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**6<sup>th</sup> Edition**

**Optical properties of dental structures  
and materials**

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## ATOMIC FORCE MICROSCOPY APPLICATIONS FOR THE CHARACTERIZATION OF DENTAL BIOMATERIALS AND TISSUE

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Advanced microscopic techniques have opened a new window on the field of dental sciences. Electron microscopy and atomic force microscopy appear to be the most powerful techniques that could be used for the characterization of dental tissue and biomaterials. The AFM technique is a 3D topographical modality with a high atomic resolution for surface analysis and roughness measurement. The AFM can provide new information about the surface of the cell properties such as friction and adhesion force measurements, viscoelastic properties. In addition, the AFM give the ability to study any kind of sample directly in its natural environment without any sample preparation, which could modify the real surface properties.

Dental caries is a very common disease nowadays. Because the dental caries are due to biofilm formation and colonization of bacteria in dental plaques, the analysis of the surface-function of the biofilm forming it's very important. The AFM is a powerful microscope for a high resolution examination of the salivary pellicle surface structure in its native state. Acid-etching is a technique used to make micro porosities in enamel and dentine surfaces for micromechanical adhesion of composites. The characterization of enamel and dentine after acid-etching is possible with SEM and AFM. Also, demineralization of human enamel could be evaluated. Fluoride therapy is a protective technique to avoid dental caries in children. Effects of fluoride treatment on phosphoric acid-etching in primary teeth could be studied using the AFM technique. One of the most important fields of dentistry is implantology. The AFM can be drawn upon as a tool for testing the biocompatibility of implant materials by investigating the surface properties that will influence the adhesion behavior of osteoblast cells in vitro. At the present time, various studies in dentistry use AFM measurements.

The AFM is a unique tool for surface analysis and open a new window on the study of different applications in dentistry like dental tissue analysis, dental material quality, molecular interaction, preventive dental therapies, and implant biocompatibility. Further development of the AFM technique will bring a significant contribution to the analysis of cellular and molecular interaction.

## GLASS CERAMIC VERSUS LITHIUM DISILICATE. PRACTICAL CONSIDERATIONS

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**Introduction.** The two ceramic materials have different chemical structure; consequently they have different physical and optical properties. We would like to offer clinical information on the type of ceramic one can use according to clinical requirements.

One of our objectives is to suggest a tooth preparation protocol for veneers by taking into account the following parameters: type of ceramic, how much of the tooth the veneer covers over, baseline color of the tooth, tooth vitality and the desired final color.

**Materials and methods.** We performed a retrospective clinical study on 500 veneers made of both feldspathic and lithium disilicate ceramic. The study was conducted by using the data collected from medical charts. We had two different groups: one for the glassceramic, one for the lithium disilicate and the parameters taken into account were the following: fissures, fractures of the veneers and teeth, color changes, debonding, periodontal implications, secondary decays, esthetic complains. We were also interested in correlating the time elapsed from bonding to the incidents.

**Results.** We observed that mechanical problems such as chipping or fractures were more frequent in feldspathic than in lithium disilicate veneers, as well as marginal discolorations and secondary decays.

We did not notice periodontal complications in either group. On the other hand, the esthetic results were more satisfying in the feldspathic group.

**Conclusions.** In patients with challenging occlusal characteristics, we recommended lithium disilicate as first option. In patients with favorable occlusion, we recommended feldspathic veneers for better esthetic results. In patients with highly discolored teeth, lithium disilicate ceramic was more likely to conceal the unpleasant appearance of the teeth.

For all the above mentioned reasons, clinical cases will be presented.

## **ESTHETIC DENTAL REHABILITATIONS USING DIGITAL SYSTEMS**

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**Faculty of Dentistry, “Carol Davila” University of Medicine and Pharmacy, Bucharest, Romania**

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In this conference, based on personal clinical cases, the modern methods of applying digital systems, in complex cases treatment planning will be discussed. There are presented dental-supported as well as implant-supported restorations cases.

All of these are associated with computerized modern technologies for obtaining dental prosthesis and new materials development: monolithic zirconia, lithium-disilicate and ceramic plated milled titanium.

## RESTORATIONS OF ENDODONTICALLY TREATED POSTERIOR TEETH: WITH OR WITHOUT POST?

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**Introduction.** The best way to restore endodontically treated teeth has, for a long time, and continues to be, a controversial subject. It is presently admitted that the quantity of residual tissue is probably the predicting factor which is most important to clinical success. The best solution, therefore, is to adopt a method which is the most economical of these tissues.

**Materials and methods.** The aim of this lecture is to show, in practice, this strategy of preservation, by developing the indications, the materials (zirconia, glass-ceramics, new nano-filled composites, hybrid ceramic, etc.) the operative procedures, as well as the prognoses for the various restoration techniques of posterior non-vital teeth. Thus, various clinical cases are proposed in order to illustrate as many procedures as possible regrouped within the two largest families: the partial bonded restorations, done either with direct or indirect technique for minor tooth destructions, and the crowns, either endocrown or peripheral (with or without post underlying) when the destruction is more important.

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## RESEARCH PROTOCOLS USED IN THE VISUAL PERCEPTION OF THE OPTICAL PROPERTIES OF TEETH AND DENTAL MATERIALS

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**Introduction.** Restoration or improving the optical properties of dentition is paramount when the esthetics of the dental treatments is considered. However, to evaluate properly and to mimic these characteristics using dental materials is still challenging, which explains the large amount of research dedicated to this area in dentistry. Two groups of methods are currently in use to record the dental shade: visual color matching, which uses shade guides and instrumental methods, based on spectrophotometry, colorimetric measurements and versions of software that enable the color analysis of digital images; whenever possible, these methods should be used in combination.

**Materials and methods.** Consequently, the studies are oriented in the same manner, to clarify topics either related with the visual assessment, or with instruments used to determine the optical properties of teeth and dental materials. The presentation aims at highlighting rules to be followed when protocols dedicated to visual perception of the optical characteristics are constructed, in case of both in vivo or in vitro studies. Examples from research performed in our group are provided.

**Results.** The main topics included in such protocols propose to answer questions like: how factors operator or non-operator dependent would influence the accuracy of shade selection, how visual and instrumental assessment can be related, which are the minimum differences in color that can be perceived or, on the contrary, the maximum that is acceptable in clinical applications, or how we can use visual assessment of dental color to follow staining or bleaching process.

**Conclusions.** Regardless of the goal, the study protocols should respect standardization regulated by ISO – TR 28642.

## INTERNAL ROOT RESORPTION IN THE DENTAL OFFICE - A CHALLENGE TO THE ELUCIDATION OF ETIOLOGIC DIAGNOSIS AND THERAPEUTIC DECISION

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**Introduction.** Internal root resorption (IRR) is defined by the American Association of Endodontists as a condition associated with a pathological or physiological process resulted in the loss of dentin, cementum and bone. IRR is the result of a chronic inflammatory process whose progression depends on: the presence of viable pulp tissue to the area of resorption or distal of it, and necrotic pulp tissue located proximal to the area of resorption. The microbial stimulus is a determining factor in the progression of IRR and the blood supply is necessary for recruiting the odontoclasts. The infection will lead the necrosis progression to entire pulp, which is a mechanism for limiting the progression of IRR.

**Hypothesis.** But how can we explain IRR occurrence in a tooth in the presence of endodontic filling? Is it possible to have an accessory channel which ensures blood supply from periodontal tissue?

**Material and method.** IRR diagnosis is usually incidental by imaging investigations: X-rays, OPT or CBCT. In situations where the clinical and imaging data does not clarify the etiology, histopathological examination is required.

**Results.** In a female patient aged 24 years, due to the presence of a fistula in the vestibule area at the level of 1.2. (with a ceramic crown and endodontic filling performed with 2 years ago) an x-ray which revealed a IRR in the middle third of the root, respectively radiolucencies distal of the root was carried out. An endodontic surgery procedure with retrograde filling was decided. Histopathological examination revealed the presence of numerous plasma cells loaded with multiple Russell corpuscles, which raised the suspicion of solitary maxillary bone plasmacytoma. The evolution was favorable.

**Conclusion.** IRR can be a challenge for the dentist from the point of view of positive diagnosis, differential diagnosis and therapeutic decision.

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## MODERN TECHNIQUES AND TECHNOLOGIES FOR CLINICAL AND IMAGING EVALUATIONS OF DIRECT COMPOSITE RESTORATIONS

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**Objectives.** To establish the clinical and therapeutic importance of the new caries diagnostic techniques based on laser-fluorescence FOTI, respectively, digital imaging fiber-optic near-infra red transillumination DIFOTI, in comparison with X-ray diagnosis, and real extent of tooth decay detected during cavity preparation.

**Materials and methods.** The oral health evaluation protocol of the European Erasmus + Com4You Project was applied. Lateral teeth of 4 young female patients were investigated and taken into preventive and minimally invasive restorative treatment. During visual examination caries were detected and classified according to ICDAS codes with additional photographic documentation. Modern examinations using DiagnoDent Pen and Diagnosticscam were followed by classical Bite-wing radiographs. Validation of existing lesions was made during cavity preparation followed by a bulk-fill sonic-activated composite filling and active preventive treatment strategy.

**Results.** The visual examination underestimated the extension of some proximal caries since it was demonstrated that the lesion depicted with modern technologies correlated very closely to the real clinical situation and to the X-ray image.

**Conclusions.** The new and non-invasive technologies show promise as a means of detection, diagnosis and monitoring of caries lesions and associated treatments on lateral teeth.

## AESTHETIC RESTORATION OF ANTERIOR TEETH: CHOOSING THE RIGHT MATERIALS

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**Introduction.** The development of new restorative materials and the continuous improvement of adhesive systems and resin cements allow us to practice an aesthetic and sustainable dentistry in virtually all clinical situations. However, this needs a reasoned choice which depends on different parameters such as tooth color, the nature of restorative materials, the nature and quantity of residual dental tissues. The aim of this lecture is to show this strategy in practice, by developing the indications, the materials, the operative procedures, as well as the prognosis for the various restoration techniques of anterior teeth.

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## FOURIER TRANSFORM INFRARED (FTIR) SPECTROSCOPY APPLICATIONS FOR THE DENTAL MATERIALS STUDY

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The FTIR spectrum of a material consists of bands of transmission (or absorption), positioned at certain wavenumbers.

The FTIR spectroscopy is a widely used technique to determine the composition and structure of organic molecules. The FTIR spectroscopy was also successfully used for the characterization of dental materials, in particular to determine the conversion degree of monomers, which by polymerization are important components of dental works. The FTIR spectrum of the uncured composite material shows the specific spectral lines of the monomers in the composite material structure. The light-curing of the materials determines the appearance on the FTIR spectra of new spectral lines corresponding to the new functional compounds formed by the organic component of the composite linking at the inorganic component. Also it finds the decreasing in intensity of the peaks corresponding to the composite monomers. Transmittance of the material also increases spectacularly as the material shows a higher degree of polymerization.

The FTIR spectroscopy on samples of material subjected to staining can determine possible chemical links that may form between a coloring agent and the organic resin matrix.

Fourier transform Infrared (FT-IR) imaging and microspectroscopy have also been extensively applied to the analyses of tissues in health and disease. With this technology, the relative amount, molecular nature, distribution and orientation of the components of connective tissues can be evaluated on histological sections.

IR spectroscopy can function as a non-destructive method as well in the analysis of calcified tissues and may reveal the alterations in enamel after hydrogen peroxide treatments.

The application of infrared spectroscopy allows for a quick differential identification of typical dental materials produced from organic compounds for inorganic restorations and of tooth structure hydroxyapatite, but also its contaminate forms.

## FACTORS THAT INFLUENCE THE ESTHETICS OF THE SMILE THROUGHOUT AN ONGOING ORTHODONTIC TREATMENT

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**Introduction.** Dental and dento-facial aesthetics is one of the main reasons why patients seek treatment in dental offices. Often, dissatisfactions with their appearance are determined by the changes in position of the teeth and in these situations is necessary to undergo orthodontic treatment. This paper aims at highlighting the problems of aesthetics of the smile that occur during orthodontic treatment.

**Materials and method.** The first part of the paper will present a study of literature meant to summarize the main factors involved in smile aesthetics in general and those affected during orthodontic treatment. The second part of the work will consist in presenting the results of studies conducted through questionnaires in which patients express fears of orthodontic treatment in terms of aesthetics, and ultimately, are exemplified the difficulties in managing aesthetics occurring during orthodontic treatment, by using clinical cases.

**Results.** From the aesthetic point of view, the development of the latest orthodontic techniques using aligning trays like Invisalign, Clear-Aligner, the lingual techniques, and the appearance of physiognomical bracket materials represent a breakthrough in terms of management of aesthetic criterion during orthodontic treatment. Extraction cases, or agenesis cases currently benefit of a special protocol so as to ensure patients' aesthetic comfort.

**Conclusions.** Although orthodontic treatments have among the main objectives achieving aesthetic ideals, management of aesthetics during treatment is also a priority for both doctor and patient alike.

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## IMAGISTIC APPROACH ON MODIFIED ADHESIVE IN CLASS II TEETH RESTAURATION

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**Introduction.** Resin composite materials have been used in anterior teeth for many years, whereas their use in posterior region has been questioned. The reason for concern has been polymerization shrinkage and their tendency to wear.

**Materials and methods.** 24 human extracted teeth (human molars) crack-free were randomly selected for this study. A standardized class II cavity was prepared on the surface of each tooth. 12 samples were grouped for fillings with normal dental adhesive and composite resin material. In the other 12 samples a nanoparticles modified dental adhesive was used and then filled with the same composite resin. The interfaces were examined by optical coherence tomography Time Domain (1300 nm) (OCT) and micro-CT using the synchrotron technology. A synchrotron radiation X-Rays micro-CT experiment was performed at the SYRMEP Beamline of the ELETTRA Synchrotron Radiation Facility (Trieste, Italy). The 1200 radiographic projections were acquired with beam energy of 29 keV over 180° with a pixel size of 9 μm. A sample – detector distance of 15 cm was considered in order to have both absorption and phase-contrast signal, for a better viewing of the interfaces. All the samples were investigated with X-rays and then the samples were evaluated with SEM and EDAX.

**Results and conclusions.** Noninvasive evaluations methods such as the OCT and micro-CT evaluation using synchrotron radiation, have a great capability to evaluate the interfaces between dental structure, resin fillings and dental adhesive when a nanoparticles modified adhesive is used.

## THE EVALUATION OF SURFACES PROPERTIES OF ORTHODONTIC ARCHES

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**Introduction.** Surface topography of the orthodontic arches represents an essential property, due to the ability to influence the mechanical characteristics, aesthetic appearance, corrosion and their biocompatibility. The surface structure depends on various factors, including: alloy used in manufacturing, complex manufacturing process and surface finishing treatment.

The purpose of this study was to evaluate surface topography of the different types of arches, in order to determine corrosion signs which reduce intraoral resistance.

**Materials and methods.** We have evaluated a total of 48 arches of different types, sizes and sections (12 Ni-Ti, 12 Ni-Ti physiognomical, 12  $\beta$ -Ti and 12 SS), under an electronic microscope, for detecting surface defects. The same arches were evaluated after removal from the oral cavity (1 and 2 months). Other 24 arches were immersed in Cola and fluoride solution and were evaluated by electronic microscopy. Experimental studies included two types of mechanical tests (tensile and bending) performed on 48 arches, using Universal Bending Machine Instron Bluehill 2.

**Results.** The correlation of changes produced by immersing the arches in different solutions, including those used intraorally, both mechanical properties and surface characteristics, can provide precious information related to the corrosion mechanism. The altering of mechanical properties for SS arches is more important than for NiTi arches.

**Conclusion.** Mechanical and surface properties for intraoral arches are changing due to orthodontic forces and chemical liquids.

Immersing the arches in different solutions (fluoride and Cola), can result in increasing activation and deactivation forces, possibly due to changes in surface topography.

## **NEW COLOR MATCHING CURRICULUM FOR DENTAL PROFESSIONALS AND STUDENTS**

**RADE D. PARAVINA**

**Professor at the University of Texas School of Dentistry at Houston and Director of Houston Center for Biomaterials and Biomimetics (HCBB)**

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This presentation will be very different from programs in color matching, communication and reproduction of natural teeth that you may have attended in the past. The new Color Matching Curriculum for dental professionals and students, developed by the presenter and the Society of Color and Appearance in Dentistry (SCAD, [www.scadent.org](http://www.scadent.org)), will be introduced. The lecture will emphasize color concepts and resources, methods, conditions and tools that are essential to master a plan for successful color matching in both office and dental laboratory, together with step-by-step instructions. Examples and practical suggestions will be provided, including the update on new developments on this subject. Dental Color Matcher, a color education and training online program for esthetic dentistry that has been used by dental professionals and students from 100+ countries, will be demonstrated.

**Objectives:**

- UNDERSTAND color;
- Learn about advanced shade matching conditions and methods;
- Contrast dental shade guides and elaborate color-related properties of dental materials;
- Review the state of the art in tooth whitening monitoring;
- Learn about resources for color education and training in esthetic dentistry.

## RESEARCH IN DENTAL OPTICAL PROPERTIES: LABORATORY OF BIOMATERIALS OPTICS

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The Laboratory of Biomaterials Optics (LBO) of the University of Granada was founded in 2008 and is specialized in the development of new optical methods for the characterization and measurement of optical properties of biomaterials, particularly, dental biomaterials.

Optical properties such as scattering, absorption and translucency of dental resin composites, zirconia ceramics and human teeth have been studied in LBO using the Kubelka-Munk Theory (S, K, T). This can be done by measuring the relative spectral reflectance against white and black backgrounds, using a spectroradiometer in a viewing cabinet with a D65 illuminant. Color and color differences (CIELAB and CIEDE2000) of dental materials have been measured in LBO as well.

Psychophysical experiments were conducted by panels of observers under diffuse/0° observation/measuring conditions and under simulated clinical setting to determine 50:50% perceptibility thresholds (PT) and 50:50% acceptability thresholds (AT) of dental ceramics using CIELAB and CIEDE2000 color difference formulas. Takagi-Sugeno-Kang (TSK) fuzzy model was used to obtain these PT and AT values. Also, other psychophysical experiments were conducted to develop a customized CIELAB-based whiteness index, WID, for dentistry accurately correlated to the perception of tooth whiteness ( $WID=0.511L^*-2.324a^*-1.100b^*$ ) The proposed WID outperformed previous indices, being also the only CIELAB-based index developed for evaluation of whiteness in dentistry.

Currently, new non-invasive optical methods based in Contrast Transfer Function (CTF) are being developed in LBO to determine phenomena that occur in dental materials, as well as their rheological characteristics using speckle techniques.

## THE EVOLUTION OF THE MANAGEMENT OF ADVANCED TOOTH WEAR

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Atypical tooth wear is frequently ignored in earlier stages but increased rates in young people have been observed by specialists in last decades. Among tooth wear mechanisms, advanced dental erosion is more frequent, even in young people. Etiological factors, diagnosis and minimally invasive treatment are under current investigation. The use of resin composite materials and ceramics to restore affected teeth is recommended when etiological factors are controlled. Traditionally, reconstructive treatment has been provided using invasive methods such as metal-ceramic crowns. Less invasive treatment would be of interest in the earlier stages of affected teeth.

**CERAMIC PARTIAL CROWNS – ESTHETIC AND TISSUE CONSERVATIVE RESTORATIONS**

**GOTTFRIED SCHMALZ, MARIANNE FEDERLIN**

**University of Regensburg, Germany**

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For partial ceramic crowns (including veneers), less sound tooth tissue has to be removed compared to a full crown restoration and optimal esthetics is achievable. Longevity of ceramic partial crowns is generally similar to those from gold alloys (85-90% over 10 years). Subgingival location of the (proximal) cavity margin is possible, if the cavity margins are clearly visible during luting and if rubber dam can be applied. Temporaries for veneers are prepared before on a gypsum model preparation and then luted with a flowable composite without adhesive. Leucite reinforced silicate and disilicate ceramics are established materials which, however, need 1-1.5 mm minimal thickness to prevent ceramic fracture. New hybrid materials are available, however, clinical data are limited, so far. Adhesive luting is strongly recommended and can be performed with dual curing composite materials and – for veneers – with light cured flowables. Dual cure materials are recommended to be used together with etch-and-rinse adhesives. Self-adhesive luting materials can be used together with etched (hydrofluoric acid) and silane pretreated ceramics, but excessive drying of dentin before luting must be avoided. Selective enamel etching improves the clinical outcome. New universal multi-mode one-bottle adhesives can either be used with an etch&rinse approach or with a self-etch approach. They are applied together with a dual curing resin-based luting composite. Own clinical experience for 18 months yielded very favorable results.

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## THE EFFECT OF DIFFERENT FIRING PROCEDURES ON CERAMIC MATERIALS EVALUATED BY OPTICAL COHERENCE TOMOGRAPHY METHOD

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**Objectives.** The aim of this study is to identify an imaging pattern observed by a noninvasive imaging method like optical coherence tomography for thermal induced problems in different ceramic materials.

**Materials and methods.** Optical coherence tomography working in Time Domain mode (TDOCT) was employed for this evaluation. The system was set at 1300 nm and for each samples 500 slices at 10 microns distances were obtained.

Two conventional ceramic and one pressed ceramic materials were used for obtaining the samples for this evaluation. The thermal factor was considered in two modes. For the first mode, the ceramic samples were burned at normal temperatures (recommended by the producers), at +30 degree (above the temperatures recommended by the producers), at +50 degree (above the temperatures recommended by the producers), respectively at –30 degree and -50 degree (below the temperatures recommended by the producers). The second mode was designated for evaluation of multiple firings (starting with three and towards ten burning for samples at the normal recommended temperatures by the producers).

**Results.** For both modes different imaging patterns were observed in TD OCT in a noninvasive way. The temperature variation over the 30 degree could be observed at this resolution.

**Conclusion.** The TD OCT could act as a valuable tool for evaluating ceramic materials at different burning programs in order to avoid the fractures induced by the thermal factor.

**BIOMIMETIC AND PRAGMATIC REHABILITATION METHODS THROUGH DIRECT TECHNIQUES**

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Dental medicine over the past years has been dominated by esthetic appearance.

A rise in patients' expectation in terms of aesthetic quality of dental treatments, especially when concerning teeth with the highest visibility, caused a particular concern for dentists to find the most appropriate therapeutic alternative and to develop esthetic skills for each clinical case.

Recent developments of restorative materials and techniques, preparation designs and adhesive protocols allow clinicians the predictability in restoring teeth disharmony, using minimally-invasive or even non-invasive treatments solutions.

The final therapeutically decision must be assessed and evaluated from several pragmatic points of view: the patient age, desires, the quality and the quantity of the remaining tooth structures, the individual financial possibilities.

The conference proposes an honest and pragmatic presentation of a few clinical and therapeutic solutions to achieve the main goal, which is to restore the natural esthetic aspects.

# ORAL PRESENTATIONS



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## THREE-DIMENSIONAL MARGINAL EVALUATION OF TWO PRESSED MATERIALS USING MICRO-CT TECHNOLOGY

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**Objective.** The main goal of the present study is to compare the marginal fit of two different types of pressed materials: a partially crystalline thermoplastic resin reinforced with ceramic particles (BioHPP) and lithium disilicate (EMax), through the use of the microCT technique.

**Materials and method.** In four caries-free mandibular first molars, first class inlay cavities were prepared. For each tooth two inlays were manufactured- one by using BioHPP thermoplastic resin (n=4) and one by using Emax Press lithium disilicate (n=4). The marginal gap was analyzed circumferentially at the occlusal margin using a Bruker micro CT, by measuring the distance at the occlusal limit of the cavities, between the restoration and the tooth in several points for every surface of each tooth before cementing. Data were analyzed statistically using the Mann-Whitney U test and the Pearson’s correlation coefficient ( $\alpha=0.05$ ).

**Results.** A significant statistical difference was found between the marginal gap size obtained for BioHPP and Emax inlays ( $p<0.001$ ). For the Emax inlays the marginal gap had an average of 72  $\mu\text{m}$ , while for BioHPP the average was 94  $\mu\text{m}$ .

**Conclusions.** Both types of used materials offer a good marginal adaptation. By summing up the gathered data we can conclude that the pressed ceramics shows a better marginal fit than the pressed resin, probably because of the different processing methods: sintering versus polymerizing with different shrinkage values.

## IN VITRO BIOCOMPATIBILITY TESTING OF BLEACHING EXPERIMENTAL AGENTS ON DENTAL FOLLICLE STEM CELLS

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**Introduction.** Tooth bleaching is one of the most popular and required dental aesthetic treatments. Unfortunately, it can generate several side effects, like oral irritation, enamel alteration, tooth sensitivity, caused especially by hydrogen peroxide, the main bleaching component of commercial products.

**Objectives.** To evaluate the biocompatibility of three experimental, natural, fruit juices derived gel formulations, compared to the commercial Opalescence 10% (Ultradent, USA) with focus on cytotoxicity, apoptosis and genotoxicity induction.

**Methods.** Organic acid composition of the experimental agents was characterized by HPLC chromatography. Biological testing was done in vitro, on human dental follicle stem cells. Cells were exposed 24 hours to dilutions ( $10^{-2}$ - $10^{-4}$ ) of the culture medium conditioned with each bleaching gel. Viability was evaluated by MTS method. For further experiments, conditioned medium diluted  $10^{-3}$  was used. Apoptosis was evaluated by FACS - Annexin V FITC/Propidium iodide, genotoxicity was evaluated through  $\gamma$ H2AX foci formation in conjunction with quantification of micronuclei formation.

**Results.** All gels exhibited physical stability. Experimental gels induced significantly better viability and apoptosis rates, when compared to Opalescence. There were no significant genotoxic effects generated by the experimental gels exposure.

**Conclusion.** The low cytotoxicity and lack of genotoxicity makes the experimental gels suitable for a safer use in clinical practice.

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## CURCUMIN AND EPIGALLOCATECHIN-3-GALLATE PROMOTE THE REGENERATIVE POTENTIAL OF HUMAN PERIODONTAL STEM CELLS

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**Objective.** Lipopolysaccharide derived from *Porphyromonas gingivalis* (Pg-LPS) induces an immune-inflammatory response in periodontal stem cells, which results in periodontal breakdown. Plant extracts that stimulate cell proliferation and differentiation might be effective as adjuvants in periodontal therapy. We investigated the effect of Curcumin and Epigallocatechin-3-gallate (EGCG) on the proliferative potential of human periodontal stem cells stimulated with Pg-LPS.

**Methods.** Mesenchymal stem cells were isolated from the gingival (GLSCs) and periodontal ligament (PDLSCs) of impacted third molars. Cells were cultured on 96-well plates using DMEM (Dulbecco’s Modified Eagle’s Medium) and osteogenic medium. Cells were stimulated with standardized Pg-LPS 500 ng/ml and treated with Curcumin in ethanol (1.25 μM) and EGCG in endotoxin-free water (2.5 μM). After 24h, we assessed the cells’ proliferation using the MTT (Thiazolyl Blue Tetrazolium Bromide) assay and the alkaline phosphatase (ALP) in the supernatant. The optic density was read with a microplate reader. Statistical analysis used one-way ANOVA and Tukey’s Multiple Comparison test.

**Results.** Pg-LPS induced cell proliferation and inhibited ALP synthesis in both GLSCs and PDLSCs. Additional treatment with Curcumin and EGCG significantly increased cell proliferation and the ALP levels. Moreover, these effects were more significant in cells cultured in the osteogenic medium. However, when cultured in osteogenic medium, GLSCs were more responsive to EGCG, whereas PDLSCs were more sensitive to Curcumin.

**Conclusions.** Cells responses to Curcumin and EGCG depended on their origin and culture conditions. These findings suggest that therapeutic strategies promoting the regenerative potential of periodontal stem cells are expected to have future applications in periodontitis.

## PARTICULAR PHYSICOCHEMICAL PROPERTIES OF DENTAL HARD TISSUES EXPOSED TO HYDROCHLORIC ACID

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**Introduction.** Dental erosion etiology implies exogenous and endogenous factors. Among intrinsic factors gastroesophageal reflux syndrome (i.e. hydrochloric acid from gastric juice) is frequently encountered.

**Objective.** The evaluation of physicochemical characteristics of dental tissues exposed to different concentrations of hydrochloric acid.

**Material and method.** Human enamel and dentin specimens were exposed (two times daily for 10 minutes) to two different concentration of hydrochloric acid (2.5 mmol/l and 4.5 mmol/l) for a period of 14 days. Quantitative measurements for mineralized tissue composition and physical properties to evaluate qualitative aspects of dentin and enamel were performed at 7 and 14 days of experiment, using the Fourier transform spectroscopy method (JASCO FTIR – 610). The identification of the surface changes was made by surface roughness measurement, using the Mitutoyo SJ 210 SurfTest, evaluating roughness average (Ra) values of the initial surface roughness and at each 7-day-interval after the beginning of treatment.

**Results.** We established that in the enamel as well as in the dentin exposed to hydrochloric acid the weight of the organic component of enamel was increased, while the mineral content was decreased. The amount of tissue inorganic reduction was proportional with the period of exposure and concentration of the hydrochloric acid. Significant differences in surface roughness values for dentin and enamel were observed at both experimental intervals, which showed an increase in roughness over time.

**Conclusions.** The FTIR spectroscopy method and roughness evaluation of hard dental tissues offer new opportunities in the study of pathogenic mechanisms involved in the initiation and evolution of dental erosions, to make a prediction of this disorder and to elaborate measures for his prevention.

## SHADE CORRESPONDENCE, COLOR AND TRANSLUCENCY DIFFERENCES BETWEEN HUMAN DENTINE AND A CAD/CAM HYBRID CERAMIC SYSTEM

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**Objective.** To determine the shade correspondence between human dentine and two versions of a CAD/CAM hybrid ceramic system and to investigate color and translucency differences between these materials.

**Materials and methods.** Twenty-four samples of different shades and opacities were fabricated from Vita Enamic CAD/CAM ceramic blocks. Human dentine samples were obtained from 73 extracted maxillary teeth. Color coordinates of all samples were measured using VitaEasyshade spectrophotometer.  $\Delta E^*ab$  and  $\Delta E^*00$

$\Delta$  The TP and Type equation here and color differences, with respect to human dentine of anterior and posterior teeth, were calculated.

**Results.** Vita Enamic Translucent was the best match for anterior teeth (>90% of cases) while Vita Enamic T 3M2 was the best match in 78.8%  $\Delta E^*ab$  and 54.5%  $\Delta E^*00$  of the cases for the dentine samples of posterior teeth. The lowest translucency difference ( $\Delta TP$ ) with the dentine samples of anterior teeth were obtained for Vita Enamic T 3M2 (92.5%) and with those of posterior teeth for Vita Enamic HT 1M2 (45.4%).

**Conclusions.** VITA Enamic Translucent is the best option as color match for both anterior and posterior teeth dentine. In terms of translucency, VITA Enamic Translucent closely matched anterior teeth dentine while for posterior teeth, VITA Enamic HT was the best option.

## IN-VIVO EVALUATION OF THE COLOR STABILITY AND THEIR FLUORESCENCE IN ESTHETIC ORTHODONTIC WIRES

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**Objective.** To evaluate the color stability of six esthetic archwires at different time periods and their fluorescence.

**Materials and methods.** Samples were evaluated after 7, 14, and 21 days of immersion in staining solution. Color measurements were performed by means of a spectrophotometer according to the Commission Internationale de l'Eclairage L\*a\*b\* system, and color changes ( $\Delta E^*$ ) and National Bureau of Standards units were computed. The fluorescence of as-received samples was evaluated by two observers and compared with that of a bovine central incisor. Statistical differences were investigated using analysis of variance and Tukey's post hoc test.

**Results.** All brands showed statistically significant color change after 21 days ( $\Delta E^*$  from 1.88 to 12.06). The Optis archwire (fiber-reinforced composite) presented the highest color alteration, although staining was observed only near its ends. The coated nickel-titanium and the Ortho Organizers archwire (coated stainless steel) presented with less color change. The Optis archwire was the only one that presented with fluorescence similar to that of bovine teeth.

**Conclusions.** All esthetic archwires assessed showed clinically noticeable color change after 21 days in staining solution. The optical properties of currently available esthetic archwires may not yet be ideal.

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## EVALUATION OF THE MASKING EFFECT OF FELDSPATHIC CERAMICS WITH DIFFERENT THICKNESSES AND OPACITIES

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**Objectives.** 1. To determine if the masking effect of feldspathic ceramic samples varies according to the thickness of the samples. 2. To assess whether the masking effect of feldspathic ceramic samples correlates with CIE L\*a\*b\* parameters and translucency parameter (TP).

**Methods.** Transparent feldspathic layering porcelain was blended with different concentrations of A3B shaded porcelain (0-100%) to obtain 3 groups of discs of 0.5, 0.75 and 1mm thickness (51 discs/group).

The reflectance spectra of the ceramic disks were measured using a non-contact spectroradiometer. For each sample, three measurements were performed over white and black ceramic backgrounds and CIE L\*a\*b\* coordinates were calculated.

TP was calculated as the color difference of the ceramic samples measured over white and black backgrounds. The masking effect of each sample was calculated as the color difference between the CIE L\*a\*b\* parameters of the black reference background and the CIE L\*a\*b\* parameters of the ceramic sample placed on the black reference background.

**Results.** The masking effect of ceramic samples differed among thickness groups, the following ranges being calculated: 2.29-23.28 ΔEab units for 0.5mm thickness samples; 5.06-29.20 ΔEab units for 0.75mm thickness samples; 7.68-34.89 ΔEab units for 1mm thickness samples. A strong correlation between masking effect and CIE L\*a\*b\* color parameters, and TP was observed.

**Conclusion.** 1. Masking effect of ceramic samples varied according to the thickness of the samples. 2. The same masking effect could be obtained by varying the thickness or the opacity of the ceramic. 3. CIE L\*a\*b\* color parameters and TP were strongly correlated with the masking effect.

## STUDY OF PATIENTS' SELF-PERCEPTION USING AN INITIAL ROMANIAN VERSION OF OHIP-49RO

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**Objective.** The Oral Health Impact Profile (OHIP) embodies one of the most elaborate tools devised for quantifying the Oral Health Related Quality of Life. The purpose of the current study was to assess the variations in the patients' self-perception regarding the impact of their oro-dental functional status upon the psychological-social comfort, during the validation process of the Romanian form of OHIP.

**Material and methods.** The initial OHIP-49 version underwent a forward-backward translation method. The obtained OHIP-49Ro form was distributed, under an interview layout, among 150 patients of the Medical Clinique of Internal Medicine, Cluj-Napoca. After the assessment of the OHIP-49Ro's factorial design and construct validity, descriptive statistics was used in order to systematize the subjects' answers. In the present study, answers regarding the dental aesthetics, the psychological impact and pain were selected.

**Results.** The most often complained impact was the “dental pain” (“very often” for 18% of the interviewed patients), followed by the presence of “sensitive teeth” (14.67%). The most frequent answer marked with “fairly often” referred to “worrying about dental problems” (28.67%). Regarding the dental aesthetics, patients related to the “affected appearance”, due to dental pathology, as the most disturbing element (8%), succeeded by a “miserable” and “uncomfortable” psychological state in respect to the dental status ( 6% opted “very often”).

**Conclusions.** Factors as dental pain and sensitivity, as well as psychological outcomes, tend to represent the main impacts upon the patients. The correlations obtained between specific factors prompt for further research and development of the OHIP-49Ro.

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## A DESCRIPTIVE STUDY OF TOOTH COLOR SPACE OF NON-VITAL TEETH

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**Objective.** The aim of the present study was to define a tooth space color of non-vital teeth and to compare it with the color-space of vital teeth recorded for the same patients and with the color space covered by the commercial shade-guides.

**Materials and methods.** In a group of 80 patients, aged 20 to 70, the middle third of the facial surface of one hundred and twenty non-vital teeth was measured using a clinical spectrophotometer (Vita Easyshade); lightness ( $L^*$ ), chromatic parameters ( $a^*$ ,  $b^*$ ), chroma ( $C^*$ ), hue ( $H^*$ ) and the closest Vita Shade in Classical and 3D Master Shade guides were recorded. For each patient, color parameters were also recorded for a vital reference tooth.

**Results.** The interval of color parameters, for the non-vital teeth varied as follows: lightness  $L^*$ : 58.26 – 92.93, the chroma interval  $C$ : 15.43 – 51.3, the hue interval  $h$ : 51.2 – 97.9,  $a^*$ : -2.53 – 19.53,  $b^*$ : 15.3 -50.23. For the reference vital teeth the interval of color recorded parameters were: lightness  $L^*$ : 70.8 – 97.16, chroma  $C$ : 11.5 – 39.3, hue  $H$ : 83.66 – 101.13,  $a^*$ : -2.36 – 3.8,  $b^*$ : 11.4 – 39.23.

The first three most frequent values in Vita Classical mode for non-vital teeth were B3, A4, A3.5 and for vital teeth were B3, A3, B2, whereas in 3D Master Values for non vital teeth were 3M3, 2M3, 2R2.5 and for vital teeth were 2M2, 2M3, 1M2.

**Conclusions.** Non-vital teeth have a wide space color that varies in comparison with the color space recorded for the vital teeth in the same group of patients: lightness, chroma and hue have higher values in vital than in non-vital teeth, but regarding the chromatic parameters  $a^*$  and  $b^*$  nonvital teeth were found to have higher and wider interval values than vital teeth.

**Acknowledgment:** This study was supported by the Research Project (PCD 4342/55).

## ESTHETIC INTEGRATION OF BULK-FILL COMPOSITE FILLINGS AFTER 4 YEARS OF CLINICAL PERFORMANCE

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**Objectives.** The aim of this study was to clinically evaluate after 4 years the restorations placed using a sonic-activated bulk-filled composite system in posterior restorations.

**Materials and methods.** Patients with caries lesions and esthetic problems were enrolled in this study for caries treatment and replacement of old fillings. Class I, class II and MOD restorations were prepared and restored using SonicFill composite (shades A2 and A3, speed setting 3) in one bulk increment of up to 5 mm depth, associated with four adhesive systems from the same manufacturer. 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 and digital photographs were used to evaluate the restorations at the baseline and during each year's recalls.

**Results.** After 4 years of clinical performance all the restorations were clinically acceptable with no significant change in color match, luster, anatomical form, secondary caries, proximal contacts, post operative sensitivity and periodontal response as compared to the baseline data. Also the patients were entirely satisfied with esthetics and function of their composite restorations.

**Conclusions.** Sonic-activated bulk-fill composite's unique injected delivery system and posterior composite properties assures the clinician that the restoration will be filled in the most efficient manner, without sacrificing clinical performance.

## GENTAMICIN ELUTING COATING ON E GLASS FIBER-REINFORCED COMPOSITES FOR CRANIO-FACIAL RECONSTRUCTION

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**Aims.** The present study focuses on the development of a fiber-reinforced composite (FRC) implant for craniofacial reconstruction with antimicrobial properties.

**Material and methods.** A new fiber-reinforced composite coated with gentamicin was developed. Surface analysis of the gentamicin coated implants was carried out using atomic force microscopy (AFM) and scanning electron microscopy (SEM) techniques. Gentamicin elution from the implants was assessed by high performance liquid chromatography (HPLC). Coated implants were subjected to bacterial adherence and antibacterial efficiency tests. Both tests were performed on two bacterial strains (*Staphylococcus aureus* and *Pseudomonas aeruginosa*).

**Results.** Gentamicin elution took place for more than 2 weeks and maintained above the minimal inhibitory concentration (MIC) for both bacterial strains. Bacteria were efficiently inactivated in direct contact with gentamicin coatings ( $p < 0.05$ ). The inhibition zone for *Staphylococcus aureus* ranged from 17.21 mm to 20.13 mm and for *Pseudomonas aeruginosa* ranged from 12.93 mm to 15.33 mm. Bacterial adherence to the surface of gentamicin coated implants was also impaired.

**Conclusions.** The results of the microbiological protocols used in the study suggested that gentamicin eluting coating not only inhibited the bacterial growth, but also led to a lower initial bacterial adhesion to the surface of the implant. Thus, antibiotic coating of craniofacial implants may reduce the infection rate related to reconstructive surgery.

## PATIENT PERCEPTION OF MODIFIED ESTHETICAL ASPECT INDUCED BY CANINE IMPACTION

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**Objectives.** The aim of this study was to determine the patient perception of modified esthetical aspect induced by canine impaction.

**Material and methods.** The study was performed on a group of 55 patients aged between 18 and 65 years, in various private and state dental offices in Cluj-Napoca. The method used for the collection of data was the completion of a questionnaire by each patient. The questionnaire included questions related to the esthetical aspects and influence of impacted canine on patient's life and social integration.

**Results.** impacted canine caused a general discomfort for 38 patients (69.1%) out of all patients included in our study. Women felt more discomfort associated with impacted canine. Out of all the patients included in our study limitation of social life occurred in a percentage of 69.1%, due to modified facial appearance. The professional life of our patients (40%) was weakly affected by canine impaction. Our study evidences the fact that the effect of canine impaction is higher in women. The mean age of diagnosis is 22 years, which demonstrates the concern of adolescents about aesthetic appearance and good functionality.

**Conclusion.** Canine impaction is a disorder that can be considered as having a greater esthetic effect on the women's quality of life. Our study shows a correlation between the age at which treatment was initiated and the improvement in the quality of life at the completion of treatment.

**CRITICAL OPINIONS ON THE DENTAL SHADE GUIDE AGREEMENT****PETRE COSTIN MĂRĂȘESCU<sup>1</sup>, HORIA OCTAVIAN MANOLEA <sup>1</sup>, FELICIA ILEANA MĂRĂȘESCU<sup>2</sup>, AUGUSTIN IONESCU<sup>3</sup>**<sup>1</sup>**Faculty of Dentistry , University of Medicine and Pharmacy, Romania**<sup>2</sup>**Specialist in Orthodontics – Private Practice**<sup>3</sup>**Dental technician, private practice**

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**Introduction.** Currently, due to the large esthetic demanding, both quantitative but also qualitative, esthetic dentistry and, moreover, the esthetic outcome of the prosthetic appliance became an important issue from clinical and scientific point of view. The present study aimed to establish agreements between different currently used shade guides.

**Material and methods.** For this study we have used the instrumental assessment of color, with the spectrophotometer, EasyShade 4.0 Advance (Vita).

We have compared the colors between the color system from Vitapan Classic (Vita) and shade guide Chromascop shade guide (Ivoclar Vivadent).

**Results.** The recorded color parameters,  $\Delta E^*$ , as well as differences in value, hue and chroma will be presented; the agreements for both shade guides and a graphic presentation including the variation of each parameter will be emphasized.

**Conclusion.** Instrumental method revealed important data regarding the correspondence between shade guides, disagreements between the desired shade and final color originating, partly, from the use of different shade guides used as reference.

## THE CUMULATIVE DOSE ON A PAEDIATRIC POPULATION DURING DENTAL RADIOLOGICAL EXPOSURE- AN EPIDEMIOLOGIC STUDY

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**Objectives.** To estimate the additional dose and risk given by CBCT in a pediatric population.

**Materials and methods.** A cohort design study was conducted in four different centers of oral radiology comprising a number of 6771 patients aged between 0-22 years who underwent a radiological examination during 2014-2015. For each patient the age, gender, pathology, type of examination and setting parameters of the equipment were noted. The cumulative dose for each patient was calculated by merging the estimated dose for 2D examinations with the estimated dose for CBCT using a dedicated software and the life attributable risk (LAR) was estimated according to BEIR VII.

**Results.** The cumulative dose for CBCT was statistically significantly higher than for 2D examinations (mean dose for CBCT  $105.38 \pm SD 84.40 \mu Sv$  and mean dose for 2D  $11.97 \pm SD 13.17 \mu Sv$ ). The highest dose was found for children aged 13-14 years and for conservative orthodontic group. Although only 11.4% of the children underwent a CBCT, the collective dose for CBCT represents 43,64% from the total collective dose given by all examinations. The highest LAR for all cancers was found in the group of children with both 2D and CBCT examinations (mean LAR  $2.026 \pm SD 0.753$  number of cases for 100,000 persons)

**Conclusions.** CBCT investigations bring a higher dose of radiation that should be considered for the susceptible group of children with orthodontic dysfunction.

This study was supported by grant FP7-Fission-2013, DIMITRA OPERRA - Project nr. 604984-2014

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## OPTICAL PROPERTIES OF A NEW UNIVERSAL BULK FILL CERAMIC-BASED COMPOSITE USED FOR THE RESTORATION OF CLASS I CARIOUS LESION

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**Introduction.** The aim of this study was to test the optical properties of a new ceramic based composite, when applied in a single shade fast track technique.

**Material and method.** This clinical study was conducted on a number of 15 patients. 20 modified class I cavities were prepared in the pits and fissures of premolars and molars. All the prepared cavities were selectively etched and bonded with a self-etching, universal adhesive, Futurabond U (VOCO, Cuxhaven, Germany). After that the cavities were restored with Admira Fusion x-tra (VOCO, Cuxhaven, Germany). The composite was placed in a single shade, single layer technique and light cured for 40 sec with a Celalux 2 curing unit (VOCO, Cuxhaven, Germany). After the finishing procedure the restorations were observed. The color matching of this single shade universal composite was assessed by the use of an Extended Visual Rating Scale for Appearance Match (EVRSAM)

### Rating Description

- 0 Excellent esthetic match, an exact match or one so close that the restoration can be delineated only with difficulty.
- 2 Very slight mismatch with esthetics still good to very good.
- 4 Obvious mismatch but within an acceptable range for most patients.
- 6 Poor esthetics on the borderline of acceptability.
- 8 Very poor esthetics that would be unacceptable for nearly all patients.
- 10 Totally unacceptable esthetics.

**Results.** The majority of the placed restoration showed value 0. A very low percentage had score 2.

**Conclusion.** The new ceramic based bulk-fill composite demonstrated good optical properties with a precise color match even if used in a single shade technique.

## THE EFFECT OF DIFFERENT DRINKS ON THE COLOR STABILITY OF GRAPHENE EXPERIMENTAL NANOCOMPOSITES

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**Introduction.** Color is one of the most important attributes of aesthetic restorations. Matrix, filler composition, filler content, minor pigment addition and initiation components affect the color of aesthetic materials. The color stability is related to the dimension of the filler particles, depth of polymerization and coloring agents. The objective of this study was to evaluate the color changes of five restorative dental nanocomposites after an artificial accelerated aging for 103 days, and then measured before and after immersion in two food colored solution for 30 days.

**Materials and method.** Five experimental nanocomposites, four with graphene oxide with SiO<sub>2</sub> (GS1, GS2), respectively ZrO<sub>2</sub> (GZ1, GZ2) filler nanoparticles in different percentage and one without graphene (N1) were used in this study. Ten specimens of each nanocomposite material (1x10 mm) were prepared by filling in a teflon mould and cured for 180 s with Wodpecker LED lamp. The specimens were artificially accelerated aging by immersion in artificial saliva and stored in a water at 37 °C for 103 days. To evaluate the color stability in two different beverages, the specimens were subdivided into 2 subgroups of 5 specimens for every nanocomposites, which were immersed in red wine and coffee for 1 h a day for 30 days. Color coordinates (L\*a\*b\*, ΔL\*, Δa\*, Δb\* and ΔE\*) were measured using a VITA Easyshade Compact (VITA Zahnfabrik) before and after 30 day of storage in two different beverages of coffee and red wine.

**Results.** The color difference (ΔE\*) of the experimental nanocomposites ranged between 4.17 and 18.28 after 30 day of immersion in the staining solutions. Changes in color of experimental nanocomposites provided by extrinsic factors are attributed to contamination like coffee and red wine. Low periods of immersion, like 30 days, are sufficient to produce staining and color changes to nanocomposite.

**Conclusions.** The findings of the study suggest that the type of restorative nanomaterial and beverage significantly influence the color stability of the materials.

**Acknowledgements.** This work was funded by the Romanian Ministry of Education and Research, National project PN-II-PT-PCCA-2013-4-1282, no. 230/2014.

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## OPTICAL PROPERTIES OF INDIRECT POLYMERIC MATERIALS DURING ORGANIC SOLVENTS TREATMENT IN A C SCAN OCT PERSPECTIVE

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**Purpose.** The present study points out the ability of C Scan (en face) Time Domain OCT to visualize the dynamical changes generated by organic solvents on the superficial layer of PMMA, based on the optical properties of the polymer solvent interaction.

**Materials and methods.** 14 PMMA cylinder shaped samples (Spofa Dental) (6 mm diameter, 3 mm height), were sectioned resulting 28 half cylinders with radius and height of 3 mm. Using a 3 mm diameter cylindrical acrylate bur at 1500 rotations/min speed, the two perpendicular surfaces of the half cylinders were milled to perfectly flat.

The surface treatment regimens were: Group 1-(14 half cylinders): Control (without chemical treatment); Group 2-(14 half cylinders): 200 seconds organic solvent treatment.

The perpendicular flat surfaces of the samples were submitted to TD (C Scan) OCT noninvasive investigation (1300 nm, 10 µm resolution).

**Results.** The chosen optoelectronic technique working parameters allowed image data captions of the width of the chemically treated PMMA superficial layer ranging from 10 % to 20%.

**Conclusions.** Based on the optical properties of the polymer samples\_solvent assembly, the C Scan (en face) Time Domain OCT has proved its ability to visualize the changes generated by the organic solvent to the superficial layer of polymer samples, changes which are directly correlated with the elapsed time of solvent treatment.

## THE INFLUENCE OF CEMENTED FULL CERAMIC CAD-CAM RESTORATIONS THICKNESS ON THE OPTICAL PROPERTIES

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**Introduction.** Full ceramic CAD CAM restoration thickness, the cement and the color of the substrate can influence the final optical properties, which are essential in obtaining exceptional esthetic results. The objective of the study was to evaluate the changing of full ceramic CAD-CAM restoration's optical properties after adhesive cementation, according to the thickness of the restorations.

**Materials and method.** The study was conducted on 20 full ceramic restorations using the CAD CAM technology. A molar crown preparation on an ideal cast model was scanned. The virtual model obtained was used to design the restorations with different facial surface thickness (n=4): (1mm, 1.25mm, 1.5mm, 1.75mm and 2mm). IPS Empress CAD B3 LT (Ivoclar) ceramic blocks were used for milling. The cementation was made with Variolink II Base Opaque (Ivoclar). With the aid of Vita Easyshade (Vita) spectrophotometer the optical parameters of the restorations were assessed before and after the adhesive cementation. The color difference  $\Delta E^*$  was calculated and the data was analyzed with SPSS program.

**Results.** The color difference varied according to the thickness of the restorations: 2mm -  $\Delta E^*=0.74$ , 1.75mm -  $\Delta E^*=1.22$ , 1.5mm -  $\Delta E^*=1.66$ , 1.25mm -  $\Delta E^*=2.52$  and respectively 1mm -  $\Delta E^*=3.20$ .

**Conclusions.** Within the limitations of this study, full ceramic CAD CAM restorations thickness influenced optical parameters after cementation. Only the 2 mm thickness generated a color difference smaller than the perceptibility threshold  $\Delta E^* = 1$ , while a 1mm thickness generated a color difference over the clinical acceptability threshold  $\Delta E^* = 3.4$ .

**Acknowledgments.** This study was supported by the Research Project PCD 4342/122 from 22.02.2016.

# POSTER PRESENTATIONS



## EXTERNAL DISCOLORATION OF ORTHODONTIC AESTHETIC ELASTOMERIC LIGATURES

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**Introduction.** The aim of this study was to assess the color changes of four types of aesthetic orthodontic elastic ligatures under the influence of exogenous pigments contained in the daily consumed liquids.

**Material and method.** For this study, four types of aesthetic Power Sticks Elastomeric Ligatures from Ortho Technology (Florida, USA) were divided into 6 groups containing 4 colors: Clear-Stain Resistant, White, Pearl and Tooth. Each group was immersed in 200 mL of solution, as follows: distilled water (control group), Coca-Cola®, coffee, Earl Grey black tea, green tea and orange juice from concentrate. After 48 hours, the ligature sticks were washed with distilled water in an ultrasonic vat for 5 min and dried with paper tissues. The portable digital spectrophotometer Vita Easyshade Compact was used to assess if there was color variation for each ligature stick. For a different type of testings, digital images of the modules were taken and processed using commercial software.

**Results.** The highest staining potential on esthetic elastic ligatures was owned by coffee, followed by black tea. The color changing for the coffee group occurred in the first 5 minutes from immersion, while the others happened more slowly. From the coffee group, the most resistant to color change was the White elastomeric stick.

**Conclusions.** The results of our study can help the orthodontist in choosing the best elastic ligatures for his patients.

## ELECTROCHEMICAL STUDY OF METALLIC ALLOYS FREQUENTLY USED IN PROSTHETIC DENTISTRY

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**Objectives.** The in vitro study aimed at highlighting the presence of the electro-corrosion process and the phenomenon speed production in some of the metal alloys commonly used in prosthetic dentistry. The test simulates the oral cavity conditions, where, due to the effect of the oral environment, these materials are exposed to alterations that are more or less pronounced.

**Materials and methods.** Two alloys (Cr-Ni and Co-Cr) commercially available on the market for dental casting were studied. The materials were encapsulated in Teflon devices in order to obtain a constantly exposed area. For electrochemical measurement, a PGStat 302N computer-controlled potentiostat (Autolab, The Netherlands) was used. The electrochemical cell was equipped with three electrodes: the working electrodes consisting of the studied alloy, a reference electrode (Ag/AgCl, KCl sat) and the counter electrode (a Pt wire). The electrolyte was a solution of artificial saliva.

**Results.** Potentiodynamic polarization curves of alloy samples were traced by varying the applied potential from -1 V to 1 V vs. Ag/AgCl, KCl sat, with a potential scan rate of 1 mV/s, in order to identify their active-passive behavior. Open circuit potential (OCP) measurements showed that the potential values increased with the time of immersion into artificial saliva, which is a proof of the passivation process occurring to the studied alloys. Electrochemical impedance spectroscopy measurements allowed an estimation of the values of the resistance to corrosion of the studied alloys and their comparison with data from literature.

**Conclusion.** The study, by electrochemical methods of investigation of the alloys used in dental prosthesis tested in artificial saliva, provided information about the type of corrosion and allowed a quantitative estimation of their resistance to corrosion.

## DIACRILIC COMPOSITE RESINS USED FOR REESTABLISHING THE DENTAL AESTHETICS

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**Objective.** Diacrilic composite resins have a vast applicability in the restorative therapy of dental lesions and dental aesthetics. The advantages and working technique offered by these materials indicates them as a class of materials used for direct veneers. The objective of this study is to evaluate the optical properties of veneers made through direct technique with two different diacrilic composite resins: G-aenial (GC) and Evetric (Ivoclar Vivadent).

**Material and method.** Diacrilic composite resin G-aenial (GC) is a light-curing composite, dedicated to anterior and posterior teeth, while Evetric (Ivoclar Vivadent) –is a nanohybrid composite. Both were used as materials for rehabilitating the upper frontal teeth. For this study were selected two clinical cases. The selected cases presented for the upper frontal teeth malpositions and color modifications which are easy to be corrected with direct veneers. The first step was represented by the shade evaluation with Vita Classic shade guide and spectrophotometer Vita Easyshade Compact. The teeth were prepared, isolated, the dental hard tissue was conditioned with  $H_3PO_4$ , stage followed by the working protocol for each kit.

**Results.** The aesthetic results were good for both materials used although were registered some minor differences. The shade was evaluated with both types of the mentioned systems (shade-guide and spectrophotometer).

**Conclusions.** Diacrilic composite resins represent an excellent alternative for ceramic veneers. The major advantages are represented by lower costs, single visit and excellent aesthetic results.

## RESIDUAL DOUBLE BONDS AND FLEXURAL STRENGTH DETERMINATION OF SOME DENTAL COMPOSITES

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**Objectives.** The aim of this study is to examine the effect of the composition of both the filler and the organic phase of 6 dental composites on the degree of conversion reached after polymerization of the monomers and their flexural strength.

**Materials and methods.** Three experimental composite materials are studied (PM, P14M, P2S) with micro and nano- fillers synthesized in our laboratory, and 3 commercial materials (Charisma, Gaenial, Enamel). By FTIR spectroscopy (JASCO) has been quantitatively determined the unreacted methacrylate groups, using the absorption band at 1635-1640  $\text{cm}^{-1}$  and at 1608-1610  $\text{cm}^{-1}$ . The specimens for flexural strength determination (Lloyd Instruments-LR5k Plus) were made according to ISO 4049/2000, with dimensions of 2x2x25mm. The test speed was 1mm/min, the data being processed by Nexygen software.

**Results.** The results reveal a lower percentage of residual double bonds and a high conversion of 86.01% for composite P2S, 78.68% for P14M and 74.48% for PM. For commercial materials, percentage of residual double bonds is slightly higher, but here we recorded the polymerization conversion of 72.32% for Enamel, 68.07% Gaenial and 56.31% Charisma. The highest values obtained for flexural strength were for composite Enamel, followed by P2S, Gaenial, P14M, PM and Charisma. The results can be explained by the increasing amounts of flexible monomers in Enamel, creating a dense and flexible polymer structure with an increased elastic deformation of the composite. The stiffness was measured by the Young's modulus, which represents the material's resistance to elastic deformation. Of the samples that contain a high amount of filler, sample P14M shows the highest value, 21.8 Gpa, modulus of elasticity.

**Conclusions.** It can be seen that by increasing the composites charging, a higher degree of rigidity is achieved, higher modulus of elasticity and a lower percentage of residual double bonds and high conversion. P2S and P14M, with 80% and 75% filler, provided the best results, comparing the two samples we concluded that the ratio of basic monomer and the dilution leads to greater resistance and a suitable modulus of elasticity.

**Acknowledgments.** This work was funded by: the Romanian Ministry of Education and Research, national project PNII no: 127/2014.

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## THE TREATMENT OF WHITE SPOT LESIONS IN PEDIATRIC DENTISTRY – INFILTRATION WITH ICON®

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**Objective.** White spot lesions are an obvious sign of modification in the enamel composition. In most cases, it is the first sign of dental cavities. The poor oral hygiene and the excessive intake of soda drinks represent causes of white spot lesions. As against the traditional methods, DMG (Dental Material-Gesellschaft, Germany), proposes an innovative technology - Icon® through which hard tissues are not removed, but infiltrated.

**Material and methods.** The study was conducted within the Pedodontic Department of the Victor Babes University of Medicine and Pharmacy, Timisoara. I selected from among children presented for treatment, 21 temporary teeth which had white spot lesions on the vestibular surface. This treatment involved the following clinical steps: isolation with the rubber dam, cleaning the vestibular surface with tooth paste without flour, application of the gel which contains hydrochloric acid (Icon- Etch) for 2 minutes, then we washed the acid for at least 30 seconds, air dry, then drying with ethanol (Icon-Dry), air drying again; after this we applied the infiltrating agent and the last step was to remove the excess with paper rolls. After 2 minutes of infiltration we light cured for 30 seconds, followed by the hygienization of the surface. Every case was followed and documented with photos for one year.

**Results.** During the period of observation, 4 teeth were lost by exfoliation, from the remaining 17 teeth, 15 did not change the clinical and photographic aspect of the infiltrated white spot lesions. The infiltration treatment of white spot lesions helps us remove the esthetic defect, stabilize the lesion, and stop the following evolution, in order to prevent a dental cavity.

**Conclusion.** This is a non-traumatic technique, with predictable results and does not involve hard dental tissues removal; it also prevents further evolution of the white spot lesions, which indicates its use in current pedodontic practice.

## HPLC DETERMINATION OF THIOSULPHINATES AND FLAVONOIDS FROM MATERIALS BASED ON NATURAL EXTRACTS

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**Objectives.** The present study reports the chromatographic determination of the thiosulphinates and the flavonoids in antiplatelet supplements based on *Allium cepa* L. extracts. Thiosulphinates were analyzed by high performance liquid chromatography (HPLC) with mass spectrometry detector (MS) and flavonoids by HPLC with UV-Vis detector in order to use these supplements for prevention of cancer and cardiovascular disorders.

**Method.** The HPLC-MS analyzes of thiosulphinates were carried out on a high performance liquid chromatograph Agilent 1200/2008 with mass spectrometry detector (MS). For HPLC separation was used a Zorbax Eclipse XDB-C18 column (4.6 x 150 mm, 5 μm) and linear gradient elution, with the H<sub>2</sub>O - MeOH in different ratio. The column temperature was 25°C and the injection volume was 5 μL. The flow rate was 0.5 ml min<sup>-1</sup>. MS detector of chemical ionization at atmospheric pressure it was used in the positive ionization mode.

The HPLC-UV analyzes of flavonoids, quercetin and catechin, were achieved on a high performance liquid chromatograph Jasco (Japan) with UV-VIS detector. Separation was carried out on a Lichrosorb RP-C18 column (25 x 0.46 cm) at 40 °C column temperature and the injection volume was 20 μL. The mobile phase was a mixture of methanol and solution 0.1% formic acid in a gradient elution. The flow rate was 1 mL min<sup>-1</sup> and UV detection was 290 nm.

**Results.** The thiosulphinates compounds present in antiplatelet supplements based onion extract were found MeS(O)S 1-propenyl (E,Z) (m/z=137); *n*-PrS(O)S 1-propenyl-(E) and *n*-PrS(O)S 1-propenyl-(Z), (m/z=165); *trans*-zwiebelane (m/z=163); *n*-PrS(O)CH<sub>2</sub>SS-1propenyl (m/z=239), 1-propenylS(O)CH<sub>2</sub>SS1-propenyl (m/z=237). The flavonoids from antiplatelet supplements based onion extract were found quercetin and catechin and were determined quantitative.

**Conclusion.** The HPLC method confirms the presence of the thiosulfinates and flavonoids compounds in extracts of antiplatelet supplements with importance in the prevention of cancer and cardiovascular disorders.

**Acknowledgment.** This work was financially supported by the Romanian Programme for Research, Development and Innovation PNCDI II Contract no. 191 / 2014.

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## EFFECT OF EXPERIMENTAL BLEACHING ON COLOR AND TRANSLUCENCE STABILITY OF RESIN COMPOSITES AFTER IMMERSION IN DIFFERENT DRINKS

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**Objective.** The goal of this study was to evaluate changes in color and translucency parameter (TP) values of composite with different filler load before and after different staining solution and after bleaching.

**Materials and methods.** Three experimental self-cure dental composites with variable filler loading (50 wt.% C1, 70 wt.% C2, 80 wt.% C3) were obtained and analyzed. Specimens (n = 5) were made as disks, 10 mm in diameter and 2 mm thick. Specimens were investigated and analyzed for L\* a\* b\* using spectrophotometer over background of white. Color changes ( $\Delta E$ ) and translucency (TP) was investigated after one-week and one-month storage at 37 °C in water (control), tea, coffee and after whitening. Whitening was performed using two experimental bleach material (Nat 19 and Nat 17 bleach material) and a market bleach material based on carbamide peroxide (CP, BleachBright).

**Results.** Color changes after 7 days aging ranging from:  $\Delta E$  1.13 - 1.40 in water;  $\Delta E$  11.11- 17.94 in tea;  $\Delta E$  17.9 - 12.78 in coffee and after 1 month of staining the color changes increase between:  $\Delta E$  3.37 -3.92 in water;  $\Delta E$  18.75-27.47 in tea,  $\Delta E$  23.92-34.11 in coffee.

TP values for C1, C2 and C3 decrease after staining between: 5.25 to 1.91 (C1); 2.72 to 0.57 (C2) and from 1.80-0.46 (C3). After whitening of composites  $\Delta E$  values for tea aging were between 4.67 and 5.87 and in coffee aging between 6.33 and 9.55.

**Conclusion.** Experimental bleaching Nat 17 and Nat 19 showed very close  $\Delta E$  values with BleachBright in case of tee storage of composites. In case of coffee storage of composites the bleach with Nat 19 had lower  $\Delta E$  values than BleachBright.

**Clinical Significance.** Color changes are one of the most common reasons of esthetic restoration replacement. New bleaching material could be an alternative material to carbamide peroxide-bleaching.

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## EVALUATION OF SCAFFOLDS MADE BY 3D PRINTING BASED ON TWO DIFFERENT TYPES OF SCAN

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**Introduction.** Three-dimensional (3D) printing, also known as "additive manufacturing" (AM) relates to various manufacturing processes used to obtain a 3D object. In 3D printing, successive layers of material are deposited under computer control to create a certain object, which can be of almost any shape or geometry. The manufacturing is made using a 3D model or based on other sources of electronic data. The objective of this study was the comparison of two scaffolds produced by 3D printing on two different scanning types.

**Materials and method.** We selected a lower jaw with a bone defect that would have prevented any prosthetic treatment-based implant. This mandible was first scanned using an optical scanner (MAESTRO DENTAL SCANNER MDS400, CERFIT, ITALY), and then using the CBCT (CRANEX 3DX, SOREDEX, SUA). We thus determined the exact position of the bone defect of the jaw. Further on, we achieved the digital design of the future scaffold with the conventional technique of wax addition directly on the mandibular bone defect. This was again scanned using the two scanning systems mentioned above. Thus a two digital designs of the future scaffold was obtained: (i) one by optical scanning of the wax design and correlated with the data of the jaw bone defect scanned initially and (ii) one by scanning using CBCT of the wax design. In consequence, two 3D printed scaffolds were made from polymeric material.

**Results.** Two polymer scaffolds were obtained. The scaffold made after the optical scan was just an empty polymer shell, however the one made after the CBCT scan of the design made of wax was developed as a piece filled with polymer. In order to perform implant treatment, a dense scaffold that provides the implants a good stability and durability over time is required.

**Conclusions.** For inserting the implants a dense scaffold is required, the one obtained after the CBCT scan.

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## A MODERN APPROACH TO TRIDIMENSIONAL MODELING IN DENTAL MEDICINE

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**Introduction.** In dentistry, whenever we deal with a significant vertical bone loss, the procedure of augmentation is not predictable and it highly depends on the technique of the clinician. The aim of this study is to develop an easy to use, tridimensional, solid membrane that is able to protect the augmented bone from the conjunctiva cells and also maintain the space.

**Materials and method.** Five patients were augmented with a mix of autogenous bone, bovine bone and PRF. The mixture was inserted into a solid tridimensional membrane fixed to the bone with bone screws. Based on a computer tomography we created a virtual model and we designed a virtual membrane that was printed with the aid of a tridimensional printer. This resorbable solid membrane is made from a polymer: Resorb x®, 100 % amorphous, non-crystalline poly D, L-lactic acid (PDLA).

**Results.** The histological analysis allowed us to assess the quality of the newly formed bone which was very good. On the CT we measured the bone level and we compared it to the bone level after the operation. The augmented zone is starting to form bone from the natural bone towards the mixture of bone that was added. The trimmed PRF membrane allows the formation of a new blood network. The autogenous bone provides the collagen and the bovine bone makes the whole mixture stable.

**Conclusions.** The solid, printed tridimensional membrane offers many advantages, reducing the costs and the duration of the surgical intervention. The risk of flap perforation is significantly lower.

## THE INCIDENCE OF PERIODONTAL INFLAMMATION IN ADOLESCENT AND ADULT POPULATION

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**Objectives.** Worldwide, more than 25 million persons suffer from dementia, with 50-60% having Alzheimer’s disease (AD). These numbers are estimated to increase, and therefore, identifying early modifiable factors that affect AD pathogenesis holds the potential for prevention, early diagnosis, and intervention. Since our long-term goal is to investigate the contribution of aggressive periodontitis (a severe periodontal disease present in young, healthy people) to AD pathology, we began to explore the occurrence of aggressive periodontitis (AgPerio) in our population and characterize it.

**Material and methods.** Since, the inflammation and infection are believed to be involved in the pathogenesis of AD, the importance of our study consists in collecting 90 of panoramic X–Rays with demographic data, as previously defined (Jose, 2016). Continuous data are presented as means and standard deviation and categorical data as percentages. On this data we can diagnose aggressive periodontitis, on patients between 18-40 years old.

**Results.** Following the complementary and clinical trial it has been demonstrated the prevalence of 20% of cases with aggressive periodontitis, which represents a high level of inflammation in the young population. The mean age of the involved subjects was 30.8 and 66,6 % were women, none reported significant medical conditions (genetic disorders, hypertension, diabetes, major depression, alcoholism, drug addictions, acute infections). Evaluating the panoramic X-ray, 8 subjects (8,88%) had radiographic evidence of AgPerio. Although subjects with AgPerio were older ( $33.7 \pm 5.1$  vs.  $27.7 \pm 3.9$ ;  $t = -3.9$ ;  $p = 0.00$ ), they did not differ in gender (57% vs. 51% female;  $p = 0.68$ ).

**Conclusion.** The results will be used in the development of modern treatment methods, on early prevention of inflammation, corresponding both in Periodontal disease and Alzheimer disease. In our convenience sample the occurrence of AgPerio was high. However, this initial study should be replicated by using clinical diagnosis criteria.

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## BIOINTEGRAION EVALUATION OF THE DENTAL IMPLANTS AFTER MAXILLARY SINUS FLOOR ELEVATION USING THE TECHNIQUE OF MIXED BONE WITH I-PRF

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**Introduction.** Maxillary sinus floor elevation (lift sinus membrane through the addition of bone) is a surgical procedure that allows the increase of the amount of additive posterior jaw bone. It is used when the position and size of the maxillary sinus procedure make it impossible to insert implants in the jaw, in the molar region, and involves adding a bone to properly integrate a dental implant. The objective of this study was to evaluate 10 cases of biointegration of the dental implants after maxillary sinus floor lifting technique using bone mixture with I-PRF.

**Materials and methods.** It was decided to rebuild the already pneumatized sinus, for a further implantation and oral esthetics prosthesis. Ten patients related to this procedure were considered for this study.

In the first step a window was opened on the buccal wall of the maxilla in the premolar and first molar area, lifting the Schneiderian membrane, using also A-PRF membranes protecting the new rebuild sinus ceiling and also the lifted sinus membrane. The new volume was filled with heterologous, equine bone Apatos-Mix (OsteoBiol) mixed with I-PRF, for a better handling, adaptation, healing and integration of the bone. After a period of 6 months, the implants were screwed in the new grown bone, with all the human maxillary bone characteristics.

**Results.** Considering the cases mentioned before with this method, a considerably shorter period of integration (30%), better quality of strength and stability of implants was noticed in the new obtained maxillary bone observed on periosteal evaluations.

**Conclusion.** Bone augmentation (addition of bone) with sinus lift allows dentists to rebuild and repair bone defects in the oral cavity so that different kinds of treatments can be made, observing the highest requirements in terms of aesthetic and functional criteria.

## A QUALITATIVE EVALUATION OF THE EFFECTIVENESS OF PROPHYLACTIC MATERIALS IN DENTAL EROSION

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**Objectives.** Qualitative assessment and visualization by Scanning Electron Microscopy (SEM) of erosive changes in the enamel structure after application of different prophylactic materials.

**Methods.** 32 enamel fragments obtained from extracted teeth were divided into the following groups: control, treated with toothpaste, treated with remineralizing toothpaste and treated with fluoride varnish. After mineralization, the fragments were immersed into a liquid with pH adjusted to 5.06 for 24 h at room temperature. The evaluation of the fragments was carried out using SEM, in various magnifications.

**Results.** The untreated enamel fragments showed significant changes, the enamel prisms being destroyed. Samples treated with toothpaste showed areas of demineralization without the exposure of unevenly distributed prisms. Samples treated with remineralizing toothpaste showed areas with a low exposure of evenly distributed prisms. The fragments treated with fluoride varnish showed the integral surface of the varnish layer with minor cracks due to dehydration and unchanged enamel.

**Conclusions.** SEM is a qualitative investigation method for dental structure changes. This method can clearly visualize the effects of erosion on dental tissues and the differences appearing after a prophylactic treatment. These aspects are important both clinically and educationally. The present study emphasized the prophylactic effect and the differences between the three materials used. The best observed protection was provided by the fluoride varnish which forms a layer on the enamel surface.

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## EVALUATION OF ENDODONTIC ANATOMY AND OF THE ROOT CANAL TREATMENT BY USING THE DENTAL OPERATING MICROSCOPE. AN IN VITRO STUDY

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**Objectives.** The use of the dental operating microscope (DOM) as a mean of identification of endodontic morphology is the first premise in achieving an accurate therapy. The purpose of the present study was to evaluate the role of magnification in the endodontic treatment.

**Material and methods.** Four un-instrumented mandibular molars and four maxillary molars (Group I), and two mandibular molars and five upper molars instrumented in a step-back technique and filled by lateral condensation (Group II) were evaluated. In Group I (n = 8), the access cavities were carried out using the magnifying glasses. Root canals were identified and samples were photographed. Another check-up under the direct observation of the DOM followed at different magnifications. In Group II (n = 7), the endodontic treatment was carried out without the use of magnifiers and verified under DOM. The teeth were observed under the magnifications: 2.5x, 1.6x and 1x and photographed. The pictures at 2.5x magnification were digitally analyzed and the distances between the orifices of the root canals were measured.

**Results and conclusions.** Upper molars presented in the majority of the samples 3 root canals, and 2 supplementary canals were identified. The shortest distance between root canals was the one between mesio-buccal and disto-buccal canals, with an average of 2.6 mm. In lower molars the lowest distance recorded was between mesiobuccal and mesiolingual canals, with an average of 3 mm. In Group II, a single supplementary canal was identified, which was already treated and filled. In approximately 33% of the samples, the root canal fillings were incorrect.

It was noticed that by mechanical instrumentation, the distances between the root canal orifices decreased, in upper molars it became approximately 2.3 mm, and in lower molars it decreased from 3 to 2.3 mm.

## ISOLATION AND DIFFERENTIATION CONDITIONS OF STEM CELLS FROM DIFFERENT TYPES OF TISSUE OF THE ORAL CAVITY

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**Objective.** Comparison between isolation and differentiation methods of stem cells from human oral cavity.

**Material and methods.** Stem cells were isolated through the explant technique, using 3 methods: isolation without trypsinization; isolation without trypsinization, but with preliminary incubation with fetal serum (the interradicular and tuberosity bone cells) and with trypsinization (the cells obtained from porcine subjects). The samples from all types of tissues were decontaminated, washed with PBS, fragmented, centrifuged, placed into cell culture media and incubated. The culture was characterized by immunocytochemistry and flow cytometry.

**Results.** The stem cell proliferation rate was different according to the type of tissue they were generated from: primary cultures of mesenchymal stem cells occurred from dental follicle after 5 days, from apical papilla after 6 days, from the pulp after 9 days, from the interradicular bone tissue after 11 days, from the tuberosity bone tissue after 18 days and from the adipose tissue after 10 days. The primary cultures obtained from bone tissue presented a precipitation reaction of NaCl crystals of pearled structures which agglomerated simultaneously with the cell growth. The pearled structures were revealed with electronic microscopy with EDAX system. The pearled structures influenced the cell proliferation, as a consequence of their high density on the surface of the flask. The isolated stem cells expressed specific characteristics of mesenchymal stem cells.

**Conclusion.** The explant method is suitable for processing large quantities of stem cell populations. The stem cells from the dental follicle had the best proliferation rate.

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## THE ANTIBACTERIAL EFFECT AND CYTOTOXICITY OF SOME EXPERIMENTAL DENTAL GIOMERS

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**Objective.** The aim of the present work was the evaluation of the antibacterial effect and cytotoxicity of some experimental giomers based on organic matrices comprising different mixtures of Bis-GMA/UDMA/TEGDMA/HEMA resins filled with pre-reacted glasses, barium fluoride glass and nano-fluorapatite powder. As a reference we used “Beautifil II” (Shofu Inc., Kyoto, Japan).

**Method.** For determination of the antibacterial activity, the materials were tested by cured disc method (disc size: 5 mm inner diameter and 1 mm thickness) on two types of bacteria: *Escherichia coli* and *Staphylococcus aureus*. For determination of the cytotoxicity of the giomers, the assessment was done on normal human dermal fibroblasts (HDFa-Invitrogen, Willow Creek, USA) and human umbilical endothelial vein cultures HUVEC (Promocell, Hamburg, Germany), according to SR ISO10993-5 by MTT test (test of mitochondrial metabolic activity).

**Results.** The antibacterial effect presented a slight decrease throughout the period of investigation. Cell viability was decreased by all biomaterials when compared to controls. The effect was dependent on the preparation time of the extract. The overall viability of the fibroblasts was more affected compared to that of the HUVEC’s.

**Conclusion.** The giomers present an antibacterial effect on *Escherichia coli* and *Staphylococcus aureus*. The experimental biomaterials showed similar and/or better cytotoxicity when compared to the Beautifil II commercial product, this effect was maintained in all tested conditions.

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## COMPARATIVE SCANNING ELECTRON MICROSCOPY (SEM) EVALUATION OF THE PROTAPER UNIVERSAL, PROTAPER NEXT AND WAVE ONE SYSTEMS

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**Objective.** The aim of this study was to compare, on extracted human teeth, the efficiency of three rotary systems of nickel titanium alloy used in root canal preparation. The quality of the treatment was assessed by x-ray then the teeth were cut into half longitudinally, assessed in optical microscopy and in scanning electronic microscopy with low pressure (low vacuum SEM). The degree of cleaning of the root canal walls and the traces left by each instrument were compared.

**Material and methods.** 15 extracted single-rooted human teeth were divided into 3 groups: Group 1 (n=5) preparation with the Wave One; Group 2 (n=5) preparation with the ProTaper Universal; Group 3 (n=5) preparation with the system ProTaper Next. A single irrigation protocol was used: the alternation between the solutions of sodium hypochlorite in concentration of 5.25% and citric acid 40%. The samples were checked by digital radiography, sectioned in half and observed under the endodontic operating microscope at a magnification of 1.6x. Assessment in low-vacuum scanning electron microscopy has been carried out at a pressure of 150 Pa and a voltage of acceleration of 30 kV, at a magnification of 1000, 2000 and 8000x.

**Results and conclusions.** From the analysis of the examined areas, the cleanest were observed in samples instrumented with Wave One and Pro Taper Next. In the analysis of the areas affected by the mechanical instruments, the deepest traces on root canal walls were observed for Wave One and ProTaper Next; however, in samples shaped with ProTaper Universal system, a higher density of cuts than in other samples was noticed. The mechanical action of the instruments, without a correct irrigation protocol, leads only to a mechanical preparation of the root canals walls, but to clean the endodontic system and to open the dentinal tubules, it is mandatory to associate instrumentation with the chemical action of the irrigants.

## EVALUATION OF MARGINAL ADAPTATION OF FIXED PARTIAL PROSTHESIS TO CERAMIC ABUTMENTS

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**Objectives.** The scanning software it is one of the most interesting domains in dentistry. The aim of this study is the correlation between the software results and the clinical aspects related to the fitting of the abutment and the inside margins of the integral ceramic dental crowns.

**Material and method.** For the study 25 all ceramic prosthetic restorations were made. After introducing the model into the 3Shape D700 Scanner and fixing it on the existing table, it was carried on with the model scanning. The final prosthetic restorations were sectioned to validate the measurements on the model using a micromasurement device.

**Results.** For the virtual evaluation performed on the mentioned software, the distance between internal marginal area of the crown and the surface of the abutments were acceptable (average values 68  $\mu\text{m}$  in the cervical area, 72  $\mu\text{m}$  in the middle area and 79  $\mu\text{m}$  in the occlusal area). In the proximal areas were observed the most variable dimensions due to the fact the ceramic appliance has a complex movement. The measurements made directly on the models shows similar values, validating the ones obtained from the software.

**Conclusions.** For long-term success of prosthetic restorations an ideal space for the luting cement should have the same dimension around the dental abutment. However some variations were observed in the proximal area corresponding to the edentulous space. Therefore, a variation of 50  $\mu\text{m}$  in this zone should be acceptable.

## STAINING STUDY AND COMPUTERIZED INTERPRETATION OF THE DIGITAL IMAGES

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**Introduction.** Changing in the color of restoration materials is a controversial phenomenon, being framed by some authors in the category of adverse effects, because the degree of discoloration is not equivalent to that of tooth discoloration; although the color composites changes under the action of the bleaching agent, studies show that their translucency does not suffer. Moreover, it is recommended that bleaching is carried out prior to the direct or indirect dental restorations, which will apply after several weeks of treatment chemical peroxide, to give time to dental color to stabilize.

**Materials and method.** In this study, we used experimental composites, P31, P 11 and P61 and commercial composite Nanofill (Schulzer), which we immersed in coffee and we have aged in artificial saliva for 10 or 30 days. For the bleaching process was used an experimental natural whitening gel G28 in comparison with a commercial bleach based on carbamide peroxide, from the company BrightBleach. Samples were measured for determination of color both before and after their immersion in the medium, using two measurement techniques: spectrophotometry, using a spectrophotometer UVVIS (Single-UV4) equipped with an integrating sphere RSA-UC-40 (LABSPHERE) and by measuring the digital images using Dentcolor program. From color coordinates ( $\Delta a^*$ ,  $\Delta b^*$ ,  $\Delta L^*$ ) read by the two techniques was calculated color difference  $\Delta E^*$  with formula:

$$\Delta E^* = [(\Delta L^*)^2 + (\Delta a^*)^2 + (\Delta b^*)^2]^{1/2}$$

**Results.** Experimental composite P61 immersed in coffee, stained more than commercial composite (Nanofill) and experimental composites P11 and P31.

After bleaching, both natural whitening gel, and with the commercial gel, composites have discolored. The consequences of bleaching to materials based on resin may vary depending on the resin and whitening gel composition, the frequency and duration of exposure.

**Conclusions.** Comparing values in color differences measured spectrophotometric, with values obtained by measuring digital images, it was a significant difference in some of composites stored in coffee and artificial saliva.

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## COMPARATIVE EVALUATION OF THE PUSH-OUT BOND STRENGTH TO RADICULAR DENTIN OF THREE ENDODONTIC SEALERS

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**Objective.** The aim of this study is to evaluate and compare the bond strength to radicular dentine, of three endodontic sealers, using a push-out test.

**Materials and methods.** 30 single-rooted human teeth were used in this study. The root canals were instrumented using Wave One reciprocating system (Dentsply-Maillefer) up to #40, and irrigated with NaOCl 5.25%, EDTA 17% and saline solution.

The teeth were randomly divided into three groups, and obturated according to manufacturer's indication: Group 1: RealSeal SE and Resilon (SybronEndo) using the warm vertical compaction technique; Group 2: BC Sealer and BC Points (Brasseler) using the single cone technique; Group 3: Endoseal MTA and gutta-percha (Maruchi).

After the sealer was set, the teeth were embedded in acrylic resin, and sectioned with a microtome, into 1 mm serial slices from the apex to the coronal part of the tooth.

A push-out bond strength test was performed using a universal testing machine. Bond failure was manifested by the loss of adhesion, at the interface sealant/dentin or sealant/core material, and the extrusion of the root filling. Failure forces were recorded for each slice. The Student t-test was used to compare the results among the experimental groups.

**Results.** Push out strength was significantly influenced by the endodontic obturation system. The EndoSequence BC Sealer/BC Points group had statistically higher bond strengths than Endoseal MTA and gutta-percha group, and RealSeal SE/Resilon group ( $p \leq 0.05$ ).

**Conclusion.** The adhesion of root canal filling materials to dentin is crucial for long term prognosis of the endodontic treated teeth. The result of this study supports the hypothesis that bioceramic sealers have an excellent adhesion to dentin.

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## BONE AUGMENTATION ASSESSMENT BY MICRO-CT IMAGING METHOD

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**Objectives.** Bone augmentation is performed on the maxillary bone which shows resorption or different defects in order to increase the volume of the bone with the use of biomaterials.

**Material and method.** In this study we used 20 rats femurs. Surgical procedures were performed in accordance with ethical codes. We induced rounded bone defects in all 20 femurs. The defects were made with a rounded Cr-Co surgical burr with a diameter of 1 mm. Previously induced defects have been filled with osteoconductive materials. The induced defects were filled with de KASIOS - kasios TCP (for 10 samples) and with DS DENTAL - easy graft crystal (other samples). The femurs were investigated with X-ray Micro-Computed Tomography (CT) for 1.5 and 2 months after the surgical procedures. This system has the following components: The x-ray detector is using a CCD. The detector pixel size is 45 microns. Each femur was mounted into the silicone support on the rotary stage. The sample was rotated for 3600 in one degree step increments. All the projections were loaded in ImageJ software and three-dimensional (3D) reconstructions were gathered from the analysis.

**Results.** The electronic data obtained by micro- CT are a very rich source of raw data for bone augmentation with osteoconductive materials. This is also potentially interesting for future research on determining the quantity of new bone formed in the defect.

**Conclusions.** Among multiple potential applications, the use of this technique in dentistry is very promising. Micro-CT appears to be ideally suited for in vitro visualization of the newly created bone within defect site.

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## MASKING DENTAL DYSCHROMIA USING LITHIUM DISILICATE VENEERS WITH DIFFERENT DEGREES OF OPACITY

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**Introduction.** We performed an in vitro study in order to present how tooth discoloration can be masked using lithium disilicate veneers. The veneers were made of three different types of ingots with three different thicknesses and subsequently applied on a highly colored abutment (ND9).

**Materials and method.** The ceramics used were divided into three groups depending on the translucency / opacity, as follows: LT (low translucency), MO (medium opacity), HO (high opacity). Within each group veneers of 3 different thicknesses (0.4 mm, 0.6 mm, 0.8 mm) were made, eventually 9 veneers in total. The baseline color of the restorations was the same (A2).

We used two types of abutments: a control abutment (ND1) that did not modify the final color of the restoration and a very dark abutment (ND9) to check the capacity of the restoration to mask the tooth discoloration.

After glazing, every veneer was analyzed using a spectrophotometer to record the final color.

All 9 veneers were evaluated firstly applied on the abutment control (ND1) and then applied on the darkest abutment (ND9).

**Results.** Veneers made of LT ingots and applied to the darkest colored abutment, had the largest variations in the final color within all thicknesses (0.4 mm, 0.6 mm, 0.8 mm).

The veneers made of MO ingots with a thickness of 0.8 mm were more effective. in terms of masking the tooth discoloration. For the veneers made of 0.4 mm HO ingots, the dark color of the abutment had the least influence in the final color of the restoration.

**Conclusions.** In case of the highly discolored abutments, color changes can be masked entirely by 0.8 mm thick lithium disilicate ingots (MO). This thickness can sometimes cause problems in terms of adhesion due to dentine exposure, because of excessive tooth preparation. The HO ingots were able of completely masking the dark color of the abutment with a thickness of 0.4 mm, but unfortunately the final aesthetic results are no longer appropriate.