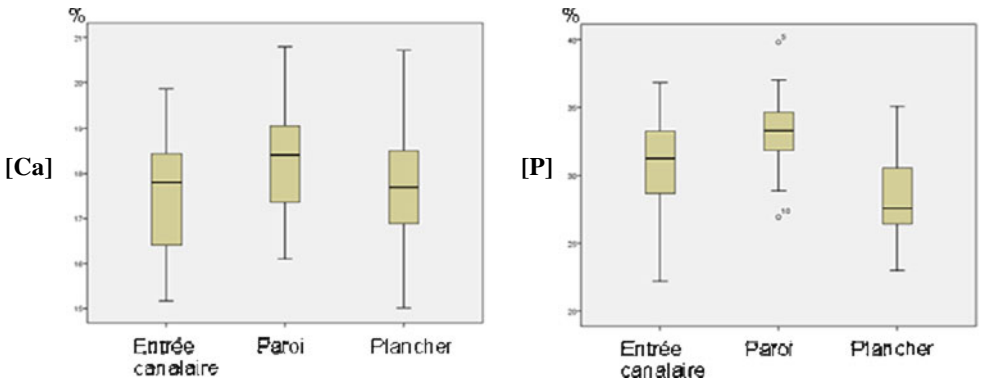


Figure 1: Distribution of Calcium rate (left) and Phosphor rate (right) in the canal orifice (Entrée canalaire), the wall (Paroi) and the pulp floor (Plancher).

The correlation test showed that in 80 % of molars, the floor presents a rate of Calcium and Phosphor lower than the two other parts of the pulp chamber.
Conclusion: In these conditions, the wall of the pulp chamber is the most heavily mineralized area and the floor is the least mineralized area. The mineral constituents of the pulp chamber are thus differentially distributed according to the topography.

046

Category: Endodontics and Pulp Biology

MTA VERSUS CALCIUM HYDROXIDE IN APEXIFICATION: RESULTS OF A RANDOMIZED CONTROLLED CLINICAL TRIAL

Bonte Eric, Beslot-Neveu Aurélie and Lasfargues Jean Jacques
Faculté de Chirurgie Dentaire (Université Paris Descartes) and Hôpital Bretonneau (Assistance Publique - Hôpitaux de Paris), Paris, France

Objective: The aim of this prospective randomized clinical trial was to compare Mineral Trioxide Aggregate (MTA) with Calcium Hydroxide (CH) as materials used to induce root-end closure in necrotic permanent immature incisors. The main objective is to determine the MTA ability to induce a hard calcific barrier over a 6 months' period. The secondary objective is to compare the time required to obtain the disappearance of clinical symptoms with CH and MTA over a 12 months' period.
Methods: This study was approved by the ethics committee (CPP Paris Ile de France IV). 34 children aged from 6 to 18 years and presenting a non-vital permanent incisor were selected. Prior to treatment, an appropriate written consent was obtained from both parents and from children. Patients were then randomly assigned to either the MTA (experimental) or CH (control) groups. Recalls are performed after 3, 6 and 12 months to determine the presence or absence of a calcified apical barrier through the use of clinical and radiographic exams. All the anonymized X-Rays were evaluated by two independent investigators. Statistical analyses were performed using SAS 9.1 (2-sided test, $p \leq 0{,}05$).
Results: 30 patients remains at the 12th month session : 15 CH and 15 MTA. The presence of a mineralized barrier is observed for 43.8 % of CH group and 64.7 % of MTA group at 6th month session (p 0.3). These data raise to 50 % for CH group and 82.4 % for MTA group at 12^{th} month session (p 0.07). For both of them, pain and percussion tenderness disappeared at the latest 3-months control.
Conclusion: The presence of a mineralized barrier is hard to discriminate at the root apex. Nevertheless none of the two materials shows significant difference at 6th month session. At the 12^{th} month session MTA group showed better results in term of apical closure. 4 of 15 teeth from the CH group exhibit coronal and/or radicular fracture at this time.
This study was promoted b : Assistance Publique - Hôpitaux de Paris, Hôpital Bretonneau, Paris, France.

047

Category: Endodontics and Pulp Biology

CYCLIC FATIGUE RESISTANCE OF THREE DIFFERENT ROTARY NICKEL TITANIUM FILES

Ugur Inan[1], Cumhur Aydin[2]
[1]19 Mayis University, Faculty of Dentistry, Department of Endodontics, Samsun, TURKEY
[2]Gulhane Military Medical Academy, Center for Dental Sciences, Department of Endodontics, Ankara, TURKEY

Objective: Introduction of nickel-titanium (NiTi) instruments has been a major development in endodontics. Despite the advantages of NiTi instruments, one of the major concerns about NiTi files is separation. Therefore, the aim of this study was to compare the cyclic fatigue resistance of Twisted Files (TF) with ProTaper and Mtwo instruments, produced by traditional grinding methods.
Methods: 120 rotary NiTi files were used in this study. 40 TF 25.06 (SybronEndo, Orange, CA, USA), 40 ProTaper F2 (Dentsply Maillefer, Ballaigues, Switzerland) and 40 Mtwo 25.06 (VDW, Munich, Germany) instruments were tested within 2 types of artificial canals having a radii of curvature of 5 and 10 mm. Cyclic fatigue testing of the instruments was performed with a device which allowed the instruments rotate freely inside an artificial stainless steel canal. Each instrument was rotated until fracture occurred. The number of cycles to fracture (NCF) was calculated. Data were analyzed using one-way ANOVA test.
Results : For the 5-mm radius, mean NCF for TF 25.06, Mtwo 25.06 and ProTaper F2 were 720.40±105.09, 577.35±43.88 and 354.20± 53.04 respectively. TF 25.06 group showed better cyclic fatigue resistance than the ProTaper F2 and Mtwo 25.06 groups ($p<0.01$). Mtwo 25.06 group was also more resistant to failure than did the ProTaper F2 group ($p<0.01$). For the 10-mm radius, mean NCF for TF 25.06, Mtwo 25.06 and ProTaper F2 were 916.70±208.32, 817.45±152.65 and 509.65±58.40 respectively. TF 25.06 and Mtwo 25.06 groups showed better resistance to cyclic fatigue than the ProTaper F2 group ($p<0.01$). No difference was found between TF 25.06 and Mtwo 25.06 groups.
Conclusion : The TF instruments showed better resistance to cyclic fatigue than did the Mtwo and ProTaper instruments in curved canals. Fewer cycles to fracture were observed for the instruments tested in artificial canals having 5-mm radius than 10-mm radius.

048

Category: Endodontics and Pulp Biology

EVALUATION OF BACTERICIDAL EFFICACY OF ANTIBIOTIC ASSOCIATIONS AND INCIDENCE ON ROOT DISCOLORATION IN REVASCULARIZATION THERAPY

Denisova Tatiana [1] - Mandras Narcisa [2] - CufÞni Anna Maria [2] - Crosasso Paola [3] - Damiano Pasqualini [1] - Berutti Elio [1]
[1]Dental School, Department of Endodontics, University of Turin, Turin, Italy
[2]Department Of Microbiology, University of Turin, Turin, Italy
[3]Sc Pharmacology, Aou S.giovanni Battista Molinette, Turin Italy

Objective: Recently, the concept of revascularization of necrotic pulps regained interest and became an alternative conservative treatment option for young permanent teeth with immature roots. In this study, we compared the antibacterial effcacy of four antibiotics mixture on bacteria from infected root canal and the incidence of root discoloration.
Methods: Microbiological analysis: the bacterial sample was taken from 29 teeth with a diagnosis of pulpal necrosis with acute or chronic apical periodontitis. In the microbiology laboratory bacterial sampling was placed in contact with 4 groups of antibiotics: TRIMIX (minocycline, ciproßoxacin, metronidazole); TRIFOSFO (fosfomycin, metronidazole, ciproßoxacin) TRICLARITRO (clarithromycin, metronidazole, ciproßoxacin) BIMIX (ciproßoxacin, metronidazole) and a control group. Bacterial load reduction in percentage and survival index were observed and compared in both group. (Kruskal-Wallis test; $p<0.05$).
Discoloration test: 65 root canals of extracted human single-root teeth, after preparation (cleaning, shaping) were divided into 5 groups and brought into contact with 4 groups of antibiotics for 3 weeks.
Results: Microbiological analysis: the mean of bacterial load reduction in percentage was: TRIMIX (−97,06 %); TRI FOSFO (−99,42 %); TRI CLARITR (−99,98 %); BIMIX (−88,46 %). In one case of TREMIX

group and three of BIMIX we have regrowth and not reduction of bacteria in contact with antibiotics. Median survival index: TRIMIX (1 ,029);TRI FOSFO (1 ,006);TRI CLARITR (1);BIMIX(1 ,1 15). The difference between groups is statistically signiÞcant ($P<0,0001$). Discoloration test: only TRIMIX (minocycline, ciproßoxacin, metronidazole) caused a strong discoloration of the roots. In the other 3 groups and the control group the color of the roots remained unchanged.
Conclusion: More studies are needed to evaluate the ability of new MIX to penetrate dentinal tubules in the complex internal canal system and eliminate the bacteria infection. But based on these results we can say that the protocol can be changed in future to avoid some disadvantages and complications of revascularization therapy.

050

Category: Endodontics and Pulp Biology

CAN MALEIC ACID REPLACE EDTA IN ENDODONTICS?

Kundabala Mala[1], N.Vasudev Ballal[2]
[1] Department of Conservative dentistry & Endodontics, and Associate Dean, Manipal College of Dental College Sciences, Mangalore
[2] Department of Conservative dentistry & Endodontics, Manipal College of Dental College Sciences, Manipal
Manipal University, Karnataka, India

Objective: Along with anatomical complexities of the root canal system, a thick smear layer on the walls of the root canal makes the task of disinfection of root canal system more difficult. EDTA has been the choice of chelating agent for many years to remove smear layer and the biofilm along with other antimicrobial agents. But the disadvantages of EDTA are dentinal erosion, minimal smear layer removal action in apical 3rd of the canal and reduction in root canal dentinal microhardness. The objective of this study is to evaluate the capacity of Maleic acid (MA), a milder acid, to replace EDTA in endodontics.
Methods: Series of investigations are conducted to compare EDTA with MA, such as smear layer removal capacity, effect of these chemicals on microhardness and surface roughness of radicular dentin, decalcifying effect on human radicular dentin, genotoxicity, cytotoxicity and chemical interaction with other commonly used irrigants by SEM analysis, Vicker's hardness testing, roughness testing, energy dispersive spectrometry; micronucleus, MTT, clonogenic assays and High Performance Liquid Chromatography respectively.
Results: 7 % MA showed better smear layer removal capacity than 17 % EDTA even from the apical 3rd of the canal. No difference were observed in microhardness values. Surface roughness and decalcifying effect were more for MA .Lesser apoptotic cell death and cytotoxicity were induced by MA when compared to EDTA. No adverse reaction or precipitate formation was observed when MA was mixed with NaOCl or Chlorhexidine.
Conclusion: 7 % Maleic acid solution can be a better alternative to 17 % EDTA as an irrigating agent

051

Category: Endodontics and Pulp Biology

OUTCOME OF ENDODONTIC TREATMENTS MADE BY POSTGRADUATE STUDENTS IN THE DENTAL CLINIC OF BRETONNEAU HOSPITAL : A RETROSPECTIVE ANALYSIS AT 4 YEARS

Touboul Virginie, Beres Fleur, Antoniolli Pauline, Touti Aziza, Nilsson Elisabeth, Colignon Zeina, EID Camille, Bayet François, Boukpessi Tchilalo, Bonte Eric, Lasfargues Jean-Jacques
UFR d'Odontologie, Université Paris Descartes, Hôpital Bretonneau, AP-HP, Paris, France

Objective: The objective of this retrospective study is double : (1) to assess the 1–4 years outcome of endodontic treatment performed by postgraduate students in Dental Clinic of Bretonneau Hospital and (2) to examine outcome predictors.
Methods: 363 teeth in 296 patients were treated. 224 teeth were lost during the follow-up and 8 were extracted, 131 teeth (38 % recall) were examined clinically and radiographically. Apical periodontitis (AP) was recorded as absent (PAI=1) or present (PAI≥2). Outcome was classified as: "healed" (absence of AP, no signs or symptoms), "healing" (decrease of PAI score and absence of signs or symptoms) or "diseased" (presence of AP, signs or symptoms). Teeth presenting without signs or symptoms were classified as "functional". Success was defined when the tooth is healed or healing.
Results: The succes rate is 92 %. No failure was observed among the 23 initial endodontic treatments. Among the 108 retreated teeth, 80 % were "healed" and 11 % were "healing", 91 % were functional. Bivariable association revealed a correlation between success rate and preoperative signs or symptoms (absent, 95 %; present, 83 %), inadequate preoperative root filling length (inadequate, 92 %; adequate, 83 %), presence of post in definitive restoration (absent, 94 %; present, 89 %). In teeth with AP, multivariable analysis revealed a correlation between the success rate and the number of treatment sessions (2.97 %; 1.86 %), intraoperative sealer extrusion (absent, 92 %; present, 84 %). The presence of preoperative apical periodontitis status is not expressed in this study.
Conclusion: Outcome in this retrospective study are similar to success rate of endodontic treatment previously reported. However, a larger sample size in each group is required to assess outcome predictors with better power.

052

Category: Endodontics and Pulp Biology

EVALUATION OF THE INTEREST OF GENERAL PRACTITIONERS FOR TISSUE ENGINEERING IN ENDODONTICS

Matane Sitruk[1], Sylvie Azogui-Lévy[2], Stéphane Simon[3]
[1]University Of Paris Diderot (Paris 7)
[2]University of Paris Diderot (Paris 7)
[3]University of Paris Diderot (Paris 7), University of Birmingham (UK), INSERM UMRS872 Team 5

Objective: The objective was to survey a group of general practitioners in dentistry regarding their interest, their knowledge and their expectations for tissue engineering in Endodontics.
Methods: A survey was carried out among 220 general practitioners who were attending a Continued Education course in Endodontics. The survey was made of 18 questions divided in 4 parts evaluating respectively the professional status, the ethical opinions, the knowledge, and the type of clinical practice of the practitioners.
Results: Results showed that (1) 97.3 % of surveyed dentists considered that tissue engineering should become a therapeutic way in odontology; (2) 86.9 % of dentists thought that dental stem cells banking would be useful and that these cells should be used for regeneration therapies in dentistry. (3) 84.6 % of dentists are willing to attend a course to implement regeneration therapies in their daily practice; (4) 50.6 % of the surveyed professional considered that the cost would be the biggest obstacle for a patient to accept a biological/regenerative treatment.
Conclusion: General practitioners showed a true interest on tissue engineering in Endodontics and were willing to improve their knowledge through Continuing Education to provide new treatments to their patients. However, general practitioners also require more information about prerequisite, implementation, obstacles, advantages, inconveniences before considering the regenerative treatments as an alternative to conventional therapies.

057

Category: Endodontics and Pulp Biology

EFFECTS OF BIODENTINE® ON DENTIN REPAIR IN A RAT PULP INJURY MODEL

Xuan-Vinh Tran [1, 2], Caroline Gorin [1,4], Brigitte Baroukh [1], Dominique Le-Denmat[1], Sibylle Opsahl Vital [1,4] ,Catherine Chaussain [1,4], Tchilalo Boukpessi [1,3,4]

[1] EA 2496, Dental school University Paris Descartes, PRES Paris Cité, France

[2] Faculty of Odonto-stomatology, University of Medicine and Pharmacy, Ho chi Minh city, Vietnam

[3] Restorative Dentistry and Endodontic Department, UFR Odontology, University Paris Descartes, PRES Paris Cité, France

[4] AP-HP, Odontology Departments Bretonneau, Charles Foix, Louis Mourier, Paris, France

Objective: Direct pulp capping consists in treating the injured dental pulp following trauma or exposure caused by an invasive drilling of carious dentin, in order to preserve the tooth vitality. $Ca(OH)_2$ and MTA are the current materials used in these clinical situations. The aim of this study was to assess the capacity of a new restorative tricalcium silicate-based cement, Biodentine® to induce pulp healing in a rat pulp injury model.
Methods: Cavities with mechanical pulp exposure were prepared on maxillary first molars of twenty-seven 6 week-old male rats (Agreement CEEA34.CC.016.11) . The damaged pulps were capped with either Biodentine® (Septodont, France), MTA (ProRoot MTA Dentsply,USA) or with $Ca(OH)_2$ mixed according to the manufacturers' instructions. All cavities were subsequently restored with Glass Ionomer Cement (GC Fuji II, GC Corporation, Tokyo, Japan). Then the repair response was evaluated at several time points by histology and immunohistochemistry. In addition, SEM analysis and energy-dispersive X-ray analysis (EDX) allowed to assess the quality of the interface between reparative dentin and the tested biomaterials.
Results: At early time point, our results show that both Biodentine and MTA induced cell proliferation and formation of mineralization foci, which were strongly positive for osteopontin. At longer time points, a homogeneous dentin bridge, secreted by cells displaying odontoblastic phenotype was observed at the injury site. Moreover the reparative tissue induced by $Ca(OH)_2$ showed porous organization, suggesting a different reparative process than those induced by tricalcium silicate cement. SEM analysis showed a good quality of the interface between Biodentine® and reparative dentin attesting a good sealing of the cavity.
Conclusion: With the inherent limitations due to animal models, these data demonstrated that Biodentine, a restorative material already used in dental practice, can also be used for direct pulp capping.

065

Category: Endodontics and Pulp Biology

STUDY OF THE CANAL AXIS PRESERVATION IN RESIN SIMULATOR: RACE® *VS* REVO-S®

Delmas Mariannick [1], Diemer Franck [1,2]

[1] Faculté de Chirurgie dentaire de Toulouse, CHU de Toulouse - France,

[2] LPCNO-INSA Toulouse - France

Objective: The main difficulty for canal shaping is to negotiate the curvature, while keeping the original axis and preventing any structural canal damage. The aim of this study was to compare the canal axis preservation when shaping simulators, using two systems: the RaCe® and the Revo-S®.
Methods: Thirty endo-training-bloc 2 % (Maillefer) were shaped in continuous rotary motion with Revo-S® (Micro-Mega) and RaCe® (FKG) systems. The size of the master apical file was 30/.06 taper tip. Each instrument was used three times and its integrity was observed after use.
The canal path was stained with Indian ink and scanned (Epson Perfection 1200) in high resolution (800dpi). The canal trajectory was colored, superimposed and imported into Image J 1.41 software (NIH) to measure the amount of prepared canal situated inside and outside the curvature. The analysis of variance and a PLSD Fischer's test were performed with a α risk fixed at 5 %.

Results:

	IN	Mean	SD		Mean	SD	OUT	
S	SU	0.053	0.014	LT-1	0.091	0.017	SU	**NS**
	RaCe 6%-#25	0.083	0.018		0.095	0.025	RaCe 6%-#25	
NS	SU	0.09	0.139	LT-2	0.108	0.018	SU	**NS**
	RaCe 6%-#25	0.103	0.016		0.111	0.026	RaCe 6%-#25	
S	SU	0.068	0.017	LT-3	0.125	0.020	SU	**NS**
	RaCe 6%-#25	0.121	0.018		0.140	0.025	RaCe 6%-#25	
S	SU	0.093	0.021	LT-4	0.161	0.030	SU	**NS**
	RaCe 6%-#25	0.145	0.014		0.153	0.029	RaCe 6%-#25	
S	SU	0.144	0.027	LT-5	0.130	0.037	SU	**NS**
	RaCe 6%-#25	0.206	0.016		0.135	0.020	RaCe 6%-#25	
S	SU	0.193	0.025	LT-6	0.115	0.028	SU	**NS**
	RaCe 6%-#25	0.248	0.018		0.131	0.023	RaCe 6%-#25	
S	SU	0.201	0.024	LT-7	0.161	0.029	SU	**NS**
	RaCe 6%-#25	0.243	0.025		0.179	0.022	RaCe 6%-#25	

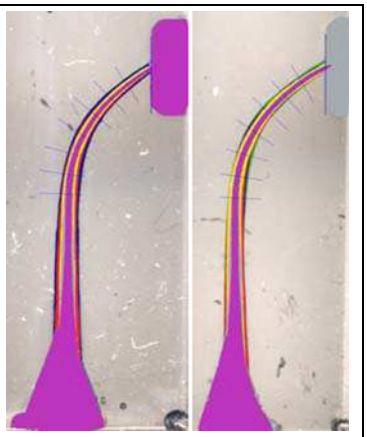


Table 1: Mean and standard deviation of canal preparations for each system recorded for seven levels of measurement. The two last columns represent an example of the overlay of canal preparations carried out with the system RaCe® (left) and Revo-S® (right).
S= significant, NS= non significant for PLSD Fischer's test

All the RaCe® files (25/.04) and the Revo-S® - SC2 files (25/.04) are unwound after three uses. No unwinding is observed with the 25/.06 files for the two systems.

The preparation of the curvature presents a statistically significant difference ($p < 0.001$), particularly for the RaCe® system promoting the canal transportation in the inner zone of the curve.

Conclusion: This study allows a direct comparison between two instruments. However, caution must be taken with the extrapolation of these findings to natural teeth. In these conditions, the Revo-S® system allows a better maintain of the canal axis than the RaCe® system, particularly in the inner zone of the curvature.

072

Category: Endodontics and Pulp Biology

PROSPECTIVE ASSESSMENT OF THE OUTCOME OF CONVENTIONAL ROOT CANAL TREATMENT PERFORMED IN A TEACHING HOSPITAL

Bénédicte Castelot-Enkel [1,2], Valérie Armengol [1], Fabienne Perez [1], Véronique Rivain Sébille [2], Pierre Weiss [3]

[1]Department of Conservative Dentistry and Endodontics, Hôtel-Dieu Hospital, 1 place A. Ricordeau, BP 84215, 44042 Nantes, France

[2]EA 4275 Biostatistics, Clinical Research and Subjective Health Measures, faculty of pharmacy, University of Nantes, rue Gaston Veil, 44042 Nantes, France

[3]INSERM U791, Laboratory for Osteo-Articular and Dental Tissue Engineering, Faculty of Dental Surgery, University of Nantes, 1 Place Alexis Ricordeau, 44042 Nantes, France

Objective: This prospective cohort evaluated the long-term survival of endodontic treatments performed in a Dental Teaching Hospital. The aim was to calculate the survival probabilities according to the follow-up extent and to assess the time allowed for a complete periapical healing.
Materials and Methods: A cohort of 256 teeth randomly selected were re-examined during a follow up period varying from 1 to 11 years after treatment. The outcome was assessed as success, uncertain, or failure, as recommended by quality guidelines. Because the presence of periapical pathosis affect the prognosis of endodontic treatment, teeth with an initial apical periodontitis (AP+) and teeth without initial apical periodontitis (AP-) were separately assessed. This particular design of study was choose to evaluate the survival outcome for each group, as well as the periapical healing for teeth (AP+). A multivariate survival analysis using the Cox model was used to highlight the predictive factors influencing the survival of conventional root canal treatment and the periapical healing.
Results: 1 year-survival probabilities are 93 % for teeth (AP-), and 83 % for teeth (AP+). Survival decreases with time, with a rapid drop before 4 years after treatment: 4 years- survival probabilities are 65 % for teeth (AP-) and about 55 % for teeth (AP+). The probability of periapical healing is lower than 4 % before 1 year and increases to 63.7 % for a follow-up period of 4 years. After 81 months, 24 % of healing process was not achieved.
Conclusion: Survival models show that many failed treatments and many complete periapical healing cases occur over 4 years. These conclusions show that a long term follow-up is necessary to optimize the survival of treated teeth over time. A defective root canal filling in association with a coronal leakage is the main significant factor of failure of root canal treatment.

079

Category: Endodontics and Pulp Biology

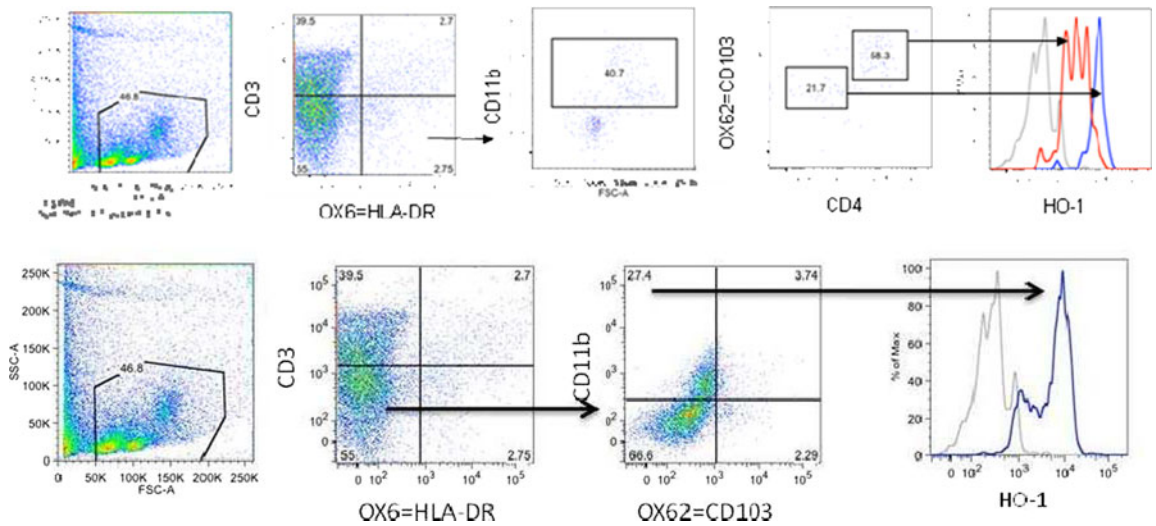
CHARACTERIZATION OF DENDRITIC CELLS AND MYELOID DERIVED SUPPRESSIVE CELLS EXPRESSING HO-1 IN HEALTHY RAT DENTAL PULP

Alexis Gaudin[1,2], Emmanuelle Renard[1,2], Brigitte Alliot-Licht[1,2], Marcello Hill[2], Maria-Cristina Cuturi [2]

(1) Faculty Odontology, *Nantes*

(2) INSERM, UMRS 1064, *Nantes*

Objectives: Myeloid-derived suppressor cells (MDSCs) are a heterogeneous population of cells that expand during cancer, inflammation and infection, and that have a remarkable ability to suppress T-cell responses. These cells constitute a unique component of the immune system that regulates immune responses in healthy individuals and in the context of various diseases. MDSCs can differentiate in macrophages, granulocytes and dendritic cells. Dendritic cells (DCs) DCs constitute a heterogeneous cell population with distinct phenotype and function. These cells are professional antigen-presenting cells, which play a critical role in the adaptive immune response. Regulation of this response could be a way to avoid pulp necrosis. Moreover, HO-1 is a heme-catabolizing enzyme with immunosuppressive functions. The aim of this work was to characterize DCs and MDSCs in rat dental pulp expressing HO-1.
Methods: 12 Healthy rat incisors were collected from Sprague Dawley rat (weight 220 g±15). The dental pulp tissue was removed. Samples were prepared in order to perform flow cytometry analysis. Analyses were performed using a FACSCantoII cytofluorometer (BD Biosciences) and FlowJo software.
Results: Flow cytometry analysis showed cells with compatible DC phenotype ($CD3^-$ $OX6^+CD11b^+OX62^+CD4^+$) and compatible MDSC phenotype ($CD3^-OX6^-OX62^-CD11b^+$). Interestingly, those cells expressed HO-1. Similar results were obtained in 3 independent experiments. Numbers within graph quadrants are percentage of positive cells.



Conclusion: We demonstrated the presence of cells having a phenotype compatible with DCs and MDSCs expressing HO-1 (described in human tissues with high immunoregulatory properties.) These cells could be targets for therapeutic strategies.

086

Category: Endodontics and Pulp Biology

PULP CHAMBER FLOOR MAPPING: A PEDAGOGIC TOOL?

Mallet Jean-Philippe [1], Monier Nicolas [1], Diemer Franck [1,2]
[1] Faculté de Chirurgie dentaire de Toulouse, CHU de Toulouse - France
[2] LPCNO-INSA Toulouse - France

Objective: Multi-rooted teeth embryology is complex. Every day, endodontists notice during molar treatment the presence of dark mark on the pulp chamber floor relying canal entries. We founded no study on this topic. So the aim of this preliminary study is to determine the ability to use easy tools to map this mark and the reliability of these data on the multi-rooted pulp chamber floor.
Methods: This study can be divided in three parts. First, we used Photoshop® tools: curve, colour range and eyedropper tool to determine a protocol with six molars. Second, three teeth (2 upper molar and 1 upper pre-molar) are cleaned with Satelec P-Max ultrasonic device. Half tooth is included in pink resin Rebaron® (GC Corporation, Tokyo - Japan) other half in Synolite® (Gaches Chimie, Toulouse - France) and sectioned at the middle of the pulp chamber orthogonally to the long axis of the tooth. They are immersed in physiologic serum in ultrasonic cleaning tank for 15 minutes. End of pulp debris present in the root canal entries are removed with H-file n°10 (Micro-Méga, Besançon - France) and physiologic serum irrigation. Numeric photo are done with Nikon D70 and Nikon AF Micro Nikkor 60 mm 1: 2.8 objective in manual mode, mounted on Leica Wild M3B (Heerbrugg - Suisse) magnification system. Intensity of lightning is fixed on three levels: low, middle and high. Selection of darkest zone is done with colour range tool with increasing tolerance (10, 20, 30, 40 and 50) and pixels counted with histogram tool.
Third, three upper and a lower molars are prepared in the same way of the second step of this study and photographed under high level of light. Colour range tool with increasing tolerance is used from the darkest zone of the floor.
Results: The curve tool used only lightning characteristics that brought bias for interpretation. Transparent resin (Synolite®) brought to much light and compromise the mapping of the floor (fig. 1). Rebaron® was more opaque, close to gum color and compatible with this study. When intensity of lightning is low, first selection of pixel (with low tolerance) is increased. When it's middle or high, selections are equivalent. Dark mark was present on every tooth used for this study.
Conclusion: Finally, this preliminary study showed an easy tool able to caracterise the dark mark present on all the pulp chamber floor used. This tool may be interesting to help the practitioner to find canal entrance in difficult cases or when hypermineralisations are present on the pulp chamber floor and when finding of MB2 for example is particulary chalenging.

089

Category: Endodontics and Pulp Biology

A COMPARATIVE EVALUATION OF GUTTA-PERCHA FILLED AREAS IN STRAIGHT CANALS INSTRUMENTED WITH NITI SYSTEMS AND OBTURATED WITH MATCHING SINGLE POINTS

Sebastian Bürklein*, Maja Köster, Edgar Schäfer
*Central Interdisciplinary Ambulance in the School of Dentistry, University of Münster, Germany

Objective : The aim of this study was to compare different single-cone obturation techniques concerning the percentage of gutta-percha filled areas (PGFA), sealer filled areas (PSFA) and voids.
Methods: A total of sixty extracted mandibular incisors with straight canals were allocated into six identical groups: A: FlexMaster; B: Mtwo; C: ProTaper; D: Reciproc; E: WaveOne. In groups A–E obturation was performed using matching single-cone gutta-percha. Group F (control): manual instrumentation and obturation using cold lateral compaction with standardized gutta-percha cones. The teeth were horizontally sectioned 2, 4, 6 and 8 mm from the apex. The total area of each canal segment was examined for the PGFA, PSFA, and percentage of voids. Data were subjected to the Kruskal-Wallis and post-hoc Dunn-test.
Results: At the 2 mm and 4 mm levels, groups A and B produced significantly higher PGFA than groups C,D, and E ($P<0.05$). At the 4 mm level, group F produced significantly higher PGFA and lower PSFA than groups C,D, and E ($P<0.05$). At the 6 mm level, group F produced significantly higher PGFA and lower PSFA ($P<0.05$) than all other groups, while groups A and B produced significantly higher PGFA and lower PSFA than groups C,D, and E ($P<0.05$). At the 8 mm level, group F produced significantly higher PGFA and lower PSFA ($P<0.05$) than all other groups.
Conclusion: Within the limitations of this study, lateral compaction and single-cone techniques using constant tapered gutta-percha (FlexMaster, Mtwo) produced higher PGFA at the apical levels than variable tapered single-cone gutta-percha (ProTaper, Reciproc, WaveOne).

101

Category: Endodontics and Pulp Biology

IS PULPOTOMY ON PERMANENT VITAL TEETH AN ALTERNATIVE TO ENDODONTIC TREATMENT?

Cousson PY[1,2], Nicolas E[1,2], Hennequin M[1,2]
[1] Clermont Université, Université d'Auvergne, EA 4847, Centre de Recherche en Odontologie Clinique, BP 10448, F-63000 Clermont-Ferrand, France
[2] CHU Clermont-Ferrand, Service d'Odontologie, Hôtel-Dieu, F-63000 Clermont-Ferrand, France

Objective: For patients requiring general anaesthesia for their dental care, pulpotomy could be an alternative to endodontic treatment for vital permanent teeth with curved roots or calcified canals. This study aims to evaluate the effectiveness of the pulpotomy performed under general anaesthesia on vital permanent teeth.
Methods: This was an observational study based on clinical data from therapeutic procedures. From April 2006 to September 2012, any patient attending the special care unit of the university dental hospital of Clermont-Ferrand was proposed for inclusion if he/she had had at least one pulpotomy performed on a permanent vital tooth during a previous dental care session under GA. Procedure for pulpotomy implied the placement of rubber dam. Gates Glidden burs were used to flare the 2 first millimetres of the coronal portion of the canals under sodium hypochlorite irrigation. Pulp capping was performed with Calcium hydroxide and ZOE. Stainless preformed crown sealed with Glass ionomer cement was used for coronal restoration. All cases were assessed with the use of the Endodontic Case Difficulty Assessment Form and Guidelines edited by the American Association for Endodontics. Pulpotomies were assessed on 2D periapical radiographs postoperatively and after a follow-up period that varied from 6 months to 2 years. The "effective treatment" status was stated for teeth having no radiographic symptoms for periodontitis.
Results: Eighty-six pulpotomies were performed in 53 patients (mean age 23.2±13.9 yrs). Thirty-five cases (1 incisor and 34 molars) were re-assessed

during a postoperative period ranging from 1 to 6 months for 19 cases and from 6 to 24 months for 16 cases. Twenty-six teeth had a high level of difficulties for endodontic treatment. All the treatments were effective.
Conclusion: This study suggests that pulpotomy, for patients requiring GA, could be an alternative to root canal treatment in vital permanent teeth presenting a high level of difficulties in endodontics.

106

Category: Endodontics and Pulp Biology

CLINICAL CONTRIBUTION OF THE CBCT IN THE DIAGNOSIS AND MANAGEMENT OF INTERNAL ROOT RESORPTIONS. A CASE SERIES

Nilsson Elisabeth[1], Colignon Zeina[2], Bayet François[3], Eid Camille[4], Boukpessi Tchilalo[5], Bonte Eric[6], Lasfargues Jean-Jacques[7]
[1,2,3,4,5,6,7] UFR d'Odontologie, Université Paris Descartes, Hôpital Bretonneau, AP-HP, Paris, France

Objective: Internal inflammatory root resorption is considered as rare and is usually detected by routine clinical and radiographic examination of teeth. Cone beam computed tomography (CBCT) technology has been specifically designed to provide three dimensional scans of dento-alveolar anatomy. The objective of this work is to present through five clinical cases, the contribution of CBCT in the diagnosis and the management of internal root resorption.
Methods : This study was conducted on 5 adult patients who were referred to the Endodontics Department of Bretonneau Hospital (Paris, France) for the management of internal root resorption. Each of these 5 teeth were examined clinically and radiographically. To assess the nature, location and severity of the resorptive lesion, a limited CBCT of the concerned region was performed. Strategies of treatment (only orthograde endodontic treatment or combined with surgical approach) for the management of defects were then carried out.
Results: For all selected cases, CBCT allowed internal resorption diagnosis. Either orthograde endodontic treatment only or combined with surgical endodontic treatment led to a short-term therapeutic success (recall 1 year). However a longer-term follow-up is needed to confirm this therapeutic success.
Conclusion: These case series demonstrate the interest of utilizing CBCT in the assessment of internal root resorption. Furthermore, this CBCT's superior diagnostic accuracy resulted in an improved management of the resorptive defects. When using associated with modern endodontic techniques and materials, the prognosis of even perforated cases is good.

116

Category: Endodontics and Pulp Biology

MODALITIES OF SECONDARY DENTIN APPOSITION THROUGH THE LIFE CYCLE: APPLICATION TO THE ESTIMATION OF THE AGE AT DEATH

Thibault Bécavin[1.3.], Dominique Lunardi[1], Etienne Deveaux[1.2.], Thomas Colard[1.3.]
[1]Faculté de Chirurgie Dentaire de l'université de Lille 2.
[2]UNITÉ INSERM U1008 - Médicaments et biomatériaux à libération contrôlée : mécanismes et optimisation
[3]Laboratoire d'Anthropologie Biologique de Lille

Objective: Age estimation's methods are often macroscopic and based on development and bone ossification of children and teenagers. The methods used for adults are more effective when they are based on the dental organ. The dental pulp continues to produce dentin through the life cycle, which makes it a good age indicator for adults [1]. In this study, two methods have been tested, the first one being 2D method and the second one being 3D method.
Methods: The sample was composed of 87 teeth with no obvious diseases or fractures which could have occurred during the sampling. It was composed of canines, premolars and molars which were sampled at the medico-legal institute of Lille on ten distinct subjects.
The first part of the study has consisted on making radiographies of each tooth then, the area of each part of the tooth (enamel, dentin and pulp) has been determined. The pulp/dentin (P/D) and pulp/dentin+ enamel (P/D+E) ratios have been calculated for each tooth. Moreover, the mean ratios have also been calculated for each subject.
The second part of the study has consisted on a 3D observation of the samples by using a micro-CT scan (Skyscan 1172 High-Resolution). Several post-treatment softwares have been used in order to obtain a 3D reconstruction of each tooth. The volume of the different tooth tissue has been determined in order to calculate the ratios for each tooth and the mean ratios for each subject.
Results: For the 2D method, a significant correlation has been found between the age and the P/D ratio ($p<0{,}008$) and P/D+E ratio ($p<0{,}004$). A linear regression has given an equation usable to determine the age of a subject. For the P/D+E ratio the equation is : $age = -400{,}2*(P/D+E)+46{,}145$
The correlation between estimated age and real age is significant ($p<$ 1,45E-05) and has a Rs coefficient of 0,991 (*Fig. 1*). For the 3D method, a significant correlation ($Rs=0{,}841$, $p<0{,}036$) has been found between the P/D mean ratio and P/D+E mean ratio for the molars and the age at death of the subject.
Conclusion: The results for the 2D method are comparable with those found in the literature [2]. Secondary dentin apposition of molars never has been used for the estimation of age at death [3]. The equations found from the 2D method as well as from the 3D method could be used for age.
We are grateful to the LAMIH laboratory (Valenciennes) for lending us their micro-CT scan.

119

Category: Endodontics and Pulp Biology

IN VITRO EVALUATION OF THE ACCURACY OF TWO APEX LOCATORS TO DETERMINE THE WORKING LENGTH DURING RETREATMENT

Olga Sena-Herrero 1[1], Teresa Alegre-Domingo 2[2], Ricardo Castelló-Escrivá 3[3], Vicente Faus-Matoses 4[2], Vicente J. Faus-Llácer 54
Master of Restorative Dentistry and Endodontics, Department of Stomatology, Medicine and Dental School, Valencia University, Spain. fausvj@uv.es

Objective: The purpose of this *in vitro* study was to evaluate the accuracy of Root ZX and ProPex II in determining the working length during retreatment.
Methods: Forty extracted single-rooted human teeth were selected for this study. The root canal length of each tooth was measured placing a #1 5 file until the tip was visible at the apical foramen. The working length was measured by subtracting 0.5 mm from this length. Teeth were instrumented with Rotary ProTaper until size F3. Once prepared, the length of each tooth was measured directly using a #25 file. After direct measurement, electronic working length was taken with the help of Root ZX and ProPexII. Teeth were divided into 2 groups and obtured by using BeeFill 2in1 + AH plus sealer (group I), and Guttacore + AH plus sealer (group II). After 7 days, the obturing material was removed with ProTaper Retreatment files and H-files. A new electronic working length was taken. Pre and post-treatment electronic working length were compared with initial working length. Performance of both apex locators was calculated for tolerance limits of±0.5 mm and±1 mm. Accuracy was compared by using x^2 tests, and difference between

initial and pre and post treatment electronic working lengths was compared by using Student *t* test.
Results: Student *t* test revealed insignificant differences between initial working length and pre and post-treatment electronic working lengths.
Conclusion : Root ZX and ProPex II can be a useful adjunct during root canal retreatment.

120

Category: Endodontics and Pulp Biology

OZONE APPLICATION IN TEETH WITH CHRONIC APICAL PERIODONTITIS IN VIVO STUDY. MEASUREMENT OF THE BACTERIAL LOAD

Sonia Guillem-Pons[1], Joaquín Sais-Sais[2], Teresa AlegreDomingo[2], Vicente Faus-Matoses[2], Vicente J. FausLlácer[3]
Master of Restorative Dentistry and Endodontic. Department of Stomatology. Medicine and Dental School. Valencia University. Spain

Objective: to compare the bacterial load after conventional endodontic treatment versus combination with HealOzone therapy (Kavo, Biberach, Germany) in teeth with chronic apical periodontitis.
Methods: sterile paper points were taken at three different times from 10 teeth of 8 patients with localized chronic apical periodontitis. The first sample was taken after the opening and location of the root canals with paper point # 15 to the working length during 30 seconds, the second sample was taken after chemomechanical preparation with rotary instrumentation and irrigation with 2.5 % sodium hypochlorite (NaOCl) and finally, the third sample was taken after the ozone application during 40 seconds. The samples were inserted into eppendorf vials and were analyzed with Peri-implant diagnostic kit (GUM ® Sunstar Americas, Chicago) to measure the total bacteria and detect the presence of Porphyromonas gingivalis (PG), Aggregatibacter actinomycetemcomitans (AA) , Tannerella Forsytia (TF), Treponema denticola (TD), Prevotella intermedia (PI), Parvimonas Micra (PM), Fusobacterium nucleatum (FN), Campylobacter rectus (CR), Eikenella corrodens (EC), Candida albicans (CA), for plurimicrobiotica nature of the lesions. The data were analyzed with the IAI-PadoTest 4.5 ® (IAI Inc., IAI Institue, Zuchwill, Switzerland).
Results: the application of ozone can improve the antiseptic effect on the endodontic treatment because of decreasing bacterial load.
Conclusion: a reduction of microorganisms that cause chronic apical periodontitis was obtained mainly after the endodontic treatment. This study proposes the combination with ozone applying during 40 seconds to enhance the success in root canals.

121

Category: Endodontics and Pulp Biology

CYCLIC FATIGUE RESISTANCE OF K3, K3XF AND TF FILES UNDER CONTINUOUS ROTATION AND RECIPROCATING MOTION AT 5 MM FROM THE TIP

Pérez-Higueras Sánchez-Escalonilla, Juan José[1], Arias Paniagua, Ana[1], De la Macorra García, Jose Carlos[1]
[1]Conservative Dentistry Department, Complutense University of Madrid. Spain

Objective: To compare the cyclic fatigue (CF) resistance of K3, K3XF and TF files at 5 mm from the tip under continuous rotation and reciprocating motion.
Methods: 60 K3 (modified triple U cross-section manufactured with a grinding process and conventional NiTi alloy), 60 K3xf (same cross-section and manufactured method but R-phase alloy), and 90 TF (triangular cross-section manufactured with a twisting process and R-phase alloy) files weres divided in seven experimental groups (30 files each one). All files had the same tip diameter (30) and taper (0.06).

GROUP	SPEED (rpm)	TYPE OF MOVEMENT
K3-C	300	Continuous rotation
K3XF-C		
TF1-C		
TF2-C	500	
K3-R	300	Reciprocating motion
K3XF-R		
TF-R		

CF resistance was tested in stainless steel curved canals (60°, *r*=3 mm). Clockwise and counterclockwise rotations were set on a ATR Tecnika Vision electric motor at 144o-72o. Using Weibull analysis, mean half-life, beta (related to variability) and eta (at this stress, 0.632 is the probability of failure) were calculated for each group.
Results:

GROUP	MEAN LIFE(s)	BETA	ETA(s)
K3-C	17,35	3.8	19,16
K3XF-C	44,67	2,72	50,21
TF1-C	26,13	3,97	28,84
TF2-C	10,11	3,28	11,27
K3-R	51,32	5,94	55,35
K3XF-R	70,38	5,8	76,01
TF-R	65,25	4,95	71,11

Probability of mean life was significantly higher when used under reciprocation motion than continuous rotation for all files. Under continuous rotation, probability of K3XF-C mean life was significantly higher than the rest of the groups. Under reciprocating motion, there where no significant differences between K3XF and TF mean life, but both were significantly higher than K3 mean life.
Conclusion: R-phase alloy increases the CF resistance of files. Alloy, section of the file, speed of rotation and type of movement parameters has influence in the CF Resistance results.

123

Category: Endodontics and Pulp Biology

DIFFERENCE BETWEEN 2D AND 3D TECHNIQUES FOR EVALUATING SHAPING PERFORMANCE IN SIMULATED ROOT CANALS

Mario Alovisi[1*], Davide Salvatore Paolino[2], Giorgio Chiandussi[2], Damiano Pasqualini[1], Nicola Scotti[1], Elio Berutti[1]
[1]University of Turin, Department of Surgical Sciences, Dental School, Endodontics
[2]Politecnico di Torino, Department of Mechanical and Aerospace Engineering, Corso Duca degli Abruzzi 24, 10129 Turin, Italy

Objective: The use of two-dimensional (2D) methods for evaluating geometry variation in root canal shaping is widely adopted in the literature. Recently, Ounsi et al. (Journal of Endodontics, 2011;37:847–50) concluded that there is statistical difference between 2D and three-dimensional (3D) measurements in assessing canal dimensions after uses of Ni-Ti rotary instruments on resin blocks

simulating curved root canals. In order to verify this conclusion a new set experimental data has been obtained and analyzed.
Methods: Fifteen resin blocks simulating curved root canals have been considered for the analysis. Each block has been scanned with microC omputed Tomography (micro-CT) to obtain an high resolution 3D model. 2D digital images of each physical block have been compared with the cross-sections extracted from the corresponding 3D model. Image matching has been carried out by using a digital imaging software (Adobe Photoshop CS4; Adobe Systems Inc, San Jose, CA); canal profiles have been extracted with an automated procedure implemented in in Matlab r2010b software (The MathWorks Inc, Natick, MA) for mathematical processing and analyzed to evaluate possible geometrical differences.
Results: Statistical analysis (hypothesis test) of the geometrical differences between the canal profiles obtained from the 2D digital images and the corresponding cross-sections extracted from the corresponding 3D model showed that with a 95 % confidence level the resulting profiles cannot be distinguished.
Conclusion: Experimental data showed that there is no statistical difference in the usage of 2D digital images and 3D micro-CT for measurements in assessing canal dimensions, if simulated root canals in resin block are considered. It is worth noting that such difference would be possible if real root canals are considered, due to the non-planar 3D path followed by the canal axis.

139

Category: Endodontics and Pulp Biology

PULP BIOENGINEERING: TRACKING OF IMPLANTED STEM CELLS BY NUCLEAR IMAGING

Souron JB[1,2], Decup F[1,2] , Petiet A[3], Willig C[1], Letourneur D[4], Chaussain C[1,2], Rouzet F[4,5], Opsahl-Vital S[1,2]
[1] EA2496, Pathologie, Imagerie et Biothérapies de l'Organe dentaire, Faculté de Chirurgie Dentaire, Université Paris Descartes, Sorbonne Paris Cité, France
[2] Hôpitaux Universitaires Paris Nord Val de Seine, APHP, France
[3] ICB-IFR 02, Université Paris Diderot Paris 7, UFR de Médecine Site Bichat, Paris, France,
[4] Inserm, U 698, Bio-ingénierie Cardiovasculaire, CHU X Bichat, Université Paris Diderot, Paris., France,
[5] AP-HP, Service de médecine Nucléaire, Hôpital Bichat, Université Paris Diderot, Paris, France

Objective: Endodontic treatment as current therapeutic may occurred when tooth is exposed to severe injuries from caries or traumatic fractures. Such treatment does not exploit the high regenerative cellular potential of the pulp. The present study is part of a larger research project aiming to develop a pulp equivalent implantable in the injured dental pulp, based on the use of mesenchymal pulp stem cells. In tissue engineering, it is a major issue to determine the fate of implanted cells in a living organism. Here, we tracked by nuclear imaging ^{111}indium-oxine (^{111}In-oxine) radiolabeled pulp cells after implantation in the rat emptied pulp chamber.
Methods: Rat pulp cells were radiolabeled with ^{111}In-oxine. Their viability and proliferation rate were controlled *in vitro*. Then, labeled cells were added to polymerizing type I collagen hydrogel in order to obtain a **pulp equivalent**. This scaffold was then implanted in the emptied pulp chamber space in the upper first rat molar, after performing pulpotomy (ethical agreement CEEA34.CC.010.11). Labeled cells were tracked by Nuclear Imaging (Nano SPECT/CT plus, Bioscan®) for 3 weeks. Negative controls were performed using radiolabeled cell lysates. Treated rats were sacrified at 1, 2 and 4 weeks after surgery. Maxillary were isolated, demineralized before embedding in paraffin for histological staining and immunohistochemistry studies.
Results: In vitro studies showed that ^{111}In-labelled pulp cells viability and cell proliferation were similar to unlabeled cells. *In vivo* imaging performed sequentially over a month showed a significant increased radioactivity level from labeled pulp equivalent into the pulp chamber, compared to controls. This labeling was clearly detectable for 3 weeks, which indicates that implanted cells remained viable in the pulp space. At all-time points, whole-body acquisitions by SPECT/CT showed no signal outside of the pulp chamber, suggesting that most radiolabeled cells remained located in the tooth. Histological and immunochemistry studies showed limited inflammation, proliferation and angiogenesis in the cellular scaffold.
Conclusion: Our study demonstrates for the first time that efficient tracking of pulp cells implanted in the dental pulp can be achieved by Nuclear imaging. Importantly, our data indicate that the grafted cells were viable and remained located in the dental pulp. These results open a promising avenue in the treatment of pulpal dental diseases by tissue engineering.

141

Category: Endodontics and Pulp Biology

COMPARISON OF THE FORCE REQUIRED TO FRACTURE ROOTS VERTICALLY AFTER ULTRASONIC AND IRS REMOVAL OF BROKEN INSTRUMENTS

Carolina Diaz-Campos, Ramiro Montenegro-Santillan, Teresa Alegre-Domingo, Vicente Faus-Matoses3, Vicente J. Faus-Llacer
Master of Restorative Dentistry and Endodontics. Department of Stomatology. Medicine and Dental School. University of Valencia (Spain)
fausvj@uv.es

Objective: To compare the force required to fracture roots vertically after broken instruments by ultrasonic tips removal and Instrumental Removal System.
Methods: Sixty extracted human anterior teeth with single and straight roots were used. The crown of each tooth was removed until the full length of the tooth was 13 mm. All canals were instrumented to a size 15 K-file and intentionally a S2 Protaper file was fractured at 4 mm in the middle third of the canals. The teeth were randomly divided into three groups: fractured instruments without removal (group 1), fractured instruments with ultrasonic tips removal (group 2) and fractured instruments with iRS removal (group 3). The samples were subjected to a continuous vertical loading, using a universal testing machine (Instron). For each root, the force at the time of fracture was recorded in Newtons.
Results: The force required to fracture the root vertically was significantly higher in the control group (group 1) than experimental groups (group 2 and 3). The roots in which the broken instruments were removed using ultrasonic tips required more force to fracture than roots in the iRS group.
Conclusion: Removal of fractured instruments from the middle third of the roots decreased the force required to fracture the root vertically, regardless of the technique used for instrument removal. There was not difference between the ultrasonic technique and iRS technique.

185

Category: Endodontics and Pulp Biology

CLEANLINESS OF ROOT CANAL WALLS—LASER VERSUS IRRIGATION: A MICRO-RAMAN SPECTROSCOPIC AND SEM ANALYSIS

Roeland De Moor [1], Maarten Meire [1], Geert Hommez [1], Filip Keulemans [1], Chris Vercruysse [2], Ronald Verbeeck [2]
[1]Department of Restorative Dentistry and Endodontology, Ghent Dental Photonics Research Cluster, BIOMAD, Dental School
[2]Basic Medical Science-Biomaterials Group, Ghent University, Ghent University Hospital, Ghent, Belgium

Objectives: To determine chemical and structural modifications in laser treated (Nd:YAG) root canal surfaces as compared to the effects of 2.5 % NaOCl and 17 % EDTA irrigation.
Methods: Fifty extracted single rooted teeth were assigned into 7 groups of 8 teeth. Group 1: Root canal wall dentine—untreated (control). Group 2: root canal treated and irrigation with 2.5 % NaOCl (3 mL) after each file size. Group 3: protocol of Group 2 with final rinse of 17 % EDTA (3 mL, 3 min). Group 4: protocol Group 2 and Nd:YAG irradiation (Fidelis, Herzele, Belgium) (1.5 W, 15 Hz, 4x 5 sec and 20 sec interval). Group 5: protocol of Group 2, vertical root splitting and Nd:YAG irradiation direct on the root canal wall. Five roots per group were selected for microRaman analysis, 3 were kept for SEM analysis.
Results: MicroRaman analysis showed local decrease or disappearance of the phosphate peak after use of EDTA (i.e. decrease of the inorganic component). The collagen peaks were modified after Nd:YAG irradiation: changes in the collagen band showed degradation of the collagen up to the formation of amorphous carbon, depending on the exposure intensity of the laser irradiation. SEM analysis confirmed these ultramorphological changes of the root canal wall dentine after laser irradiation. Irrigation with EDTA resulted in the removal of smear layer and the presence of open dentinal tubules. The sole use of NaOCl did not result in smear layer removal.
Conclusion: Depending on the degree of laser irradiation exposure a broad peak due to collagen degradation or creation of amorphous carbon appeared. Nd:YAG does not result in the so called 'evaporation' of the smear layer. EDTA removed smear layer most efficiently.

200

Category: Endodontics and Pulp Biology

A CONFOCAL LASER SCANNING MICROSCOPE STUDY OF THE PENETRATION OF MTA FILLAPEX AND AH PLUS INTO ROOT CANAL DENTINAL TUBULES

Marta Reviejo[1], M. Victoria Fuentes[2], Nuria Escribano[2], Jose Aranguren[3], Laura Ceballos[2]
[1]DDS, PhD, Professor, Master of Endodontics and Restorative Dentistry, Health Sciences Faculty, Rey Juan Carlos University, Alcorcón (Madrid), Spain
[2]DDS, PhD, Department of Stomatology, Health Sciences Faculty, Rey Juan Carlos University, Alcorcón (Madrid), Spain
[3]DDS, Department of Stomatology, Health Sciences Faculty, Rey Juan Carlos University, Alcorcón (Madrid), Spain

Objective: To compare the percentage and depth of dentinal tubule sealer penetration at several root canal levels of teeth obturated with a sealer based on mineral trioxide aggregate, or an epoxy resin-based endodontic sealer, under confocal laser scanning microscope (CLSM).
Methods: 20 extracted human canines were mechanically prepared with Protaper files. Irrigation was performed with 5.25 % NaOCl and final rinse with 17 % EDTA followed by NaOCl. Teeth were randomly divided into two groups ($n=10$), according to sealer used: G1, Gutta-percha/MTA Fillapex, and G2, Gutta-percha/AH Plus. Sealers were labelled with Rhodamine B dye After a week, roots were transversally sectioned at 6, 4 and 2 mm from the apex. Percentage and depth of sealer penetration in the root canal walls were examined using a CLSM at 10x and 40x (Leica SP5). Results were analyzed using Kruskal-Wallis and Mann-Whitney U tests ($p<0.05$).
Results: Mean (standard deviation) values are shown in the table. Regarding percentage of penetration, similar statistically results were measured for both endodontic sealers along the root canal. Depth of penetration was significantly higher for MTA Fillapex only at 6 mm level. Both sealers showed statistically significant differences among root levels in both percentage and depth of penetration.
Conclusion: Percentage and depth of sealer penetration into the root canal walls was similar using both sealers, except for MTA Fillapex at the coronal segment, showing a higher depth of penetration. The percentage and depth of penetration decreased towards the apical region with both sealers.

Sealer/Root canal levels from the apex (mm)		6	4	2
MTA Fillapex	*Percentage of penetration (%)*	67,8 (21,3)	43,6 (27,4)	17,4 (20,2)
	Depth of penetration (μm)	502,2 (80,9)	131,0 (166,5)	58,8 (98,3)
AH Plus	*Percentage of penetration (%)*	67,0 (22,7)	45,7 (31,8)	17,1 (25,3)
	Depth of penetration (μm)	231,6 (116,1)	129,6 (78,6)	55,3 (58,1)

211

Category: Endodontics and Pulp Biology

MSX2 HOMEOGENE BOX PLAYS A ROLE IN THE PULP HEALING PROCESS AFTER DIRECT PULP CAPPING

Stephane-Xavier Djole[(1)(2)], Ariane Berdal[(1)(2)], Stéphane Simon[(1)(2)(3)]
[(1)]University Of Paris Diderot (Paris 7)
[(2)]INSERM UMRS872 Team 5
[(3)]University of Birmingham (UK)

Objective: Msx2 plays a key role in regulating progenitor's recruitment, cellular differentiation, and regulation of terminal function during tooth development process. In our previous experiments we showed that Mice lacking the homeobox gene Msx2 exhibit defects in dentine structure and that odontoblasts/pulp cells are embedded within the mineralized matrix. The aim of this study was to decipher the implication of Msx2 gene in the pulp healing process after direct pulp capping.
Methods: Pulp exposures were created on the first maxillary molar of 5-week-old Msx2 transgenic mice and on same age CD1 Swiss as control as described in our previsous work (Simon et al. 2008). Direct pulp capping on exposed teeth was performed with Mineral Trioxide Aggregate followed by restoration with a light-cured adhesive system (AS) and composite resin. Animals were euthanized at five weeks postoperatively.
Histological cuts were stained with Godner's trichrome technique to determine both pulpal response and dentine bridge formation.
Results: The histological analysis showed a dentine formation inside the dental pulp of Msx2 -/- homozygous mice. At 5 weeks post operatively, the canals were fully filled with reparative dentine. On the control Wild Type mice, a dentine bridge was present between MTA and dental pulp, as previously described.
Conclusion: Uncontrolled dentine formation on Msx2 null mutant demonstrated the essential role of this transcriptor factor for odontoblast regulation. Our team had previously described the implication of Msx2 on physiological Odontoblast differenciation. Our experimentation demonstrate here that Msx2 is implicated in pulp healing process, probably by regulating the inflammation or the odontoblast differenciation process. Further investigation are actually required to decipher this role and the regulating pathways.

221

Category: Endodontics and Pulp Biology

MECHANICAL BEHAVIOR STUDY OF NITI ENDODONTIC FILES TAKING INTO ACCOUNT ANATOMIC SHAPE OF ROOT CANALS

V. Chevalier[1,2,3], V. Legrand[1,4], S. Moyne[1], L. Pino[4], S. Arbab Chirani[1,4] , S. Calloch[1], R. Arbab Chirani[2,3,5]
[1]LBMS - ENSTA Bretagne - 2, rue François VERNY - 29806 Brest cedex 9 - France
[2]Faculté d'Odontologie de Brest UBO-UEB - 22, rue C. Desmoulins - 29200 Brest - France
[3]CHRU de Brest - 2, av. Foch - 29200 Brest - France
[4]LBMS - ENIB - CS 73862 - 29238 Brest cedex 3 - France
[5]LATIM - CHU Morvan, Bat. 2bis - 2, avenue Foch - 29609 Brest - France

Objective: Superelastic NiTi Shape Memory Alloy (SMA) is the base of endodontic rotary files. Unfortunately the intracanal file separation can occur. To have a good idea of the mechanical behavior of these instruments during root canal preparation, finite elements simulations taking into account the real shape of root canals are proposed.
Methods: At first, experimental tests have been realized to allow the material parameters identification. These ones have been implemented in a model, based on constitutive equations relative to the superelasticity of SMA under multiaxial (torsion and bending) and non-proportional (*i.e.*, out-of-phase) loadings. Then, an instrument Hero (MicroMega, France) has been meshed by the finite element method in Abaqus (Simulia-USA). Besides, a tooth was scanned by microtomography and the axis of the canal has been extracted. It has been applied as boundary conditions.
Results: The insertion of a file in an anatomical root canal has been simulated. The model provides the stress value and the martensitic transformation rate in each point of the instrument for each moment of insertion.

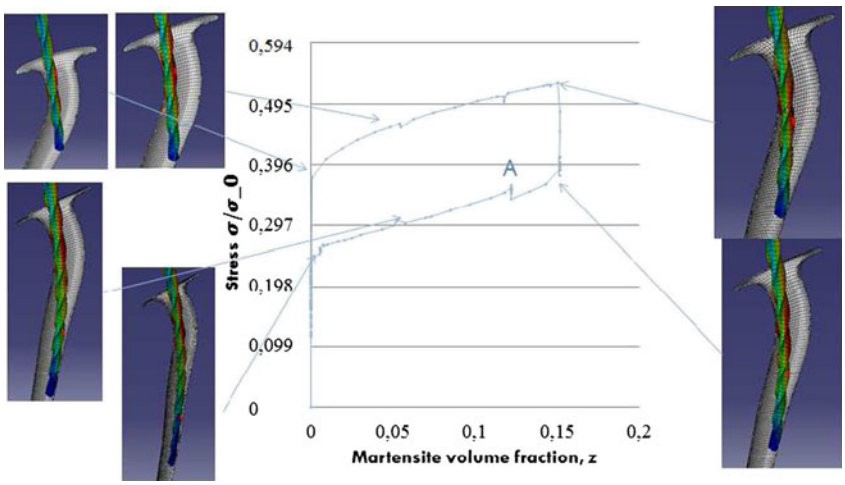


Fig: Stress level and martensite volume fraction in an element during insertion

However, it is important to precise that we have made assumptions. For example the cutting forces have been neglected during the insertion.
Conclusion: The use of a finite elements approach to study NiTi endodontic files taking into account anatomic shape of root canals appears to be relevant to calculate mechanical loading without making test on real teeth. This will be useful for fatigue study or design of these structures.

223

Category: Endodontics and Pulp Biology

MICRO-COMPUTED TOMOGRAPHY ANALYSIS OF THREE ROOT CANAL FILLING TECHNIQUES PERFORMED BY AN INEXPERIENCED OPERATOR

Z. Bouhnaida[1, 2], J. Braux[1, 2], A. Viteaux[2], M. Guigand[1, 2]
[1]EA 4691 «Biomatériaux et inflammation en site osseux» (BIOS), SFR CAP-Santé (FED 4231), Université de Reims Champagne-Ardenne
[2]U.F.R. Odontologie de Reims, France

Objective: The aim of this study was to measure the percentage of three dimensional voids in apical, medial and coronal thirds of root canals filled with three different techniques using micro-computed tomography (micro-CT).
Methods: Thirty human root canals with curvature ranging from 0 to 25° were prepared using Revos-S® (MicroMega, Besançon, France) up to SU. The root canals were randomly allocated into three groups: group 1 was filled with warm vertical compaction (Touch'n heat®), group 2 with a combined technique (cold lateral and thermomechanical compaction), and group 3 with Herofill® system. Roots were then scanned using Explore Locus SP X-Ray ICT micro-ct with a pixel size of 20 μm (microscanner General Electric, Milwaukee, WI, Bordeaux). For each third of the root canal, 'Analyze' and 'image J' softwares were used to assess the following measures: root filling volume, volume of voids distributed inside the filling material, along the canal wall, into the material communicating with the canal walls. Data were statistically analyzed using Kruskal-Wallis test (P <0.025) and if needed, supplemented by Mann-Whitney U test (P <0.05).
Results: The present study showed that none of the root canal-fillings was gap free. No statistically significant difference was found between the three techniques in the cervical third (p>0.05). In both apical and medial thirds, the highest volume of voids was recorded for the warm vertical compaction. The analysis of these thirds revealed a statistically significant difference between vertical compaction and combined technique, and

between vertical compaction and Herofill® ($p<0.025$), with no statistically significant difference between combined technique and Herofill®.
Conclusion: Micro-CT is a powerful nondestructive ex vivo investigation method that allows qualitative and quantitative examination of root canal fillings. Under the conditions of this study, warm vertical compaction seems to be a less reproducible technique for an inexperienced operator.

003

Category: Operative Dentistry

OMNICAM VS BLUECAM—A COMPARATIVE PILOT STUDY OF THE MARGINAL FIT

Mannaa Alaa[1], Rossier Isaline[1], Crottaz Claude[2], Tissiana Bortolotto[1], Krejci Ivo[1]
[1]Division of Cariology and Endodontology, School of Dental Medicine, University of Geneva, Geneva, Switzerland
[2]Department of Fixed Prosthodontics and Occlusion, School of Dental Medicine, University of Geneva, Geneva, Switzerland

Objective: To primarily compare the marginal fit between Bluecam and Omnicam fabricated restorations, and to secondarily assess whether the application of a powder prior to Omnicam impression registration could improve the marginal fit of the restorations.
Methods: Inlay, onlay and crown preparations were scanned using Sirona CEREC® Bluecam and Sirona CEREC® Omnicam with and without powder. The corresponding restorations were designed and fabricated using the Sirona CEREC® SW 4.0 software, Sirona CEREC® 4.0 MC XL milling machine and 3 M ESPE Lava™ Ultimate Restorative blocks for CEREC®. The marginal fit of each restoration was determined by measuring the smallest and largest marginal gaps detected on calibrated macro-photographic images of different surfaces of the restoration using the Image J 1.46 r software.
Results: The Omnicam based restorations displayed statistically significantly lower marginal fits when compared to their Bluecam equivalents ($p<0.05$). A trend of marginal fit improvement in the Omnicam-fabricated restorations was observed when Omnicam was used with powder (ns). The highest marginal discrepancy was observed in the inlay group (ns).
Conclusion: Restorations fabricated from Omnicam based impressions had an inferior marginal fit when compared to those fabricated from Bluecam based impressions.

004

Category: Operative Dentistry

SEALING ABILITY OF DIFFERENT NEW GENERATION RESTORATIVE MATERIALS AS INTRAORIFICE BARRIERS IN ENDODONTICALLY TREATED TEETH: AN *IN VITRO* STUDY

Fulya Toksoy TOPÇU[1], Elif Aybala OKTAY[1], Hüseyin TORT[1*]
[1]Gulhane Medical Academy, School of Dentistry, Dept. of Restorative Dentistry, Ankara, TURKEY

Objective: The aim of the study was to evaluate intraorifice sealing ability of three new generation restorative materials.The null hypothesis was there is no difference between the groups.
Methods: 40 extracted teeth with single roots and canals were randomly allocated into three experimental and one control groups ($n=10$). Teeth were decoronated at cement-enamel junction, standardized at 17 mm in length. Working length was determined and roots were prepared up to 40/.04 with ProTaper. The root canal system was not filled. Each canal orifice was® deepened 5 mm by using a standard drill. The holes in experimental groups were filled with SDR® in GroupI, SonicFill® in GroupII, GrandioSO Flow® in GroupIII. GroupIV was used as control group. After setting the materials, the samples were coated with sticky wax and nail varnish. The samples were placed into vacuum flask filled with Indian ink and subjected to a vacuum pressure of 75 torr and 30 minutes and the samples were left 10 days into Indian-ink at room temperature.Wax and varnish layers were removed and horizontal grooves at vestibular and palatinal sides were performed using a diamond disc to section the roots into two halves. Halves were examined under 40x stereomicroscope in terms of length of the dye leakage numerically. Kruskal Wallis variance of analysis and Wilcoxon rank sum test were used for statistical analysis.
Results: The null hypothesis was rejected. There was difference statistically significant between the experimental and control groups ($p=0,023$). There was statistically difference between experimental groups ($p=0,042$). No significant difference was found between Group I and Group II ($p=0,667$).
Conclusion: Under the conditions of the study, materials containing filler showed better pluging. The orifices of the root canal should plug in terms of a success endodontic treatment. Control group showed greater dye leakage than experimental group.

005

Category: Operative Dentistry

THE EFFECT OF TWO BLEACHING AGENTS ON THE SURFACE ROUGHNESS OF FOUR COMPOSITE MATERIALS : AN IN VITRO STUDY

Mathias Alexander Spraul[1], Romy von Eichel-Streiber[1], Elmar Hellwig[1], Olga Polydorou[1]
[1]University Medical Center Freiburg, Dental School and Hospital, Department of Operative Dentistry and Periodontology, Freiburg Germany

Objective: The aim of this in-vitro study was to evaluate the effect of two bleaching agents on the surface roughness of four composite materials.
Methods: Four different composite materials (Filtek Supreme XTE, Filtek Silorane, Ceram X, Grandio) and two bleaching agents (Opalescence Boost: 40 % hydrogene peroxide; Opalescence PF: 10 % carbamide peroxide) were used in this study. Composite specimens (diameter: 4.5 mm; thickness: 2 mm) of each tested material ($n=40$) were prepared according to the manufacturers' instruction and subsequently polished and cleaned. Half of the specimens of each group ($n=20$) were bleached four times for 15 minutes with Opalescence Boost, the other half ($n=20$) seven times for eight hours with Opalescence PF. They were then stored in Ringer's Solution. Surface roughness was measured before bleaching, 24 hours and one week after bleaching using laser profilometry.
Results: Bleaching with Opalescence PF led to a significant decrease of the surface roughness after 24 hours for CeramX ($p<0.0001$), Filtek Silorane ($p<0.0001$), and Grandio ($p<0.0001$). After one week the surface roughness did not change compared to the 24 hours results.
Bleaching with Opalescence Boost led to a significant increase of the surface roughness for all of the investigated composite materials after 24 hours (CeramX $p<0.0001$; Filtek Supreme $p=0.0064$; Filtek Silorane $p<0.0001$; Grandio $p=0.0123$). After one week, the surface roughness of all composite materials dropped back to baseline levels.
Conclusion: Within the limitations of the present study, it can be concluded that bleaching with 40 % hydrogene peroxide led to alterations of the surface roughness of the composite materials. However, storage of the samples compensated for the increased surface roughness.

006

Category: Operative Dentistry

THE EFFECT OF BLEACHING ON THE DISCOLORATION OF COMPOSITE MATERIALS AFTER STORAGE IN STAINING SOLUTIONS

Olga Polydorou[1], Agata Sczepanski[1], Martin Wolkewitz[2], Elmar Hellwig[1]

[1]Department of Operative Dentistry and Periodontology, Dental School and Hospital, University Medical Center Freiburg, Germany
[2]Institute of Medical Biometry and Medical Informatics, Department of Medical Biometry and Statistics, University Medical Center Freiburg, Germany

Objective: The aim of this in-vitro study was to evaluate the effect of bleaching on the discoloration of composite materials after staining.
Methods: Two different composite materials were used: Filtek Supreme XT (nanohybrid composite) and Ceram X (Ormocer). From each material, four groups (n=20) were prepared (diameter 4.5 mm; 2 mm thickness) and polymerized according to manufacturers' instructions. After polymerization all samples were stored in human saliva for 3 days and then each sample was bleached for 45 minutes (3×15 minutes) using Opalescence Xtra Boost (38 % hydrogen peroxide). After bleaching, the four groups of each material were immersed in four different staining solutions (human saliva; tea; coffee and 0,1 % chlorhexidine) for 7 days. The solutions were renewed every 24 h. After staining, the samples were polished to remove external discoloration. The color of each sample was determined at four different time points: before bleaching, after bleaching, 1 and 7 days later. The respective shade (L*C*H*) was evaluated using a spectrophotometer (VITA Easyshade). For the statistical analysis, the least-square means were calculated and a pairwise comparison by Tukey's Test took place.
Results: The color (L*C*H* values) of both tested materials changed significantly, after bleaching and staining (p<0.05). Among the two tested materials, the color of Ceram X was found to be more stable after bleaching while the bleaching/staining procedure had a stronger effect on the color of Filtek Supreme XT. The highest color changes were observed after the first day of staining. The effect on color after bleaching differed significantly among the staining solutions (p<0.0001). Coffee caused the highest effect followed by tea and chlorhexidine.
Conclusion: After bleaching, composite materials are susceptible to discoloration, especially after storage in coffee. Tea and chlorhexidine exhibited lower effects. Nanohybrid composite materials are more sensible to bleaching/staining procedures compared to ormocer.

030

Category: Operative Dentistry

PORPHYRIN INVOLVMENT IN REDSHIFT FLUORESCENCE OF DECAY DENTIN

Slimani Amel[1], Panayotov Ivan [1], Terrer Elodie[1], Levallois Bernard[1], Cloitre Thierry[3], Jacquot Bruno[1], Gergely Csilla[3], Tassery Hervé [2], Cuisinier Frédéric[1]

[1]EA 4203, UFR Odontologie, Université Montpellier 1, France.
[2]Aix-Marseille-Université, APHM Hôpital Timone, service odontologie, France.
[3]Universite'Montpellier2, Laboratoire Charles CoulombUMR5221. CNRS, Laboratoire Charles Coulomb UMR 5221, F-34095, Montpellier, France

Objective: The aim of this study is to understand the involvement of porphyryns in the origin of the red fluorescence observed with intraoral cameras SoproLife® and VistaCam®. Fluorescence and micro-Raman spectra of sound and carious dentin were analyzed and compared to the fluorescence images recorded with the cameras *in vitro,* to assess the involvement of porphyrins in this redshift of the fluorescence emission.
Methods: Porphyrin I (P) and Protoporphyrin IX (PpIX) powders (Sigma Aldrich), sound and carious dentin samples were respectively observed in the fluorescence mode with SoproLife® and VistaCam®. Fluorescence Emission spectra were recorded using an epi-fluorescence microscope (Nikon Eclipse TE) with an excitation wavelength range of 380–420 nm and a spectrometer (Acton SP215i-CCD PIXI400B). The radiance shown was computed with image-analysing software Win roof®. Micro-Raman spectra of the same samples were measured with LabRAM ARAMIS IR^2 confocal micro-Raman spectrometer equipped with BX41 Olympus microscope and a CCD detector. The Raman spectra were normalized using Peakfit v4.12 software.
Results: Porphyrin I (P) and Protoporphyrin IX (PpIX) look red-brown dark with SoproLife® and signals were hazardous with VistaCam® depend of the distance, background color of support and focus of the picture. Fluorescence emission spectra of PpIX revealed a maximum peak at 715 nm and is red shifted, compared to the carious dentine spectra with three peaks between 600–700 nm. Raman spectra revealed a high level of fluorescence in dentine decay but a very low relative intensities ratio of Porphyrin and Protoporphyrin.
Conclusion: Fluorescence devices provide significant benefits to clinicians toward more preventive dental care. Understanding the specific role of porphyrins in the caries process brings additional elements to this complex biological reaction in spite of the weakness of this signal in the dentin decay. Further work is ongoing to establish the biochemical characteristics of porphyrins involved in the dental caries process.

031

Category: Operative Dentistry

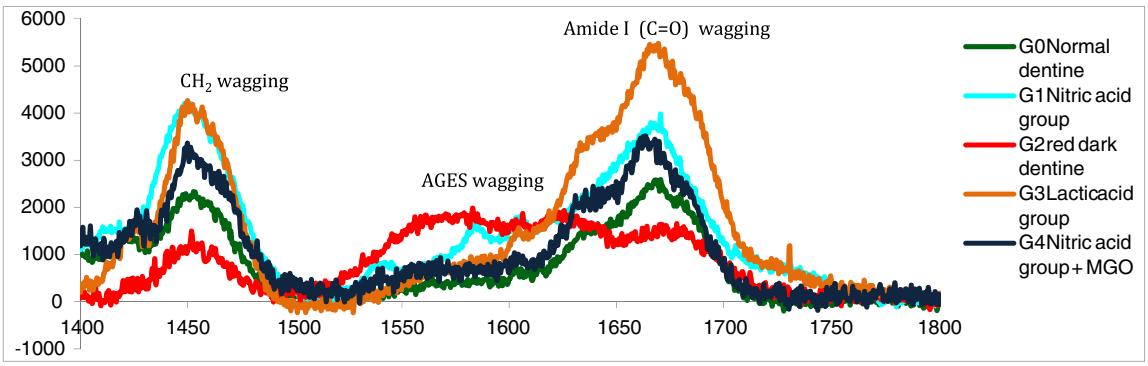
MOLECULAR STRUCTURAL ANALYSIS OF CARIOUS LESIONS USING MICRO-RAMAN SPECTROSCOPY

Ivan Panayotov[1], Elodie Terrer[1,2], Slimani Amel[1] Levallois Bernard[1], Salehi Hamideh[1], Hervé Tassery[1,2] and Frédéric Cuisinier[1]

[1]EA 4203, UFR Odontologie, Université Montpellier 1, 34193 Montpellier Cedex 5, France
[2]UFR Odontologie, 27 Bd jean Moulin 13355 Marseille cedex, Aix-Marseille-Université

Objectives: (1) To analyze the Raman spectra of sound, carious and demineralized dentine, (2) to compare this spectral analysis with the fluorescence variation when using a fluorescent camera (SoproLife®), (3) to evaluate the involvement of the Maillard reaction in the fluorescence variations.
Methods: Samples were prepared in-vitro with methylglycoxal (MGO) to mimic the Maillard reaction occurring during caries (browning reaction) and the demineralization with acid solutions. Sound dentine G0, sound dentine demineralized in aqueous nitric acid solution G1, carious soft dentine G2, sound dentine demineralized in lactic acid solution G3, sound dentine demineralized in aqueous nitric acid solution and immersed in MGO solution G4, sound dentine demineralized in aqueous nitric acid solution and immersed in MGO and glucose solutions G5 were studied by micro-Raman spectroscopy. Additionally pentosidine, one of the AGE products, was also studied by Raman spectroscopy. Raman spectra of the samples were analyzed and correlated with the fluorescence obtained with the SoproLife® camera.
Results: Modifications of Raman spectra in the band ratio of AGEs, amide, phosphate and carbonate were observed in the decayed and

demineralized group, as compared to the sound dentine. The results indicated that the fluorescence of carious dentine with a fluorescent camera and the Raman spectra variation were closely related and that a close relationship exists between the Maillard reaction (AGEs) and fluorescence variations. Fig 3 Raman spectra in the CH_2, AGEs and amide I bands



Conclusion: There is a perfect superimposition between the red fluorescence given by the SoproLife® and the browning reaction. Nevertheless the same correlation is visible between intensity variations of the AGEs, pentosidine bands, typical of the Maillard reaction during caries.

035

Category: Operative Dentistry

ASSESSMENT OF EROSIVE LESIONS IN AUSTRIAN DENTAL STUDENTS. A CROSS-SECTIONAL STUDY

Corinna Bruckmann[1], Arabella Jelinek-Gaugusch[1]
[1]Conservative Dentistry and Periodontology, Bernhard Gottlieb University Clinic of Dentistry, Vienna, Austria

Objective: To assess the prevalence of dental erosions and influencing factors in 3rd year dental students.
Methods: Data on socioeconomic factors, nutrition, diet, exposure to gastric acid, and oral hygiene in 53 students (3rd year of education) using a questionnaire (A. Lussi, University Berne) were collected. Clinically, we recorded caries with the DMFT, and erosion with the BEWE. A plaque and periodontal index were measured. Standardized clinical photographs and saliva samples were taken. Saliva pH and buffer capacity were assessed. Spearman's correlation coefficient was used to assess the relation between BEWE and number of acid attacks per day as well as BEWE and saliva pH and buffer capacity.
Results: Mean age was 25 years (range 22–44). Mean number of acid attacks was 5.6. Mean DMFT and BEWE amounted to 8.8 and 2, respectively. Mean API was 47.1 %, with mean saliva buffering capacity and mean saliva pH amounting to 5.1 and 6.8, respectively. Pronounced erosions were only seen in 2 students with a history of bulimia or reflux disease. There was no correlation of BEWE and acid intake, or of BEWE and saliva pH or buffering capacity, respectively.
Conclusion: In this convenience sample of dental students prevalence and extent of erosive lesions were low, although the frequency of acid attacks was high. Probably, the rather high plaque level served as a protective mechanism. However, this resulted in a high DMFT. Future Austrian studies should include more participants, and preferably also from other age groups and with different educational backgrounds.

037

Category: Operative Dentistry

EFFICACY OF A BLEACHING ENZYMATIC-BASED TOOTH PASTE. A DOUBLE-BLINDED CONTROLLED CLINICAL TRIAL

Amengual J[1], Llena MC[1], Forner L[1], Oteo J[2], Oteo C[2]
[1]Department of Stomatology. Universitat de València - Spain
[2]Department of Stomatology II (Conservative Dentistry). Universidad Complutense de Madrid - Spain

Objective: To evaluate the clinical efficacy of a bleaching tooth paste versus a placebo dentifrice.
Methods: A double-blinded controlled clinical trial was performed. A 3 % carbamide peroxide with a 5 % lactoperoxidase tooth paste (White Kin) and a control one were compared. A sample of 48 adults with all their anterior teeth completely erupted was selected and randomly assigned to the study or control group. An approval from the ethical committee was obtained as well as a consent form from each participant. Participants in both groups brushed their teeth twice a day (3 minutes each time) during 12 weeks. Following the CIELab criteria (L, a*, b* and ΔE), color changes were assessed with an Easy Shade spectrophotometer (Vita) at baseline, 3, 6, 9, and 12 weeks. Comparisons between groups were assessed by the Mann-Whitney U Test. Changes in color parameters in each group were evaluated with the Wilcoxon paired test.
Results: At 12-weeks follow-up lightness and ΔE was significantly higher in the experimental group than in the control one (80.14 vs.79.31). Significant differences for ΔE values between 3 weeks and the end of the evaluation period were obtained in both experimental and control groups (1.08 and 0.6 units respectively). Significant ΔE changes were observed in canines as well as in central and lateral incisors in the experimental group, but not in the control one.
Conclusion: When participating in a tooth bleaching study, tooth brushing it self improves dental color, nevertheless, the analyzed enzymatic-based tooth paste achieved objective tooth color changes.

038

Category: Operative Dentistry

CLINICAL EVALUATION OF ANTERIOR ESTHETIC COMPOSITE RESTORATIONS: TWO YEAR RESULTS

Asuman Eroglu[1], Beyser Pişkin[2]
[1]DDS, PhD, associate professor, Department of Restorative Dentistry, School of Dentistry, Yeni Yuzyil University, Istanbul, Turkey
[2]DDS, PhD, professor, Department of Endodontics, School of Dentistry, Ege University, Izmir, Turkey

Objective: Creating an esthetic smile primarily requires the arrangement of color, form and proportion of the anterior teeth. Currently direct composite restorations have been used increasingly to fulfil the requirement of esthetics and durability. The improvements in resin composites and adhesive systems have offered direct composite bonding to be a more durable, conservative and economic alternative for the patients. This study evaluated the clinical performance of two adhesive systems used in esthetic direct composite restorations.
Methods: A total of 76 composite restorations were performed in 25 patients in the Department of Restorative Dentistry, Ege University, between 1998 and 1999 for esthetic reasons such as localized discoloration, diastema, deviation from shape or position. 38 teeth were restored with Scotchbond Multi-Purpose and the other 38 with Single Bond (3 M Dental Products, St. Paul, MN, USA) adhesive system using a conventional hybrid composite Valux™ Plus (3 M Dental Products, St. Paul, MN, USA). The restorations were clinically evaluated by 3 experienced examiners at baseline, 6, 12, 18 and 24 months according to modified Ryge criteria. Gingival bleeding index and periodontal index were also recorded.
Results: The clinical performances of both types of adhesive systems were similar and the results indicated that supra-gingival direct composite restorations did not have a negative influence on gingival health for 2 years. Superficial localized marginal discoloration and marginal discrepancy were observed at 18 months, which were found to be statistically significant (p= 0.000) but did not require replacement of any of the restorations.
Conclusion: The results of this study revealed that at the end of 24 months this minimal invasive or non-invasive procedure of direct hybrid composites exhibit a clinically acceptable success rate and are a promising alternative for the esthetic and functional restoration of anterior teeth.

040

Category: Operative Dentistry

EXTERNAL CERVICAL RESORPTION TREATMENT. A THREE-CASE REPORT

Diomataris Michail[1], Gkavela Grigoria[1], Prevezanos Panagiotis[1], Papazoglou Efstratios[1]
[1]Department of Operative Dentistry, School of Dentistry, University of Athens, Greece

Objective: The aim of this case report is to present the treatment protocol of three cases of external cervical root resorption. Cervical resorption is a clinical term used to describe a relatively uncommon and aggressive form of external tooth resorption which may occur in any tooth in the permanent dentition. Characterized by its cervical location and invasive nature, this resorption process can lead to severe loss of tooth structure and can occur following injury to the root surface at or just below the epithelial cervical attachment apparatus.
Methods: Three cases of external cervical root resorption are presented. The first case was treated following the protocol of root canal therapy, orthodontic extrusion and pericision. The coronal movement of the defect made it restorable at a second stage with direct application of adhesive system and composite resin. The other two lesions were treated following the protocol of surgical access raising a flap with subsequent root canal therapy and direct restoration of the lesions.
Results: All three cases were treated according to the extent and the access of the lesion. In the post operative x-ray radiographs and follow-ups, all three teeth seem to have responded well to therapy.
Conclusion: Both orthodontic extrusion and surgical access followed by direct restoration of the lesion with adhesive system and composite resin are sustainable treatment protocols for dealing with external cervical root resorption.

043

Category: Operative Dentistry

TEMPORARY ZINC OXIDE-EUGENOL CEMENT: EUGENOL QUANTITY IN DENTIN AND BOND STRENGTH OF RESIN COMPOSITE

Koch Tamara[1], Peutzfeldt Anne[1], Malinovskii Vladimir[2], Flury Simon[1], Häner Robert[2], Lussi Adrian[1]
[1]Department of Preventive, Restorative and Pediatric Dentistry, School of Dental Medicine, University of Bern, Freiburgstrasse 7, CH-3010 Bern, Switzerland
[2]Department of Chemistry and Biochemistry, University of Bern, Freiestrasse 3, CH-3012 Bern, Switzerland

Objectives: To investigate the effect of zinc oxide-eugenol cement (ZOE) exposure on quantity of eugenol and microtensile bond strength (μTBS) of resin composite.
Methods: ZOE (IRM® Caps) was applied on dentin of human molars (21/group) for 1, 7, or 28 days and then removed. One half of each molar was used for determination of eugenol quantity by spectrofluorimetry. The other half was used for μTBS testing. Dentin was treated with either OptiBond FL using H_3PO_4 or with Gluma Classic using EDTA conditioning. One group without conditioning (for eugenol quantity) and two groups without ZOE exposure (for eugenol quantity and μTBS) served as control. Nonparametric ANOVA models with two fixed factors and post-hoc Wilcoxon rank sum tests were applied for statistical analysis. The significance level was set at α=0.05. Failure mode was stereomicroscopically determined at 45x magnification.
Results: When dentin had been exposed to ZOE, quantities of eugenol in the range of 0.33–2.9 nmol per mg dentin (medians) were detected, but no effect of duration of ZOE exposure was found. Conditioning with H_3PO_4 or EDTA significantly reduced eugenol quantity compared to non-conditioning. For OptiBond FL ZOE exposure significantly decreased μTBS regardless of exposure duration resulting in predominantly adhesive failures between adhesive system and dentin. For Gluma Classic a decrease in μTBS after ZOE exposures of 7 and 28 days was observed, the predominant failure modes being pretest failure and adhesive failure between adhesive system and dentin. OptiBond FL showed significantly higher μTBS than did Gluma Classic. No significant correlation was found between eugenol quantity and μTBS.
Conclusion: Conditioning with H_3PO_4 or EDTA reduced eugenol quantity in dentin. Nevertheless, previous ZOE exposure negatively influenced bond strength of resin composite. Thus, ZOE should be avoided in cavities later to be restored with resin-based materials.

054

Category: Operative Dentistry

UPDATE ON RESIN INFILTRATION OF EARLY CARIOUS LESIONS

Raphaël Ducamp*, Stéphanie Tubert-Jeannin, Sophie Doméjean
CHU Clermont-Ferrand, Service d'Odontologie, Hôtel-Dieu, Clermont-Ferrand, France ; Univ Clermont1, UFR d'Odontologie ; Centre de Recherche en Odontologie Clinique EA 4847, Clermont-Ferrand, France

Objective: Dental caries treatment has changed dramatically in recent years, from traditional restorative treatments to preventive, non-invasive and minimally invasive strategies. The aim of the present study was to evaluate the scientific evidence related to the resin infiltration of early carious lesions, a recently developed non-invasive therapeutic option.
Methods: PubMed database was searched (1 Oct. 2012) for randomized controlled trials evaluating the *in vivo* effect of resin infiltration (*versus* no treatment, placebo or other preventive treatment) on carious lesion progression.
Results: Among the 109 articles originally identified, only 3 studies were included in the present review. One study was conducted among 48 high caries risk children while the 2 others concerned moderate and low caries risk adults (respectively $n=22$ and 39). The quality of the studies was high: randomization, split-mouth design, and double-blinding. Caries progression was significantly lower in the resin infiltration groups. RR was 0.37 after 6 months in high-risk children and respectively 0.19 and 0.46 in moderate- and low-caries risk adults after 18 and 36 months.
Conclusion: These surveys thus found that resin infiltration (low-viscosity light-cured resin) is an effective method to arrest caries progression of non-cavitated proximal carious lesions.

055

Category: Operative Dentistry

ADHESION TO MILD FLUOROSED ENAMEL: A COMPARATIVE STUDY OF TWO ETCHING PROTOCOLS

Chems Belkhi [1], Asma Arous [2], Mohammed Semir Belkhi [3],
[1]Faculté de Medecine Dentaire, Monastir, Tunisie

Objective: The objective of our laboratory study is to evaluate the adhesion quality of a two-steps total-etch adhesive system to mild fluorosed enamel by two different etching protocols.
Methods: Thirteen human teeth (molars and premolars) showing a mild fluorosis (TFI 1-3) according to Thylstrup and Fejerskov index were used. On each tooth two amelo-dentinal Class II box-only cavities were prepared.
The distal cavities were etched once for 30 seconds using orthophosphoric acid at 37 %. The mesial cavities were etched twice for 30 seconds using orthophosphoric acid at 37 %. Following the obturation with composite resin, thermocyling, infiltration with methylene blue and sectioning in the mesio-distal direction, the teeth were observed with a stereomicroscope. Three samples were observed with a scanning microscope. Methylene blue infiltration degree was evaluated in the cervical and occlusal enamel of each cavity. The statistical study was conducted using the Fisher exact test.
Results: No significant differences were noticed between the two etching protocols $p=0.583$. Significant differences were noticed in adhesion quality between the cervical enamel and the occlusal enamel for the simple etching protocol $p=0.035$ and for the double etching protocol $p=0.045$.
Conclusion: Our study shows that composite adhesion to mild fluorosed enamel is not influenced by the etching time and that adhesion is better in the occlusal enamel than in the cervical enamel.

058

Category: Operative Dentistry

DESENSITIZING EFFECT OF A 10%CARBAMIDE-PEROXIDE BLEACHING AGENT CONTAINING FLUORIDE AND POTASSIUM NITRATE: AN *IN VIVO* STUDY

Milena Cadenaro[1*], Chiara Ottavia Navarra[1], Reda Bachar[1], Marina Diolosà[1], Lorenzo Breschi[1]
[1]Department of Medical Sciences, University of Trieste, Trieste, Italy

Objective: The aim of this study was to evaluate *in vivo* the effect of a 10 % carbamide peroxide agent containing fluoride and potassium nitrate compared to a similar product with no desensitizing agents on tooth sensitivity, tooth colour, and enamel morphological changes.
Methods: Twenty subjects were treated for two weeks with an at-home nightguard bleaching agent containing 10 % carbamide peroxide (CP) with (Opalescence PF, Ultradent Products Inc.) or without (Vivastyle 10 %, Ivoclar Vivadent) fluoride and potassium nitrate. Sensitivity, evaluation of colour, and enamel morphological analyses were performed before and after treatment. Tooth sensitivity to thermal stimuli was tested using an air spray syringe; tooth colour was recorded using a spectrophotometer (Micro SpectroShade, MHT SpA); tooth morphology was assessed with SEM using a replica technique of the right-upper incisor of each patient. Sensitivity and colour data were statistically analysed with the Wilcoxon and Mann–Whitney tests.
Results: After treatment, both bleaching agents significantly increased tooth sensitivity ($p<0.05$); however, the 10 % CP bleaching agent with fluoride and potassium nitrate (Opalescence PF) produced significantly lower sensitivity ($p<0.05$) than the bleaching product without desensitizing agents (Vivastyle 10 %). The spectrophotometric evaluation showed no difference in bleaching effectiveness between the tested bleaching agents, while the SEM analysis indicated absence of relevant alterations of the enamel surface in both tested groups.
Conclusion: The use of a 10 % carbamide peroxide agent containing fluoride and potassium nitrate reduced the incidence of sensitivity during the bleaching treatment compared to a similar bleaching agent with no desensitizing agents. Both tested products were safe inducing no enamel changes and effective in whitening the teeth.

059

Category: Operative Dentistry

THE PREVALENCE OF CERVICAL DENTIN HYPERSENSITIVITY IN THE GENERAL POPULATION OF ATHENS, GREECE

Rahiotis C[1], Polychronopoulou A[2], Tsiklakis K[3], Kakaboura A[4]
[1]Dept of Operative Dentistry
[2]Dept of Preventive and Community Dentistry
[3]Clinic of Oral Diagnosis & Radiology
[4]Dept of Operative Dentistry

Objective: The purpose of this study has been to identify the prevalence of cervical dentin hypersensitivity in the general population in the city of Athens, Greece.
Methods: 767 subjects were examined. Participants were patients processed for a first examination in the Clinic of Oral Diagnosis and Radiology at the Faculty of Dentistry, University of Athens. The evaluation of hypersensitivity was performed using two methods; for each tooth, the response a) to tactile (mechanical) and b) air-blast (thermal) stimulus. Additional factors such as smoking habits, oral health behaviour, education level, consumption of acidic foods, type of toothbrush, daily use of fluoride solution and of desensitizing toothpaste, gingival recession and non-carious cervical lesions were recorded. Descriptive statistics on the demographics of the study sample, of oral health behaviour characteristics and of oral examination findings were calculated. Comparisons of these characteristics in the presence or absence of cervical hypersensitivity were conducted using the chi-square test. Data were further analyzed using stepwise multiple logistic regression analysis.
Results: 21.3 % of the participants had at least one cervical dental hypersensitivity reaction to the mechanical stimulus and 38.6 % to the thermal stimulus 14 % had one non-carious lesion and 22 % one case of gingival recession. Multivariate analysis detected an association between hypersensitivity to mechanical or thermal stimulus and non-carious lesions and gingival recessions; additionally, an association between hypersensitivity to thermal stimulus and gender (female) and age (>60 years). No association was found between hypersensitivity to stimuli and level of education, smoking, consumption of acidic foods, type of toothbrush and daily use of fluoride solution or desensitizing toothpaste.
Conclusions: The prevalence of dentin hypersensitivity in the general population in Athens was 21.3–38.6 % dependent on the type of stimulation. Cervical non-carious lesions and gingival recessions were shown as contributing factors in the incidence of cervical hypersensitivity.

064

Category: Operative Dentistry

SELF-ETCH AND ETCH-AND-RINSE ADHESIVES IN CLASS V RESTORATIONS: CLINICAL PERFORMANCE OVER 2-YEARS

Sandra Faria[1*], Patrícia Manarte-Monteiro[1], Sandra Gavinha[1], Liliana Costa[1], Maria Conceição Manso[2]
[1] Department of Dental Medical Sciences, Faculty of Health Sciences, University Fernando Pessoa, Porto, Portugal
[2] Faculty of Health Sciences, University Fernando Pessoa, Porto, Portugal & REQUIMTE-University of Porto, Portugal

Objective: The cervical dental hard tissues loss is a clinical model for evaluating the performance of adhesive restorations in non-retentive preparations. The aim of this study was to compare the clinical performance at 2-years, of Self-Etch (SE) and Etch-and-Rinse (ER) adhesives in composite restorations of non-carious cervical lesions (NCCL).
Methods: Prospective clinical trial, approved by UFP-FHS Ethics Committee, in 29 adult patients with 77 restorations randomly allocated according to two groups (microhybrid composite/adhesive system); SE Group: 43 restorations, Amaris®/FuturabondNR; ER Group: 34 restorations, Amaris®/SolobondM (Voco GmbH). All restorations were evaluated (aesthetic, functional and biological parameters) at baseline and at 2 years, using USPHS criteria and Hickel and colleagues (2007) recommendations, by three calibrated (ICC≥0.928) examiners. SE and ER efficacy (success rate) was evaluated at 2 years follow-up; Statistical analysis with nonparametric tests (alpha=0.05).
Results: At 2 years, the SE (n=40; 7 % dropout) and ER (n=34; 0 % dropout) restorations showed success rates of 100 % (Fisher /Chi-square tests, $p>0.05$), respectively. No significant differences between SE/ER ($p>0.05$) regarding aesthetic, functional and biological restorations performance except for surface staining ($p=0.012$), for wear ($p=0.012$), patient's view ($p=0.012$) and tooth integrity ($p=0.009$), with less changes for ER restorations. Regarding baseline-2 years follow-up, SE and ER restorations showed significant changes in aesthetic (McNemar/Wilcoxon tests.; $p<0.020$ and $p<0.008$, respectively), functional ($p<0.012$ and $p<0.014$) and biological ($p<0.001$ and $p=0.009$) parameters.
Conclusion: The effectiveness of restorations with SE and RE is high and similar at two-years follow-up. Aesthetic, functional and biological performance of restoration with ER appears to be better than with SE adhesive. However, a continuous and longer evaluation of these adhesive restorations longevity is necessary. The adhesives ER and SE in composite restorations of NCCL indicate a clinically acceptance and a comparable performance in the mean-term evaluation.

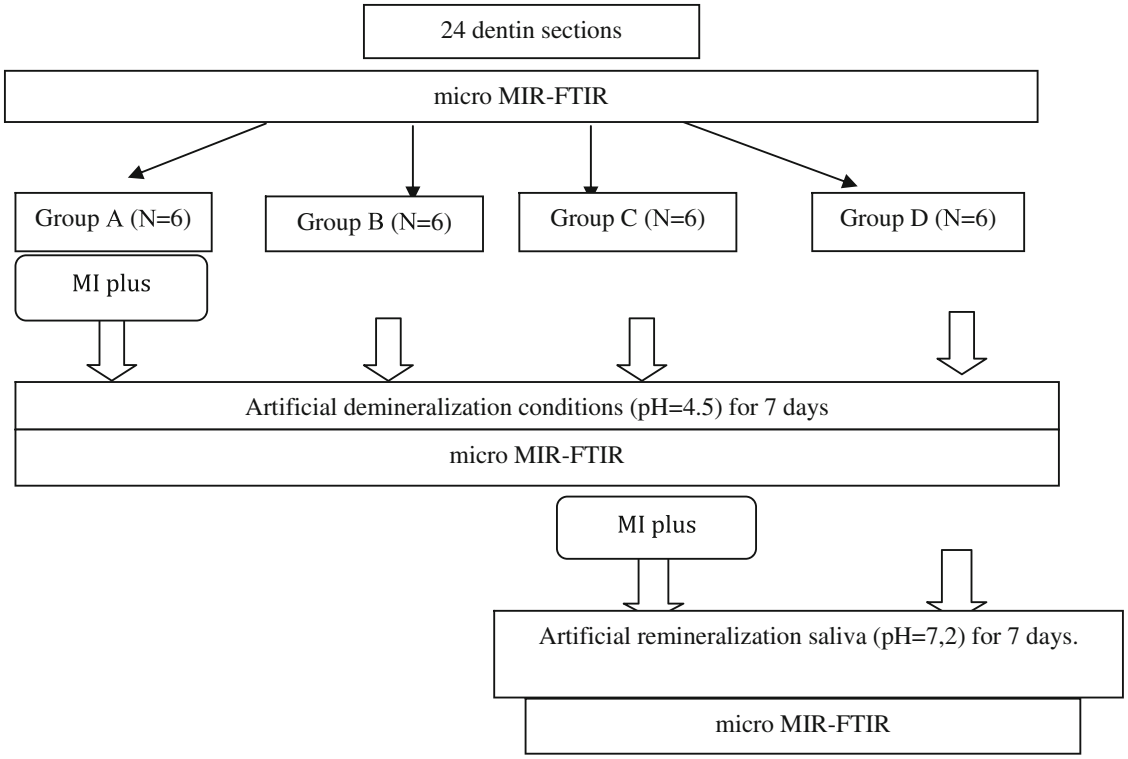
066

Category: Operative Dentistry

EFFECT OF A "MI PLUS" AGENT ON THE DEMINERALIZATION AND REMINERALIZATION OF DENTINE IN VITRO

Tagka Elissavet Maria[1], Rahiotis Christos[2],Vougiouklakis George[3]
Dept. Of Operative Dentistry, University of Athens, Greece

Objective: The objective of this in vitro study was to evaluate the possible protective role over demineralization or promoting remineralization of the commercial formulation MI plus (GC, Japan) on dentine specimens.
Methods: The crowns of twenty-four sound human permanent third molars were sectioned in order to obtain 24 dentin sections of 2 mm. The specimens were divided randomly into 4 groups. The four Groups (A), (B), (C), and (D) were treated and examined as mentioned in the following diagram:



Modifications over the mineral content of samples were evaluated with the technique of infrared spectroscopy (multiple internal reflection transformation Fourier-micro MIR-FTIR).The mineral content of Groups (A) and (B) was compared over the possible protective role of the agent. Results from Groups (C) and (D) were compared over the potential role of the agent to promote remineralization. The data were statistically analyzed using paired t-test (a=0.05).
Results: The % demineraliazation was 61,4±25,1 and 56,6±33,5 for groups A and B, respectively. The % demineraliazation was 46,8±26,9 and 19,2±14,2 for groups C and D, respectively. Statistical analysis showed that one single application of MI plus was not enough to protect surfaces of dentin against in vitro demineralization. Furthermore, there was no significantly difference of the remineralization of the dentin samples after the application of the agent, compared to the remineralization which occurred after placing the samples to an artificial saliva solution.
Conclusion: The protective role of MI plus over demineralization and the promotion of remineralization of dentin surfaces was not supported by this in vitro study.

068

Category: Operative Dentistry

OCCLUSAL CARIOUS LESIONS MANAGEMENT IN FRANCE—DIAGNOSTIC AND 2002–2012 CHANGES IN RESTORATIVE STRATEGIES

Doméjean Sophie [1*], Maltrait Marie [2], Tubert-Jeannin Stéphanie [1]
[1]CHU Clermont-Ferrand, Service d'Odontologie, Hôtel-Dieu, Univ Clermont1, UFR d'Odontologie ; Centre de Recherche en Odontologie Clinique EA 4847, France
[2]CHU Clermont-Ferrand, Service d'Odontologie, Hôtel-Dieu, Univ Clermont1, UFR d'Odontologie, F-63000 Clermont-Ferrand, France

Objective: The study investigated diagnostic and treatment decisions for occlusal carious lesions among French dentists and assessed changes over a 10-year period (2002–2012).
Methods: A questionnaire already used in a national survey conducted in 2002 was sent, in 2012, to a random sample (n=2000) of dentists on a national register (response rate: 41.9 %).
Results: When shown illustrations of one particular occlusal surface, 41.3 % of the respondents diagnosed an enamel lesion, 10.4 % a dentinal lesion, 33.2 % a sound surface while 15.2 % were uncertain. Diagnosis was related to the dentists' demographic characteristics: for example, male were less likely to be uncertain (χ^2; p=0.012). For an enamel lesion, if 57.7 % of the respondents proposed a non-invasive management, 42.3 % chose a restorative option.
When asked about their restorative thresholds in a low-caries-risk adult, 39.3 % of the respondents would place a restoration for an enamel lesion and 60.7 % would wait for dentine involvement. Comparisons with the 2002 results showed that, in 2012, restorative thresholds have been postponed at later stages of caries progression (χ^2; p<0.0001); less invasive cavity designs were preferred (χ^2; p=0.027); and amalgam restorations were less frequently proposed (χ^2; p<0.0001).
Conclusion: Changes occurred between 2002 and 2012 but French dentists still varied markedly in their diagnostic and treatment decisions depending on their demographic characteristics.

074

Category: Operative Dentistry

ICDAS CLINICAL REPORT: CARIES EXPERIENCE AND RESTORATIVE INTERVENTIONS BY VISUAL EXAMINATION

Patrícia Manarte-Monteiro[1], Joana Domingues[1], Sandra Gavinha[1], Filipe Martins[1], Liliana Teixeira[1], Sandra Faria[1], Maria Conceição Manso[2*]
[1] Department of Dental Medical Sciences, Faculty of Health Sciences, University Fernando Pessoa, Porto, Portugal
[2] Faculty of Health Sciences, University Fernando Pessoa, Porto, Portugal & REQUIMTE-University of Porto, Portugal

Objective: The International Caries Detection and Assessment System (ICDAS) categorize dental caries/restorations and can be applied in Dental Medicine (DM) education, clinical practice, clinical and epidemiology research. This trial evaluated dental caries experience/severity and restorative interventions by ICDAS, in a population of university DM services.
Methods: Observational, transverse and descriptive study; random sampling: 284 individuals aged≥18 years, attending the 1st dentistry appointment at the Faculty of Health Sciences, University Fernando Pessoa, over a period extending from September-2008 to July-2010. The intra-oral (visual/tactile) ICDAS record was validated by four examiners trained/calibrated (ICC=0.963) to identify the restorative and dental caries clinical (non-cavitated and cavitated carious lesion) conditions. Descriptive/inferential statistical analysis (alpha=0.05) was conducted.
Results: In the sample (64.8 % female) the average (±SD) age was 44.3 (±16.4) years, with no significant differences (t-student test, p=0.110) between genders. In average, 118.7 (±81.7) tooth surfaces/individual were observed; Decayed surfaces were: 9.1(±11.8) with primary caries, of which 5.63 (±8.48) were non-cavitated lesions (enamel); of those 0.15 (± 0.97) had fissure sealants and 3.6 (±4.3) were cavitated (dentin). Surfaces restored with definitive material: 9.2 (±13.2). There were secondary caries in 1.7 (±2.9) surfaces; Secondary caries in enamel and dentin occurred at 0.71 (±2.11) and 1.0 (±1.2) surfaces, respectively. The population dental surfaces' condition was: 56.3 % healthy, 52.5 % with caries (51.8 % cavitated lesions (dentin) and 49.3 % non-cavitated lesions (enamel)), 53.2 % restored, but 42.6 % had secondary caries (33.5 % cavitated and 31 % non-cavitated lesions).
Conclusion: The ICDAS clinical report revealed high experience/severity of dental caries and restorative interventions, but variable values when analyzing the individual and the population. Trials that include registration of caries activity are needed in order to define individual/population risk. The ICDAS assessment allows the definition of more accurate preventive/restorative decisions in clinical practice and clinical and epidemiological investigations.

077

Category: Operative Dentistry

COMPARATIVE EVALUATION OF MICROLEAKAGE IN DIRECT RESTORATIONS WITH CA_3SIO_4 BIOACTIVE MATERIAL (BIODENTINE) UNDER COMPOSITE RESIN

Kosmas Tolidis, Christina Boutsiouki, Paris Gerasimou
Dept. Operative Dentistry, School of Dentistry, Aristotle University of Thessaloniki

Objective: In order to minimize polymerization shrinkages stress, deep cavities restored with composite resin, require the use of a base material underneath. Flowable composite resins and resin-modified glass-ionomer cements have been used for this purpose, exhibiting acceptable results. Recently developed Ca_3SiO_4 bioactive material (Biodentine) is designed to substitute dentine, but it is advised by the manufacturer to finish the restoration in two visits. Aim of this study was to evaluate Ca_3SiO_4 bioactive material (Biodentine) as base, under directly placed composite resin in comparison to a flowable composite resin and a resin-modified glass-ionomer cement.
Methods: Thirty class I cavities were prepared in permanent teeth. Teeth were restored as follows: Group 1 (resin modified glass ionomer cement), Group 2 (flowable composite resin) and Group 3 (Ca_3SiO_4 bioactive material, Biodentine). Base materials were placed in 1 mm thick layers. Self-etch bonding agent was used where appropriate and composite resin was directly placed in increments. Teeth were thermocycled (5°°C–36°°C–55°°C–36°° C), covered in varnish and immersed in 5 % aqueous solution of methylene blue for 24 hours. Teeth were cut longitudinally in a microtome. Microleakage was assessed under a low-magnification microscope and was classified according to the depth of dye penetration.
Results: Group 3 exhibited the lowest mean microleakage values (2.0, 0.6325). Groups in increasing microleakage values were as follows: 3 < 1 < 2. No statistical difference was observed between Group 1 and 2 or Group 1 and 3 (p>0.05).
Conclusion: The choice of base materials under composite resin restorations affects microleakage. Resin-modified glass-ionomer cement, exhibits better results in comparison to flowable resin. Within the limitations of the present study, it is concluded that Biodentine provides an excellent seal, even when composite resin is directly placed, and thus it is suggested to finish the combined restoration in a single patient visit.

081

Category: Operative Dentistry

REMOVAL OF DEEP DENTIN CARIES: BEHAVIOUR AND ATTITUDES OF CLINICAL DENTISTS IN NORTHERN GERMANY

Falk Schwendicke[1], Hendrik Meyer-Lueckel[2], Christof Doerfer[1], Sebastian Paris[1]
[1]Clinic for Conservative Dentistry and Periodontology, University of Kiel, Germany
[2]Department of Operative Dentistry, Periodontology and Preventive Dentistry, RWTH Aachen University, Germany

Objectives: One- or two-step incomplete caries removal was shown to reduce risks of pulpal exposure and post-operative symptoms compared with complete excavation when treating deep caries. It is of interest if dentists know, support and practice such techniques. The aim of this study was to survey the knowledge, attitudes and behaviour of 2346 German concerning removal of deep dentin caries.
Methods: A newly drafted questionnaire was validated and mail-delivered to all registered dentists within Schleswig-Holstein, a Northern German federal state. Non-responders were analysed separately. Groups were statistically compared using Chi-square test. To identify diagnostic and treatment patterns multidimensional scaling and correlation analysis was performed.
Results: Based on comparison with all registered dentists both responders (n=821) and non-responders (n=59) were found representative (p>0.05, Chi-square). During excavation 98 % and 88 % of dentists used hardness and moisture to assess caries removal, with attempted complete removal ("hard" and "dry" dentin) being common (both 76 %). When treating a deeply carious asymptomatic vital tooth, 50–80 % of dentists considered complete excavation, even if pulp exposure was likely. In case of exposure direct capping was the treatment of choice for 75 %. Only 20–50 % would consider incomplete excavation, with stepwise excavation being more common than one-step incomplete removal. The latter treatment was expected to have low success rates and 72 % feared that remaining caries may progress or harm the pulp. Dentists who aimed at long restoration survival chose to perform complete excavation with subsequent direct capping or root canal treatment more frequently, and rejected the idea of incomplete excavation more

often (multidimensional scaling). These findings were not related with age, gender or practice environment (Spearman's ρ −0.1 to +0.2).
Conclusions: Incomplete excavation is not a common concept for dentists in Northern Germany. An updated dental education is required and regulators should implement incentives to perform less invasive caries removal.

082

Category: Operative Dentistry

SYSTEMATIC APPROACH FOR AMALGAM REPLACEMENT : INTEREST IN ANALYSING PHYSICO-CHEMICAL MODIFICATIONS OF MINERALIZED TISSUES

Alexandre Epaillard, Florence Chemla, Franck Decup
Faculté de Chirurgie Dentaire Paris Descartes, Paris, France

Objective: Restorations replacement, especially amalgams, represent sixty percent of dental surgeon's activity. A long-term contact, with this metallic alloy, affects mineralized dental tissues, and triggers more or less visible physico-chemical changes. These have an influence on the tooth's mechanical resistance, on aesthetics and especially on bonding performances of an adhesive replacement restoration. The objective of this literature review is to defined decision criteria in the management of dental tissues after amalgam removing.
Methods: Based on a literature review, our study suggests a systematical approach of tissues particulars features and the procedure to adopt in order to sustainably restore a vital tooth exposed to corrosion products.
Results: Tissular injury stay the main criteria for clinical decision, and the elimination of corroded tissues would be essential on the margin of the restoration, in order to optimize the quality of the bonding.
Conclusion: The conservation of indepth corroded tissues could be done on a poor surface without affecting the vitality of the pulp and maintening dentinal sealing of the tooth restoration.

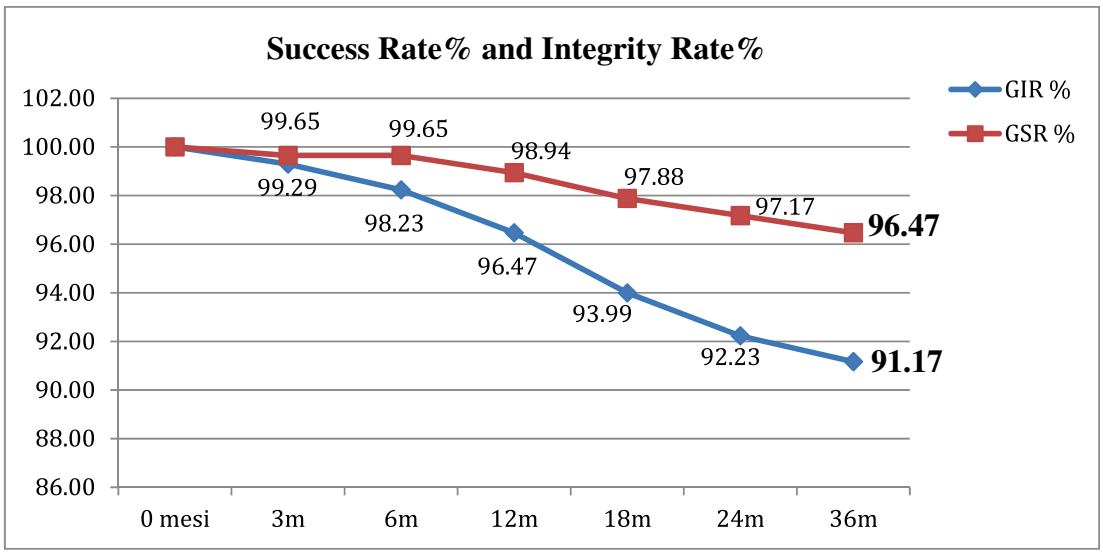
083

Category: Operative Dentistry

GLASSIONOMER RESTORATIVE SYSTEM FOR PERMANENT DENTAL RESTORATIONS. CLINICAL EVALUATION ON 283 RESTORATIONS AT 36 MONTHS

Matteo Basso[1], Manuel Goñe Benites[1], Luca Francetti[2]
[1]Università degli Studi di Milano, IRCCS Galeazzi Orthopaedic Institute, Centre of Minimal Invasive and Aesthetical Oral Rehabilitation (CROME)
[2]Università degli Studi di Milano, IRCCS Galeazzi Orthopaedic Institute, Research Centre of Oral Implantology (CRIO)

Objectives. The aim of this clinical trial was to evaluate clinical efficiency and mechanical resistance of permanent restorations performed with a high-viscosity, resin-coated glassionomer cement, after 3 years of follow-up.
Materials. 288 class I, II or V restorations were performed in 155 patients. All dental restorations were performed only by 4 expert and trained operators, following the same operative protocol. A restorative system named Equia™ (GC, Japan) was selected. Integrity of restorations and margins was evaluated through visual observation with 4x magnification loupes and status of all restorations was classified using Frencken's 1997 and Zanata's 2010 evaluation criteria. Follow-ups were planned at 3, 6, 12, 18, 24, 36 months. Yearly failure rate less of 2,5 % has been assumed as further criterion of success for the restorative procedure.
Results. Of the 288 restorations, 283 completed the study (78 Class I, 137 Class II, 68 Class V). During the study, 15 restorations reported chipping of margins (Criteria 1 or 2, successful); 10 restorations were completely lost (Criteria>5, failures). The highest number of failures has been reported in class V (6) in respect to Class II (4) and Class I (no failures) . The majority of chippings (9) were reported for class II. Failures and chippings didn't seem to be statistically influenced (a) by the use or not of the rubber dam, (b) by different operators or (c) by the vitality of the restored teeth. At 36 months, the recorded general success rate (GSR%) was of 96,47 %, and evaluating the general integrity rate (GIR%, involving only Criteria =0) the percentage was 91,17 %.
Conclusions. These results revealed an yearly failure rate much lower than 2.5 % assumed as success criteria in this study, suggesting that the restorative system used in this trial seems to be a reliable choice for permanent dental restorations, even in load bearing tooth surfaces of molars and premolars.



084

Category: Operative Dentistry

CLINICAL PERFORMANCE OF A BULK-FILL RESIN COMPOSITE: 6-MONTH RESULTS

Meike Schulz[1], Thomas Seitner[2], Severin Holl[3], Matthias J. Roggendorf[1], Andreas Braun[1], Roland Frankenberger[1]
[1]Department of Operative Dentistry and Endodontics, Dental School, University Medical Center Giessen and Marburg, Campus Marburg, Germany
[2]Private Practice, Singen, Germany
[3]Private Practice, Geislingen, Germany

Objective: In a controlled prospective clinical split-mouth study, the clinical behavior of two different resin composite philosophies (2-mm layering vs. 5-mm bulk fill) in Class II cavities was observed over six months.
Methods: Forty-three patients received 118 direct resin composite restorations (n=64 OptiBond FL/SonicFILL as 5-mm bulk-fill; n=54 OptiBond FL/Herculite XRV in 2 mm layers) by three dentists in two private dental offices. In the SonicFILL group, 28 upper premolars, 11 upper molars, 10 lower premolars, and 15 lower molars were filled. In the Herculite group, 26 upper premolars, 12 upper molars, 10 lower premolars, and 6 lower molars were restored in a random decision according to recommendations of the CONSORT statement. Restorations were examined according to modified USPHS criteria at baseline, after three and six months.
Results: Overall success was 94.9 % (Kaplan-Meier survival algorithm). Six restorations failed, three in each group (SonicFILL: 1 resin composite fracture, 1 recurrent caries, 1 persisting hypersensitivity; Herculite XRV: 1 persistent hypersensitivity, 2 recurrent caries), resulting in a 95.3 % success rate for SonicFILL and 94.5 % for Herculite (p>0.05). All patients attended the recalls (dropout rate: 0 %). Neither restorative materials nor localization of the restorations had a significant influence on any criterion after six months (p>0.05; Mann–Whitney U test). Irrespective of the resin composite used, significant changes over time were found for marginal integrity (Friedman test; p<0.05).
Conclusion: Both materials performed satisfactorily over the 6-month observation period. The bulk-fill resin composite performed at least equal compared to the conventionally layered resin composite during the first six months of the present clinical trial.
Supported by KaVo and Kerr.

091

Category: Operative Dentistry

INFLUENCE OF ADHESIVE SYSTEMS ON CAVITY CONFIGURATION FACTORS

Ayaz F[1], Tagtekin D[1], Yanıkoglu F[1]
Marmara Üniversity, Restorative Dentistry, İstanbul, Turkey

Objectives: Due to polymerisation shrinkage of resin based composites, a high configuration factor (C-factor) in Class I cavities leads to a certain amount of stress when the material is bonded. The aim of this in vitro study was to evaluate the influence of C-factor on bonding to dentin.
Methods: A composite resin (Herculite XRV, Kerr) was bonded to 1.5 mm deep occlusal Class I cavities and to flat dentin surfaces on the same dentin depth using two-step total-etch adhesive Solobond M (SM, Voco), two-step self-etch adhesive Clearfil SE Bond (SE, Kuraray) and one-step self-etch adhesive Optibond All-in-One (OA, Kerr). For each group, 5 teeth were used. 4 stick specimens with 1 mm^2 of bonding area were prepared from the center of the each tooth. All specimens were thermocycled for 5000 cycles between 5–55 C and subjected to microtensile bond strength (μTBS) test.
Results: The mean bond strengths for flat dentin surfaces were SM 26.44 MPa, SE 24.54 MPa, and OA 23.38 MPa. The mean bond strengths for Class I cavities were SM 21.15 MPa, SE 18.88 MPa, and OA 17.01 MPa. The flat surface groups exhibited higher bond strengths than the cavity groups. For all groups, the bond strength of Optibond All-in-One was significantly lower than Solobond M. There were no significant differences between Solobond M and Clearfil SE Bond.
Conclusions: Increasing C-factor negatively affected the μTBS. All adhesive systems used, appeared sensitive to cavity configuration factor.

096

Category: Operative Dentistry

EFFECTS OF DIFFERENT KINDS OF BEERS ON THE SURFACE ROUGHNESS OF GLAZED AND POLISHED METHACRYLATE- AND SILORANE-BASED COMPOSITES: A 1-MONTH STUDY

Ugur Erdemir[1], Murat Tiryaki[2], Esra Yıldız[1,3], Taner Yücel[1], Sevda Ozel[2]
[1]Department of Operative Dentistry, Faculty of Dentistry, Istanbul University, Istanbul, Turkey
[2]Department of Biostatistics and Medical Informatics, Faculty of Medicine, Istanbul University, Istanbul, Turkey

Objective: The aim of this in vitro study was to evaluate the effect of different kinds of beers on the surface roughness of glazed and polished methacrylate- and silorane-based resin composites after different immersion periods.
Methods: The methacrylate-based resin composites (Tetric N-Ceram and Ceram-X) and a silorane-based resin composite (Filtek Silorane) were tested in the study. A total of 126 specimens (n=42 for each composite) were fabricated using a cylindrical custom metal mould (8 mm×2 mm). After light curing, all the specimens were stored in distilled water for 24 h at 37 °C. Seven specimens from each resin composite randomly assigned to one of the two polishing systems (Optidisc, KERR; Optidisc + Biscover LV, Bisco). Surface roughness measurement was performed by using a profilometer at baseline and after 1-week and 1-month immersion in different kinds of beers (Regular Beer and Dark Beer) or distilled water (control) for two hours a day at cold temperature (i.e. 4 °C). The results were analyzed by repeated measure ANOVA and Tukey's HSD test (α=0.05).
Results: Repeated measure ANOVA results revealed that immersion period was a significant factor in the surface roughness of the tested specimens (p<0.001). There were no significant surface roughness differences among the tested solutions on different resin composites (p=0.245). The lowest surface roughness values were obtained with the specimens' polished optidisc + Biscover LV. Regardless of the polishing systems used, Tetric N-Ceram showed statistically lowest surface roughness values (p<0.05), whereas, Filtek Silorane showed highest surface roughness (p<0.001).
Conclusion: The surface roughness values of the tested composite resins were affected by the polishing procedure used, exposure time in the solutions and by the type of composite resin.

097

Category: Operative Dentistry

EFFECTS OF DIFFERENT KINDS OF BEERS ON THE COLOR STABILITY OF METHACRYLATE- AND SILORANE-BASED COMPOSITES AFTER SHORT-TERM IMMERSION: INFLUENCE OF DIFFERENT POLISHING TECHNIQUES

Murat Tiryaki, Ugur Erdemir, Batu Can Yaman, Esra Yıldız, Sevda Ozel
Department of Operative Dentistry, Faculty of Dentistry, Istanbul University

Objective: The purpose of this study was to compare the effects of different finishing and polishing techniques on the color change of dimethacrylate and silorane based composites after exposed to different kind of beers for 1-week and 1-month periods.
Methods: Twenty-one disk-shaped specimens (diameter: 8 mm and thickness: 2 mm) each were made from three composite resins (Tetric N-Ceram, Ceram-X, and Filtek Silorane). After polymerization, all the specimens were stored in distilled water for 24 h at 37 °C. Seven specimens from each composite resin randomly assigned to one of the two polishing systems (Optidisc, KERR; Optidisc + Biscover LV, Bisco). After baseline color measurement of each specimen using a spectrophotometer according to the CIEL*a*b* color scale, specimens were then immersed in one of the two drinks (Beer, Dark Beer) or distilled water (control) for two hours a day at cool temperature (4 °C). After 1-week and 1-month immersion, the color values of each specimen were remeasured and color change values (ΔE^*_{ab}) were calculated. Two-way ANOVA and Bonferroni tests were used for statistical analysis ($p<0.05$).
Results: Two-way ANOVA revealed that immersion period in the tested solutions was a significant factor in the discoloration of different kind of composites resins tested ($p<0.05$). Regardless of the composite resins and solutions tested, Optidisc + Biscover LV groups demonstrated significantly lower color change ($p<0.05$). The lowest color change values were observed in the Tetric N-Ceram groups for both polishing techniques ($p<0.05$). Independent of the composite material tested, dark beer resulted in the highest level of color change ($p<0.05$).
Conclusion: Discoloration of the composite resins were affected by the immersion period, polishing technique, type of solution and the type of composite resin tested.

102

Category: Operative Dentistry

DISCREPANCIES BETWEEN IDF RECOMMENDATIONS FOR RESTORATION'S REPLACEMENTS AND CLINICAL DECISIONS IN A FRENCH UNIVERSITY DENTAL HOSPITAL

Decerle Nicolas[1,2], Nicolas Emmanuel[1,2], Hennequin Martine[1,2]
[1]Clermont Université, Université d'Auvergne, EA 4847, Centre de Recherche en Odontologie Clinique, Clermont-Ferrand, France
[2]CHU Clermont-Ferrand, Service d'Odontologie, Hôtel-Dieu, Clermont-Ferrand, France

Objective: The concept of minimum intervention in dentistry emphasizes—repair rather than replacement for defective restorations. This study aims to compare the criteria for repair or replacement of defective restorations between the students and their supervisors in a French university dental hospital to those of two investigators calibrated for the use of the International Dental Federation (IDF) criteria.
Methods: Two investigators were calibrated for the use of the IDF classification for evaluation of the quality of restorations on the E-Calib website (www.e-calib.info). In a French university hospital, all the restorations that needed assessment before the clinical decision were evaluated by one investigator from 05/03/12 till 27/07/12. The IDF form gathered 4 esthetic-, 6 functional- and 6 biological parameters that were expressed with scores ranging from 0 to 5. Repair was indicated for the restoration having at least one parameter scoring 4 (without any criteria scoring 5), while the replacement was assessed for the restorations with at least one parameter scoring 5. All other restorations were considered as acceptable. The calibrated investigator's assessment was compared to the clinical decision that was made by the student and his/her supervisor for each restoration (Chi2).
Results: During the study period, 124 restorations (38 amalgams, 86 composites) were evaluated in 77 patients (mean age 43.4±16.6). According to the IDF classification, 9 restorations were acceptable, 22 were reparable and 93 were indicated for replacement, while for the students and their supervisors, 16 restorations were acceptable, 8 were reparable and 100 were indicated for replacement. The decision of students and their supervisors led to more invasive actions than those indicated by the IDF recommendations ($p<0.01$).
Conclusion: The systematic use of the IDF recommendations could preserve from replacement a significant number of restoration in a french University Dental Hospital.

113

Category: Operative Dentistry

PREHEATING OF BULK-FILL RESIN COMPOSITES: EFFECTS ON MONOMER CONVERSION AND SHRINKAGE FORCE

Tobias T. Tauböck[1*], Danijela Marovic[2], Zrinka Tarle[2], Thomas Attin[1]
[1]Department of Preventive Dentistry, Periodontology and Cariology, Center for Dental Medicine, University of Zurich, Zurich, Switzerland
[2]Department of Endodontics and Restorative Dentistry, School of Dental Medicine, University of Zagreb, Zagreb, Croatia

Objectives: To investigate the influence of preheating of bulk-fill composite materials on their degree of conversion and shrinkage force generation.
Methods: Four bulk-fill composite materials [Tetric EvoCeram Bulk Fill (Ivoclar Vivadent), x-tra fil (VOCO), QuixFil (Dentsply DeTrey), SonicFill (Kerr)] and one conventional nano-hybrid resin composite [Tetric EvoCeram (Ivoclar Vivadent)] were selected. The test materials were either kept at room temperature (23 °C) or preheated to 68 °C by means of a commercial heating device (Calset, AdDent), before being photoactivated with a LED curing unit (Bluephase G2, Ivoclar Vivadent) for 20 s at 1170 mW/cm^2. Shrinkage force ($n=5$) of 1.5-mm-thick specimens was continuously recorded for 15 min using a custom-made stress analyzer. Degree of conversion ($n=5$) was determined after 15 min at the bottom of equally thick (1.5 mm) specimens using Fourier-transformed infrared spectroscopy. Data at the end of the 15-min observation period were statistically analyzed with Student's t-test and analysis of variance (ANOVA) followed by Tukey's HSD post-hoc test ($\alpha=0.05$).
Results: Composite preheating to 68 °C significantly increased the degree of conversion of Tetric EvoCeram Bulk Fill, but had no effect on monomer conversion of the other materials investigated. SonicFill attained the significantly highest degree of conversion, irrespective of the pre-cure temperature. For each of the test materials, preheated composite (68 °C) generated significantly lower shrinkage forces than room temperature composite (23 °C). At both temperature levels, Tetric EvoCeram Bulk Fill created the significantly highest shrinkage forces and QuixFil caused significantly higher shrinkage forces than both x-tra fil and Tetric EvoCeram.
Conclusion: Both the composite material and the pre-cure temperature affect shrinkage force generation. Preheating of bulk-fill and conventional restorative composites prior to photoactivation decreases polymerization-induced shrinkage forces without compromising the degree of conversion.

114

Category: Operative Dentistry

MICROLEAKAGE OF CLASS II CAVITIES RESTORED WITH CONVENTIONAL COMPOSITES COMPARED WITH BULK FILL COMPOSITES USED AS RESTORATIVE OR LINER

Guler Eda[1], Karaman Emel[1], Ozdemir Emine[2]
[1]Ondokuz Mayis University, Faculty of Dentistry, Department of Restorative Dentistry, Samsun TURKEY
[2]Ondokuz Mayis University, Faculty of Dentistry, Department of Restorative Dentistry, Samsun, TURKEY

Objectives: The aim of this study was to investigate the microleakage of bulk-fill composite resins used as restorative or liner compared with conventional composite resins in Class II (MOD) cavities in vitro.
Methods: 40 extracted human upper premolar teeth were used. After the teeth were divided into four groups (n=10), standardized MOD cavities were prepared and restored with different resin composites: Group I: Quixfill® ,Group II: x-trabase® + GrandioSo®, Group III: GrandioSo® ,Group IV: Filtek Silorane®. The restorations were finished and polished after 24 h. Following thermocycling, the teeth were immersed in 0.5 % basic fuchsin for 24 h, then mid-sagitally sectioned in a mesio-distal plane, and examined for microleakage using a stereomicroscope at x40 magnification. The degree of cervical margin microleakage was scored as below: 0: no evidence of dye penetration, 1: superficial penetration not beyond the dentinoenamel junction (DEJ), 2: penetration beyond the DEJ but limited to 2/3 of the cervical wall length, 3: penetration beyond 2/3 of the cervical wall length. Two examiners scored the restorations independently. For each restoration, only the worst score was used for the analyze. Data were statistically analyzed with one-way ANOVA.
Results: The microleakage scores of groups were significantly different by one-way ANOVA (p<.0001). Group x-tra base® demonstrated the lowest microleakage values. No statistical significant difference was observed between Silorane and Quixfill (p=.136) and these groups demonstrated higher scores when compared with the x-trabase (p<.05). No statistical significant difference was observed between Quixfill® and Grandio So® (p=.776) and these groups demonstrated the highest microleakage values.
Conclusions: The use of bulk fill composite did not reduce the microleakage when compared with other composites used incrementally. Placement of x-tra base bulk fill® composite as a liner reduced microleakage significantly *($p< 0.05$)*.

117

Category: Operative Dentistry

THE EFFECT OF A DESENSITIZING AGENT IN RELIEVING DENTIN HYPERSENSITIVITY

Elif Ercan, Tijen Pamir, Zeynep Ergücü, Banu Önal
Ege University School of Dentistry, Department of Restorative Dentistry, İzmir, TURKEY

Objective: This *in vivo* study was planned to determine the effect of a desensitizing agent on exposed dentin surfaces in the patients with moderate to severe dentin hypersensitivity.
Methods: Forty teeth in ten patients with a history of hypersensitivity were assigned in this study. At baseline visit, the initial sensitivity levels were recorded using the visual analog scale (VAS). In order to activate the sensitivity, evaporative (air-blast) and thermal (ice-stick) stimuli were applied to each hypersensitive teeth. The responses of patients to the stimuli were recorded on VAS. Then, the teeth were enrolled either to the treatment or placebo group. The desensitizing agent used was Clinpro White Varnish®; whereas distilled water as the placebo. The patients were recalled after four weeks and their responses were recorded.
Results: The VAS scores of the study groups did not differ at baseline (p>0.05). After four weeks, VAS scores of both treatment and the placebo groups were found to be lower than those of the baseline (p<0.05). However alleviation effect of desensitizing agent was significantly different from placebo right after the treatment and at four-week control (p<0.05). Additionally, thermal stimuli caused higher patient discomfort than evaporative stimuli for all periods of the study (p<0.05).
Conclusion: It was concluded that the desensitizing agent used in this clinical study was effective in relieving dentin hypersensitivity. Meanwhile, the placebo response was also shown to play a significant role.

118

Category: Operative Dentistry

MICROSHEAR BOND STRENGTHS OF DIFFERENT LUTING MATERIALS TO ENAMEL

Elif Ercan, Tijen Pamir, Ayşegül Kaya
Ege University School of Dentistry, Department of Restorative Dentistry, İzmir, TURKEY

Objective: The aim of this study was to evaluate the effect of luting cements having different bonding mechanisms on microshear bond strengths of an indirect composite resin to enamel.
Methods: Twenty-four non-carious human molars were sectioned buccolingually into two halves. Then, 48 samples obtained were randomly divided into six study groups. Bonding procedures of this study were as follows: I. All-Bond **SE**® (self-etching adhesive system) + Duolink® (composite luting cement); II. All-Bond **TE**® (etch & rinse adhesive system) + Duolink®; III. RelyX U200® (self-adhesive cement); IV. Meron® (glass-ionomer cement); V. All-Bond **SE**® + Clearfil Esthetic Cement (composite luting cement); VI. All-Bond **TE** ® + Clearfil Esthetic Cement®.
Microhybrid® composite resin cylinders of 0,90 mm in diameter were fabricated with Tescera indirect resin composite system in laboratory and bonded to enamel according to any of bonding procedures as mentioned above. Then, microshear bond strengths of the samples were measured in universal testing machine. Data obtained were analyzed with Kruskal Wallis followed by Mann-Whitney U (α=0,05).
Results: Samples bonded with self adhesive luting cement RelyX® U200 presented higher microshear bond strength than the others (p<0,05). Additionaly, groups luted with Duolink® and Clearfil Esthetic Cement® presented lower microshear bond strengths when they were used with self-etch adhesive compared to total-etch system (p<0,05).
Conclusion: Within the limitation of this study, self adhesive luting cement seems to exhibit better performance in bonding of indirect resin composite to enamel.

125

Category: Operative Dentistry

EVALUATION OF A NEW RESTORATIVE CONCEPT : PRACTITIONERS AND SONICFILL®

C. Ribeyron[1&2], N. Pradelle-Plasse[1&2], A. Hartmann[2], C. Menez[2], C. Villat[1&3], B. Grosgogeat[1&3], P. Colon [1&2]
[1]LMI. UMR CNRS 5615, Université Lyon 1, France
[2]UFR Odontologie, Université Paris Diderot; Hôpital Garancière Rothschild, AP HP, France
[3]UFR Odontologie, Université Lyon 1; Service de Consultations et de Traitements Dentaires, Hospices Civils de Lyon, France

Objectives: To investigate the evaluation of a new concept of restorative material in terms of handling advantages for practitioners discovering the system. This new concept is the Sonicfill® system, which combines a new composite material, a specific handpiece and a homemade capsule which allows the handpiece adaptation. The aim of this restorative solution is to combine good functional results with easy handling, thus saving time for the general practitioner.
Methods: After a short presentation, a practical training session on Kavo models was organized. At the end of the session, each practitioner filled in questionnaire about the use of the system (handpiece and composite placement), the time required to fill the cavities, the

applications for this new material and the advantages and weaknesses of the system (31 questions).
Results: All attendees found the Sonicfill handpiece and the delivery system of the composite material to be convenient. The concept (instrument + material) was found to be attractive (80 %). The modeling of the composite was good (63 %). The ratio outcome/time was also good (77 %). The adaptability assessment to this new concept was good (84 %). This concept would be recommended by 74 % of attendees. The main advantage of the concept is the variation of the viscosity (71 %); the weakness is the aesthetic results (26 %).
Conclusion: The viscosity of the composite during insertion in the cavity makes it easy to use for practitioners and the difference during modelling allows for easy anatomical restoration. The idea of a bulk fill material is a good way to save time. Nevertheless, the aesthetic aspect is not entirely satisfactory. This concept has been well accepted, but further clinical researchs are required to confirm the interest of this system.

128

Category: Operative Dentistry

COMPARISON OF BOND STRENGTHS OF RESIN CEMENTS USED FOR AESTHETIC POST CEMENTATION

Gamze Yildirim[1], L.Şebnem Türkün[1], Övül Kümbüloğlu[2]
[1]Ege University School of Dentistry, Department of Restorative Dentistry, İzmir, TURKEY
[2]Ege University School of Dentistry, Department of Prosthetic Dentistry, İzmir, TURKEY

Objective: The aim of this study was to compare the bond strengths of five resin cements used for aesthetic post cementation with pushout test.
Methods : 50 lower premolars were used. The root lengths of the teeth were standardized. Root canals were enlarged with rotary instruments (Protaper) and their filling was achieved with lateral compaction technique. Specimens were assigned to five groups (n=10).
Group 1: Variolink II Professional Pack + FRC Postec Plus (*Ivoclar Vivadent*) (Control)
Group 2: Core X Flow + X.Post + XP BOND (*Dentsply, DeTrey*)
Group 3: Gradia Core + GC Fiber Post (*GC*)
Group 4: Clearfil DC Core Plus + SnowPost (Abrasive) + Clearfil S^3 Bond Plus *(Kuraray)*
Group 5: Corecem + Macro-Lock Post Illusion X-RO + SealBond Ultima (RTD)
Slices of 2 mm were prepared with a low-speed saw (Isomet). The push-out tests were performed with a cylindirical metal tip at a cross-head speed of 0,5 mm/min from the center of the fiber posts with a universal testing machine (Elista, Beyhekim Ltd. Şti. Turkey) until the failure occurence. The data were analyzed by one-way ANOVA and Tamhane's T2 tests (p <0.05).
Results: The best results were obtained in group 4, 3 and 2, while the worst results were seen in the control group. There was no statistically significant difference between group 5 and the other groups.
Conclusion: The resin cements tested for aesthetic post cementation were found to be more reliable than the conventional material from the point of bond strength values.

133

Category: Operative Dentistry

CAN GLASS-FIBER INSERTION IMPROVE FRACTURE RESISTANCE OF POST-ENDODONTIC COMPOSITE RESTORATION?

Alberto Forniglia[1], Michele Ribero[1], Elio Berutti[1], Mario Alovisi[1], Damiano Pasqualini[1], Nicola Scotti[1]
[1]University of Turin, Department of Surgical Sciences, Dental School, Italy

Objective: The aim of this in vitro study was to evaluate the fracture resistance and fracture pattern of endodontically treated mandibular first molars restored with glass-fiber reinforced direct composite. The null hypothesis is that glass-fibers can increase fracture resistance of direct composite restorations.
Methods: 32 extracted intact first molar were endodontically treated; an MOD cavity were prepared and the samples were divided in 4 groups according to the restoration technique: direct composite (G1), direct composite with fiber post insertion (G2), reinforced direct composite with direct glass-fibers (G3), no restoration (G4, control). All specimens were thermocycled (6000 cycles at 5°–55 °C), embedded in acrylic resin and exposed to a 20 N cyclic loading. Subsequently samples were submitted to static fracture resistance test until fracture occurred. Fracture loads and mode of failure were evaluated. Fracture loads were statistically evaluated with Two-Way ANOVA and Dunn post-hoc tests (p<0,05). Statistical significance was set at p=0.05.
Results: means and standard deviations of fracture loads (expressed in Newton) and fracture pattern of the different groups are expressed in table 1. Different superscript letters indicate statistical significance.

			FRACTURE PATTERN	
	RESTORATION	FRACTURE RESISTANCE [N]	RESTORABLE	UNRESTORABLE
GROUP 1	Direct composite	376,99 (±59,13) [a]	25 %	75 %
GROUP 2	Fiber-post reinforced composite	518,51 (±96,93) [b]	50 %	50 %
GROUP 3	Glass-fiber reinforced restoration	494,10 (±82,95) [b]	100 %	0 %
GROUP 4	No restoration (control)	281,66 (±32,63) [a]	0 %	100 %

Conclusions: The null hypothesis is accepted since direct restorations reinforced with fiber post or inserted glass-fibers showed an increased fracture resistance. Moreover the glass-fibers, horizontally inserted within the restoration in order to replace the pulp chamber roof, induced more restorable fractures than other tested techniques.

135

Category: Operative Dentistry

THE EFFECT OF NANO-HYBRID LOW-SHRINKAGE COMPOSITE ON CAVITIES WITH NON-SUPPORTED ENAMEL: A RANDOMIZED CLINICAL TRIAL

Marco Cuppari[1], Mario Alovisi[1], Damiano Pasqualini[1], Elio Berutti[1], Davide Paolino[2], Nicola Scotti[1]
[1]University of Turin, Dept. Surgical Sciences, Dental School
[2]Politecnical School of Turin, Department of Mechanics, Italy

Objective: The aim of this in vivo study was to evaluate the efficacy of a low-shrinkage composite resin in the restoration of cavities with not-supported enamel. The null hypothesis is that the non-supported enamel can be maintained within cavity preparation procedure when low-shrinkage composites are employed.
Methods: Patients with one posterior tooth affected by primary caries were recruited. Forty cavities with non-supported enamel were included in the present study under a protocol approved by the Ethical Committee of the University of Turin. Cavities were divided into two groups according to the composite employed: Group 1, Venus Diamond (Heraeus Kultzer); Group 2 Filtek Supreme XTE (3 M ESPE). Etch-and-rinse adhesive system (Optibond FL) was employed and composite was placed into cavity with an oblique 2 mm layering technique. Each group was subsequently divided in two groups according to the curing protocol, performed with a LED lamp: subgroup A, ramp curing; subgroup B, conventional curing. Follow-up was scheduled after 7 days and 12 months in accordance with USPHS modified criteria and enamel crack formation. Data obtained during follow-up were statistically analyzed with ANOVA test ($p<0.05$).
Result: Results showed statistically significant differences for enamel crack formation ($p=0.041$) at 12-month follow-up between Venus Diamond and Filtek Supreme XTE. Regarding USPHS criteria, nor composite or curing technique significantly influence the results (Table 1).

Source	DF	Seq SS	Adj SS	Adj MS	F	p
Material	1	0.000450	0.000894	0.000894	0.82	0.373
Irradiation	1	0.002267	0.001936	0.001936	1.77	0.193
Material*Irradiation	1	0.000704	0.000704	0.000704	0.64	0.428
Error	32	0.035008	0.035008	0.001094		
Total	35	0.038430				

Conclusion: The null hypothesis tested was partially accepted, since the two tested composites showed comparable results after 12 months but the low-shrinkage composite resin induced low enamel cracks formation under masticatory function. Future follow-up, scheduled at 24, 36, 48, 60 months, are necessary to confirm the above-mentioned results.

137

Category: Operative Dentistry

EFFECT OF SODIUM ASCORBATE ON DENTIN BOND STRENGTH AFTER TREATED WITH OXIDIZING ROOT CANAL IRRIGANTS

Nihan Gonulol[1*], Elif Kalyoncuoglu[2], Ertan Ertas[1]
[1]Restorative Dentistry,
[2]Endodontics

Objective: The aim of this study was to evaluate the effect of 10 % sodium ascorbate solution on dentin bond strength after treatment with different oxygen releasing root canal irrigants.
Methods: Twenty-one sound freshly extracted human third molars were used in this study. The specimens were randomly divided into seven groups according to the irrigation solutions as follows: Group C (control group): distilled water, Group SH: 5,25 % NaOCl, Group SHA: 5,25 % NaOCl+10 % sodium ascorbate solution, Group HP: 10 % H_2O_2, Group HPA: 10 % H_2O_2 +10 % sodium ascorbate solution, Group OW: Ozonated water, Group OWA: Ozonated water+10 % sodium ascorbate solution. A two-step self-etching adhesive system (Clearfil SE Bond) was applied to surfaces and resin core build-ups (Filtek Z550) were placed in two increments of approximately 2 mm height. The specimens were sectioned into 1 mm^2 beams and tested in a μTBS testing machine at a cross-head speed of 1 mm/min, until specimen failure occurred. Fractured specimens were examined with a stereomicroscope (Nikon SMZ 1500) to determine the mode of failure (adhesive, cohesive or mixed). Data were analyzed by one-way ANOVA and Tukey tests ($p< 0.05$).
Results: The highest microtensile bond strength values were obtained in control group and the application of 10 % sodium ascorbate solution after irrigation with 5,25 % NaOCl and 10 % H_2O_2 caused similar bond strength with the control group ($p> 0.05$). The ozonated water treated groups showed the lowest μTBS values among all groups. Although 10 % sodium ascorbate application increased dentin bond strength in Group OW, the difference was not significant ($p>0.05$).
Conclusion: Although 10 % sodium ascorbate application for 10 min is an effective method to reverse the compromised bond strength of NaOCl and H_2O_2 treated dentin, it might not have sufficient effect when dentin is treated with ozonated-water.

144

Category: Operative Dentistry

EFFECT OF LITHIUM DISILICATE THICKNESS ON CONVERSION DEGREE AND MICRO HARDNESS OF VENEERS RESIN CEMENTS

Comba Allegra[1], Monaco Carlo[2], Scotti Roberto[2], Scotti Nicola[1]
[1]University of Turin, Department of Surgical Sciences, Dental School
[2]Alma Mater Studiorum, University of Bologna, Italy

Objective: The aim of this in vitro study was to evaluate the conversion degree (DC) and the micro-hardness (MH) of a dual and a light curing cement when employed under lithium disilicate of different thickness. The null hypothesis is that (1) thickness influence resin cement curing and (2) dual cements reach higher DC compared to light curing cements.
Methods: 60 Lithium Disilicate (E-Max CAD) discs 2 cm of diameter, A2 shade LT were prepared and divided into three groups ($n=20$) according to the thickness of the material: Group A 0.6 mm; Group B 1 mm; Group C 1.5 mm. Each group was, further, divided into two subgroups ($n=10$) according to the resin cement employed: subgroup 1, NX3 dual cement (Kerr); subgroup 2 Choice2 light-curing cement (Bisco). A single surface of all samples was treated with 4 % phosphoric acid application for 30 sec, silane and etch-and-rinse (Optibond FL) adhesive. DC was evaluated with ATR FT-IR spectrophotometer (Thermo Scientific Nicolet IS10): a 0.2 mm cement layer was applied, and samples were placed on the FT-IR light beam. Curing was performed with a multiLED polywave lamp (Valo) for 60 sec at 1700 mW/cm2 with the lamp in slight contact with the opposite surface towards the cement layer. Once the DC was established, a Vickers Test was performed on the cement with a nano-indentometer. Results were statistically analysed with Two-Way ANOVA and Bonferroni test. Statistical significance was set at $p=0.05$.

Results: means and standard deviations of DC and MH of the different groups are expressed in the table 1. Different superscript letters indicate statistical significance.

	Thickness	Vickers Hardness	DS	Conversion Degree	DS
Light curing cement	0.6 mm	50.08[a]	± 2.93	69.19[a]	± 7.12
	1.0 mm	54.10[a]	± 4.80	63.82[a]	± 4.87
	1.5 mm	43.67[b]	± 9.39	53.25[b]	± 4.12
Dual cement	0.6 mm	29.10[c]	± 6.49	53.03[b]	± 6.01
	1.0 mm	24.93[c]	± 2.75	43.63[c]	± 5.56
	1.5 mm	28.93[c]	± 4.02	37.81[c]	± 7.34

Conclusion: The initial null hypothesis was partially accepted since Lithium Disilicate thickness influences the DC but not MH of the two cements, while the light curing cement tested showed significantly higher DC and MH values than dual-curing cement.

146

Category: Operative Dentistry

EFFECTS OF REPEATED USE OF ETCH-AND-RINSE ADHESIVES ON DENTIN BOND STRENGTH

A.Ruya Yazici*[1], Duygu Tuncer [2], Taner Akca[3], Gul Ozgunaltay[1], Berrin Dayangac[1]
[1]Hacettepe University, School of Dentistry, Department of Restorative Dentistry, Ankara, Turkey
[2]Duygu Tuncer, Baskent University, School of Dentistry, Department of Restorative Dentistry, Ankara, Turkey
[3]Private dentist, Mersin, Turkey

Objective: The aim of this study was to evaluate the effects of repeated use of etch-and-rinse adhesives with different solvents on the microtensile bond strengths (MTBS) to dentin.
Methods: Sixty extracted human third molars were sectioned perpendicularly to their long axis to expose flat occlusal dentin surfaces and then were polished using a 600-grit abrasive paper. Teeth were randomly divided into four groups (n=15) according to the adhesives: Prime and Bond NT (P&B NT, acetone-based), Adper Single Bond 2 (SB, ethanol/water), XP Bond (XPB, tert-butanol), and One Coat Bond (OCB, solvent free). Each adhesive group was then subdivided into three groups (n=5); group a (baseline), where the adhesives' bottles were just opened; group b, after opening bottles for four times a day for 2 weeks, group c, after opening bottles for four times a day for 4 weeks except weekends. The bottles were left opened for 60 seconds. After the adhesives were applied, composite resin (TPH) build-ups were incrementally constructed on bonded surfaces. Specimens were sectioned into sticks and subjected to MTSB test with a crosshead speed of 1 mm/min (n=15/group). The data were analysed using Kruskal-Wallis test followed by Mann Whitney-U test.
Results: No statistically significant difference was observed among different opening times for each adhesive (p>0.05). None of the adhesive systems showed a statistically significant reduction of bond strength after repeated use. While there were no statistically significant differences between adhesives in their baseline and after 2 weeks bond strength values (p>0.05), significant differences were observed when the adhesives were opened for 4 weeks (p<0.05). The bond strength values of SB and XP Bond were statistically higher than PB and OCB (p<0.05).
Conclusion: Repeated use did not reduce dentin bond strength values within each adhesive. However, prolonged opening times caused differences in dentin bond strength values among tested adhesives.

155

Category: Operative Dentistry

INFLUENCE OF SURFACE TREATMENTS AND ADHESIVE SYSTEMS ON THE REPAIR BOND STRENGTH OF RESIN-BASED RESTORATIVES

Cigdem Celik[1], Neslihan Arhun[1], Sevi Burcak Cehreli[2], Bora Bagıs[3]
[1]Baskent University, Faculty of Dentistry, Department of Restorative Dentistry, Ankara, Turkey
[2]Baskent University, Faculty of Dentistry, Department of Pediatric Dentistry, Ankara, Turkey
[3]Katip Celebi University, Faculty of Dentistry, Department of Prosthetic Dentistry, Izmir, Turkey

Objectives: The purpose of this study was to investigate the effect of different surface treatments and bonding agents on the repair bond strength of different resin-based restorative materials by microtensile bond strength (μTBS) testing protocol.
Methods: 24 Grandio SO (VOCO) and 24 Filtek Z250 (3 M) resin composite blocks were prepared. Half of the samples (N=12) were diamond bur roughned and the other half (N=12) were sandblasted by 50 μm aluminum oxide particles. The samples were further divided into 4 sub-groups (n=3) and received the following adhesive system applications. Sub-Group1: Adper Single Bond2 (Etch&Rinse adhesive system) (3 M); Sub-Group2: Clearfil SE (Self-etch adhesive system) (Kuraray); Sub-Group3: Beauty Bond (HEMA-free all-in-one adhesive system) (Shofu); Sub-Group4: All Bond3 (HEMA-free, hydrophobic, etch&rinse adhesive system) (Bisco). All of the resultant sub-groups combinations consisted of one of the composite type, surface treatment type and adhesive systems. The conditioned samples were then repaired by Filtek Z250 (3 M) to form a block. A total of 18 groups were prepared including 2 homogeneous GrandioSO and Filtek Z250 blocks. They were kept in deionized water for 3 weeks and thermocycled (1000X) between 5°C and 55°C with a dwell time of 30 seconds and a transfer time of 10 seconds. μTBS measurements were performed. Data were statistically analyzed with Kruskall Wallis and Mann-Whitney U tests.
Results: None of the experimental groups' μTBS values could reach to the cohesive strength of the resin materials irrespective of the surface finishing and adhesive type. The pre-extisting composite type is found to be statistically important. When the surafce is bur-finished, Grandio performed better; when air-abrasion is considered, Z250 showed higher bond strength. All-in-One adhesive system produced the weakest bond strength at all parameters.
Conclusion: It may be suggested that when the pre-existing composite is unknown, air-abrasion may be performed with etch&rinse or two-step self-etch adhesives.

156

Category: Operative Dentistry

EFFECT OF SURFACE SEALING ON STAIN RESISTANCE OF A NANO-HYBRID RESIN COMPOSITE

Isil Bayrak[1], Gunce Saygi[2], Deniz Eski[3], Ugur Erdemir[2], Sevda Ozel[3]
[1]Bezmialem Vakif University, Faculty of Dentistry, Department of Operative Dentistry, DDS, PhD
[2]Istanbul University, Faculty of Dentistry, Department of Operative Dentistry, DS
[3]Istanbul University, Faculty of Medicine, Department of Biostatistics, PhD

Objective: This study investigated the influence of sealant application on stain resistance of a nano-hybrid composite resin and evaluated the efficacy of a bonding agent used as a surface sealant on prolonging colour stability of the composite resin.
Methods: Disc-shaped specimens (8 mm×2 mm) were prepared from a nano-hybrid composite resin (Filtek Z550; 3 M ESPE) of shade A2 and assigned to 4 groups (n=7). Specimens in GI were non-sealed for control while specimens in GII, GIII, GIV were sealed with a one-bottle bonding agent (Single Bond; 3 M ESPE) and two different low-viscosity resins (Fortify, Biscover LV; Bisco) respectively. After 24-hour storage in distilled water at 37±1 °C, all specimens were subjected to thermocycling and subsequently immersed into coffee solution 3 times a day (15 minutes each). Colour measurements were performed using spectrophotometer (VITA Easyshade; Vita) according to CIEL*a*b system at predetermined evaluation periods: baseline and after thermocycling, 7, 14 and 28 days. Colour differences (ΔE) between the groups were analyzed by one-way ANOVA and multiple comparisons were performed using Bonferroni tests at 0.05 level of significance.
Results: Colour change values were significantly different among the groups in each evaluation period except for after thermocycling (p<0.05). GII, GIV exhibited statistically significant differences (p<0.05 and p<0.0001 respectively) compared to control group (GI) in 14-day evaluation period whereas no remarkable difference was found between GI and GII in 28-day evaluation period (p>0.05). However, ΔE values of sealed specimens (GIII, GIV) differed significantly from non-sealed (GI) specimens after 28 days of immersion in coffee solution (p<0.05 and p<0.0001 respectively).
Conclusion: Based on these results, it may be concluded that using a bonding agent as a surface sealant doesn't increase stain resistance of resin composites. Among the sealants evaluated, Biscover LV showed the highest efficacy to prolong colour stability of the composite resin.

159

Category: Operative Dentistry

RELYX UNICEM: INFLUENCE OF SELECTIVE ENAMEL ETCHING. A CLINICAL THREE-YEAR RESULTS

Vanessa Vogl[1*], Karl-Anton Hiller[1], Birger Thonemann[1,2], Gottfried Schmalz[1], Marianne Federlin[1]
[1]University of Regensburg Dental School
[2]Private Practice Düsseldorf , Germany

Objective: To evaluate in a prospective randomised controlled trial the clinical performance of the self-adhesive resin luting cement RelyX Unicem (RXU) for luting partial ceramic crowns (PCCs). The influence of additional selective enamel etching (RXU + E) was assessed as compared to luting with RXU without etching (RXU). Three-year results are reported.
Methods: 34 patients (68 PCCs) had received one PCC (Cerec 3D) placed with RXU and one placed with RXU + E in a split-mouth design at baseline (BL), fabricated by different practitioners during clinical routine. After three years, 23 patients with *both* restorations (46 PCCs) under risk were available for assessment. Restorations were clinically rated at BL and 36 months (m) after placement according to the USPHS criteria. The "percentage failure" within the three-year recall period for restorations under risk (n=46) was calculated according to ADA Program Guidelines. For statistical analysis, the Chi-square test was applied (α=0.05).
Results: 19 RXU PCCs were placed in molars, 4 in premolars, 18 RXU + E PCCs in molars, 5 in premolars. Statistically significant changes were observed for *marginal adaptation* and *marginal discoloration* between BL and 36 months for both, RXU and RXU + E. For RXU + E, *postoperative hypersensitivity* decreased significantly (BL n=6 ; 36 m n=0). No significant differences were found between the two groups (RXU vs. RXU + E). At three years, three RXU PCCs and two RXU + E PCCs were rated failures (11 %).

			Marginal Adaptation				Marginal Discoloration			
			alfa	bravo	charlie	delta	alfa	bravo	charlie	delta
RXU	BL	n(%)	22(95.7)	1(4.3)	0(0)	0(0)	22(95.7)	1(4.3)	0(0)	0(0)
	36 m		4(18.2)	16(72.7)	1(4.5)	1(4.5)	10(47.6)	11(52.4)	0(0)	0(0)
RXU + E	BL		23(100)	0(0)	0(0)	0(0)	22(95.7)	1(4.3)	0(0)	0(0)
	36 m		6(27.3)	13(59.1)	2(9.1)	1(4.5)	10(45.5)	12(54.5)	0(0)	0(0)

Conclusion: Selective enamel etching prior to luting with a self-adhesive material does not improve clinical performance after three years. Furthermore, it impose a hazard with respect to postoperative hypersensitivity.

167

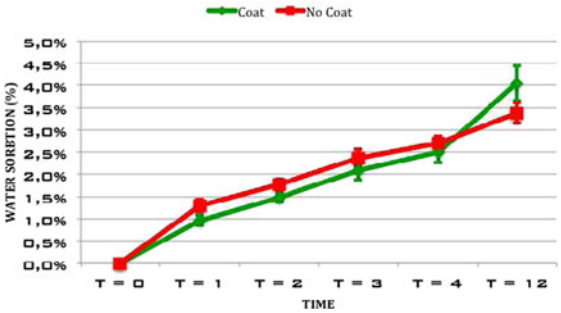
Category: Operative Dentistry

COMPARISON OF TWO DIFFERENT METHODS TO EVALUATE WATER SORPTION OF DIFFERENT COMPOSITES RESINS WITH OR WITHOUT COATING SEALER APPLICATION

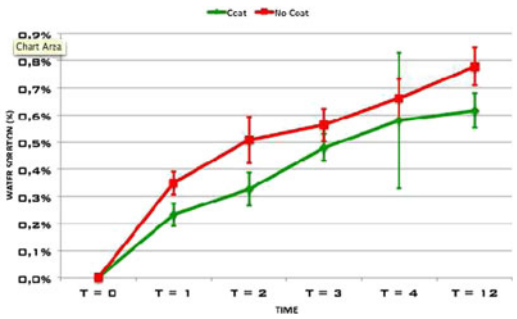
Ludovica Fierravanti, Allegra Comba, Mario Alovisi, Damiano Pasqualini, Elio Berutti, Nicola Scotti
University of Turin, Department of Surgical Sciences, Dental School

Objective: The aim of this study was to evaluate, using two different methods, water sorption of different composites, with or without the application of a hydrophobic surface sealer. The null hypothesis was that coating application is able to reduce water uptake.
Methods: 4 different composites (Filtek Supreme (3 M espe), Clearfil Majestic (Kuraray), Gradia Direct (GC), Venus Diamond (Heraeus Kulzer) and coating sealer, EasyGlaze (Voco), were chosen for both protocols. For each method samples were divided in 4 groups, according to the material used. Each group was subsequently splitted in 2 subgroups, according to the use or not of a hydrophobic surface sealer. Method 1: Forty anterior extracted teeth were selected and sectioned 1 mm under the CEJ. On each sample a standard cavity (2×2×2 mm) was prepared on the buccal surface, bulk filled with composite. The pulp chamber and the whole crown were made waterproof with nail polish until 1 mm from the restoration margins. Method 2: 40

metallic molds, with only 1 free surface, were filled with composite and then finished and polished. For both method composites were cured for 40s with 1000 mW LED lamp, finished and polished. Hydrophobic sealer was applied and cured. Samples were weighed with a precision scales at T=0, stored in distilled water at 37° and reweighed at 2, 3, 4, 12 and 24 weeks. Results were statistically analyzed with T-student test ($p<0,05$).
Results: The two tested methods showed contrasting results, as represented in graphs 1 and 2. The statistical analysis showed a significant influence of the coating sealer on water sorption ($p=0.016$) for method 2.



Graph 1: % of water sorption for method 1



Graph 2: % of water sorption for method 2

Conclusion: The initial null hypothesis was partially accepted because for method 2 the application of a coating sealer on the surface of a resin restoration is able to reduce significantly water uptake. However, the two methods showed different results probably due to the higher number of variables present in the protocol followed for method 1.

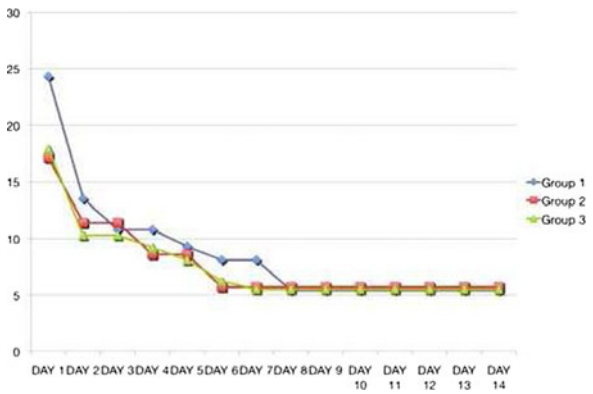
171

Category: Operative Dentistry

CLINICAL OUTCOMES OF ETCH-AND-RINSE AND SELF-ETCH ADHESIVE APPROACHES IN DEEP CARIOUS LESION TREATMENT

Lerda Francesco[1], Giovannini Roberta[1], Alovisi Mario[1], Breschi Lorenzo[2], Damiano Pasqualini[1], Elio Berutti[1], Nicola Scotti[1]
[1]University of Turin, Department of Surgical Sciences, Dental School
[2]University of Trieste, Department of Medical Sciences

Objective: The aim of this in vivo study was to evaluate the influence of the adhesive system on post-operative sensitivity, pain and clinical outcome in deep cavities restorations. The null hypothesis is that the self-etch approaches induce a lower post-operative sensitivity and pain compared to etch-and-rinse adhesives in deep cavities.
Methods: Sixty patients were selected for deep carious lesions treatment. Exclusion criteria were: general health problems, lack of proper oral hygiene, bruxism, pregnancy, altered sensitivity, previous restorations, enamel-dentin fractures or crack, periodontal problems, absence of pulpal vitality, abutment of a fixed or removable prosthesis. Carious lesions closed 1 mm or less from the pulp were included in the study. They were randomly divided into three groups according to the adhesive system used: G1, etch-and-rinse 3-step (Optibond FL, Kerr), G2, self-etch 2-step (Adper SE, 3 M ESPE) and G3, self-etch one-step (Clearfil S3 Bond, Kuraray). VAS questionnaire was given to assess the post-operative pain and thermal sensitivity during the 2 weeks after treatment and 12 and 24 month follow-up was performed following USPHS modified criteria. The VAS data were analysed by cross-tabulation analysis and Pearson Chi-square test, while USPHS data were analysed with balanced ANOVA ($p<0.05$).
Result: Statistical analysis showed a statistically significant difference between groups ($p=0.02$) only for post-operative sensitivity (Figure 1). At 24-month etch-and-rinse group showed better clinical results, above all for marginal ditching and sensitivity. Pulp vitality maintenance was comparable in all groups.



Conclusion: The null hypothesis is partially rejected because post-operative pain was not influenced by the adhesive system; instead thermal sensitivity showed lower values with the self-etch approach, both 2-step and one-step, probably because etch-and-rinse adhesives induced a reversible pulp inflammation caused by acid conditioning. The 24-month follow up showed that etch-and-rinse 3-step adhesives still are the gold standard for clinical success.

178

Category: Operative Dentistry

CERAMIC REPAIR CAPACITY OF A SELF-ADHESIVE FLOWABLE COMPOSITE AFTER DIFFERENT SURFACE PRETREATMENTS

Ugur Erdemir[1], Hande Sar Sancaklı*,[1], Erkan Sancaklı[2], Esra Yıldız[1], Taner Yucel[1], Meltem Mert Eren[1], Sevda Ozel[3]
[1]Istanbul University Faculty of Dentistry, Department of Operative Dentistry
[2]Istanbul University Faculty of Dentistry, Department of Prosthodontics
[3]Istanbul University Faculty of Medicine, Department of Biostatistics

Objective: Repair of the ceramic material in clinical conditions is a promising issue. The novel self-adhesive flowable composite is recommended to be used for the repair of all-ceramic restorations without any surface pretreatment techniques. The aim of this in vitro study is to compare the influence of different surface pretreatment on the repair capacity of leucite-reinforced ceramic material by a novel self-adhering flowable composite.
Methods: 80 IPS Empress II ceramic ingots were prepared to maintain a flat suface and divided into 5 groups (n=16/group) of different surface pretreatment techniques performed; 1: ER:YAG laser treatment (power settings 300 mJ), 2: Silica coating with 30 μm SiO_2 particles (CoJet), 3: 9,6 % Hydrafluoric acid (HF), 4: High-speed diamond bur (30 μm grain size), 5: control with no pretreatment. Self-adhering flowable composite (Vertise Flow; Kerr) was applied on all pretreated and control ceramic groups after silanization according to the manufacturer's instructions using the Ultradent shear bond Teflon mold system. Each specimen was subjected to a shear load at a crosshead speed of 1 mm/min until fracture occurred. Ceramic surfaces were examined with scanning electron microscopy (SEM) to determine the surface characteristics of the pretreated surfaces. Kruskal-Wallis test and multiple comparison tests using MedCalc test were used for statistical analysis of data.
Results: Ceramic surfaces pretreated with HF + silanization (6.821 MPa) and CoJet + silanization (5.359 MPa) groups were revealed the highest bond strength values respectively with statistically significant difference among the groups applied (p<0.05).
Conclusion: Bond strength of the self-adhesive flowable composite showed different repair capacity when applied after different surface pretreatment techniques. The results of this in vitro study showed that acid etching is recommended for an increased bond strength although the material has a self-adhesive capacity to repair ceramic material, that was found insufficient in the present study.

181

Category: Operative Dentistry

THE INFLUENCE OF RETENTION GROOVE AND ADHESIVE SYSTEM ON THE BOND STRENGTH OF RESIN COMPOSITE TO AMALGAM

Safa Tuncer[1], Mustafa Demirci[2], Murat Tiryaki[1]
[1] DDS, PhD, Istanbul University, Faculty of Dentistry, Department of Operative Dentistry
[2] DDS, PhD, Professor, Istanbul University, Faculty of Dentistry, Department of Operative Dentistry

Objective: This study evaluated the influences of surface conditioning methods with or without retention groove on shear bond strength to amalgam, using commercially available adhesive systems.
Methods: Amalgam specimens were randomly divided into one of the following conditioning groups. Group 1: Surface was roughened with a diamond bur. Group 2: Surfaces were sandblasted with 50 μm aluminum oxide powder. Group 3: Retention groove of 1 mm diameter and 1 mm width prepared with a diamond bur by using a cavity preparing apparatus, then surface roughening with a diamond bur. Group 4: Retention groove prepared, then sandblasted with 50 μm aluminum oxide powder. Resin composite (Filtek Ultimate) cylinders were bonded onto the amalgam surfaces using the Optibond All-In-One (Optibond AIO), Clearfil SE Bond and Scotchbond Multi-Purpose (Scotchbond MP) adhesive systems. Specimens were stored in water at 37 °C for five weeks. Shear bond testing was performed with a universal testing machine. Stereomicroscope examination was carried out to determine the bond failure sites. The results were analyzed by two-way ANOVA and Tukey's tests (p≤0.05).
Results: Surface conditioning significantly affected the shear bond strengths of adhesive systems. In Group 1, the shear bond strength of Optibond was significantly higher AIO (2.661±0.480 Mpa) than the other adhesive systems. In Group 3, Scotchbond MP (3.818± 0.985 MPa) increased the bond strength significantly compared to Optibond AIO (2.731±0.471 MPa). In Group 4 Scotchbond MP (3.794±0.787) showed the highest bond strenght, however no significant differences were noted between the adhesive systems. The shear bond strenght results of the adhesive systems in Group 4 were significantly higher than results of Group1 and Group 2
Conclusion: Surface conditioning methods affected the bond strengths of adhesion of composite to amalgam. Preparation of retention groove by repair or veneering of amalgam restorations improves the bond strengths.

182

Category: Operative Dentistry

INFLUENCE OF DIFFERENT LUTING CEMENT ON THE STRESS DISTRIBUTION IN MAXILLARY CENTRAL INCISOR RESTORED BY COMPOSITE LAMINATE VENEER: A 3D-FINITE ELEMENT ANALYSIS

Meltem Mert Eren[1], Esra Yildiz[1], Taner Yucel[1], Alper Tunga Celebi[2], Esra Icer[2], Cengiz Baykasoglu[6] , Ata Mugan[7]
[1]Department of Operative Dentistry, Faculty of Dentistry, Istanbul University
[2]Faculty of Mechanical Engineering , Istanbul Technical University, Turkey

Objective: The aim of this study is to investigate biomechanical behavior of composite laminate restoration of the maxillary central incisor luted with an adhesive cement that has two different elastic modulus compared with intact teeth, by using the finite element (FE) method.
Methods: 3-D FE model of a maxillary central incisor was built by μCT (SkyScan1172, Aartselaar, Belgium) data. The laminate veneer structure designed with incisal bevel preparation. Luting cements' elastic moduli were 4500 MPa (Mod V) and 12850 MPa (Mod E). Elastic modulus of composite laminate veneer was 14500 MPa. A structural linear static analysis has been performed to evaluate the effect of stress distribution on tooth restored with composite laminate veneers under the loads of 15 N applied at 90° angle and 50 N applied at 60° angle along the tooth's longitudinal axis.
Results: Von Mises stress results were obtained based on which, all models showed higher stress value compared with the intact teeth. A relatively higher stress value was observed in all models at the cervical and incisal region. The composite laminate veneers luted by adhesive cement with higher elastic modulus (Mod E15N and Mod E50N) showed reduced Von Mises stress in tooth structure in comparison with composite laminate veneers luted with adhesive cement with lower elastic modulus (Mod V15N and Mod V50N). Luting cement layer in Mod E15N and Mod E50N had higher stress values than the Mod V15N and Mod V50N.
Conclusion: The stress distrubution of composite laminate veneer was affected by the difference of elastic moduli of adhesive cement under load. Also, the load orientation was observed to be of importance in development of stress.

184

Category: Operative Dentistry

THE EFFECT OF KTP LASER AND HIGH POWERED GREEN LED BLEACHING AS COMPARED TO FOUR CONVENTIONAL BLEACHING PROCEDURES ON ENAMEL MICROHARDNESS

Andrii Diachuk, An Rimbaut, Filip Keulemans, Peter De Coster, Mieke De Bruyne, Roeland De Moor
Department of Restorative Dentistry and Endodontology, Ghent Dental Photonics Research Cluster, BIOMAD, Dental School, Ghent University, Ghent University Hospital, Ghent, Belgium

Objectives: This in vitro study evaluated the effects of KTP laser bleaching and high powered LED bleaching versus different conventional vital bleaching techniques on the microhardness of bleached bovine enamel.
Methods: Seventy two bovine enamel samples were distributed among six groups (A–F), each having 12 samples. Half of each surface remained unbleached; the other halves were bleached with (A) Opalescence 35 % H_2O_2, (B) Opalescence 20 % H_2O_2 , (C) KTP laser / Smartbleach 36 % H_2O_2 1 W–30 sec, (D) 3LT 6 % H_2O_2, (E) Nite White 22 % H_2O_2, (F) Nite White 16 % H_2O_2 [A–B: Ultradent Products, South Jordan, USA; C–D: KTP laser and 3LT, High Tech Laser and SBI, Herzele, Belgium; E–F: Discus Dental, Culver City, USA]
The Knoop microhardness (KHN) of each specimen was determined by means of 10 indentations at baseline immediately after removal from the cow skull i.e. post extraction (1), at baseline after immersion in artificial saline during 14 days or pre-bleaching (2), immediately after bleaching (3) and post-bleaching after 10 days (4) and after 6 weeks (5). Statistical analysis was performed using ANOVA and Wilcoxon Signed Ranks Test ($p<0.05$).
Results: Bleaching led to a statistically significant decrease ($p<0.05$) of KHN in Groups A3-B3-E3-F3 (non-laser & non-LED bleached), compared to Groups C3–D3, where microhardness values did not differ significantly from the baseline values. The post-bleach values demonstrated an increase in microhardness, demonstrating a recovery of the enamel microhardness.
Conclusions: KTP laser bleaching with the Smartbleach system with 36 % H_2O_2-gel and 3LT high powered green LED bleaching with 6 % H_2O_2-gel resulted in an unaltered enamel surface. In the non-light activated bleached groups a statistically significant decrease in enamel microhardness was observed immediately after bleaching, followed by a recovery of the enamel microhardness as a function of time.

195

Category: Operative Dentistry

CLINICAL COMPARISON OF A FISSURE SEALANT AND FLOWABLE COMPOSITE: A-24 MONTH'S RANDOMIZED, AND CONTROLLED STUDY

Ugur Erdemir[1], Hande Sar Sancaklı[1], Batu Can Yaman[2], Esra Yıldız[1*],Taner Yucel[1], Sevda Ozel[3]
[1]Department of Operative Dentistry, Faculty of Dentistry, Istanbul University
[2]Department of Operative Dentistry, Faculty of Dentistry, Osmangazi University
[3]Department of Biostatistics and Medical Informatics, Faculty of Medicine, Istanbul University

Objective: The aim of this clinical study was to evaluate the retention rate and caries prevention effect of a flowable composite material used as pit-and-fissure sealant compared with a fluoride containing conventional resin-based sealant in a young population over a 2-year period.
Methods: 34 patients ranging 16–22 years of age, representing of at least two pits and fissure caries on first and second molars were selected for this randomized, controlled trial using a half-mouth design. A total of 220 sealants, distributed in 117 on the upper molars and 103 on the lower molars were placed. The teeth were sealed with a sealant material (Helioseal F) or a flowable resin composite (Tetric Evo Flow). Each restoration was independently evaluated at baseline and 1, 6, 12, and 24 months. The sealants were evaluated in terms of retention and presence of caries. Data were analyzed using non-parametric Mann-Whitney U and Friedman 1-way ANOVA tests at $p<0.05$.
Results: Helioseal F showed complete retention with 98.1 %, 95.5 %, 94.8 % and 85.4 % at 1, 6, 12 and 24-months evaluations, while, Tetric Evo Flow rates were 100 %, 95.5 %, 93.8 % and 88.5 % respectively. At the 24-month recalls 12 partial losses (12.5 %) were observed in subjects treated with Helioseal F and 7 (7.3 %) partial losses for Tetric Evo Flow, respectively. Total loss rates were 2 (2.1 %) with Helioseal F, and 4 (7.3 %) with Tetric Evo Flow after 24-months. No significant differences were observed between the materials in terms of retention rates ($p>0.05$). Thus, no significant differences with respect to caries preventing ability for each evaluation period ($p>0.05$).
Conclusion: Application of flowable composite as a fissure sealant material in young population seems to be as effective as conventional fluoride containing fissure sealant for the prevention of fissure caries.

201

Category: Operative Dentistry

MICROTENSILE BOND STRENGTH OF REPAIRED GRANDIO COMPOSITE

Eugenia Baena[1], ValeriaVignolo[1], M Victoria Fuentes[2], Laura Ceballos[2]
[1]DDS, Rey Juan Carlos University, Stomatologia, Madrid, Spain
[2]DDS, PhD, Rey Juan Carlos University, Stomatologia, Madrid, Spain

Objective: To investigate the effect of different surface treatments on microtensile bond strength (μTBS) when repairing an aged composite (Grandio®, Voco).
Methods: 20 composite disks were made by layering 2 mm thick increments of the nanohybrid Grandio composite shade A1 in a Teflon mold (4×8 mm). They were light-cured for 40s (Elipar, 3 M ESPE) and stored (37º/7 days) in a saline solution. Specimens were randomly divided into 4 experimental groups according to the surface treatment applied. G1: composite surface was roughened with a Cimara® bur (Voco) and adhesive was applied (Solobond®, Voco); G2: air-abrasion with 30 μm alumina particles coated with silica (Cojet Sand®, 3 M ESPE), silane (Monobond S®, Ivoclar-Vivadent) and adhesive was applied; G3: sand-blasting with 27 μm aluminum oxide particles (Kavo Rondoflex®, Kavo Dental GmbH), and adhesive application; G4: without surface treatment. Afterwards, Grandio composite (shade A3.5) was packed incrementally on the treated surface obtaining another disk (4×8 mm). After 24 hours, sticks of 0.8 mm^2 were obtained from bonded disks (Isomet 5000, Buehler) and μTBS test was carried out (Instron 3345). The failure mode was evaluated using a stereomicroscope at 30X magnification. Data were analyzed by one way ANOVA and SNK ($p<0.05$).
Results: μTBS means (standard deviations) in MPa obtained for each group are shown in the table. Groups with same letters do not significantly differ.

	Cimara bur	Silica coating	Aluminum sandblasting	Control
n	25	29	25	25
μTBS mean (sd)	54,7 (22,9)**a b**	61,3 (18,2)**a**	46,6(19,5) **b**	58,8 (17,4) **a, b**
Failure	Adhesive (72 %)	Adhesive (52 %)	Adhesive (12 %)	Adhesive (88 %)
	Cohesive (28 %)	Cohesive (48 %)	Cohesive (68 %)	Cohesive (4 %)
			Mixed (20 %)	Mixed (8 %)

Conclusion: Surface pretreatment influenced bond strength results when repairing an aged composite. The micromechanical and chemical reaction produced by pretreatment with Cojet seems to improve the bond strength of repaired composite.

203

Category: Operative Dentistry

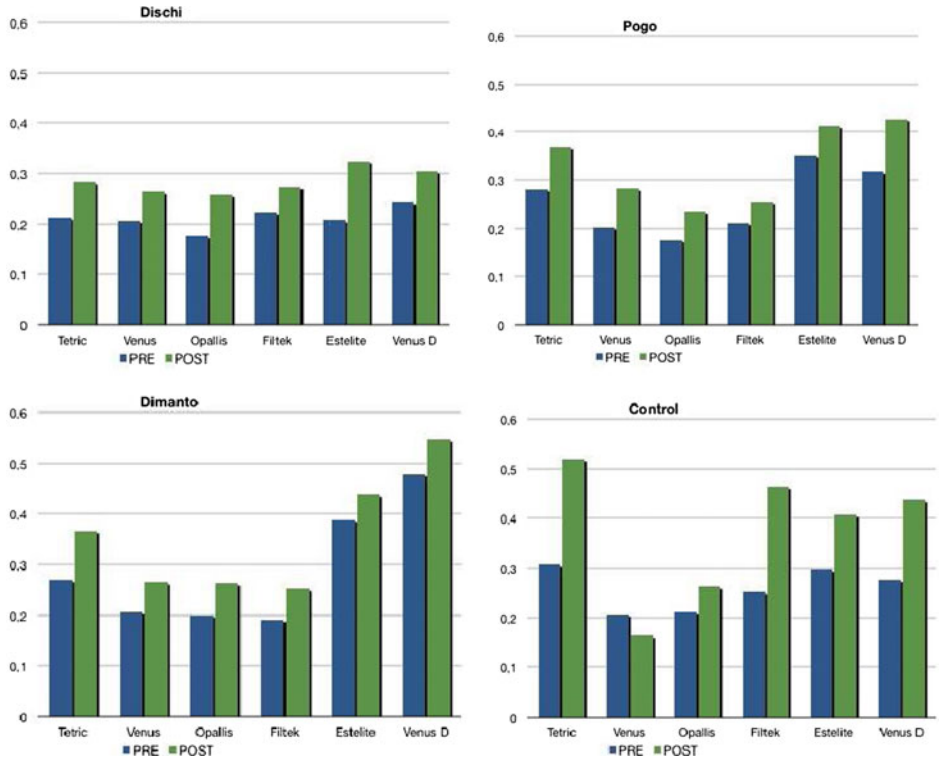
DO POLISHING REDUCE COMPOSITE ROUGHNESS OVERTIME? AN IN VITRO STUDY

Serra Stefano[1], Bergantin Emanuele[1], Pasqualini Damiano[1], Berutti Elio[1], Scotti Nicola [1]
[1]University of Turin, Department of Surgical Sciences, Dental School, Italy

Objective: The aim of this vitro study was to determine the effect of different polishing systems on resin composites roughness before and after artificial ageing. The hypothesis is that there is no difference in surface roughness among artificially aged composites.

Methods: 90 pressed round discs 2 mm thick were prepared. The samples were divided in five groups (n=6) according to the resin composite employed. Group 1: Venus Diamond (Heraeus, Germany); Group 2: Opallis (FGM, Brasil); Group 3: Estelite (Tokuyama, Japan); Group 4: Filtek Supreme XTE (3 M ESPE, USA); Group 5: Tetric Evoceram (Ivoclar Vivadent, Italy). Specimens were then divided in subgroups according to the polishing systems employed: rotating disc (SofLex); diamond-interspersed silicone polishers (Dimanto, Voco); diamond-impregnated resin polishers (PoGo, Dentsply); control group (none). Polishing procedures were performed with a water- and pressure-calibrated handpiece. Specimens were immersed in artificial saliva for 12 month and then thermocycled (4000 cycles at 5 °C–55 °C). The surface roughness (Ra) was assessed by using a RT-70 profilometer with a 5 μm diamond stylus. The Ra was calculated before and after artificial aging treatment. The statistical analysis was performed with a Wilcoxon Test (p<0,05).

Results: The mean roughness before and after ageing of each group is represented in graph. The ageing treatment statistically increased the roughness of all groups, independently of the composite finishing technique. Rotating discs obtained better roughness values than other groups (p=0.0038).



Conclusion: The hypothesis was rejected since artificial ageing induced a statistically significant increase in the mean roughness of all tested composites. The rotating abrasive discs significantly reduced roughness increase with artificial ageing, thus they are useful in reducing composite deterioration.

208

Category: Operative Dentistry

MARGINAL ADAPTATION ON ANTERIOR TREATED TEETH: COMPOSITE VS CERAMIC COMPUTER-AIDED DESIGN/COMPUTER-ASSISTED MANUFACTURING CROWNS

A Ramírez-Sebastià[1,2], T Bortolotto[2], M Roig[1], I Krejci[2]
[1]Department of Endodontic and Restorative Dentistry, Universitat Internacional de Catalunya, Sant Cugat del Valles, Barcelona, Spain
[2]Department of Cariology and Endodontology, Geneva School of Dentistry, Switzerland

Objective: To compare the marginal adaptation between ceramic and composite CEREC crowns in endodontically treated teeth restored with endocrowns or with a short or a long post.
Methods: Forty-eight intact maxillary incisors were used. After endodontic treatment, the crowns were sectioned 2 mm coronally to the cemento-enamel junction, which provided a ferrule of 2 mm. The prepared teeth were divided randomly into six groups (n=8). Group 1 was restored with a large fiberglass post, composite core, and ceramic full-coverage computer-aided design/computer-assisted manufacturing (CAD-CAM) crown. Group 2 was restored with a short fiberglass post, composite core, and ceramic full-coverage CAD-CAM crown. Group 3 was restored with a large fiberglass post, composite core, and composite full-coverage CAD-CAM crown (LPCpr). Group 4 was restored with a short fiberglass post, composite core, and composite full-coverage CAD-CAM crown (SPCpr). Groups 5 and 6 were restored with ceramic and composite CEREC machined endocrowns, respectively EndoCer and EndoCpr. The restored teeth were loaded thermomechanically in a computer-controlled chewing machine. Impressions of each restoration were made in a polyvinylsiloxane material before and after loading. Gold-coated epoxy replicas were prepared for scanning electron microscopy examination at 200× magnification.
Results: Loading had a statistically significant effect (p<0.05) on the percentage of "continuous margin" in all groups. The LPCpr, SPCpr, and EndoCpr groups showed the highest percentage of continuous margin initially and after loading. The effect of the different post lengths on marginal adaptation was not significant (p>0.05).
Conclusion: CAD-CAM crowns fabricated from millable composite resin blocks (Paradigm MZ100) offer a superior option to all-ceramic crowns (IPS Empress CAD).

210

Category: Operative Dentistry

MASTICATION IN PATIENTS WITH MULTIPLE CARIOUS LESIONS TREATED UNDER GENERAL ANAESTHESIA WITH A CONSERVATIVE APPROACH

Decerle N[1,2], Cousson Py[1,2], Nicolas E[1,2], Hennequin M[1,2]
[1] Clermont University, Université d'Auvergne, EA 4847, Centre de Recherche en Odontologie Clinique, BP 10448, F-63000 Clermont-Ferrand, France,
[2] CHU Clermont-Ferrand, Service d'Odontologie, Hôtel-Dieu, F-63000 Clermont-Ferrand, France

Objective: This study aimed to measure modifications of mastication in patients with multiple carious lesions after full mouth treatment with a conservative approach under general anaesthesia (GA).

Methods: Fifteen women and five men (mean age 28.2± 8.9 years old) with a mean of 11.7±4.7 carious lesions were treated under GA with a conservative approach that included endodontic and restorative treatment in order to avoid extractions for teeth having a functional role. Patients were observed before and 1 month after treatment while masticating three standardized pieces of carrot and two model foods with increasing hardness. The granulometry of the expectorated boluses from carrot was characterized by median particle size (D50), determined at the natural point of swallowing. Chewing time (CT), number of chewing cycles (CC), and chewing frequency (CF) were video recorded. The evolution of the number of posterior dental functional units (PFU) and the occlusal functional areas were measured. A self-assessment questionnaire for oral health-related quality of life (GOHAI) was also used.
Results: During the GA session, 3.1±3.5 teeth were extracted and 9.4±7.2 teeth were restored. Overall, the mean number of teeth decreased from 28.5 ± 2.6 to 25.3 ± 3.5 (t-test, p<0.001) after treatment, while the mean number of PFU and the mean functional occlusal areas did not change. The granulometry of the carrot bolus improved as the mean D50 value decreased significantly from 8508±3071 μm to 7508 ± 2887 μm, while the kinematic parameters of mastication changed neither for carrot nor for model foods. Finally, the GOHAI score increased from 39.9 ± 9.8 to 53.1 ± 6.3 (t-test, p<0.001).
Conclusion: Patients with multiple carious lesions treated with a conservative approach under GA improved their chewing efficiency and their Oral Health Quality of life.

216

Category: Operative Dentistry

INFLUENCE OF DIFFERENT ADHESIVES UPON BOND STRENGTH OF SILORANE-BASED COMPOSITES

Stephanie Krifka, Karl-Anton Hiller, Susanne Kramer, Gottfried Schmalz
University Hospital of Regensburg - Department of Operative Dentistry and Periodontology

Objective: This in vitro study analysed the adhesion of conventional and flowable silorane-based composite resins to dentin and enamel of human teeth in shear bond strength using of different adhesive luting agents.
Methods: Silorane System Adhesive (SSA, 3 M Espe), OptiBond FL (OFL, KerrHawe), Adaper Scotchbond Multi Purpose (ASB, 3 M Espe) or Clearfil SE Bond (CSE, Kuraray, containing MDP) as well as combinations of components (Primer, Bonding or Adhesive) of these adhesive luting agents were used together with either the conventional silorane-based composite Filtek Silorane or its experimental flowable Hermes Flow (both 3 M Espe) and applied to enamel (E) or dentin (D) of human origin teeth. After light curing (Bluephase 8, Ivoclar Vivadent) with an intensity of 1148 mW/cm^2, specimens were stored in aqua dest. at 37 °C for 24 h and then shear bond strength (cross head speed: 0.5 mm/min) as well as fracture modes were determined. For each group (n=10) the data of shear bond strength were statistically analysed with the Mann Whitney U-test, Wilcoxon-Rank-Sum-test and the Error Rates Method (p≤0.05).
Results: Shear bond strength in MPa (medians and 25–75 % quartiles, n=10); E = Etched; P = Primer; B = Bond; A = Adhesive; SSA-B = Silorane System Adhesive-Bonding

		Filtek Silorane (FS)		Hermes Flow (HS)		HS + FS	
		E	D	E	D	E	D
SSA	P + B	3.5 (2.4/ 5.6)	14.9 (12.9/ 17.0)	4.7 (4.0/ 5.7)	13.3 (10.7/ 14.7)	–	–
OFL	E + P + A	5.5 (4.8/ 7.4)	5.2 (4.1/ 7.9)	1.8 (1.7/ 2.3)	1.5 (1.3/ 2.0)	3.3 (2.9/ 4.2)	0.8 (0.2/ 1.7)
	E + P	6.9 (5.8/ 8.9)	1.3 (0.4/ 1.9)	3.7 (2.6/ 4.6)	0 (0/0.2)	0.3 (0/ 0.7)	0 (0/ 0.1)
	E + P + A + SSA-B	16.4 (12.8/ 23.2)	16.2 (13.3/ 24.4)	17.5 (15.4/ 23.7)	14.0 (10.4/ 15.5)	–	–
	E + P + SSA-B	20.1 (17.0/ 22.4)	10.2 (8.4/ 16.2)	17.7 (13.9/ 23.9)	10.4 (7.7/ 12.9)	–	–
ASB	E + P + A	5.5 (4.8/ 7.4)	5.5 (1.6/ 15.0)	6.5(3.3/ 9.0)	1.7 (0.8/ 5.3)	13.1 (9.0/ 14.3)	3.9 (0.9/ 11.5)
	E + P	6.9 (5.8/ |8.9)	0 (0/0.2)	0.5 (0.3/ 1.0)	0 (0/0)	0.2 (0/ 0.8)	0 (0/0)
	E + P + A + SSA-B	16.4 (12.8/ 23.2)	18.2 (9.8/ 21.4)	11.7 (8.5/ 13.9)	5.5 (4.0/ 10.4)	–	–
	E + P + SSA-B	20.1 (17.0/ 22.4)	10.8 (6.2/ 16.3)	10.0 (9.2/ 12.1)	4.1 (1.5/ 7.4)	–	–
CSE	E + P + A	5.5 (4.8/ 7.4)	6.4 (4.8/ 7.8)	2.2 (0.6/ 5.0)	1.6 (0/ 6.2)	15.5 (11.0/ 20.1)	9.4 (8.3/ 14.2)
	E + P	6.9 (5.8/ 8.9)	0.1 (0/ 0.3)	0.1 (0/ 0.1)	0 (0/0)	0.3 (0/ 1.6)	0 (0/ 0.1)
	E + P + A + SSA-B	16.4 (12.8/ 23.2)	24.3 (18.9/ 26.4)	14.7 (12.8/ 15.1)	13.2 (11.9/ 17.3)	–	–
	E + P + SSA-B	20.1 (17.0/ 22.4)	23.8 (20.4/ 24.5)	16.8 (15.0/ 20.2)	15.3 (12.9/ 17.9)	–	–

Bond strength, especially for dentin, of commonly used methacrylate-based luting agents (OFL,ASB,CSE) alone were, in general, inferior to SSA for silorane-based composite resins. However, the combination of those luting agents and the SSA-B (Bond) significantly enhanced bond strength of both silorane-based composites on enamel and dentin. CSE-P and SSA-B yielded significantly higher shear bond values then other material combinations. Fracture modes were mostly adhesive fractures at the resin-tooth substrate (enamel and dentin) interface.
Conclusion: The replacement of the special Silorane System Adhesive by classical methacrylate-based adhesive luting agents is not recommended for silorane based resins. However, the combination of methacrylate based adhesives (especially CSE containing MDP) with silorane and SSA-Bond results in even better adhesion.

240

Category: Operative Dentistry

REPAIR OF RESIN COMPOSITE RESTORATIONS. PREFERENCES AND TECHNIQUES USED AMONG CLINICIANS

Antoniadou Maria, Paximada Charikleia, Lagouvardos Panagiotis
Department of Operative Dentistry, Dental School of Athens, Greece

Objective: Reasons for repairing dental restorations vary among clinicians, while criteria of using repairing techniques are not yet well defined. The aim was to evaluate preferences and techniques used among clinicians in repairing resin restorations.
Methods: An electronic internet formed questionnaire consisting of 20 multiple-choice and Rank ordering questions was emailed to 1540 dentists of Attiki Dental Society. Questionnaire was remained open for 3 months. Collected data were analyzed statistically for differences between clinician's sex or years after graduation using x^2-test (p=0.05).
Results: 320 persons have answered the questionnaire (20.78 % response rate)(m=59.6 %, f=40.4 %). 70.3 % were graduated in less than 20 years ago. 89.4 % have responded positive on doing repairs (38.3 % resin restorations). The main reasons for resin repair were improvement of: a) surface color (32.6 %) b) contact point (20.5 %). 6.6 % did not know the type of resin used for repair. From the rest, 47.2 % use flowables, 61.4 % nanohybrids and 35.5 % microhybrids. For repairing the margins of restorations, 73.6 % open up the margins with a diamond bur, 89.7 % etch, 92,5 % bond and fill it with flowables (60.9 %) or packable resins (63.2 %). To repair a veneer, the old resin was roughened with a diamond bur (90.4 %), etched (82.5 %), bonded (96.4 %) and filled with a resin found in practice (78.3 %). In general, 40,5 % decided repair whatever was the prationner who has realized the original restoration. 43.5 % decided repairs easier if they had placed the original. Bad oral hygiene (20 %), multiple dental caries (21 %) and high caries risk (13.5 %) were the reasons for deciding repair, although 33 % of respondents did not decide by general rules. No significant differences were found between sex or age groups (p>0.05).
Conclusions: Significant percentage of clinicians perform repair of resin restorations using different types of resins. Restorations made by the same clinician were more easily repaired. General factors of the patient's profile do not play an important role on repairing restorations.

013

Category: Preventive Dentistry

CARIES EXPERIENCE IN TURKISH YOUNG ADULTS WITH DIFFERENT RISK LEVELS

Sevgi Sener[1], Said Karabekiroğlu[2], Nimet Unlu[2]
[1] Department of Oral Radiology, Konya, Turkey
[2] Department of Operative Dentistry, Konya, Turkey
[2] Department of Operative Dentistry, Konya, Turkey

Objective: The aim of the present study was to investigate in detail the distribution of caries lesions among tooth types and surfaces in the permanent dentition in a young Turkish adult population with different risk levels.
Methods: This study was carried out on 398 young adults (18–26 years old) of both genders. Caries experience was assessed on patient, tooth and surface levels. The subjects were categorized into three groups: low caries experience (LC), moderate caries experience (MC) and high caries experience (HC) according to DMFT index of persons. The range of DMFT scores 0–2, 3–5 and≥6 for the LC, MC and HC groups respectively. Caries experience was reported as decayed and filled surfaces (DF) at surface level. Chi-square test was used for statistical analysis.
Results: Caries prevalence was 85.4 % in subjects, 15.9 % in teeth and 4.3 % in all surfaces. The mean DMFT was 4.6 in this young adult population. The number of subjects was 124, 117 and 157 for LC, MC and HC groups respectively. Females showed a higher incidence of caries than males (p <0,05). Caries distribution was higher in the maxilla (54 %) than in the mandible (46 %). The highest caries rate was found in posterior teeth (94 %) in both jaws. The most commonly affected teeth were first molars an all risk groups. The most commonly affected surface was occlusal in total.
Conclusion: Occlusal surfaces of molar teeth are highly suspected for dental caries in this young adult population. The preventive strategies should be focused on preventing the plaque accumulation due to tooth anatomy. The caries distribution at tooth and surface levels can be characterized using different quantitative or qualitative index other than DMFT.

015

Category: Preventive Dentistry

DENTAL EROSION AMONG AN ISRAELI POPULATION: AN EPIDEMIOLOGICAL SURVEY EMPLOYING THE BEWE INDEX

Yuval Vered[1], Avraham Zini[1], Adrian Lussi[2], Jossef Gleitman[3], Harold D. Sgan-Cohen[1]
[1]Department of Community Dentistry, Faculty of Dental Medicine, Hebrew University Hadassah, Jerusalem, Israel
[2]Department of Preventive Restorative and Pediatric Dentistry, School of Dental Medicine, University of Bern, Bern, Switzerland
[3]Department of Oral Rehabilitation, Faculty of Dental Medicine, Hebrew University Hadassah, Jerusalem, Israel

Objectives: To investigate an Israeli population in order to assess dental erosion prevalence, and related variables, and to contribute to the ongoing review, evaluation and further development of the basic erosive wear examination (BEWE) index as an international standard.
Methods: We conducted a cross sectional, descriptive and analytic epidemiological pioneer survey among 500 Israeli subjects. We measured dental erosion according to the BEWE index. Independent variables included gender, age groups, origin, education, employment status and diet.
Results: Fifty percent of the survey subjects had no erosive wear and 10 % had distinct erosion of over 50 % of the dental surface. Total BEWE score of the six sextants was 1.84±2.53 (mean ± standard deviation). We employed a different classification for tooth erosion severity more suitable to the present survey population. Mean total BEWE score differences by age groups were statistically significant; as age increased, mean total BEWE scores increased from 1.07±1.82 at 15–18 yrs to 2.34±2.73 at 55–60 yrs of age ($p<0.001$). The association between acidic foods and erosion was evident among the younger population, especially, in the 25–28 yrs age group ($p=0.038$). In a multiple regression model for mean tooth erosion total score, age ($p<0.001$) and diet ($p=0.044$) achieved statistical significance as predictors of tooth erosion.
Conclusion: Our study is one of the first to use the BEWE scoring system in an epidemiological survey. We found that age and diet were predictors of increasing dental erosion among adolescents and adults. The present findings, together with further international research, should contribute towards continued evaluation of the BEWE system as an international standard, and also towards more optimal, evidence-based treatment and prevention of dental erosion.

024

Category: Preventive Dentistry

COLLATERAL BENEFITS OF ORAL CALCIUM THERAPY ON THE GUT

M.J. Manhart, T.B. Steg
Calcium Therapy Institute, Ohama, USA

Objective: The object is to consider the benefits of oral calcium therapy for gum disease and for gut inflammations. Periodontal disease has shown to be linked with gut ailments that affect half of most populations. Severe chronic inflammations of both the gums and the gut exhibit vague symptoms and often lead to late diagnosis. Gut diseases are so hard to detect, and some so lethal, that serious concerns for early detection are a worthy investigation.
Methods: Treatment methods for these inflammations, their duration and the direction that they take, either gut-to- mouth or mouth-to-gut, is significant. That is, where do these bacterial colonies originate and how do they sustain themselves? From mouth-to-gut would seem reasonable and research appears headed on that path . Both environments exhibit little oxygen, plenty chronic inflammation, and harbour the same spore-forming, gram-negative, anaerobic bacteria such as Fusobacteria, Clostridium difficle, Actinomyces naeslundi, as well as bacteria that can replicate with or without oxygen. Tenacious periodontal spores of "smart" bacteria readily pass through the digestive tract and re-colonize in the only other place they can survive, the gut, where they can re-assert themselves as inflammation of the gut and its organs. Many studies of efforts to combat this "colonial" relocation during elongated antibiotic therapy are frustrating, costly, plagued with undesirable results, and offer scarce help against anaerobic bacteria. In fact, there are dangerous side effects, even death . Nonsurgical Calcium Therapy used against periodontal disease has significant collateral benefits, as recent findings suggest, for the gut.
Results: Timed-release calcium materials rapidly control and manage chronic inflammation of periodontal disease. They have long been available to affect the entire dental environment in terms of inflammation and oxygen levels for extended periods with no untoward responses. These calcium materials directly impact the levels of anaerobic bacteria and display significant antimicrobial collateral benefits against the same bacteria of the gut.
Conclusion: The Calcium Therapies are presently being utilized and studied for their value in tempering and assisting the gut as they have the oral cavity in the struggle for a healthier digestive environment. In light of the limits of multiple antibiotic regimens, additional dental research toward a more environmental approach would seem to be imperative.

033

Category: Preventive Dentistry

PREVALENCE AND RISK PROFILE OF DENTAL EROSION IN ENDURANCE ATHLETES

Cornelia Frese[1], Falko Frese[2], Silke Kuhlmann[3], Diana Wolff[1]
[1]University Hospital Heidelberg, Department of Conservative Dentistry, Dental School, Im Neuenheimer Feld 400, 69120 Heidelberg, Germany
[2]Department of Internal Medicine, GRN-Klinik Weinheim, Röntgenstr. Weinheim, Germany
[3]Praxisgemeinschaft am Burghof, Herrenstr. 2, 79539 Lörrach, Germany

Objective: During their weekly training endurance athletes complete long and time-consuming sessions and are dependent on special sport drinks and nutrition. The objective of this study was to assess prevalence and potential risk factors of dental erosion in endurance athletes.
Methods: In the test group 25 triathlon athletes ($n=18$ men, $n=7$ women) participated in a clinical oral investigation. We assessed dental erosion with the basic erosive wear examination (BEWE). In addition, we measured the level of hydratation, saliva consistency, pH, stimulated saliva flow rate, and buffering capacity (Saliva-Check BUFFER, GC N.V., Leuven, Belgium). All athletes completed a questionnaire with regard to their personal training program and habits.
Results: Mean age of endurance athletes was 35.80 (SD 7.52) years, and mean body mass index (BMI) was 22.36 (2.14). The mean cumulative BEWE-score of all sextants was 9.32 (2.11). Saliva diagnostics revealed a pH of 6.7 (0.45), normal level of hydratation, and a stimulated saliva flow rate of 1.84 (0.66) mL/min. Nineteen athletes showed high buffering capacity, while five showed medium and one displayed low buffering capacity. Analysis of the questionnaire yielded 3.30 (1.44) h of running, 4.10 (2.50) h of cycling, and 2.00 (1.26) h of swimming with a cumulative weekly training of 9.40 (3.10) h. A significant correlation was found between hours of swimming per week and pH ($p=0.04$).

Conclusion: Within the limitation of this study, we conclude that even with beneficial clinical saliva parameters, endurance training is consistent with elevated risk for dental erosion. The higher the hours of swimming, the lower was the pH of athletles' saliva. Further research should establish strategies to prevent dental erosion in high-risk groups.

041

Category: Preventive Dentistry

ORAL HEALTH OF 2- TO 3-YEAR OLD THURINGIAN CHILDREN, GERMANY

Yvonne Wagner[1], Monika Rudisch[2], Roswitha Heinrich-Weltzien[1]
[1]Department of Preventive and Paediatric Dentistry, Jena University Hospital, Germany
[2]Public Dental Health Service, City Council Jena, Germany

Objective: Early Childhood Caries (ECC) is the most common infectious disease in childhood. Purpose of this study was to investigate the impact of a preventive program on oral health of Thuringian children in Germany.
Methods: All parents of newborns (n=1162) living in Jena, Thuringia 7/2009 to 10/2010 received a patient information and consent form about the study and had the opportunity to participate in the program. They were visited and advised about general and dental health by midwives of the Youth Welfare Office. 512 children were included in a risk related recall system with periodically quarterly or semi-annually dental examinations. Dental caries was scored by WHO diagnostic criteria at d1-level without radiography. All records were performed by the same calibrated dentist (YW). For preventing initial caries progression lesions were treated by fluoride varnish application (Fluoridin N5, VOCO GmbH, Germany). Data were compared with the results of the dental examination of all 3-year old children (n=533) in kindergartens of the region conducted by the dentist (MR) of the public health service.
Results: In 2011/12 334 children aged 3 years (2 years±9.6 months) who had been longitudinally followed since birth (originally 512, drop out 178/34.8 %) could be examined. Caries prevalence was 2.1 %. Caries experience amounted to 0.02 dmft/ 0.04 dmfs. 8.1 % of the children revealed initial carious lesions. 23.4 % of the children revealed an increased caries risk (26 children suffered from a general disease, 11 children with migration background, 23 children with familial ECC burden, 11 children of single parent, 7 children with breast/bottle feeding>3 times/night). In contrast for the public health service, caries prevalence was 18.8 % and caries experience amounted to 0.65 dmft.
Conclusion: Early dental visits and fluoride varnish applications are effective for prevention of ECC.
Supported by MAM Babyartikel GmbH and VOCO GmbH.

042

Category: Preventive Dentistry

ANTIMICROBIAL EFFECT OF OZONE ON THE CARIOGENIC MICROORGANISMS IN VITRO

Duygu Tuncer[1]* , A.Rüya Yazici[2], Seniz Ayturan[3], Gül Ozgunaltay[4], Berrin Dayangac[5]
[1]Baskent University School of Dentistry
[2]Hacettepe University School of Dentistry
[3]Hacettepe University School of Medicine
[4]Hacettepe University School of Dentistry
[5]Hacettepe University School of Dentistry

Objective: The aim of this study was to examine the antibacterial effect of ozone on cariogenic microorganisms.
Methods: *Streptococcus salivarius, Streptococcus mutans, Lactobacillus acidophilus, Lactobacillus casei* and *Actinomyces viscosus* were used to test the antimicrobial activity of ozone. The microorganisms were exposed to 2, 3, 4 parameters of ozone device with 20, 40, 60, or 120 s time parameters. To examine the ozone-treated bacteria, CFU numbers of bacteria were counted after ozone application. Bacterial cells were stained with LIVE/DEAD_ BacLight^{TM} Bacterial Viability Kit and evaluated with fluorescence microscope.
Results: The number of bacterial cells were decreased. Fluorescence microscopic analysis revealed that some bacterial cells were killed instantaneously in ozone. The electron microscopic analysis showed no difference in the surface morphology of bacteria when ozone was applied.
Conclusion: These results suggest that ozone should be useful in reducing the infections caused by oral microorganisms in oral environment.

069

Category: Preventive Dentistry

COMBINED EFFECT OF A TIN-, FLUORIDE- AND CHITOSAN-CONTAINING TOOTHPASTE AND A TIN-CONTAINING RINSE IN EARLY ENAMEL EROSION AND ABRASION *IN VITRO*

Thiago Saads Carvalho*[1], Marie Louise Stämpfli[1], Barbara Beyeler[1], Ekaterina Rakhmatullina[1], Adrian Lussi[1]
[1]Department of Preventive, Restorative and Pediatric Dentistry, University of Bern, Switzerland

Objective: The aim of this study was to assess the effect of a tin-, fluoride- and chitosan containing toothpaste (Sn-F-Chit-TP), in combination with a tin-containing rinse, on enamel erosion and abrasion.
Methods: A total of 60 human premolars had their roots removed and their lingual surfaces were ground and polished, then divided into 2 groups (n=30 per group): Sn-F-Chit-TP followed by rinsing with tap water (TW), or Sn-F-Chit-TP followed by the application of a tin-containing rinse (Sn-Rinse). The samples were submitted to abrasion by immersing them in toothpaste slurry for 2 minutes and brushing with 20 toothbrush strokes. After the abrasive challenge the samples were either rinsed with tap water (TW) or Sn-Rinse (10 mL, 2 min, 25 ° C; under constant shaking 70U/min). Later, the enamel samples were individually submitted to erosion (2 min in 30 mL 1 % citric acid, pH= 3.6, 25 °C; under constant shaking 70U/min) once a day. Surface microhardness (SMH) was measured initially and after every abrasion/-rinse and erosion (10 g force for 10s). Also, enamel substance loss was measured with new 200 g force indentations made before each abrasion and re-measured soon after. Brunner-Langer F1_LD_F1 and Wilcoxon Rank tests were used for analysis.
Results: Samples in both groups behaved differently over the time of experiment, loosing SMH to different degrees (p<0.001). The samples in the Sn-Rinse group lost less SMH than those in the TW group (p<0.001). Substance loss occurred in both groups due to abrasion, but it was significantly greater in the group rinsed with tap water compared to the Sn-rinse group (p=0.040).
Conclusion: Although both groups had some surface softening and substance loss, the combination of tin-, fluoride- and chitosan containing toothpaste and the tin-containing rinse promoted a significantly lower enamel softening and substance loss, providing a better efficacy in the prevention against early enamel erosion and toothbrush abrasion.
The authors appreciate the support of the University of Bern and GABA International AG, Therwil, Switzerland.

090

Category: Preventive Dentistry

VALIDATION OF THE HAS CARIES RISK EVALUATION METHOD OF IN A POPULATION OF *6 YEARS-OLD* SCHOOL CHILDREN IN FRANCE

Clara Joseph[1], Denis Bourgeois[2], Michèle Muller-Bolla[1]
[1]Nice Sophia Antipolis university, [2]Claude Bernard-Lyon 1 University, France

Objective: The aim of this study was to answer the HAS request regarding the individual caries risk evaluation method they published in 2005, which was based on an Evidence based dentistry method (international studies were included). This method was evaluated in a French population.
Methods: A prospective study on 341 six years-old children in elementary schools of the Alpes-Maritimes over 2 years, was carried out. The constitution of the sample was made by stratification (rural, urban and sensitive zone). All factors identified by the HAS were recorded with a clinical examination (using ICDAS for the diagnosis) and a questionnaire for children and parents. The judgment criterion was "the development of new carious lesions" at two diagnosis thresholds: any caries (ICDAS code 1 to 6) and only cavitated lesion (ICDAS code 5 to 6). Univariate and multivariate logistic regression analysis were conducted considering the 14 risk factors identified by the HAS as independent variable.
Results: The identified caries predictor depends on the caries diagnosis level chosen. When considering the development of at least one caries (ICDAS 1–6), "presence of at least one caries (ICDAS code 1 to 6) at the beginning of the study" was the only significant variable (3.25 [1.85, 5.70]). Whereas, "sugary snacks consumption" was only associated with the development of cavitated lesions (2.81 [1.34, 5.90]). The other factors were not significantly associated with the dependent variables.
Conclusion: According to the HAS method, 80.6 % of the children were at high caries risk. This method over-evaluates the high caries risk population. The number of factors should be reduced and more precise to improve its relevance. The severity of caries should also be considered.

098

Category: Preventive Dentistry

DENTAL INJURY EXPERIENCE AND MOUTHGUARD KNOWLEDGE OF BASKETBALL PLAYERS AND COACHES IN ISTANBUL, TURKEY

Murat Tiryaki[1], Gunce Saygi[1*], Sevda Ozel[3]
[1] Department of Operative Dentistry, Faculty of Dentistry, Istanbul University
[2] Department of Biostatistics and Medical Informatics, Faculty of Medicine, Istanbul University, Turkey

Objective: The objective of the study was to determine the occurence of dental injuries and to survey the players' and coaches' awareness concerning the use of mouthguards during basketball trainings and games in Istanbul, Turkey.
Methods: An 11 item questionnaire was designed and tested with licensed basketball players and coaches, all of whom were exposed to dental injury risks continuously. The questions were focused on the frequency of the dental injuries, attitudes and knowledge of the players and coaches on the subject of using mouthguard. Data was calculated with using descriptive statistics and chi-square tests.
Results: 53 coaches (aged 18–69) and 351 players (aged 13–38) participated in the questionnaire. 124 players (35 %) had suffered from oral injuries including soft tissue lacerations (80.6 %), fractures (17.7 %) and avulsions (1.6 %). Although basketball players had sustained dental injuries and 95 % of them reported mouthguards to be protective, only 6.3 % of them (22 players) used mouthguard. The rate of using mouthguards among players who had experienced an oral injury was significantly increased compared to those without any history of injury ($p<0.05$). The most common reason for not using a mouthguard was stated to be due to discomfort during wearing (37.7 %), difficulty with breathing (7.3 %), and speaking (6.4 %). Both, the coaches (56.6 %) and players (54.1 %) had reported basketball as a medium risk sports activity. Eventhough 98 % of coaches believed that the mouthguards could be preventive against dental injuries, only 47 % of them suggested mouthguards to their players.
Conclusion: This study showed that the use of mouthguards among basketball players is very rare, and coaches' knowledge about mouthguards is inadequate in Istanbul. Consequently, more information and education are required through sports associations and dentists, not only for players but also for coaches.

099

Category: Preventive Dentistry

SCANNING ELECTRON MICROSCOPY STUDY ON THE EFFECTS OF TYPES OF ABRASIVES IN EXPERIMENTAL SN/F/CHITOSAN TOOTHPASTES ON ERODED ENAMEL

Carolina Ganss[1], Matthias Jung[1], Joachim Klimek[1], Nadine Schlueter[1]
[1]Dental Clinic, Department of Conservative and Preventive Dentistry, Justus-Liebig-University, Giessen, Germany

Objective: A Sn/F/chitosan toothpaste is markedly effective against enamel erosion/abrasion. The mode of action is assumed to be the incorporation of the Sn-ion into enamel and the adsorption of chitosan building protective layers. The role of abrasives, however, is not very well understood. They may not only interact with Sn^{2+}, but could impact the surface structure as well as the precipitation/adsorption of active ingredients. To contribute to understanding of the complex interaction of such chemical and physical processes the study sought to investigate the surface microstructure of eroded enamel after brushing with experimental Sn/F/chitosan toothpastes with different types of abrasives.
Methods: Samples ($n=15$) were eroded (10 days, 0.5 % citric acid; 6× 2 min/day), immersed in toothpaste slurries (2×2 min/day) and brushed for 15 s within this time. Toothpastes (3500 ppm Sn^{2+}, 1400 ppmF^-, 0.5 % chitosan) contained 20 % silica or 20 % polyethylene, one formulation contained active ingredients, but no abrasives, the placebo contained 20 % silica but no active ingredients. Scanning electron microscopy was performed at x1500, element analysis (Sn, C; wt%) was done by Energy-Dispersive-X-ray-spectroscopy, tissue loss (μm) and surface roughness (Rz) were measured profilometrially.
Results :

	Microstructure	Rz	Loss	Sn	C
No abrasives	Distinct smooth coating, where this coating was lost, signs of etching pattern or coarse surface	2.3± 0.7[a]	3.1± 1.5[a]	8.57± 1.89[a]	14.04 ±2.0[a]
Silica	Blurred etching pattern, smooth surface, minor signs of precipitation	2.5± 1.7[a]	4.0± 1.6[a]	3.33± 0.55[b]	8.5± 1.8[b]
Polyethylene	Distinct etching pattern	2.5± 0.3[a]	2.4± 1.0[a]	3.02± 0.25[b]	10.6± 1.6c
Placebo	Distinct etching pattern, partly smeared	3.1± 1.2[a]	14.7± 1.8[b]		4.7± 0.5[d]

Different letters indicate significant differences within columns

Conclusion: Abrasives decreased Sn and C on the surface distinctly, and, depending on type, caused distinctly different surface morphologies, but these findings were not related to efficacy in terms of tissue loss indicating a very complex mode of action of the Sn/F/chitosan toothpastes.
Supported by GABA International

100

Category: Preventive Dentistry

IN VITRO TOXICITY OF COMBINATIONS OF PRE-TREATMENT AGENTS AND AN ADHESIVE SYSTEM IN A L929 FIBROBLAST BIOASSAY

Nadine Schlueter*[,1,2], Adrian Lussi[1], Carolina Ganss[2], Reinhard Gruber[1]
[1]Department of Preventive, Restorative and Pediatric Dentistry, University of Bern, Switzerland
[2]Department of Conservative and Preventive Dentistry, Dental Clinic, Justus Liebig University, Giessen, Germany

Objectives: The μTBS between a self-etching bonding system and dental hard tissues may be increased by the application of a tin chloride solution ($SnCl_2$, 35 %) as a pre-treatment agent instead of or in combination with phosphoric acid (H_3PO_4; 35 %). However, only little is known about the potential toxicity of combinations of these agents and the primer of the adhesive system.
Methods: The aim of the present study was to determine the in vitro toxicity of $SnCl_2$, H_3PO_4, the primer and combinations thereof at three concentration-levels (low, medium, high; 0.01–0.3 %) in a L929 fibroblast bioassay. Cell viability was determined by MTT assay. Cell morphology and their permeability for trypan blue were analyzed by light microscopy.
Results: At concentration-level low the single components and combinations thereof showed no reduction of cell viability. At concentration-level medium only the single components showed no effect on viability, whereas combinations thereof partially decreased it. The incubation of the single components at concentration-level high showed toxicity only for the primer, the combinations of the components showed reduction of viability in each case. In the trypan blue assay, the application of $SnCl_2$ on its own at medium and high concentration-levels and in combination with H_3PO_4 at medium concentration-level showed an increase of cell-membrane permeability indicating necrosis, however, the MTT assay revealed no decrease of viability. The reason for increase of cell-membrane permeability is currently not clear and has to be investigated in further studies.
Conclusion: $SnCl_2$, H_3PO_4 and the primer showed at higher concentrations additive toxic effects. This should be considered, if $SnCl_2$ and H_3PO_4 should be used as pre-treatment agents. Thorough rinsing prior to application of the primer can reduce the concentration of these agents and probably potential toxic effects.

107

Category: Preventive Dentistry

A PRELIMINARY STUDY ON EFFICACY OF CONE BEAM CT CONTRAST DENSITY MEASUREMENTS TO ASSESS IN VITRO ENAMEL EROSION

Gábor Nagy[1], Tamás Bányász[2], Melinda Madléna[3], Rita Mohácsi[4] János Angyal[4]
[1]Department of Oral Diagnostics, Semmelweis University, Budapest,
[2]Department of Physiology, University of Debrecen
[3]Department of Pedodontics and Orthodontics, Faculty of Dentistry, Semmelweis University, Budapest
[4]Faculty of Dental Sciences, University of Debrecen, Hungary

Objective: The aim of this study was to test the protective effects of Elmex® Erosion Protection anti-erosive mouth rinse on acid induced tooth material loss in vitro by CBCT and digital image analysis.
Methods: Enamel samples taken from crowns of 20 human impacted molars were embedded into resin blocks. Half of the enamel sample (cca. 3×3 mm) was covered by acrylate, and the other half was exposed to acidic challenge. During a 5 days period each specimen was immersed in 0.05 M citric acid, pH2.3, for 6×5 min daily, then rinsed with water and stored for the remaining time in remineralising solution. In test group after the first and last acidic attack, samples were treated for two minutes with Elmex® Erosion Protection anti-erosive mouthrinse (500 ppm fluoride from AmF and NaF). Each sample was scanned by a dental CBCT unit (3D Accuitomo-XYZ Slice View Tomograph J. Morita, Kyoto, Japan). After the 5th day each tooth was scanned by a dental CBCT unit (3D Accuitomo-XYZ Slice View Tomograph J. Morita, Kyoto, Japan). The radiographic pictures were digitally analyzed to compare the linear densitometric profile of the control and treated sides.
Results: The acid treated sides of samples exhibited significantly lower enamel density values by CBCT in both groups than that seen on control sides. In the anti-erosive mouthrinse treated group differences were smaller indicating either effective protection or more complete remineralization.
Conclusion: These findings are in good correlation with our previously published profilometric study, showing the beneficial effect of some antierosive rinses. Based on this preliminary study, CBCT could be a potential, promising method to assess density changes in dental erosion in vitro, but further examinations with higher sample numbers are needed.

131

Category: Preventive Dentistry

ANALYSIS OF EFFICIENCY OF DIFFERENT TOPICAL FLUORIDATION PROTOCOLS BY XPS CHARACTERIZATION OF DENTAL ENAMEL

Larissa Bubnowicz[1, 2], Victor Gong[2], Rodrigo França[2]
[1]The School of Dental Hygiene
[2]Dental Biomaterials Laboratory, Department of Restorative Dentistry. Faculty of Dentistry, University of Manitoba. Winnipeg, Canada

Objective: Topical fluoride application is used to increase the resistance of tooth enamel to acid erosion, the main contributing factor of tooth decay and dental caries. There is much debate as to which treatment time (1 or 4 minutes) and which topical fluoridated agent (gel or foam) is more clinically effective at chemically reacting free fluoride into the hydroxyapatite crystals of enamel. The aims of this research were to examine the influence of two different fluoride topical agents on the enamel tooth structure, to investigate the effect of application time of each topical fluoridated agent, to characterize the enamel nano-surface of non-fluoridated and fluoridated treatments, by determining the atomic percentages of its elemental composition, and to assess the penetration depth of the fluoride solutions ions within the surface layers of the enamel.
Materials and methods: Enamel tooth samples (n=6) were randomly selected and fragmented. Two topical fluoridated agents (1.23 %F ion) were used: 1) Gel: PCxx Professional, (Ross ChemPharm); 2) Foam: Oral B Minute Foam (Oral B), at two treatment application times, 1 and 4 minutes. X-ray photoelectron spectroscopy (XPS) technique was utilized to characterize the enamel nano-surface of the samples to a profile depth of 0, 10, 20 and 30 nanometers.
Results: There is no statistically significant difference (ANOVA) between application times and between the two consistencies of fluoridated topical agents. However, the highest atomic percentage of elemental fluoride was discovered at a profile depth of 10 nm, within the surface layers of enamel, for both application treatments and for either topical fluoridated agent.

Conclusion: This research has demonstrated, at a nano-level that regardless of which application time (1or 4 min), fluoride agents (gel or foam) are equally beneficial; there is no statistical difference.

134

Category: Preventive Dentistry

SELF REPORTED ORAL HYGIENE, ORAL HEALTH PROBLEMS AND USE OF DENTAL SERVICES IN TURKISH PREGNANT WOMEN

Esma Demirezen (PhD, MSc., RN)*[1], Murat Tiryaki (PhD,DDS)[2], Ozlem Karabulut (CNM)[3]
[1]Health Science Faculty, Department of Midwifery, Istanbul University
[2]Department of Operative Dentistry, Faculty of Dentistry, Istanbul University
[3]Turkish Ministry of Health, Zeynep Kamil Women and Child Diseases Education and Research Hospital, Istanbul

Objective: The objective of this study was to determine oral hygiene habits, oral health problems, use of oral health care services in Turkish pregnant women.
Methods: In this cross-sectional study, data were collected from pregnant women (n:408) visiting the prenatal care unit at state hospital in Istanbul. A questionnaire including sociodemographics, pregnancy informations, oral hygiene habits, oral health problems and use of oral health care services were used. Illiterate women were assisted by the researcher. Data were analysed by using the SPSS 15 Package program.
Results: Mean age was 28.58±5.43, with 25.30±8.62 pregnancy weeks and 2.06±1.20 times pregnancy, 2 % (n:8) were illiterate. Oral hygiene covered 44.4 % teeth brushing in the morning and evening, 17.9 % only in the morning, 13.2 % rarely, 6.6 % morning, noon and evenings; average daily teeth brushing were 1.59±0.80 times daily, other hygiene attitudes was mouthwash with water (53.9 %), teeth friendly chewing gum (22.51 %), dental floss (15.9 %), antiseptic mouthwash (14.5 %) and use of traditional miswak cleaning stick (4.7 %). Dental problems were gingival bleeding (45.8 %),gingival sensitivity (26.5 %), dental pain (25.2 %), caries (15.4 %), gingival swelling (11 %), gingival recession (9.1 %), erythema (9.1 %) and gingivitis (6.1 %). Not knowing the feasibility of dental treatment in pregnancy was common (72.8 %) , 6.9 % routinely visit their dentist every 6 months, in pregnancy 10.3 % had dentist visit and treatment (9.3 %).Main reasons for not visiting the dentist were stated as "no complains"(29.2 %), "no constant dentist" (27.2 %), "knew that oral dental problems are pregnancy related" (25.5 %), "not knew the need for dental visit in pregnancy" (22.8 %),"thought that no dentist can make any dental treatment during pregnancy"(19.9 %). Having routine dental control were not significant between education, economic level groups and being insured ($p>0.05$).
Conclusion: Oral health problems in pregnancy are common, the awareness of periodic oral examination and treatment possibilities in pregnancy are low. Awareness can be increased by health education programs.

151

Category: Preventive Dentistry

EVALUATION OF RISKS FACTORS OF DENTAL EROSION IN SEVERE EATING DISORDERS: A CLINICAL STUDY

A. Pallier[1], A. Ali[2], N. Godart[2], P. Colon[1]
[1]Faculty of Dentistry, University of Paris Diderot, AP-HP Rothschild Hospital
[2]Institut Mutualiste Montsouris, France

Objective: Dental erosion has been demonstrated to be strongly correlated with severe eating disorders. The vital prognosis is often critical with severe anorexia justifying hospitalization. Prevention could be useful when patients are hospitalized in psychiatric units, if individual risk factors could be determined. To evaluate the use of questionnaires completed by the patients with a body mass index (BMI) ≤ 15, in order to evaluate risk factors of dental erosion at the end of their hospitalization.
Methods: This clinical study was approved by the ethical committee of Paris Ile de France III N° 2530. Questionnaires were prepared to evaluate previous dental care, habits, oral hygiene, food, drinks, vomiting habits, sensitivities. Patients were divided into 2 groups : 64 patients completed the questionnaires. With a dental examination and discussion between the dentist and patient confirmed information provided. Overall, 242 other patients completed the questionnaires without any dental appointment. Statistical analysis was conducted for each group. In addition, we focused on the correlation between the 2 groups to evaluate the impact of avoiding the dental appointment in the identification of risk factors.
Results: Most of young patients had no sign of dental erosion. However, some specific habits well known as main risk factors of dental erosion were identified: acidic beverages and food, drugs affecting saliva flow, traumatic tooth brushing habits, vomiting and gastro esophageal reflux. Risk factors were mainly associated and this is a specific datum. Statistical analysis demonstrated good correlation of data between the two groups indicating that the dental appointment can be avoided.
Conclusion: Some risk factors in severe eating disorders were identified before the first erosive lesion appear, and specific individual recommendations for prevention were made using the opportunity of hospitalization.

202

Category: Preventive Dentistry

EFFECTS OF SONIC AND ULTRASONIC SCALING ON THE MICROLEAKAGE OF TOOTH-COLORED RESTORATIVE MATERIALS

Yachkovska Yanka, Coero Borga Francesco Andrea, Pasqualini Damiano, Berutti Elio, Scotti Nicola
University of Turin, Department of Surgical Sciences, Dental School, Italy

Objective: The aim of this study was to evaluate the influence of sonic and ultrasonic scaling on microleakage of tooth-colored restorative materials.
Methods: 18 mandibular molars, extracted for periodontal reasons, were selected for this study. A total of 36 class II cavities were prepared: 18 with the cervical margin 1 mm above the CEJ; 18 with the cervical margin 1 mm under the CEJ. Cavities were divided according to the restoration material: subgroup 1 ($n=9$) 1 mm of flowable composite and nanohybrid composite, subgroup 2 ($n=9$) nanohybrid composite.
All filled cavities were divided in six subgroups ($n=6$): 1, flow + composite + ultrasonic scaling; 2, flow + composite + sonic scaling; 3, composite + ultrasonic scaling; 4 composite + sonic scaling; 5, flow + composite; 6, composite. Sonic and ultrasonic scaling was performed under a calibrated load of 100 g at a constant speed for 5 minutes on each tooth-restoration surface. Samples were immersed in methylene blue for 30 minutes and subsequently washed under running water for 10 minutes. The specimens were sectioned, observed under stereomicroscope at 40x magnification and a 0 to 3 score was given. The microleakage values were statistically analysed using one-way ANOVA test and Bonferroni test as needed.
Results: The statistical analysis did not show any significant differences between groups.
Conclusion: Within the limitations of an in vitro study we can conclude that the use of sonic or ultrasonic scaling do not influenced the microleakage at enamel- and dentin-composite interface, either with or without flowable material.

212

Category: Preventive Dentistry

ORAL HEALTH IN HUMAN SCULLS FROM TWO ANCIENT NECROPOLISES OF ANTIQUE PERIOD OF DARDANIA

Ferit Koçani[1], Blerim Kamberi[1], Mimoza Ahmetaj[2], Metush Disha[3]
[1]Conservative Dentistry and Endodontics, Prishtina University/Faculty of Medicine/Stomatology, Prishtina Kosovo
[2]Orthodontics, Private Clinic, Prishtina, Kosovo
[3]Peridontology, Prishtina University/Faculty of Medicine/Stomatology, Prishtina, Kosovo

Objective: To describe and determine the presence, frequency of caries, periapical lesions, periodontal disease, antemortem tooth loss, and tooth wear in permanent dentition of human skulls from two ancient archeological locations, antique period of Dardania, today Kosovo.
Methods: Twenty one human skulls from two ancient archeological necropolises (Vendenis and Municipium Dardanorum DD) were included in the analysis of samples for this study. A total of 498 teeth were present in all human skulls. The skulls (with their accompanying teeth) were then divided into groups according to locality of origin, age and sex. Macroscopic (observational) analysis of the teeth relied on inspection and exploration of the teeth in their totality. The classification system that was used to rate tooth wear was Tooth Wear Index (TWI). Statistical analysis used: Chi-test for small samples was used to evaluate the observations obtained from the study. Multiple Logistic Regression Analysis was not performed due to the small number of teeth and the content of zero values in respective age groups
Results: The results show that out of total 498 teeth, 89.35 % had attrition and 10.65 % had no attrition or Grade 0 TWI. 21.48 % were Grade 1, 28.71 % Grade 2, 26.90 % Grade 3, 7.42 % Grade 4 and 4.81 % Grade 5.
Conclusion: Comprehensive analysis reveals that the teeth with no abrasion have been in function for a very short time following their eruption; in fact, they have suffered tooth wear immediately after eruption. Over the third of the teeth fit into Grade 2 and 3 of attrition and with such high grade of abrasion they have retained their qualitative function and powerful mastication. Grade 2 and higher rate of attrition, was predominantly present in first permanent molars.

217

Category: Preventive Dentistry

DETERMINATION OF DENTAL CARIES WITH CLINICAL EXAMINATION AND AC IMPEDANCE TECHNIQUE

Renata Chałas, Dominika Piątek, IlonaWójcik-Chęcińska, Joanna Zubrzycka-Wróbel, Teresa Bachanek
Department of Conservative Dentistry and Endodontics, Medical University of Lublin, Poland

Objective: The aim of the study was to determine dental caries clinically and characterize its bio-impedance to gain detailed information about the progression of the process.
Methods: 50 extracted human permanent premolars and molars were used in this in-vitro experiment. Teeth were unrestored and undamaged, expect of caries. Their occlusal surfaces were examined by dentists according to Universal Visual Scoring System (UniVISS) and assessed with CarieScan PRO™. The results were coded and evaluated statistically.
Results: The obtained results of visual evaluation and probability of caries lesion appearance have embraced all measurement ranges of values. It was from 5 to 100 for CarieScan, and from 0 to 3 L for UniVISS. The statistical analysis revealed that clinical examination and AC impedance measurements showed differences in impedance depending on changes and stages in caries progress.
Conclusion: Our preliminary results from this in-vitro experiments with human teeth indicate that AC impedance may be a useful additional aid for caries diagnosis together with clinical examination.

025

Category: Student's Session

EFFECT OF DENTAL BLEACHING ON HYDROXYAPATITE SOLUBILITY AND SALIVARY PROTEIN ADSORPTION

Najlaa Yousef Qusti[1], Steven Brookes[1], Paul Brunton[1]
[1]The University of Leeds, Leeds Dental Institute, UK

Objective: Controversy surrounds whether peroxide bleaching demineralises or modifies tooth surfaces. Nothing is known about how bleaching may predispose enamel to subsequent acid challenges or how it may affect the adsorption of protective salivary proteins. The main objective is to evaluate the affect of hydrogen peroxide (H_2O_2) on the acid resistance of hydroxyapatite (HAP) and the adsorption of salivary proteins.
Methods: Synthetic HAP was exposed to 35 % H_2O_2 for 1 hour while controls were exposed to distilled water. The HAP was then challenged with 10 mM acetic acid and the mineral dissolved assessed by the spectrophotometric determination of phosphate released into the acid. This experiment was repeated with the inclusion of a step whereby salivary proteins were adsorbed onto the HAP prior to the acid challenge. In addition, salivary proteins adsorbed to both peroxide and water treated HAP was desorbed with 0.1 M phosphate buffer and analysed using SDS-PAGE and, for protein identification, using mass spectrometry.
Results: There were no significant differences, in terms of mineral loss, between peroxide and water treated HAP when subjected to an acid challenge. Adsorbed salivary proteins significantly reduced mineral loss from peroxide and water treated HAP by 26 % and 19 % respectively ($P<0.005$). SDS-PAGE revealed that peroxide treated and water treated HAP adsorbed salivary proteins differentially. The greater protection afforded by salivary proteins adsorbed to peroxide treated HAP was significant ($P<0.05$).
Conclusion: Bleaching treatment did not affect the acid resistance of HAP but did alter the adsorptive properties. The spectrum of salivary proteins adsorbed to peroxide treated HAP conferred a greater protective effect against acid dissolution than the proteins adsorbed to water treated HAP controls. Results suggest that hydrogen peroxide does not have a deleterious effect on the acid resistance of HAP and may enhance the protective effect of adsorbed salivary protein. Further work is required to identify how hydrogen peroxide modifies the adsorptive properties of HAP.

049

Category: Student's Session

SUSCEPTIBILITY OF DIFFERENT RESTORATIVE MATERIALS TO TOOTHBRUSH ABRASION AND COFFEE STAINING

Daniela Kuster[1], Adrian Lussi[1], Tamara Koch[1], Brigitte Zimmerli[1]
[1]Department of Preventive, Restorative and Pediatric Dentistry, School of Dental Medicine, University of Bern, Switzerland

Objective: The aim of this study was to evaluate the susceptibility of different restorative materials to surface alterations after an ageing simulation.
Methods: Specimens ($n=15$ per material) of five different restorative materials (CER: ceramic/Vita Mark II; EMP: composite/Empress

Direct; LAV: CAD/CAM composite/Lava Ultimate; COM: prefabricated composite/Componeer; VEN: prefabricated composite/Venear) were produced. Whereas CER was glazed, EMP and LAV were polished with silicon polishers, and COM and VEN were left untreated. Mean roughness (Ra and Rz) and colorimetric parameters (L*a*b*), expressed as colour change (ΔE), were measured. The specimens underwent an artificial aging procedure. After baseline measurements (M1), the specimens were successively immersed for 24 hours in coffee (M2), abraded in a toothbrushing simulator (M3), immersed in coffee (M4), abraded (M5) and repeatedly abraded (M6). After each aging procedure (M2-M6), surface roughness and colorimetric parameters were recorded. Differences between the materials regarding Ra/Rz and ΔE were analysed with a nonparametric ANOVA analysis. The level of significance was set at $\alpha=0.05$.
Results: The lowest roughness values were obtained for CER. A significant increase in Ra was detected for EMP, COM and VEN compared to CER. The Ra/Rz values were found to be highly significantly different for the materials and measuring times (M) ($p<0.0001$). Regarding ΔE most alterations were found for EMP and COM, whereas CER and LAV remained mostly stable. The ΔE values were significantly different for the materials and M ($p<0.0001$).
Conclusion: The ceramic and the CAD/CAM composite were the most stable materials with regard to roughness and colour change and the only materials that resulted in Ra values below 0.2 μm (the clinically relevant threshold). Venears and Componeers were more inert than the direct composite material and thus might be an alternative for extensive restorations in the aesthetic zone.

087

Category: Student's Session

LONGEVITY OF CLASS II POST-ENDODONTIC DIRECT RESTORATIONS ON POSTERIOR TEETH: A RETROSPECTIVE CLINICAL STUDY

Carpegna Giorgia, Eruli Cristina, Alovisi Mario, Pasqualini Damiano, Berutti Elio, Scotti Nicola
University of Turin, Department of Surgical Sciences, Dental School, Italy

Objective: The aim of this retrospective clinical study was to evaluate the longevity of endodontically treated teeth restored with direct resin composite, with or without the insertion of fiber posts. The null hypothesis is that direct restorations with fiber post better perform than without fiber post.
Methods: Patients recruited for this study were all treated in the Department of Cariology and Operative Dentistry (University of Turin) between 2006 and 2010. 142 patients with 188 endodontically treated posterior teeth, restored with direct resin composite, were recalled for a control visit. Only Class II cavities were considered. Two groups were defined based on the absence (Group A) or presence (Group B) of fiber post. Failures and complications, such as periodontal failure, endodontic failure, tooth extraction, root fracture, post fracture, post debonding, replacement of restoration, crown displacement, and coronal-tooth fracture were noted. Functional restorations quality was evaluated following modified USPHS criteria. Data were statistically evaluated with ANOVA test.
Results: Group A comprised 98 patients with 108 restorations (38 premolars and 70 molars); the mean observation period was 34.44 months. Group B comprised 72 patients with 80 restorations (52 premolars and 28 molars); the mean observation period was 31.37 months. Results of restoration longevity evaluation are expressed, as percentage, in table 1. Within quality evaluation, Alpha and Beta values in the two groups were comparable, while Charlie and Delta values were significantly more present in Group A (Charlie=8,82 % and Delta=7,35 %) than in Group B (Charlie=2,38 and Delta=0 %).

	GROUP A			GROUP B		
	2nd class OM/OD	2nd class MOD	TOTAL	2nd class OM/OD	2nd class MOD	TOTAL
Tooth extraction	0 %	0 %	**0 %**	0 %	2.44 %	**2.44 %**
Expected extraction	3.08 %	1.54 %	**4.62 %**	0 %	0 %	**0 %**
Root Fracture	0 %	1.54 %	**1.54 %**	0 %	0 %	**0 %**
Post Fracture	0 %	0 %	/	0 %	0 %	**0 %**
Post Debonding	0 %	0 %	/	0 %	0 %	**0 %**
Expected replacement	4.61 %	3.08 %	**7.69 %**	0 %	0 %	**0 %**
Coronal Fracture	0 %	1.54 %	**1.54 %**	2.44 %	0 %	**2.44 %**
Composite Fracture	4.61 %	0 %	**4.61 %**	0 %	0 %	**0 %**
Restoration replaced with crown	3.51 %	5.72 %	**9.23 %**	2.81 %	4.61 %	**7.32 %**
Functional Restoration	55.39 %	24.61 %	**80 %**	68.29 %	26.83 %	**95.12 %**
Endodontic Lesion	0 %	1.54 %	**1.54 %**	0 %	0 %	**0 %**
Periodontal Lesion	0 %	0 %	**0 %**	0 %	0 %	**0 %**

Conclusions: The null hypothesis was accepted because direct post-endodontic restorations with fiber post better performed than restorations without post after three year of masticatory function.

105

Category: Student's Session

POSTERIOR VITAL TOOTH CORONAL RESTORATION: A SURVEY IN A POPULATION OF FRENCH GENERAL DENTAL PRACTITIONERS

Vanessa Gaillard[1], Caroline Darbin-Luxcey[2,3], Reza Arbab-Chirani[2,3], Valérie Chevalier[2,3]
[1] Private practice, Rennes
[2] CHRU-Service d'Odontologie, Brest
[3] UBO-Faculté d'odontologie, Brest, France

Objective: For a few years, the use of composites for direct posterior restorations has increased with the improvement of adhesion, of composites materials and of aesthetic request. However, the best way to restore posterior vital teeth still is a controversial subject of debate to this day. The aim of this study is to assess the current clinical practices for posterior restorations of vital tooth in a population of French dental practitioners.
Methods: 160 anonymous questionnaires of 34 questions have been sent to dentists practicing in Bretagne (French north west region). Three zones in Bretagne were surveyed: "Finistère", "Ile et Vilaine", "Other". A statistical analysis was made (Khi-2 test and Fisher test).

Results: The response rate is 61 % (97 responses). The practitioners of the sample use composite (95 %), amalgam (75 %) and glass ionomer cements (67 %) for direct restorations. Amalgam is more employed to fill molars than premolars and is significantly more employed in Finistère than in Ille et Vilaine. 53 % of the practitioners don't disinfect the cavity before filling it. 80 % of the dentists never use rubber-dam when they fill a cavity with amalgam and 60 % never use it with composite. M&R2 and SAM1 bonding systems are the most usual ones, with a frequency of use of respectively 40 % and 28 %. Only 58 % of the practitioners use inlays-onlays to restore a vital posterior tooth.

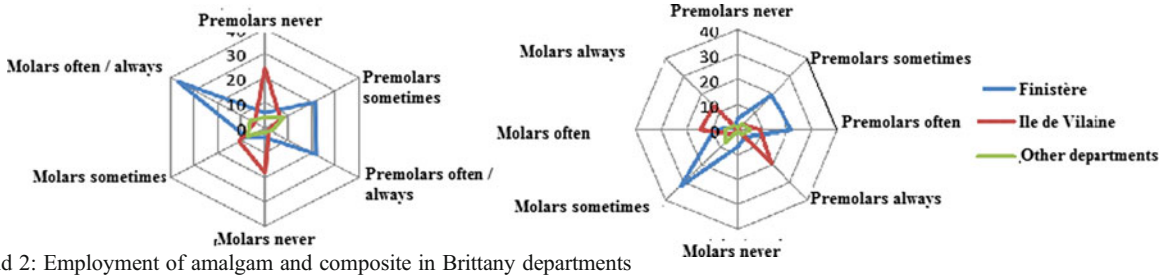


Fig 1 and 2: Employment of amalgam and composite in Brittany departments

Conclusion: Composite materials are more and more used, even if there is a significant difference among geographical zones. There is a gap between the recommendations and the realisation of the dental treatment. It will be interesting to make further and larger investigations.

Gilmour ASM, Latif M, Addy LD, Lynch CD. Placement of posterior composite restorations in United Kingdom dental practices: techniques, problems, and attitudes. International Dental Journal. 2009; 59:148-154

109

Category: Student's Session

REPARATIVE DENTINOGENESIS : DO BACTERIAS INDUCE TERTIARY DENTINE?

Gabriel Magnucki[1,2], Tarek Mustafa[3], Alexander Navarete-Santos[4], Christian Gernhardt[1], Hans-Günter Schaller[1], Cuong Hoang-Vu[2]

[1]Department of Operative Dentistry and Periodontology, University School of Dental Medicine, University of Halle-Wittenberg, Halle (Saale), Germany

[2]Department of General, Visceral and Vascular Surgery, Faculty of Medicine, University of Halle-Wittenberg, Halle (Saale), German

[3]Department of Oral and Maxillo-Facial Surgery, Faculty of Medicine, University of Magdeburg, Magdeburg, Germany

[4]Department of Cardiothoracic Surgery, Faculty of Medicine, University of Halle-Wittenberg, Halle (Saale), Germany

Objective: Carious lesions are induced by bacterial destruction, as demonstrated by Miller in the year 1890. Upon the micro-bacterial invasion, reactionary dentine is secreted by primary odontoblasts. After the apoptosis of these odontoblasts, progenitor cells differentiate to odontoblast-like and produce fibro-dentine to protect the dental pulp against contamination. These mesenchymal stem cells were firstly isolated by Gronthos in 2000. Therefore, the aim of our study was to elucidate the effects of the bacterial components LPS and Pam_3CSK_4 on the odontoblastic differentiation and proliferation of human dental pulp stem cells (DPSC).

Methods: At first, we isolated DPSC from human third molars and FACS-sorted them with the marker STRO-1. Afterwards we stimulated the cells with the bacterial toll-like receptor (TLR)-Ligands and investigated the odontoblastic differentiation with the markers DSP(P) and DMP1 by PCR, western-blot and immunohistochemistry. The mineralization was detected with Alzarin-red S. The intracellular activated cascades were analysed by ELISAs. Finally, we tested the mitotic activity of DPSCs after the treatment with LPS and Pam_3CSK_4 by MTT-assay.

Results: After the confirmation of the stem cell characteristics we demonstrated the expression of TLR on DPSCs. After 7 d of stimulation DSP(P) and DMP1 were increased compared to untreated DPSCs confirmed on mRNA- and protein-level. Furthermore, the mineralization was increased upon the treatment with LPS and Pam_3CSK_4. After 14 and 21 days of treatment the odontoblastic markers declined. The TLR-Ligands induced intracellular JNK- and p38-pathways. But the proliferation rate was unaffected.

Conclusion: Low-dose of bacterial agents were able to induce an initial differentiation of mesenchymal stem cells to odontoblast-like cells. Hereby the p38 and JNK-pathways were activated. In future strategies of regenerative endodontics and direct pulp capping procedures this data could be useful for the induction of tertiary dentinogenesis.

140

Category: Student's Session

TOXICITY EVALUATION OF TWO DENTAL COMPOSITES: 3D CLSM TIME-LAPSE IMAGING OF CELL BEHAVIOUR CLSM FOR COMPOSITE BIOCOMPATIBILITY EVALUATION

Nina Attik[1], Nelly Pradelle-Plasse [2], Doris Campos[1], Pierre Colon[2] and Brigitte Grosgogeat[1,3]

[1]LMI; UMR CNRS 5615, Université Lyon1, Villeurbanne, France

[2]UFR d'Odontologie, Université Paris Diderot; APHP, Hôpital Rothschild, Service d'Odontologie, Paris, France

[3]UFR d'Odontologie, Université Lyon1 ; Service de Consultations et de Traitements Dentaires ; Hospices Civils de Lyon, Lyon, France

Objective: The purpose of this study was to investigate the *in vitro* biocompatibility of two available dental composites (namely A and B)

with a similar chemical composition which are used for direct restoration using innovative 3-dimensional Confocal Laser Scanning Microscopy (CLSM).
Methods: Time-lapse imaging was performed on cultured human gingival fibroblast-like cells (HGF-1) after staining, using Live/Dead®. Image series were obtained with a FV10i confocal biological inverted system. Resazurin assay was used to confirm the active potential of composites in cell metabolism.
Results: Image analysis showed a higher mortality rate in the presence of composite A than composite B. The viability rate decreased in a time-dependent manner during the 5 hours of exposure. Morphological alterations were associated with toxic effects; cells were enlarged and more rounded in the presence of composite A as shown by F-actin and cell nuclei staining. Resazurin assay was used to confirm the active potential of composites in cell metabolism; results showed severe cytotoxic effects in the presence of both non light-curing composites after 24 h of direct contact. However, extracts of polymerized composites induced a moderate decrease in cell metabolism after the same incubation period. Composite B was significantly better tolerated than composite A at all investigated end points and all time points.
Conclusion: Our findings highlighted the use of 3D CLSM time-lapse confocal imaging as a sensitive method to distinguish the biocompatibility behavior of two composites based on similar methacrylate monomers. The tolerability of the selected composites was qualitatively and quantitatively evaluated. This confirms the need to choose adequate investigation methods when biocompatibility of dental materials is assessed in vitro.

142

Category: Student's Session

EVALUATION OF INTERFACIAL FRACTURE WITH TWO DENTIN ADHESIVES

Hazem Abouelleil [1,2], Cyril Villat [1,2], Nina Attik[1], Brigitte Grosgogeat [1,3], Pierre Farge [2]
[1]Laboratory of multimaterials and interfaces (CNRS UMR 5615), Lyon 1, France
[2]Department of dentistry and endodontics, Faculty of Odontology, France
[3]Department of biomaterials, Faculty of Odontology, France

Objectives: The aim of this study was to concentrate all the loading forces of a bond strength test on the dentin-adhesive interfaces either with an etch-and-rinse or a one-step self-etch adhesive system; the results were compared to that of a glass ionomer cement, used as a control.
Methods: Superficial and deep dentin discs were prepared from freshly extracted permanent third molar teeth and bonded to a one etch-and-rinse adhesive (Adper™ Scotchbond) or to a one-step self-etch adhesive (Adper™ Easy Bond 3 M) or to a glass ionomer cement (GC Fuji IX). The 4 by 4 mm bonded areas were subjected to shear stress using a sharp blade forced perpendicularly. Bond strength and crack length measurements were obtained. Fracture morphology was observed using scanning electron microscopy. Statistical analysis of the data was conducted with the SPSS software.
Results: Deep and superficial dentin bond strength for the etch-and-rinse adhesive (Adper™ Scotchbond 3 M), showed a statistically significant difference. This was not true for the glass ionomer cement (GC Fuji IX). Crack length measurements were significantly higher for the self-etch adhesive (Adper™ Easy Bond 3 M) than with the etch-and-rinse adhesive (Adper™ Scotchbond 3 M), and the glass ionomer cement (GC Fuji IX). Scanning electron microscopy demonstrated cohesive failures inside the adhesive layer for both adhesive types.
Significance: Using an experimental set up targeting the forces solely on the adhesive layer, Adper™ Easy Bond showed a higher resistance to fracture than Adper™ Scotchbond and GC Fuji IX. The test setup, with the thickened adhesive layer, made the results more dependent on the mechanical properties (stiffness) rather than on the adhesive properties of the adhesive material itself and reflects its ability to resist the fracture load.

148

Category: Student's Session

AETIOLOGICAL DIAGNOSIS OF DENTAL EROSION : KEYS FOR UNDERSTANDING

Katherine Semennikova[1], Alice Pallier[1], Pierre Colon[3]
[1]Service of Odontology, Rothschild Hospital, France
[2]Service of Odontology, Rothschild Hospital, France
[3]University Paris Diderot, Service of Odontology, Rothschild Hospital, France

Objective: Prevalence of dental erosion in today's population is in constant increase. Practitioners are exposed to see multiple erosive lesions, which causes need to be defined. A good anamnesis and careful observation of erosive lesions are essential for understanding erosion's aetiology. The objectives of this study are to evaluate the relationships between clinical expression of erosive lesions and their aetiology, in order to guide the diagnosis and the treatment planning.
Methods: Through several clinical cases, selected in a specialized consultation at Rothschild Hospital, a specific clinical examination and specific questions to define anamnesis of erosive lesions (vomiting aetiology, dietary origin, GERD and alcoholism origin, GERD origin) is used. Location, symmetry, bruxism are evaluated.
Results: 1) Dental erosions are difficult to define because of the association of aetiological factors. 2) Lesions are mostly asymptomatic except for advanced erosion associated with hypersensitivity. 3) Erosion with extrinsic origin (extrinsic acids) are found on facial side of maxillary anterior teeth, with major ravages on cervical zone. Ravages of cusps come in a second time. 4) Erosion with intrinsic origin affect lingual surface of the maxillary anterior teeth, with a progressive erasure of the dental relief. 5) Modifying factors can be associated as gastroesophageal reflux disease (GERD), bruxism or medication. GERD origin lesion present a specific profil with a destruction of the occlusal face of mandibular molars on only one side as other erosive lesion are mainly two-sided. A specific table is a help for the decision making.
Conclusion: Erosion's aetiology influences significantly their clinical appearance and location. Most often, dental erosion is a

multifactorial disease: a meticulous observation associated to a good knowledge of aetiopathogenical factors are the only efficient tools for an early detection and identification of all aetiological factors.

153

Category: Student's Session

MICRO-HARDNESS EVALUATION OF BULK-FILL RESINS COMPOSITES

Elena Manzon[1], Mario Alovisi[1], Damiano Pasqualini[1], Elio Berutti[1], Milena Cadenaro[2], Lorenzo Breschi[2], Nicola Scotti[1]

[1]University of Turin, Department of Surgical Sciences, Dental School

[2]University of Trieste, Department of Medical Sciences, Italy

Objective: The aim of this in vitro study was to evaluate the relationship between hardness and thickness of five different bulk fill resin composite materials. The hypothesis tested was that hardness decrease is directly related to bulk-fill composite thickness.

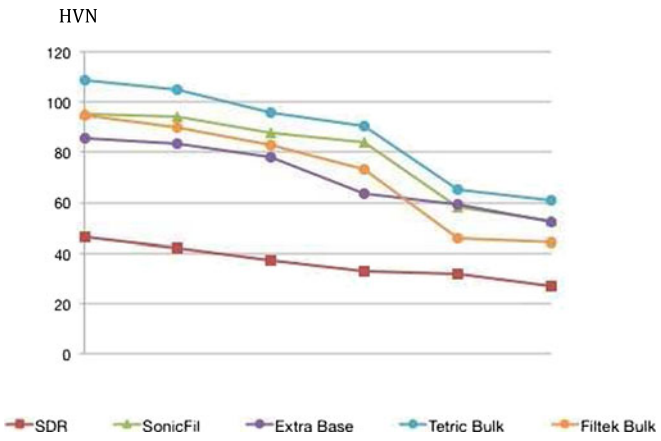
Methods: 50 specimens of bulk-fill resin composites were prepared with 5 different materials (N=10 each): SonicFill® (Kerr), Tetric Bulk® (Ivoclar), SDR® (Dentsply), Extra Base® (Voco), Filtek Bulk® (3 M ESPE). Composites were bulk-placed in semi-circular mould with 10 mm diameter and 6 mm depth. Light curing tip was placed in contact with the top surface of the sample and curing was performed for 40 s with a LED lamp (BluePhase 2). Vickers hardness was tested with a micro-indenter at top and bottom surfaces (4 measurements for each surface), and along the lateral side of the sample (6 measurements, one each mm) starting from the side in contact with the light curing tip. Top and bottom surfaces microhardness values were statistically analyzed with Two-Way ANOVA and Bonferroni test. Hardness progression along lateral side of each group was compared with Friedman test. Statistical significance was set at p=0.05.

Results: Means and standard deviations of Vickers hardness of the different groups are expressed in the table. In all groups, a significant difference between top and bottom surfaces was observed (p=0.001). The trend of mean measurements taken on the lateral surface is represented in graph 1. SDR progressive hardness decrease was significantly worst than for the other tested materials (p=0.021).

Material	Top Surface Microhardness	Bottom Surface Microhardness
SONICFILL	90,975	45,415
TETRIC BULK	106,41	45,23
SDR	54,97	28,905
EXTRA BASE	94,53	56,52
FILTEK BULK	97,67	36,945

Conclusion: The tested hypothesis was partially accepted because some bulk-fill materials tested showed a significant hardness decrease, which was directly correlated to thickness. Sonicfill, Tetric Bulk and Filtek Bulk showed that microhardness is not influenced by thickness up to 4 mm, while a significant microhardness decrease is observed from 4 to 5 mm.

Material	Top Surface Microhardness	Bottom Surface Microhardness
SONICFILL	90,975	45,415
TETRIC BULK	106,41	45,23
SDR	54,97	28,905
EXTRA BASE	94,53	56,52
FILTEK BULK	97,67	36,945



180

Category: Student's Session

ORAL HEALTH NEEDS AND STATE OF PROSTHETIC APPLIANCES AMONGST ELDERLY HOME RESIDENTS IN NORTHERN CROATIA

Emina Kabil, Larisa Music, Matej Par, Adnan Catovic
School of Dental Medicine University of Zagreb, Croatia

Objective: The human population is notably ageing and its demographic profile has strikingly changed in the past decades. Inadequate and sometimes insufficiently accessible healthcare for the elderly presents a significant problem in developing countries such as Croatia. Oral health is often unjustly neglected, not only by the elderly themselves, but unfortunately also by healthcare professionals, especially supporting and paramedical staff in geriatric care homes. A possible reason for the latter is a lack of information and knowledge of the specific needs and defining features of the geriatric population. The aim of this study was to assess oral health needs in the target elderly population—elderly residents of geriatric care homes.
Methods: A total of 110 participants were enrolled in this study from various geriatric care homes in northern Croatia. Clinical evaluation was carried out by three dental students who previously participated in training and standardization according to the WHO dental status criteria. Data from checkups and interviews comprising: dental and medical history, DMFT index, state of prosthetic appliances, oral hygiene and chewing ability index according to Yoshida et al., were filled out in specially designed questionnaires.
Results: The estimated average age of a prosthetic appliance was between 10 and 15 years. Approximately 40 % of participants were recorded as edentulous, whilst 15 % had 5 or less remaining teeth. Participants exhibited relatively poor oral hygiene, with approximately 20–25 % of them using toothbrush and toothpaste less than once every day or never and over 75 % never using a tongue cleaner. Extensive tooth loss reduced chewing performance and affected food choice, mean score of chewing ability being 2.2. Prosthetic appliances have shown worn masticatory surfaces, reduced denture retention and stability, due to the effects of alveolar bone resorption, indicating a normative need for replacement in more than 60 % of the examined appliances.
Conclusion: This study indicates a relatively low level of oral health amongst the elderly population and a subsequent need for its improvement by education of the elderly and healthcare paramedical and supporting staff in the geriatric care homes, through oral health promotion and programmes.

183

Category: Student's Session

EFFECT OF A NOVEL LIGHT-CURED MTA-LIKE MATERIAL ON DIRECT PULP CAPPING OUTCOME

Francesco Petrolo, Marco Scansetti, Mario Alovisi, Damiano Pasqualini, Elio Berutti, Nicola Scotti
University of Turin, Dept. Surgical Sciences, Dental School, Italy

Objective: Direct pulp capping is a treatment to preserve vital pulp and to induce the formation of reparative dentin within restorative material and pulp tissue instead of endodontic therapy. The aim of this *in vivo* study was to compare the clinical outcome of resin-based dental materials in direct pulp capping procedures.
Methods: Patients with asymptomatic primary carious lesions that showed a pulp exposure during cleaning procedures were recruited for this study. A total of 18 teeth were randomly treated with three different materials: Group 1 (n=8), two-step self-etch adhesive system (Protect Bond NT, Kuraray); Group 2 (n=5), glass-ionomer resin-cement (Fuji IX, GC); Group 3 (n=5), light-cured MTA-like material (TheraCal, Bisco). Each pulp capping treatment was performed according to the manufacturer's instructions. The restoration was completed with nanofilled resin composites (Filtek Supreme XTE, 3 M ESPE). The follow-up visit was made after one-week and 6 month, with a clinical (electric pulp test and thermal test) and a radiographic evaluation. The intergroup success criteria were analysed using a Kruskal-Wallis test in each follow-up period.
Results. After one week 6 teeth (75 %) of Group 1 presented hypersensitivity to cold stimulus, whereas in Group 2 and 3 all teeth were asymptomatic. At 6 months follow-up, Group 1 presented one pulpal necrosis (12,5 %), one symptomatic tooth (12,5 %) and 6 asymptomatic teeth (75 %); group 2 presented one tooth with hypersensitivity to cold stimulus (20 %); group 3 showed a clinical success rate of 100 %.
Conclusions: Vital permanent teeth with cariously exposed pulp can be treated successfully with light-cured MTA-like material. Further follow-up visits and an increased number of cases should be performed to validate these results.

188

Category: Student's Session

MICROLEAKAGE ANALYSIS AT ENAMEL/DENTIN-COMPOSITE INTERFACE WITH CONFOCAL LASER SCANNING MICROSCOPY: AN IN VITRO STUDY

Ventura Gabriele, Tempesta Riccardo, Alovisi Mario, Pasqualini Damiano, Berutti Elio, Scotti Nicola
University of Turin, Department of Surgical Sciences, Dental School, Italy

Objective: The aim of this study was to examine marginal microleakage either between composite and enamel, or between composite and dentin, with two different methods. The matched interfaces were controlled both with methylene blue infiltration and with confocal laser scanning microscopy (CLSM). The hypothesis is that (1) confocal laser spectroscopy better detect marginal microleakage at adhesive interfaces; (2) enamel finishing influences microleakage; (3) flowable composite better seals dentin substrate.
Methods: 16 non-carious extracted human molars were selected; occlusal enamel was removed with a diamond disc to obtain flat enamel-dentin surfaces. Samples were randomly divided into four groups as showed in the table. After 7 days, samples were sectioned to obtain sticks with a cross-sectional area of 1 mm^2. Each composite-tooth interface has been analyzed with two different methods. Method 1: samples were immersed in a methylene blue solution for 30 min at 25 °C, observed with a 40x stereomicroscope and scored with a 0 to 3 scale. Method 2: samples were infected with monoclonal biofilms of *Streptococcus mutans* NG8 over interfacial margins. After incubation, stained specimens have been assessed individually for bacterial penetration by CLSM. Six equidistant Z-stack series were captured along one side of each tooth-restoration interface through a C-Apochromat 63x/1.2 W (water-immersion) objective lens, zoom 2X. CLSM Z-stack images were processed to remove background fluorescence and allow for quantification of cells. Results were statistically analyzed with one-way ANOVA test. Statistical significance was set at p=0.05.

	ENAMEL PREPARATION	MATERIAL EMPLOYED ON DENTIN SUBSTRATE
GROUP 1	Bevel	Flowable resin + Nanofilled Composite
GROUP 2	Bevel	Nanofilled Composite
GROUP 3	Butt-Joint	Flowable resin + Nanofilled Composite
GROUP 4	Butt-Joint	Nanofilled Composite

Results: Samples treated with Method 1 demonstrated significantly higher levels of interfacial microleakage ($p<0.001$) than Method 2, independently of enamel and dentinal treatments. Enamel finishing technique ($p=0.0756$) and the presence of flowable resin on dentin ($p=0.632$) did not influence the interfacial cellular penetration with CLSM.
Conclusions: The first hypothesis was accepted, since CLSM showed results qualitatively and quantitatively more reliable than dye penetration. The second and third hypotheses were rejected.

189

Category: Student's Session

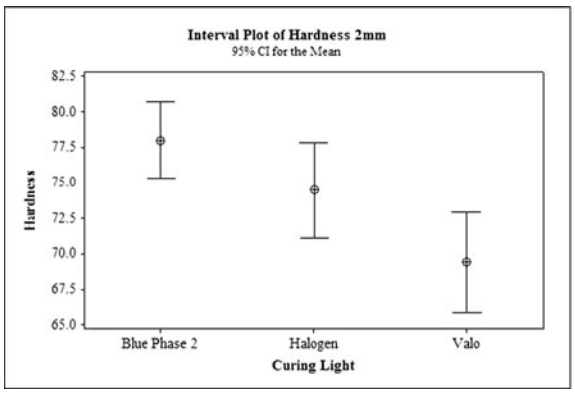
INTERACTION BETWEEN NANOFILLED COMPOSITES AND POLYWAVE MULTILED CURING LAMPS: AN IN VITRO STUDY

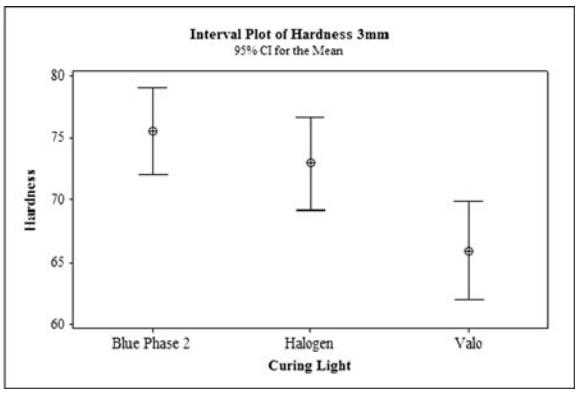
Battaglia Valter[1], Bergantin Emanuele[1], Paolino Davide[3], Coero Borga Francesco Andrea[1], Cadenaro Milena[2], Breschi Lorenzo[2], Berutti Elio[1], Scotti Nicola[1]
[1]University of Turin, Department of Surgical Sciences, Dental School
[2]University of Trieste, Department of Medical Sciences, Italy

Objective: The aim of this *in vitro* study was to assess the correlation between different nanofilled composites and polywave multiLED curing lamps. The hypothesis is that polywave multiLED lights increase hardness than a halogen light.
Methods: A non-carious molar tooth, extracted for periodontal reasons, was selected. Crown was horizontally sectioned 2-mm above the CEJ. A 3×4-mm class I cavity was prepared in order to obtain a "tooth mould". Four resin composites containing different photoinitiators (Venus Pearl-Heraeus Kulzer, Filtek Supreme XTE-3 M ESPE, Estelite-Tokuyama, Ceram X-Dentsply) were selected to prepare 2 mm- ($n=15$) and 3 mm-thick ($n=15$) composite discs using the tooth mould. Composites were cured with three curing lights (Valo-Ultradent, Bluephase G2-Ivoclar Vivadent, Swiss Master Light-EMS) at the same energy density (1400 mW). Composite discs were then submitted to Vickers hardness test, performing 8 measurements both on top and on bottom surface. To evaluate the effects of composite, curing light, surface (top vs bottom) and their influence on hardness, analysis of variance (ANOVA) was performed. Differences were considered statistically significant for $p<0.05$.
Results: Statistical analysis revealed that all factors significantly influenced composite hardness (table 1). A correlation between composites and curing lamps was confirmed, with BluePhase G2 and Halogen significantly better matching with the tested composites (Figure 1), independently from the composite thickness.

Table 1: Analysis of Variance for Hardness

	Thickness = 2		Thickness = 3	
Source	F	P	F	P
Composite	16.02	0.000	27.97	0.000
Curing light	17.99	0.000	23.89	0.000
Surface	1084.10	0.000	2088.17	0.000
Composite*curing light	37.27	0.000	24.37	0.000
Curing light*surface	88.43	0.000	6.56	0.001





Conclusion: The tested hypothesis was partially accepted since only Bluphase G2, probably because of its wider wavelength than Valo, produced significantly higher hardness values with all tested nanofilled composites, both with 2 mm- and 3 mm-thick samples.

190

Category: Student's Session

EFFECT OF POLYWAVE MULTILED CURING LIGHT DISTANCE ON SURFACE MICRO-HARDNESS DISTRIBUTION OF NANOFILLED COMPOSITES

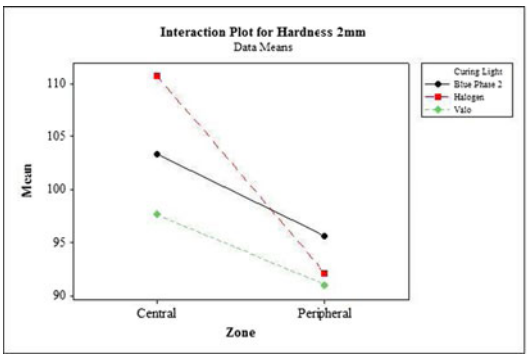
Chiapello Mattia[1], Bergantin Emanuele[1], Coero Borga Francesco Andrea[1], Milena Cadenaro[2], Breschi Lorenzo[2], Paolino Davide[1], Berutti Elio[1], Scotti Nicola[1]

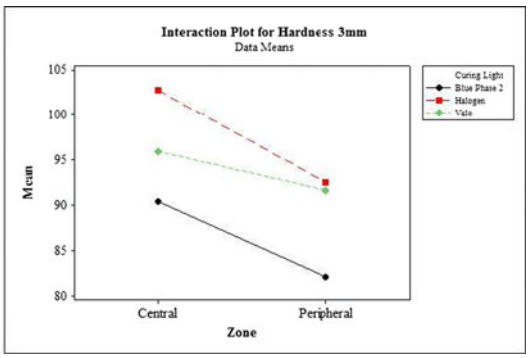
[1]University of Turin, Department of Surgical Sciences, Dental School
[2]University of Trieste, Department of Medical Sciences, Italy

Objective: The aim of this *in vitro* study was to assess the effect of light curing distance on surface microhardness of different nanofilled composites. The hypothesis is that polywave multiLED lights induce uniform hardness distribution on composite surface.
Methods: A non-carious molar tooth, extracted for periodontal reasons, was selected. Crown was horizontally sectioned 2-mm above the CEJ. A 3×4-mm Class I cavity was prepared in order to obtain a "tooth mould". Four resin composites with different photoinitiators (Venus Pearl-Heraeus Kulzer, Filtek Supreme XTE-3 M ESPE, Estelite-Tokuyama, Ceram X-Dentsply) were selected. Composite discs, with the top surface distant 2 mm (n=10) and 3 mm (n=10) from the curing light tip, were prepared using the tooth mould. Composites were cured with three curing lights (Valo-Ultradent, Bluephase G2-Ivoclar Vivadent, Swiss Master Light-EMS) at the same energy density (1400 mW). Composite discs were submitted to Vickers hardness test on the top surface, performing 4 measurements in the central area of the specimen and 4 measurements in the peripheral area of the specimen. Analysis of variance (ANOVA) was performed to evaluate the effects of composite, curing light, specimen zone (central vs peripheral) and their influence on hardness. Differences were considered statistically significant at $p<0.05$.
Results: Statistical analysis revealed that all factors significantly influenced the surface hardness (Table 1). The interaction between curing light and zone was confirmed only in specimens where the curing tip was 2 mm distant from the surface. The halogen light, when 2 mm distant from the surface, showed the greatest difference between the central and peripheral zones of composite specimens. When the curing tip was 3 mm distant, no difference between the curing lights was observed (Figures 1 and 2)

Table 1: Analysis of Variance for Hardness

	Tip distance = 2		Tip distance = 3	
Source	F	P	F	P
Composite	37.79	0.000	10.02	0.000
Curing light	5.41	0.005	15.68	0.000
Zone	36.63	0.000	20.53	0.000
Composite*Curing light	10.61	0.000	29.48	0.000
Curing light*Zone	4.50	0.012	1.08	0.341





Conclusions: The tested hypothesis was rejected since none of the tested curing light produced a uniform micro-hardness distribution on nanofilled composites. In all cases, the peripheral area was significantly softer than the central area, in particular when the tip was 2 mm from the composite surface.

197

Category: Student's Session

INFLUENCE OF SURFACE COATING ON STAINING SUSCEPTIBILITY AND SURFACE ROUGHNESS OF ESTHETIC COMPOSITE RESIN MATERIALS

Ribero Michele[1], Giuliano Carlotta[1], Bergantin Emanuele[1], Tempesta Riccardo[1], Ventura Gabriele[1], Pasqualini Damiano[1], Berutti Elio[1], Scotti Nicola[1]

[1]University of Turin, Department of Surgical Sciences, Dental School
[2]Department of Medical Sciences, University of Trieste, Trieste, Italy

Objective: The aim of this in vitro study was to evaluate the influence of surface coating on color stability and surface roughness of composite resin materials when exposed to several staining agents. The hypothesis is that surface coating sealer reduces color change and roughness of nanofilled composites.
Methods: Pressed 2 mm thick disk-shaped specimens were prepared with eight different composites: Venus Pearl, Venus Diamond, Clearfil Majesty, Filtek, Gradia, Adonis, Tetric, GC Kalore. Each specimen was polished and one-side was coated with BisCover (Bisco, USA). The initial color of each specimen's side was assessed by a calibrated reflectance spectrophotometer (SpectroShade) and the surface roughness (Ra) was assessed using a RT-70profilometer with a 5 μm Diamond stylus. The specimens were placed into six different staining solutions after 7 days: coffee, tea, red wine, orange juice, coca-cola and water. L*a*b* scores, which determined the color changes, and surface roughness were calculated at 0, 1, 7, 30, 90, 180 days. The differences among coated and polished composites surfaces for each staining solution were statistically analyzed using ANOVA and Student-Newman-Keuls post-hoc tests ($p<0.05$).

Results: The presence of a surface coating sealer significantly influenced ($p<0.0001$) both color changes and roughness of all tested composites after immersion in staining solutions. Coca-Cola and Orange Juice increased composite roughness significantly more than other solutions, after 30 days of immersion. Red Wine and Tea increased color change significantly more than other solutions, after 7 days of immersion.
Conclusion: Surface coating sealer does prevent composite surface from color change and roughness increase after immersion in several staining solutions.

205

Category: Student's Session

PREVALENCE OF MOLAR INCISOR HYPOMINERALIZATION: A SYSTEMATIC REVIEW

Aminata Seydi[1,2], Elisabeth Dursun[1,2]
[1] Pediatric Department, Faculty of Dental Surgery, University of Paris Descartes, Montrouge, France; Pediatric Department, Mondor-Chenevier Hospital Complex, Créteil, France

Objective: Molar incisor hypomineralization (MIH) is a rising pathology which can affect one to four first permanent molars and frequently associated to the incisor group. The aim of this study was to review the literature published to estimate the prevalence of MIH in the world.
Methods: An electronic search on the Medline database attempted to identify all relevant studies. Papers published in English were identified after a review of their titles, abstracts and full text. Papers were selected on the following diagnosis of MIH: one first permanent molar affected by demarcated opacities. Examination criteria and conditions, selection and size of the group of children and examiners' calibration were evaluated for selection.
Results: The initial search found 646 eligible papers and finally 26 were included in this systematic review. The worldwide prevalence ranging from 3 to 40 %. Comparison of the studies was difficult because of use of various: diagnostic criteria, examination conditions and age of children.
Conclusion: The prevalence of MIH highlights the public health challenge posed by this syndrome. A standardization of diagnostic criteria and study design would be highly appreciable to allow comparisons.