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**Research in Dental Medicine - from Preclinical Studies
to Clinical Applications**

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PHYSICAL AND MECHANICAL PROPERTIES OF CURRENT DENTAL NANOHYBRID AND EXPERIMENTAL RESIN COMPOSITES WITH GRAPHENE

CAMELIA ALB¹, DIANA DUDEA¹, ANCA MESAROS¹, SORINA SAVA², MOLDOVAN MARIOARA³

¹Department of Dental Propedeutics and Dentofacial Esthetics, Cluj-Napoca, Romania

²Department of Dental Materials, University of Medicine and Pharmacy "Iuliu Hatieganu" Cluj-Napoca, Romania

³ Department of Polymeric Composites, University "Babes Bolyai" Cluj-Napoca, Romania

The aim of this study was to measure and analyze the mechanical properties of several composite materials with/without graphene and commercial composite Herculite, designed for direct composite restorations.

Material and methods. The materials were composed of a visible light-curing monomer mixture (Bis-GMA+TEGDMA) as a matrix and hydroxyapatite with graphene, bioglasses, colloidal silica as a reinforcing filler. Ten specimens of different composites were prepared for each mechanical test: flexural strength, Young's modulus, diametral tensile strength, and compressive strength test (Lloyd Instruments- LR5k Plus). Water sorption and solubility were assessed during 21 days in artificial saliva and distilled water at 37°C (ISO-4029). Mean values and standard deviations were calculated and ANOVA and Student Newman Keuls multiple comparison tests were applied ($P < 0.05$).

Results. The addition of 5-10 wt% hydroxyapatite with graphene nano-particles to the unfilled monomer mixtures led to the increase of both Young's modulus, surface hardness of the material, and the flexural strength. Hydroxyapatite with graphene has been used as reinforcing nano-filler in polymeric materials, having potential applications for restorative composites.

Conclusion. Studies determining the water sorption and solubility of composite materials used in dentistry are important mainly for their relative values and numerical comparisons. The preparation, characterization and properties of graphene filled different polymer based nano-composites for a number of polymers are discussed in most papers

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.

TRENDS IN DENTAL BIOMATERIALS SURFACE MODIFICATION

IULIAN ANTONIAC

University Politehnica of Bucharest, Romania

Objectives. Integration of dental appliances is critical for the healing of dental tissues. Dental biomaterials surfaces have been recognized to play an important role by interacting with dental tissues, cellular response and osseointegration, and many scientists have developed and studied different techniques for modifying the dental biomaterials surface in order to improve their interaction with dental tissues.

Methods. Different techniques could be used for surface modifications like machining, sandblasting, acid etching, bioactive coatings, thin films depositions, laser ablation. Surface roughness has been identified as a crucial parameter for a dental implant and its capacity for being anchored in the bone tissue. In this lecture we shall present different aspects regarding the modified surface of dental implants. Some advanced microscopic techniques such as scanning electron microscopy and atomic force microscopy are used now to determine the interfacial structure/property/biofunctionality relationships of synthetic dental materials with natural tissues, like bone, dentin, enamel and collagen.

Results. Dental biomaterials surface modifications and their influence on adhesion will be evaluated based on the experimental results obtained using different microscopic and spectral techniques.

Conclusions. The data obtained from microscopically analyses are critical to define factors and/or mechanisms that appear at the interface between the surface of dental biomaterials and tissues. As a conclusion, it is very important to correlate the quality and stability of surface modified dental applications with biofunctional demands and pay attention to the specificity for each clinical case.

APPLICATIONS OF MICRO-CT USING SYNCHROTRON RADIATION IN DENTISTRY

COSMIN SINESCU¹, MEDA LAVINIA NEGRUTIU¹, VIRGIL-FLORIN DUMA^{2,3,4}, ADRIAN MANESCU⁵

¹“Victor Babes” University of Medicine and Pharmacy of Timisoara, Romania

²3OM Optomechatronics Group, “Aurel Vlaicu” University of Arad, Romania

³Polytechnics University of Timisoara, Romania

⁴West University of Timisoara, Romania

⁵Universita Politecnica delle Marche, DISCO Department, Ancona Italy

*Corresponding author: *Cosmin Sinescu, e-mail: minosinescu@yahoo.com*

Introduction. The aim of this study is to present some of the applications of microCT using the synchrotron radiation in dentistry.

Materials and methods. Synchrotron Radiation X-Ray micro-CT imaging was performed on the same samples at the SYRMEP Beamline of the ELETTRA Synchrotron Radiation Facility (Trieste, Italy). The 1200 radiographic projections were acquired with a beam energy of 25 keV over 180° with a resulting pixel size of 9 µm. The tomographic reconstruction was performed by means of the common filtered back-projection method. A commercial software, VGStudio MAX, was employed for generating the 3D images and for the 3D visualization of the different constituents' distribution, such as tooth, adhesive and composite resin.

Results. Working in transmission/absorption mode, the results of this technology are able to present the microarchitecture of different interfaces related to direct restorations procedures, endodontics, orthodontics and bone augmentations techniques. Different materials could be identified and a quantitative analysis can be provided based on these investigations.

Conclusions. The microCT investigation could act as a valuable tool in the evaluation and validation of different interfaces in dentistry.

OSSEOINTEGRATION ASSESSMENT OF Ti6Al7Nb CUSTOM MADE IMPLANTS ON A RABBIT MODEL

GABRIEL ARMENCEA¹, CRISTIAN BERCE², HORATIU ROTARU¹, DAN LEORDEAN³, CAMELIA-AUGUSTA JULA⁴, DAN GHEBAN⁵, GRIGORE BACIUT¹, RADU SEPTIMIU CAMPIAN⁶

¹Department of Oral and Maxillofacial Surgery, “Iuliu Hatieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

²Laboratory Animal Facility, “Iuliu Hatieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

³Department of Manufacturing Engineering, Technical University, Cluj-Napoca, Romania

⁴Faculty of Dental Medicine, “Iuliu Hatieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

⁵Department of Pathology, “Iuliu Hatieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

⁶Department of Oral Rehabilitation, Oral Health and Management of Dental Office, “Iuliu Hatieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

*Corresponding author: Gabriel Armencea, e-mail: garmencea@gmail.com

Introduction. The objectives of the study were to test the osseointegration of Titanium–Aluminum–Niobium (Ti6Al7Nb) alloy used for 3D maxillo-facial reconstruction, and the osseointegration of this type of alloy with different coatings (hydroxyapatite and SiO₂-TiO₂).

Material and methods. The Ti6Al7Nb implants were manufactured using a selective laser melting technology and had a cylindric screw-type shape and a total porosity of 25%. Thus, 18 rabbits were used in this study. The animals received intrafemural implants. The samples were harvested at 3 and 6 months after implantation and histopathological examination of the bone surrounding the implants was performed.

Results. The histopathological examination compared the amount of mineralized bone and osteoid formed at the implant site, revealing more bone formation for the implants with coating at 3 months and similar mineralized bone for all of the implants at 6 months.

Conclusion. The study revealed better and faster osseointegration for the implant with coating, this being a reliable way of bone reconstruction that leads to a shorter integration period.

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APPLICATIONS OF THE ANTIMICROBIAL PHOTODYNAMIC THERAPY IN DENTISTRY

MINDRA E. BADEA, RAMONA AVRAM, IULIA BADEA, RADU CHIFOR

Department of Preventive Dentistry, “Iuliu Hatieganu” University of Medicine and Pharmacy of Cluj-Napoca, Romania

Photodynamic therapy (PT) is an alternative method used to control the bacterial biofilm associated with various oral diseases.

Photodynamic therapy is a therapy with light, which besides the photobiological effect can also have an antimicrobial effect if in the presence of oxygen, the light acts on a photosensitizing agent specific for selected target cells, respectively the microorganisms.

Photodynamic therapy represents an adjuvant, minimally invasive method in the conservative treatment approach concerning deep cavities, periodontal disease, endodontic diseases, alveolitis, periimplantitis, etc.

Although the gold standard for the control of dental plaque in oro-dental diseases remains the mechanical treatment, there is also a need for an antimicrobial adjuvant approach.

PT represents an option of an antimicrobial treatment, which avoids the side effects of the antibiotherapy, having also the advantage of the accessibility of the oral cavity to the light therapy.

PT could be used complementary to the antibiotic therapy or as an alternative in the cases where the antibiotics are no longer effective.

PT could be essential to some special categories of patients, as the oncological patients, patients with HIV, patients with resistance against the antibiotics, elderly patients with persistent oral infections, etc.

The antimicrobial photodynamic therapy will find a special place in the fight against the biofilm present in oro-dental disease.

ASPECTS OF NANOSCIENCE EVOLUTION IN DENTISTRY

CRISTINA MARIA BORȚUN, MEDA LAVINIA NEGRUȚIU

“Victor Babeș” University of Medicine and Pharmacy, Timișoara, Romania

Nanotechnology or nanoscience would be applied for future diagnosing, treating, and preventing diseases using nanoscale-structured materials, genetic engineering, nanorobots and nanodevices.

The applications in dentistry are focused on different domains like: nanocharacterization in dentistry, nanomaterials: nanocomposites, advanced restorative materials, materials for endodontic regeneration, esthetic materials, impression materials, biomimetic materials and nanorobotics for: local nano-anesthesia, dental hypersensitivity, orthodontics, dentifrobots, renaturalization procedures and gene therapy focused on chromosomal replacement therapy.

A special mention is for identifying diseases, diagnostic decision and genetic sequence detection. The nanomanipulation through surgical nanorobots can be used as corrector of lesions, acting as a semiautonomous surgeon inside the human body. Drug delivery by nanoparticles to specific cells could be used in implantable delivery systems for cancer therapy. Tissue engineering can play a role in the “nanobiomimetic” strategy which depends on: intelligent biomaterials, bioactive signaling molecules and cells.

Nanodentistry, which might sound like a fiction now, has a strong potential to revolutionize dentistry and opens up new ways for research work.

RESEARCH IN DENTISTRY- NATIONAL AND INTERNATIONAL ORAL HEALTH PROMOTION

RADU SEPTIMIU CAMPIAN

Dean of the Faculty of Dental Medicine, “Iuliu Hatieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

Dental medicine is a distinct liberal profession among other medical specialties. It involves great responsibility but it also ensures professional achievements and satisfaction. At the same time, dentistry is a continuously and rapidly developing medical field.

As in every field of medicine, in dentistry dental research is a promoter of the diagnosis, prevention and restoration of the normal tissues. Based on national and international projects, scientific research is oriented, in our Faculty of dentistry, in different fields:

- Stem cells and cell cultures developed in the Laboratory of cell growth for stem cell banks and stem cell transplant clinics
- Obtaining biomaterials and scaffolds for bone reconstruction in oral and maxillofacial surgery
- *In vitro* studies and clinical testing of classes of dental materials - composites, glass ionomer cements, dental ceramics – analysis of optical and mechanical properties, of tissue integration, studies of adhesion at the interface between tooth and restorative material.

The educational and research programme of the Faculty of Dental Medicine takes into account Romania's European integration, the major qualitative changes in higher education, the increased competition between faculties with the same profile, and the diversification of learning opportunities for young people.

Members of the teaching staff and students alike are involved in regional international cooperation programmes, in partnerships under the auspices of the AUF (Francophone University Association), as well as in multisite research projects, the majority of which are run in cooperation with researchers from foreign institutions.

COMPUTERIZED DESIGN TECHNIQUES IN DENTISTRY

BOGDAN CULIC, ALEXANDRU BURDE, CRISTINA GASPARIK, DIANA DUDEA

Propaedeutics and Aesthetic Dentistry Department, "Iuliu Hațieganu" University of Medicine and Pharmacy,
Cluj-Napoca, Romania

Introduction. In-office CAD/CAM systems allow to obtain in a very short time period all ceramic restorations such as : inlays, onlays, single crowns and bridges.

Objective. Evaluation of different software design techniques performed with Cerec SW 4.2.4 and Cerec inLab 4.2 for creating high accuracy prosthetic restorations.

Material and methods. The same preparation was scanned using Cerec Omnicam intraoral camera, Apollo DI intraoral Scanner, and laboratory scanner InEos X5 (on the basis of the working model). The design of the restoration was done with Cerec SW software 4.2.4 or inLab 4.2. Milled restorations were obtained using the same material.

Restorations designs were compared using GEOMAG Qualify 2013 software. Final restorations were compared clinically.

Results. A strong correlation was obtained between the designs made by the two software systems, regardless of the scanning method used.

From the clinical point of view no differences were found between the three restorations.

Conclusions. Using both intraoral and laboratory CAD/CAM systems, resulted in good designs and the corresponding prosthetic final restorations.

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THE USE OF DENTAL SPECTROPHOTOMETERS IN EXPERIMENTAL RESEARCH

DIANA DUDEA¹, BOGDAN CULIC¹, CRISTINA GASPARIK¹, ALEXANDRA BOTOS¹, DAIANA PRODAN¹,
LINA SCUTELNIC¹, MARIOARA MOLDOVAN²

¹“Iuliu-Hatieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

²ICCRR, “Babes-Bolyai” University Cluj-Napoca, Romania

There are two groups of methods currently used in order to record the dental shade: visual selection of the dental color, which uses shade tabs organized to form color standards (shade guides) that are compared with the tooth surface by the clinician, and instrumental methods, based on spectrophotometric or colorimetric measurements, digital color analyzers or instruments that combine these technologies.

Among these systems, dental spectrophotometers are mostly used by the dentists and dental technicians.

A spectrophotometer records the reflectance or transmittance curve of an object. The amount of light reflected from a specimen is measured for each wavelength in the visible spectrum. Recorded data are converted and displayed in the CIE L*a*b* system and as shade tab codes of different shade guides.

Vita Easyshade® (Vita) is one of the most known due to its compact structure, easy handling and multitude of recorded data. At present, several generation of Vita Easyshade have been developed.

The presentation is an overview of our experience regarding the use of Vita Easyshade Spectrophotometer on dental structure, dental composite, ceramic substrate and shade guides tabs.

The presented studies are focused on various goals, depending on the experimental protocols: The comparative performance of spectrophotometers (Vita Easyshade and ShadePilot), experimental studies on coloring effect of extrinsic factors upon dental structures and composites resins with different translucencies, effectiveness of the bleaching treatments tested on extracted teeth and on composites materials, the ability of ceramic materials to mask the colored substrate, the clinical use of dental spectrophotometers.

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OBJECTIVE COLOR MEASUREMENTS AND THEIR APPLICATIONS IN DENTISTRY

RAZVAN GHINEA

Department of Optics, University of Granada, Spain

The color of a sample depends on the light source producing the incident radiation, the interaction between the sample and the incoming radiation (depending on its reflectance and transmittance properties) and finally the observer (or detector), which both detects the light reflected or transmitted by the sample and converts the detected signal into the desired response. Since all these factors are required to produce color, they must also be quantified in order to produce a reliable system of objective color measurement. Once measured, the color of a sample can be specified in a variety of color representation systems. In the specific case of dentistry, color specification in the CIELAB color space has become very popular lately, and several dental instruments have already incorporated this color representation system.

Objective color measurements can be used for a large variety of applications in the dental field. Color differences have the potential to improve the shade matching process. Also, combined color differences and psychophysical experiments can lead to the quantification of limits (thresholds) of perceptibility and acceptability for dentistry, which have the ability to help assessing a successful esthetic restoration. Furthermore, translucent dental samples can be evaluated through the Opalescence and Translucency Parameters, with great applicability in decision making when selecting between different materials in the case of a highly aesthetic anterior restoration. Finally, the progress of a bleaching process can be assessed with the use of a Whitening Index.

CLINICAL PERFORMANCE OF A SONIC-ACTIVATED BULK-FILL COMPOSITE SYSTEM

ROXANA ILICI, ION PATRASCU, BOGDAN GALBINASU, LUCIAN CIOCAN, VERONICA BUCUR

Prosthetics Technology and Dental Materials Department., Faculty of Dental Medicine, "Carol Davila" University of Medicine and Pharmacy, Bucharest, Romania

*Corresponding author: *Roxana Ilici, e-mail: roxana.cara@gmail.com*

Objective. The aim of this study was to clinically evaluate restorations placed using a sonic-activated bulk-filled composite system in Class II and MOD restorations.

Methods. Two female patients with caries lesions and esthetic problems were enrolled in this study for caries treatment and replacement of old fillings. Class II (n=4) and MOD (n=2) restorations were prepared and restored using SonicFill/Kerr composite (shade A2, speed setting 3) in one bulk increment of up to 5 mm depth, associated with three 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 were used to evaluate the restorations at the baseline and 3, 6, 9, 12 and 18 months later. Digital photographs were taken at each step of the restorative protocol and each recall session.

Results. After 18 months of clinical performance all the restorations were clinically acceptable with no significant change in color match, luster, secondary caries, anatomical form, proximal contacts, post operative sensitivity and periodontal response as compared to the baseline data. Also the patients were entirely satisfied with the esthetics and function of her composite restorations.

Conclusion. SonicFill'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.

MEDICAL APPLICATIONS OF ADDITIVE MANUFACTURING TECHNOLOGIES

H. ROTARU¹, R. SCHUMACHER², ST. FLORIAN³, H. STAN³, N. BALC⁴, H. CHEZAN⁵, C. DINU¹,
I. MOLDOVAN¹, S. BRAN¹, M. BACIUT¹, GR. BACIUT¹, L. HURUBEANU¹, H.F. ZEILHOFER⁵,
AL. ROTARU¹, P. BERCE⁴.

¹Department of Oral and Maxillofacial Surgery, “Iuliu Hatieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

²University of Applied Sciences, Basel, Switzerland

³Department of Neurosurgery, “Iuliu Hatieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

⁴Technical University, Cluj-Napoca, Romania

⁵High-Tech Research Centre, Basel, Switzerland

Defined as a group of technologies capable to produce physical models and parts from a CAD dataset through an additive process, rapid prototyping (RP) represents at present an everyday tool in engineering. Since their dawn in 1986, rapid prototyping technologies evolved quickly from an experimental process to a billion-euro industry.

Medicine embraced these technologies soon after their launching. Nowadays, from 3D models generation for diagnostic use to custom-made implant fabrication, these technologies are widely used in medical departments.

The present lecture will give an overview of these RP technologies for the medical use, with examples from clinical practice.

PULP CAPPING AND DENTIN FORMATION

G. SCHMALZ, K. GALLER

Univarsitatsklinikum Regensburg, Germany

Biom mineralization is one of the key characteristics of the dental pulp leading to the generation of new dentin-like hard tissue (tertiary dentin) to compensate for dentin loss; e.g. due to caries or trauma. Early approaches to induce tertiary dentin formation included the application of calcium hydroxide on the exposed and healthy dental pulp. Recently, the use of dentin adhesives had been proposed for direct pulp capping and thus tertiary dentin formation was advocated. However, this was heavily challenged. In cell culture experiments, exposure of pulp cells to acrylate monomers like TEGDMA lead to a down-regulation of biom mineralization markers like alkaline phosphatase or dentin sialoprotein. Odontogenic differentiation and mineralization processes in pulp-derived cells including stem cells were shown to be down-regulated. Furthermore, TEGDMA or HEMA induced in pulp cells as well as in macrophages a depletion of the non-enzymatic antioxidant glutathione (GSH) and a consecutive increase of ROS formation. The consequence was oxidative DNA damage, by which cellular repair mechanisms were up-regulated potentially resulting in apoptosis. These are energy consuming processes. The application of N-acetyl-cysteine, a GSH precursor, however, reduced the ROS formation and the rate of monomer induced apoptosis. Modern approaches to induce pulp biom mineralization use Mineral-Tri-Aggregates (MTA), a material belonging to the group of Tricalcium-silicate containing cements. Animal as well as clinical data show for MTA preparations excellent results. However, handling of MTA is difficult and the material is rather expensive. Recently, another Tricalcium silicate cement was marketed (Biodentine) with good biological and handling properties.

DENTAL CALCULUS: INSIGHTS INTO STRUCTURE AND COMPOSITION

V. SIMON, M. POP-MURESAN

Faculty of Physics & Institute of Interdisciplinary Research in Bio-Nano-Sciences, “Babes-Bolyai” University, Cluj-Napoca, Romania

*Corresponding author: V. Simon, e-mail: viosimon@phys.ubbcluj.ro

Objectives. This work deals with the supragingival dental calculus characterization regarding both inorganic and organic components of a mature calculus.

Methods. The structure of the inorganic part was investigated by X-ray diffraction (XRD). Thermal characterization was performed by differential thermal analysis (DTA) and thermogravimetric analysis (TGA). Fourier transform infrared spectroscopy (FTIR) was primarily used to assess the secondary structure of proteins.

Results. XRD results were examined with respect to disordered and ordered structures, and to the crystalline phases typical to dental calculi, i.e. brushite, hydroxyapatite, octacalcium phosphate and whitlockite. DTA analysis evidenced exothermic events accompanied by low weight loss which are assigned to bacteria included in the calculus. The total weight loss up to 600°C is about 18 %. Infrared absorption signals characteristic to vibrational modes of phosphate ions in mineral phases along with the amide I and amide II protein bands were evaluated from FTIR spectrum. Information on the secondary-structure elements of the protein was obtained by deconvolution of amide I band in the 1700–1600 cm⁻¹ spectral range. For fitting, the number of components and their positions were determined from the second derivative spectrum. The prevalent secondary structure consists of alpha helices.

Conclusions. XRD, DTA and FTIR techniques are well suited to characterize the structure and composition of dental calculi.

AN INTEGRATED APPROACH TO DENTAL ESTHETIC RESTORATIONS – THE GIOMER FAMILY OF RESTORATIVE MATERIALS

KOSMAS TOLIDIS

Dept. Operative Dentistry – Dental School of Thessaloniki, Chief Dental Officer of the Hellenic Republic

Modern restorative dentistry has come a long way from simply restoring dental form and function in a passive way, to an innovative approach comprising tooth colored materials capable of interacting with the oral environment, releasing and recharging beneficial ions such as fluoride. Concurrently the introduction of different types of esthetic materials, from fissure sealants to fiber reinforced composite resin constructions allowed for the development of the concept of “Minimally Invasive Cosmetic Dentistry” which corresponds perfectly with the trend of preserving as much as possible hard dental tissues. The presentation is a comprehensive overview of the capabilities of modern composite resin’s systems, divided in sections devoted to composite resins in general (characteristics, advantages-disadvantages), the Giomer family of materials (characteristics and benefits) and case presentations of different uses of Giomer materials from the smallest to the biggest restoration. Also special issues such as ceramic repair will be presented in an extensive way.

The main key points are:

- Definition and explanation of SHOFU’s concept of “*Minimally Invasive Cosmetic Dentistry*”
- Materials and instruments used in the application of modern restorative dentistry
- Shrinkage of composite resins, how affects the restoration, how is affected and avoided
- What is a GIOMER, special characteristics of GIOMER materials
- Bonding to tooth hard tissues, choice of bonding system, tips and directions
- Shade selection and proper composite layering, finishing and polishing
- Aesthetic posts, ceramic repair, tooth fragment re-attachment
- Use of fibers in restorative dentistry
- Discussion of special clinical cases

LASER USED IN SOFT TISSUE MANAGEMENT

IOANA ROXANA BORDEA¹, BOGDAN CRIȘAN², PATRICIA ONDINE LUCACIU¹, MIHAELA BACIUȚ²,
RADU SEPTIMIU CÂMPIAN¹

¹Department of Oral Rehabilitation, Oral Health and Management of Dental Office, Faculty of Dentistry,
“Iuliu Hațieganu” University of Medicine and Pharmacy, Cluj Napoca, Romania

²Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, “Iuliu Hațieganu” University of Medicine and
Pharmacy, Cluj Napoca, Romania

*Corresponding author: Ioana Roxana Bordea, e-mail roxana.bordea@ymail.com

Introduction. The use of laser energy, as a reshaping method of the soft tissues in different cases of gingival hyperplasia is beginning to gain more ground among specialists. The diode laser ($\lambda=980$ nm) is mainly used for soft tissue management.

Material and methods. A diode laser with $\lambda=980$ nm was used in the present study to treat hyperplasia of different etiologies. Our study included a total of 40 patients who addressed Oral Rehabilitation and Maxillofacial Surgery Department and were diagnosed with gingival hyperplasia.

Results. The study presents methods of using diode laser ($\lambda=980$ nm) in a group of patients diagnosed with various gingival hyperplasia of different etiologies. We show clinical cases that were treated with laser therapy for the soft tissue management.

Conclusions. Laser assisted surgery was validated as a reliable method to improve the patients' comfort during the surgical procedure, because of the easy handling of soft tissue; it became a promising method due to its multiple advantages. The duration of interventions decreased considerably, as well as the recovery period.

EFFECT OF EROSIVE CONDITIONS ON AESTHETIC DENTAL FILLING MATERIALS – IN VITRO STUDY

ANDREEA BORȘ¹, MELINDA SZÉKELY¹, CRISTINA MOLNAR-VARLAM¹, OANA PONTA²,
IULIAN ANTONIAC³

¹Faculty of Dental Medicine, University of Medicine and Pharmacy of Târgu Mureș, Romania

²“Babes-Bolyai” University, Cluj-Napoca, Romania

³Faculty of Materials Science and Engineering, University Politehnica Bucharest, Romania

*Corresponding author: Andreea Bors, email: andreeabors@gmail.com

Aim. To evaluate the influence of erosive challenge on wear and chemical composition of different tooth-coloured materials for direct restorations.

Methods. Eleven aesthetic dental filling materials were included in the study: a conventional glass-ionomer, three resin reinforced glass-ionomers, four composites, three polyacid-modified composite resins. Following the manufacturers' instructions for the manipulation/mixing of the materials, unset pastes were placed in plastic cavity moulds of 4 mm length, 3 mm width and 1 mm depth, covered with celluloid matrices and cured. Twenty blocks of each material were prepared in this manner, for a total of 220 specimens (n=220) and kept in artificial saliva at 37°C. After 24 hours each group was exposed to 1% citric acid for a period of 8 hours. A non-contact profilometer was used to determine surface roughness (Ra) and wear of the material was assessed using an analytic electronic balance at baseline and after test period. Scanning electron microscope (SEM) and EDAX analyses were performed to examine the degrees of erosive wear of the materials following exposure to the erosive solution. The data were analyzed by one-way ANOVA and two-sample t-test. The level of significance was set at $p < 0.05$.

Results. There were significant differences between the tested restoratives ($p < 0.05$). One resin composite presented an increase in percentage weight loss after final erosive cycle over the rest of the materials. The erosive environment significantly increased roughness (Ra) for conventional glass-ionomer.

Conclusions. The tested restorative materials showed different behavior under the same erosive conditions. The erosive wear resistance of aesthetic dental filling materials can be assessed by measuring surface roughness and weight loss.

CURCUMIN EFFECT ON THE NITRO-OXIDATIVE STRESS IN LIGATURE-INDUCED RAT PERIODONTITIS

ADINA BIANCA BOȘCA¹, ELENA DINTE², HORAȚIU COLOSI³, ARANKA ILEA⁴,
RADU-SEPTIMIU CÂMPIAN⁴, ANA UIFĂLEAN⁵, ALINA ELENA PÂRVU⁵

¹Department of Histology, Faculty of Medicine, “Iuliu Hațieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

²Department of Pharmaceutical Technology and Biopharmacy, Faculty of Pharmacy, “Iuliu Hațieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

³Department of Medical Informatics and Biostatistics, Faculty of Medicine, “Iuliu Hațieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

⁴Department of Oral Rehabilitation, Oral Health and Dental Office Management, Faculty of Medical Dentistry, “Iuliu Hațieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

⁵Department of Physiopathology, Faculty of Medicine, “Iuliu Hațieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

*Corresponding author: Adina Bianca Bosca, e-mail: biancabosca@yahoo.com

Aim. The aim of the study was to assess the effect of curcumin on the nitro-oxidative stress in ligature-induced rat periodontitis.

Methods. Periodontitis was induced in male albino rats with a silk ligature around the inferior incisors. Curcumin was administrated alone or with piperine. Rats were randomly assigned to five groups (n=5): 1. PER, periodontitis; 2. OC, periodontitis plus Curcumin p.o.; 3. OCP, periodontitis plus Curcumin and Piperine p.o.; 4. OCPLC, periodontitis plus Curcumin and Piperine p.o, and local periodontal Curcumin; 5. LC – local periodontal Curcumin. Curcumin (1 g/kg bw) and Piperine (5mg /kg bw) were administered p.o. daily by gavage. Local periodontal treatment with curcumin was performed with a 2% muco-adhesive gel.

Blood was collected and serum nitro-oxidative stress was evaluated through total oxidative status (TOS), total antioxidant capacity (TAC), total nitrites and nitrates (NOx) and oxidative stress index (OSI).

Results. The results demonstrated that orally administered curcumin, either alone or associated with piperine significantly reduced the serum NOx, TOS and OSI. Oral curcumin alone increased TAC. Piperine association did not cause significant reduction of the systemic nitro-oxidative stress compared with curcumin alone. Local curcumin did not influence significantly the serum parameters.

Conclusions. In conclusion, in rat ligature-induced periodontitis, oral administration of curcumin was effective in reducing the systemic nitro-oxidative stress, whereas local delivery showed no effect.

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CONTRIBUTION OF THE CERAMIC LAYER TO THE PERCEIVED COLOR OF RESTORATIONS

ALEXANDRA BOTOS¹, CRISTINA GÁSPÁRIK¹, ANCA MESAROȘ¹, ADELA ZIMBRAN¹,
MÎNDRA BADEA², DIANA DUDEA¹

¹Department of Prosthetic Dentistry and Dental Materials, “Iuliu Hatieganu” University of Medicine and Pharmacy Cluj-Napoca, Romania

²Department of Prevention in Dentistry, “Iuliu Hatieganu” University of Medicine and Pharmacy Cluj-Napoca, Romania

*Corresponding author: Botoș Alexandra, e-mail: alexandrabotosch@gmail.com

Objective. This study aimed to compare the masking ability of lithium disilicate ceramics in different opacities and thicknesses upon dyschromic substrates.

Method. The color parameters of IPS e.max® Press (Ivoclar Vivadent) ceramic disks (10 mm diameter, thickness 0.3, 0.6, 0.9, 1.2, 1.5 mm), (n=5) were evaluated upon samples of light cured composite material that simulate the shade of prepared teeth (IPS Natural Die Material Kit, Ivoclar Vivadent) (disks 10 mm diameter, 5 mm thickness). Saturated sucrose solution was interposed between the ceramic disks and the composite disks. Color parameters CIE L*, a*, b* were recorded with the VITA Easyshade® Advance spectrophotometer (VITA Bad Säckingen, Germany). L*, a*, b* values corresponding to the 0.3 mm thickness disk were considered reference. The color differences (ΔE) were calculated between each thickness group and the reference ($\Delta E1$ - color difference 0.6 mm-0.3 mm thickness, etc.) upon each substrate. Data were analyzed statistically using univariate ANOVA tests and paired *t*-tests ($\alpha=0.05$).

Results. Overall, there was a significant difference between ΔE values for a certain thickness group on all substrates, for both materials tested ($p<0.001$). However, when different thickness groups were compared among them, a significant difference was found only between $\Delta E1$ and $\Delta E3$, $\Delta E4$ respectively ($p<0.05$). When the different opacities were compared, significant differences were found between each of the four thickness groups ($p<0.01$).

Conclusions. 1. More opaque ceramic material have a better capacity to mask underlying substrates. 2. Masking increases with the increased thickness of the ceramic layer, all differences between thickness groups being higher than $\Delta E=3.5$ acceptability threshold.

EFFECTS OF 830 NM LASER RADIATION ON HUMAN OSTEOBLASTS SEEDED ON NANOSTRUCTURED COMPOSITE SUBSTRATES

LIANA CRISAN¹, OLGA SORITAU², MIHAELA BACIUT³, ALEXANDRU RADU BIRIS⁴,
RADU SEPTIMIU CAMPIAN⁵, GRIGORE BACIUT¹, BOGDAN CRISAN³

¹Department of Cranio-Maxillofacial Surgery, "Iuliu Hațieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

²Radiotherapy, Tumor and Radiobiology Laboratory, The Oncology Institute „Prof. Dr. Ion Chiricuță”, Cluj-Napoca, Romania

³Department of Implantology and Maxillofacial Surgery, "Iuliu Hațieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

⁴Department of Mass Spectrometry, Chromatography and Applied Physics, National Institute for Research and Development of Isotopic and Molecular Technologies INCDTIM, Cluj-Napoca, Romania

⁵Department of Oral Rehabilitation, "Iuliu Hațieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

*Corresponding author: Liana Crisan, e-mail: petrutliana@yahoo.com

Introduction. Nanotechnology can offer numerous attractive applications in medicine, due to the elaborated smart nanomaterials that can be handled and adapted to the medical needs. In vitro growth of osteoblasts is a slow process and laser therapy can be used to stimulate osteoblast proliferation on these nanocomposites substrates. The aim of this study was to evaluate the effects of the 830 nm laser radiation on human osteoblastic cells grown on nanostructured composite substrates.

Material and methods. Human osteoblasts isolated from bone fragments were used for this study. A semiconductor laser type BTL-10 with a wavelength of 830 nm was used for irradiation. Determination of cellular proliferation osteoblasts irradiated with laser, was carried out using the MTT assay at 30 minutes, 24 hours, 5 days and 10 days after irradiation. The viability and proliferation of osteoblasts cells were also analyzed using the FDA assay.

Results. In the first 30 minutes there were no significant differences between the irradiated and non-irradiated cells. 24 hours after laser irradiation procedure a significant increase of MTT values was observed in case of irradiated osteoblasts cultivated on S1, S3 and S4 substrates. A more pronounced proliferation rate was observed after 10 days of irradiation for irradiated osteoblasts seeded on S2, S3 and S4 substrate.

Conclusions. The association between the 830 nm laser irradiation of osteoblasts and their long-term cultivation of the nanostructured composite substrates induce cell proliferation and differentiation and, therefore, it could be a useful alternative for bone regeneration therapy.

THE USE OF BIODENTINE™ AS A ROOT-END FILLING MATERIAL: A LITERATURE REVIEW

ANDREEA IULIANA GULIE (KUI)¹, LIANA LASCU¹, MÎNDRA BADEA²

¹Department of Prosthodontics, Faculty of Dentistry, “Iuliu Hatieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

²Department of Dental Prevention, Faculty of Dentistry, “Iuliu Hatieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

*Corresponding author: *Andreea Iuliana Gulie (Kui)*, e-mail: gulie.andreea@umfcluj.ro

Introduction. Biodentine™ is a calcium silicate based cement released in January 2011 by Septodont (France). The purpose of this study was to evaluate the literature regarding the use of Biodentine™ as a retrograde filling material.

Methods. Two independent reviewers (A.G and M.B) conducted a literature search for on November the 1st 2014 in Medline (PubMed), Embase, Web of Science, Cochrane, Scopus, SciELO and clinicaltrials.gov. The search terms used were “biodentine”, “tricalcium silicate”, “root-end filling” and “endodontic surgery”.

Results. The research included clinical trials, case reports, in vitro studies, in vivo studies and other reviews, all written in English. From a total of 1766 articles, 52 formed the basis of the present review.

Conclusion. According to the published literature, Biodentine could be an efficient alternative to mineral trioxide aggregate or other dental cements to be used as a root-end filling material because of its physical, biological and handling properties. Although it seems it has a good behaviour in clinical practice, more clinical studies are required in order to support its indication as a root-end filling material.

THE ROLE OF GROWTH FACTORS IN BONE DIFFERENTIATION OF MESENCHYMAL STEM CELLS DERIVED FROM ADIPOSE TISSUE

ARANKA ILEA¹, OLGA SORIȚĂU², PIROSKA VIRÁG², EVA FISCHER², BIANCA BOȘCA³, MIHAI CENARIU⁴, COSMIN PEȘTEAN⁵, RĂZVAN CODEA⁵, DAN BUHĂȚEL¹, MIHAI ȚIRIAC¹, RADU SEPTIMIU CÂMPIAN¹

¹Department of Oral Rehabilitation, Oral Health and Dental Office Management, Faculty of Dentistry, “Iuliu Hațieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

²Laboratory of Radiotherapy, Radiobiology and Tumor Biology, “Ion Chiricuță” Oncological Institute, Cluj-Napoca, Romania

³Faculty of Medicine, Department of Histology, “Iuliu Hațieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

⁴Department of Reproduction, Obstetrics and Veterinary Gynecology, Faculty of Veterinary Medicine, University of Agricultural Sciences and Veterinary Medicine (USAMV), Cluj-Napoca, Romania

⁵Department of Anaesthesiology and Resuscitation, Faculty of Veterinary Medicine, University of Agricultural Sciences and Veterinary Medicine (USAMV), Cluj-Napoca, Romania

*Corresponding author: Ilea Aranka, e-mail: arankailea@yahoo.com

Introduction. Growth factors like BMP₂ (Bone Morphogenetic Protein 2) and TGF-β₁ (Transforming Growth Factor-β₁) play important roles in bone formation and TGF-β₁, and also in mitogenesis.

Objectives. Assessment of bone differentiation *in vitro* of porcine mesenchymal adipose derived stem cells (pADSCs), under the action of BMP₂ and/or TGF-β₁.

Materials and methods. The adipose tissue pieces were harvested from 8 Vietnamese pigs, aged 3.5 months. pADSCs were isolated, cultured and then characterized by immunocytochemistry and flowcytometry. pADSCs were differentiated with growth factors on 6-well plates: two wells were control (pADSCs+medium DF₁₂ 15%, pADSCs+medium DF₁₂ 10%), a well with medium osteogenic simple (OS), a well with OS+BMP₂, a well with OS+TGF-β₁ and a well with OS+BMP₂+TGF-β₁. Bone differentiation was noticed in optical microscopy by changing cellular phenotype, osteogenesis nodes; at flowcytometry and immunocytochemistry by expressing markers for osteopontin and alkaline phosphatase.

Results. At characterization of pADSCs the stemness characters were found: positivity for CD₉₀ and Sox₂ markers, partial positivity for CD₇₃ and Oct_{3/4}. Under the action of the OS or OC (osteogenic complex) medium, the stem cells became polyhedral in shape and showed nodules of osteogenesis. The best results at bone differentiation were achieved with OS+BMP₂ and OS+BMP₂+TGF-β₁ mediums. pADSC differentiated into osteoblasts expressed markers for osteopontin and alkaline phosphatase.

Conclusions. Culture mediums OS, respectively OC+BMP₂ and/or TGF-β₁ determined differentiation of pADSCs into bone, *in vitro*. The best results at bone differentiation were achieved with OS+BMP₂ and OS+BMP₂+TGF-β₁ mediums. pADSCs bone differentiation *in vitro* ensuring the optimum conditions for their implantation *in vivo*.

CUSPAL DEFORMATION AND TEMPERATURE ANALYSIS IN COMPOSITE RESTORATIONS

ROXANA ILICI¹, ION PATRASCU¹, EDUARD GATIN², RUXANDRA SFEATCU³,
BOGDAN GALBINASU¹, LUCIAN CIOCAN¹, VERONICA BUCUR¹, ANDREEA DIDILESCU⁴

¹Prosthetics Technology and Dental Materials Dept., Faculty of Dental Medicine, “Carol Davila” University of Medicine and Pharmacy, Bucharest, Romania

²Faculty of Physics, University of Bucharest, Bucharest, Romania

³Oral Health and Behavioural Sciences Dept., Faculty of Dental Medicine, “Carol Davila” University of Medicine and Pharmacy, Bucharest, Romania

⁴Anatomy and Embryology Dept., Faculty of Dental Medicine, “Carol Davila” University of Medicine and Pharmacy, Bucharest, Romania

*Corresponding author: Roxana Ilici, e-mail: roxana.cara@gmail.com

Objectives. To assess cuspal deformation and thermal changes during and after light-curing of large MOD composite restorations.

Methods. Premolars (n=10/grp) with standardised large MOD preparations were incrementally restored using two low-shrinking posterior restorative systems, a dimethacrylate-based composite Premise Packable (PP) (KERR) and a silorane-based composite Filtek Silorane (FS) (3M ESPE). Each increment was irradiated for 20 s using a high-intensity LED light-curing unit (Demi/KERR). Cuspal deformation was recorded in real time, for 320 s from the start of light-exposure, using a DCDT Twin Deflection Gauge. A K-type thermocouple was attached to the specimen to monitor intrapulpal thermal changes during the restorative scenario. A one-way ANOVA ($p<0.05$) was used to determine differences in the cuspal deformation per time intervals between groups. A two-sample t-test ($p<0.05$) was used to analyze the temperature data.

Results. The most significant cuspal deformation took place during the first 5 seconds of light exposure (cuspal extension $4.33 \pm 0.61 \mu\text{m}$ for FS and $1.36 \pm 0.20 \mu\text{m}$ for PP; $p<0.05$) and during the first minute after turning off the light (cuspal deflection $-5.28 \pm 0.88 \mu\text{m}$ for FS and $-4.72 \pm 0.92 \mu\text{m}$ for PP; $p>0.05$). During the light-exposure FS produced a temperature rise ($10.179 \pm 2.844 \text{ }^\circ\text{C}$) significantly higher than PP ($4.915 \pm 1.05 \text{ }^\circ\text{C}$) ($p<0.05$).

Conclusion. The ring opening Silorane curing technology is beneficial in terms of reducing the polymerization shrinkage-related cuspal deformation but a concern develops regarding thermal expansion-related cuspal extension during light-curing with high-intensity LED lights, compared to a highly-filled free-radical polymerization dimethacrylate-based resin system.

DEVELOPMENT OF NEW FIBRE-REINFORCED COMPOSITES TO SERVE CRANIAL BONE RECONSTRUCTION

M. LAZAR¹, C. PREJMEREAN², I. BALDEA¹, N. BALC³, H. ROTAR¹

¹Department of Maxillofacial Surgery and Implantology, "Iuliu Hatieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

²"Raluca Ripan" Institute for Research in Chemistry, "Babes Bolyai" University, Cluj-Napoca, Romania

³Technical University of Cluj-Napoca, Romania

*Corresponding author: Lazar Madalina, e-mail: madilazar@yahoo.com

The reconstruction of the bone defects has always been an issue of primary importance. In spite of all the improvements brought to the techniques of bone reconstruction, present-day biomaterials still have some shortcomings that limit their application and sometimes cause clinical problems.

Objectives. Our study aims to elaborate new advanced biomaterials based on fibre-reinforced composite (FRC) that will serve cranial bone reconstruction, in case of large bicortical calvarial defects. The customized implant will be obtained by the injection of FRC and photo polymerization into a 3D model master produced by means of rapid tooling.

Method. Four different resins were prepared starting from Bis-GMA, TEGDMA, UEDMA and HEMA. Fibreglass T2-E500g/m² was selected to reinforce the polymeric matrix. To ensure the chemical connection between the organic and inorganic phases, 3-metacriloloxipropil-1-trimetoxisilan was used. The FRC were obtained through chemical and photochemical polymerization. The conversion of resins, cytotoxicity and mechanical behaviour of new FRC were analysed.

Results. Better conversion of resins was observed in case of photochemical polymerization, when UDMA and HEMA monomers were used. None of the tested FRC lowered the viability of human dermal fibroblasts or dental follicle stem cells. Finite elements analysis showed a physiological 0.15 mm maximal deformation when craniofacial implant obtained from FRC was submitted to accidental loading.

Conclusion. Encouraging preliminary results were obtained, giving opportunity to continue in vivo investigation to assess the biocompatibility, an essential criterion for clinical use.

IMPROVING THE OSSEOINTEGRATION PROCESS OF TITANIUM IMPLANTS

ONDINE LUCACIU¹, OLGA SORIȚĂU², GRIGORE BĂCIUȚ³, CATALIN POPA⁴, SIMION SIMON⁵,
PETRU BERCE⁴, MIHAELA BĂCIUȚ³, RADU CÂMPIAN¹

¹Department of Oral Rehabilitation, “Iuliu Hațieganu” University of Medicine and Pharmacy Cluj-Napoca, Romania

²“Ion Chiricuță” Oncological Institute Cluj-Napoca, Romania

³Department of Cranio-Maxillofacial Surgery, Dental Implantology, “Iuliu Hațieganu” University of Medicine and Pharmacy Cluj-Napoca, Romania

⁴Technical University, Cluj-Napoca, Romania

⁵Faculty of Physics & Institute of Interdisciplinary Research in Bio-Nano-Sciences, “Babes-Bolyai” University, Cluj-Napoca, Romania

*Corresponding Author: Ondine Lucaciu, e-mail: ondineluc@yahoo.com

Introduction. Numerous studies have focused on the potential benefits of dental follicle (DF) stem cells as a cell source in tissue engineering. In the present study we aimed to demonstrate that DF stem cells from impacted molars and canines can be used to improve the osseointegration process of titanium implants.

Methods. After harvesting the dental follicle, phenotypical analysis and immunocytochemical staining was performed in order to establish the presence of dental follicle stem cells. Dental follicle stem cells were seeded on three different titanium surfaces (Ti6Al7Nb implants, titanium infiltrated with hydroxyapatite and with silicatitanate). DF stem cells migration ability was conducted in presence of serum-free medium collected from osteoblasts and DF stem cells cultures on titanium implants (Ti6Al7Nb implants, titanium infiltrated with hydroxyapatite and with silicatitanate).

Results. In our research the migration of fluorescent marked DF stem cells (evaluated after one hour and 20 hours) was significantly stimulated by conditioned medium harvested from DF stem cells cultivated 8 days on titanium control implants compared to osteoblasts cultured on control titanium, hydroxyapatite titanium and SiO₂ titanium implants.

Conclusions. Dental follicle stem cells are a valuable cell source for improving the osseointegration process of titanium implants.

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THE SUITABILITY OF INTRODUCING A NEW TYPE OF DENTAL IMPLANT

A. MANEA¹, G. BACIUT², S. BRAN³, MIHAELA BACIUT³, H. COLOSI⁴, D. POP⁵

¹Clinic of Cranio-Maxillofacial Surgery, "Iuliu Hațieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

²Department of Cranio-Maxillofacial Surgery, "Iuliu Hațieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

³Department of Maxillofacial Surgery and Implantology, "Iuliu Hațieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

⁴Department of Medical Informatics and Biostatistics, "Iuliu Hațieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

⁵Department of Mechanical Systems Engineering, Technical University of Cluj-Napoca, Romania

Introduction. The aim of our study was to review published results regarding the survival rates of dental implants as well as the quality of the surrounding bone. This review of published data served to evaluate the suitability of a new and original dental implant, designed to increase its survival rate and maintain the health of surrounding tissues.

Materials and Methods. A systematic review of PubMed indexed literature was conducted in November 2014, to identify studies focusing on dental implants survival rates and bone levels surrounding dental implants. Data on marginal bone loss and implant survival were collected from all included articles. Median survival rates (%) and median marginal bone loss (mm) were calculated at 1, 2, 3, 5 and 10 years.

Results. Forty-nine studies were included in the analysis out of 808 results (19 retrospective and 30 prospective studies). The total number of included patients was 5646, with 12271 endosseous dental implants. The median survival rate after 1 year was 96.95% (22 studies), after 2 years 96.94% (9), 3 years 96.40% (6), 5 years 95.42% (18) and 10 years 93.50% (6). The median marginal bone loss was 0.72 mm after the first year (26 studies) and 0.87 mm, 1.29 mm and 1.43 mm respectively, after the 2nd, 3rd and 5th year, based on 14, 7 and 7 studies, respectively.

Conclusion. Given the need to increase success rates of dental implants and to maintain the health of surrounding tissues, a new type of dental implant, that could improve these parameters, could be suitable.

STUDY OF THE MECHANICAL PROPERTIES OF ORTHODONTIC ADHESIVES

ANCA MESAROS¹, CAMELIA ALB¹, BOGDAN CULIC¹, MICHAELA MESAROS²,
MARIOARA MOLDOVAN³, LAURA BRU-CIFRE⁴

¹Department of Dental Propaedeutics and Aesthetics, “Iuliu Hațieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

²Department of Paediatric Dentistry, “Iuliu Hațieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

³“Babes-Bolyai” University Cluj-Napoca, “Raluca Ripan” Institute of Chemistry, Cluj-Napoca, Romania

⁴Student, “Iuliu Hațieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

*Corresponding author: *Anca Mesaros, ancames@yahoo.com*

Objectives. In orthodontics, adhesives are of great importance for the success of treatment. In this study, we tested 5 different adhesives, 4 already on the market and 1 experimental. The aim was to observe the influences of accelerated staining and bleaching procedures on the mechanical properties of adhesives.

Methods. 60 human extracted premolars were selected. Each group was divided into 5 sub-groups of 12 premolars: 4 teeth underwent accelerated staining procedure with natural coffee, 4 underwent accelerated whitening procedure, and 4 remained in the control group. To test the mechanical strength of adhesives after exposition to causative agents, a shear-bond stress (SBS) test was done. Once the bracket was removed, we observed the fracture line between the bracket and the adhesive, in order to assess the quality of the adhesion to enamel. The CEREC 3D Red Cam was used in establishing a 3D image of the remaining adhesive still attached to the enamel.

Results. Regarding the adhesives strength, results show that coffee staining induces a slight statistical difference in resistance to SBS when compared to the control group, whereas the bleaching treatment induces a greater difference. Regarding the adhesion in the group submitted to staining, less than half of the adhesive remained on the tooth while for the bleaching group, predominantly more than half of the adhesive remained on the tooth.

Conclusion. Mechanical properties of tested adhesives were different in accordance with the class of adhesive used and the procedures to which they were submitted during testing.

ABSORPTION AND SOLUBILITY - A COMPARATIVE IN VITRO STUDY FOR ORTHODONTIC SEALERS

ALEXANDRINA MUNTEAN¹, ANCA MESAROS², DANA FESTILA³, MARIOARA MOLDOVAN⁴, STANCA BOBOIA⁴, MICHAELA MESAROS¹

¹Pediatric Dentistry Department, Faculty of Dental Medicine, "Iuliu Hațieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

²Dental Propaedeutic and Aesthetics Department, Faculty of Dental Medicine, "Iuliu Hațieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

³Orthodontic Department, Faculty of Dental Medicine, "Iuliu Hațieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

⁴"Babes Bolyai" University, "Raluca Ripan" Chemistry Research Institute, Cluj-Napoca, Romania

*Corresponding author: Alexandrina Muntean; ortoanda@yahoo.com

Introduction. Water absorption and solubility correspond to undesirable characteristics because they may cause microleakage and dissolution of composite materials used for orthodontic attachment bonding. The dimensional change of the sealer affects the integrity of the bond between the enamel and bracket base.

The aim of this study was to evaluate the performance of four orthodontic sealing materials, relative to water and 50% alcoholic solutions, using in vitro tests of absorption and solubility.

Materials and method. For this study we used an experimental composite sealer SO[®] (ICCRR Cluj-Napoca) and 3 commercial products already on the market: Blugloo[®] (Ormco), Opal Bond MV[®] (Ultradent) and Bond It[®] (DB orthodontics). Water absorption expresses weight gain and solubility represents the weight reduced of material sample, for 15mmx1mm specimens (ISO 4049/2000) kept up for 7, 14 and 21 days in water and 50% alcoholic solution respectively. Data were recorded and specific statistic tests using SPSS13 for Window were performed.

Results indicate statistically significant differences ($p < 0.002$) for all materials relative to the tested solutions.

Conclusions. Physical characteristics of orthodontic sealers could affect clinical behaviour and thus have an influence on the quality of adhesion on bracket-tooth interface. The materials evaluated in our study reveal an adequate performance in terms of absorption and solubility. Different situations are seen in everyday practice and therefore a constant development of dental materials must respond to each particular case.

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DENTINE TRANSLUCENCY AND COLOR EVALUATION IN HUMAN INCISORS, CANINES AND MOLARS

IOANA-SOFIA POP-CIUTRILA¹, RAZVAN GHINEA², MARIA DEL MAR PEREZ GOMEZ²,
HORATIU ALEXANDRU COLOSI³, MARIOARA MOLDOVAN⁴, MANDRA BADEA⁵, DIANA DUDEA⁶

¹Department of Conservative Dentistry and Endodontics, "Iuliu Hatieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

²Department of Optics, Faculty of Science, University of Granada, Spain

³Department of Medical Informatics and Biostatistics, Faculty of Medicine, "Iuliu Hatieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

⁴Department of Polymeric Composites, "Raluca Ripan" Institute of Research in Chemistry, "Babes Bolyai" University, Cluj-Napoca, Romania

⁵Department of Preventive Dentistry, "Iuliu Hatieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

⁶Department of Prosthodontics and Dental Materials, "Iuliu Hatieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania.

*Corresponding Author: Ioana-Sofia Pop-Ciutrilă, e-mail: ioanasofia_ciutrilă@yahoo.com

Objectives. To investigate the translucency and CIE L*, a* and b* color coordinates of human dentine in both frontal (incisors and canines) and lateral (molars) teeth, by spectrophotometric and spectroradiometric methods.

Methods. Two millimeters uniformly thick samples of mid coronal human dentine were obtained from 33 maxillary incisors, 7 canines and 33 molars. CIE L*, a* and b* color coordinates were measured using a clinical spectrophotometer (Easyshade Compact) and a non-contact spectroradiometer (SpectraScan PR-704). The translucency parameter (TP) was calculated. Bland-Altman plots and Wilcoxon signed rank tests for paired samples were used in order to investigate the agreement of the two measurement techniques. The differences between frontal and lateral dentin samples regarding color coordinates and translucency parameter were analyzed using Mann-Whitney-Wilcoxon rank sum tests.

Results. Statistically significant differences between spectrophotometric and spectroradiometric measurements of TP and CIE color coordinates were found in both groups of dentine samples ($p < 0.05$). Molar dentine samples TP values were significantly higher compared to frontal ones, regardless of the method of assessment ($p < 0.001$). Frontal dentin samples exhibited higher L* values but lower a* and b* values on both black and white backgrounds when compared to molar dentine.

Conclusions. In frontal teeth, human dentine was found to be lighter, less translucent and less chromatic than in molars, regardless the method of assessment. The results of the present study can provide an extensive database of frontal and lateral human dentine translucency and color parameters, needed to improve the optical properties of dental composites and ceramic materials, as well as their layering techniques.

THE ANTIBACTERIAL EFFECT AND CYTOTOXICITY OF THE EXPERIMENTAL ENDODONTIC SEALERS

DOINA PRODAN¹, IOANA BALDEA², RAHELA CARPA³, OVIDIU PASTRAV², MARIOARA MOLDOVAN¹, LOREDANA COLCERIU², CRISTINA PREJMEREAN¹

¹"Babes Bolyai" University, "Raluca Ripan" Chemistry Research Institute, Cluj-Napoca, Romania

²"Iuliu Hatieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

³Faculty of Biology and Geology, "Babes Bolyai" University, Cluj-Napoca, Romania

*Corresponding author: Doina Prodan, email: doina_prodan@yahoo.com

Objectives. The aim of the present work was the evaluation of antibacterial effect and cytotoxicity of some experimental endodontic sealers based on Bis-GMA, UEDMA, HEMA or TEGDMA organic matrix filled with zinc glass and hydroxyapatite powders in combination with metal oxides and the comparison with the commercial sealer "RealSeal".

Method. For determination of the antibacterial activity, the materials were tested both in the form of paste, freshly mixed (the paper disc method and the wells method), as well as strengthened (disks method), on two types of bacteria: *Escherichia coli* and *Staphylococcus aureus*.

For determination the cytotoxicity of the experimental endodontic sealing materials, the assessment was done on normal human dermal fibroblasts on (HDFa-Invitrogen, Willow Creek, USA), according to SR ISO10993-5 by MTT test (test of mitochondrial metabolic activity).

Results. The differences in the antibacterial effect of the studied sealers decreased in time for the same investigation method. The cytotoxic effect of the investigated materials decreases at the higher dilutions. The most pronounced cytotoxic effect was recorded for the first two dilutions in the experimental sealer with HEMA as a monomer of dilution in the polymer matrix.

Conclusion. The experimental endodontic sealers present an antibacterial effect more pronounced on *S. Aureus* meanwhile the Real Seal sealer presents an antibacterial effect more pronounced on *e-coli*. Among the studied materials, the sealer with TEGDMA as monomer of dilution in polymer matrix presents the lowest cytotoxicity.

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HOW SAFE ARE DENTAL OFFICE AEROSOLS?

MEDA-ROMANA SIMU¹, TEODORA RADU², MICHAELA MESAROȘ¹, MIRCEA TEODOR CHIRIAC^{3,4}, CRISTINA BORZAN⁵

¹ Department of Conservative Dentistry, Faculty of Dentistry, “Iuliu Hațieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

² Faculty of Physics & Interdisciplinary Research Institute on Bio-Nano-Sciences, “Babes-Bolyai” University, Cluj-Napoca, Romania

³ Department of Biology, “Babes-Bolyai” University, Cluj-Napoca, Romania

⁴ Department of Medicine 1, University of Erlangen-Nuremberg, Erlangen, Germany

⁵ Department of Community Medicine, Faculty of Medicine, “Iuliu Hațieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

*Corresponding author: Meda-Romana Simu, e-mail: medaromana@yahoo.com

Aim. Workplace conditions are directly reflected on the health of dental practitioners which in turn influences the quality of the medical services. Using a complementary approach our study aimed to determine the elemental composition, morphology and size distribution of non-microbial particles present in the air of a dental office, during various dental treatments, in order to identify and analyse potential risk factors for the human health.

Methods. The samples were collected on carbon double adhesive tape - an original and very efficient particle collecting method. The aerosols produced during various treatments were analysed using the X-ray photoelectron spectroscopy (XPS), scanning electronic microscopy (SEM) and energy dispersive X-ray analysis (EDX).

Results. Using the highly sophisticated equipment allowed to augment the accuracy of our findings and helped to identify various types of elements, some of which were not reported in previous studies dealing with a similar problematic.

Conclusion. Our results underline the aerosols potential of deeply penetrating into the respiratory system, even to the level of pulmonary alveoli, and thereby they may represent health threats for the practitioners and patients.

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OXIDATIVE STRESS AND APOPTOSIS INDUCTION *IN VITRO* FOLLOWING EXPOSURE TO BLEACHING EXPERIMENTAL AGENTS

IOANA BALDEA¹, DIANA ELENA OLTEANU¹, ADRIANA GABRIELA FILIP¹, MIHAI CENARIU², DIANA DUDEA³, ALINA TOFAN³, CAMELIA ALB³, MARIOARA MOLDOVAN⁴

¹Department of Physiology, "Iuliu Hatieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

²Department of Biochemistry, University of Agricultural Sciences and Veterinary Medicine, Cluj-Napoca, Romania

³Department of Propedeutics and Dental Materials, Faculty of Dental Medicine, "Iuliu Hatieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania.

⁴Department of Polymer Composites, "Raluca Ripan" Chemistry Research Institute, "Babes Bolyai" University Cluj-Napoca, Romania;

*Corresponding author: Adriana Gabriela Filip, e-mail: adrianafilip33@yahoo.com

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 bleaching efficiency as well as the biological effects of four experimental, natural, fruit juices derived gel formulations, named B1, D, L and 4, compared to the commercial Opalescence 15% (Ultradent, USA) with focus on cytotoxicity, apoptosis and oxidative stress induction.

Methods. Organic acid composition of the experimental agents was characterized by HPLC chromatography. Bleaching efficiency was tested by spectrophotometry on Filtek Ultimate composite materials and natural, extracted teeth.

Biological testing was done *in vitro*, on human fibroblasts. Cells were exposed 6 and 24 hour 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, oxidative stress induction was assessed by spectrophotometric measurement of malondyaldehyde and superoxidedismutase activity, Western Blot analysis of NFkB.

Results. All gels exhibited physical stability and dental bleaching capabilities. Experimental gels induced significantly better viability and apoptosis rates; lower lipid peroxidation and increased antioxidant defense, namely stronger and sustained activation of NFkB and superoxidedismutase, compared to Opalescence.

Conclusion. The low cytotoxicity and bleaching efficiency makes the experimental gels suitable for a safer use in clinical practice.

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THE EFFECT OF EXPERIMENTAL BLEACHING AGENTS ON THE SURFACE HARDNESS OF COMPOSITE MATERIALS

S. BOBOIA¹, C. SAROȘI¹, L. SILAGHI-DUMITRESCU¹, D. PRODAN¹, G. POPESCU², D. DUDEA³, M. MOLDOVAN¹

¹"Babes Bolyai" University, "Raluca Ripan" Chemistry Research Institute, Cluj-Napoca, Romania

² Technical University of Cluj-Napoca, Romania

³ "Iuliu Hațieganu" University of Medicine and Pharmacy of Cluj-Napoca, Romania

*Corresponding author: Stanca Boboia, stancabobo@yahoo.com

Objectives. The purpose of this study was to evaluate the effects of experimental natural bleaching gel G19® and commercial BrightBleach® bleaching gel on the Vickers microhardness of universal nanocomposite (Nanofill), and 3 experimental nanocomposites (CN1, CN3, CN4).

Materials and Methods. Forty composite resin samples with 15 samples for each type of composite resin were prepared Teflon molds (1 × 1.5 mm). Each type of composite resin was further divided into three groups [n = 5 controls were placed in distilled water for 10 days, and the other two groups of n = 5 were bleached with experimental and commercial gel for 10 days]. Surface hardness of the composite resin was tested with a Vickers hardness tester, by using the universal device 270 VRSA.

Results. After 10 days of bleaching treatment, there were no significant changes in the surface hardness of all the composite materials. On the other hand, the surface hardness of composite materials after the bleaching process can increase, decrease or remain unchanged. Such variations suggest that some restorative materials may be more susceptible to discoloration and some whitening agents.

Conclusions. Although the surface hardness is dependent on the material, no significant changes were obtained for the tested composites and bleaching materials, following the whitening protocol.

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QUANTITATIVE EVALUATION OF ACCURACY FOR TWO RAPID PROTOTYPING SYSTEMS IN DENTAL MODEL MANUFACTURING

ALEXANDRU-VICTOR BURDE¹, MIHAI VARVARĂ¹, DIANA DUDEA¹, RADU-SEPTIMIU CÂMPIAN²

¹Departament of Dental Propaedeutics and Aesthetics, "Iuliu Hațieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

² Department of Oral Rehabilitation, Oral Health and Management of the Dental Office, "Iuliu Hațieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

*Corresponding author: Burde Alexandru-Victor; e-mail: Burde.Alexandru@umfcluj.ro

Objective. To evaluate three-dimensional accuracy of the virtual models based on reconstruction with two additive manufacturing methods: a) fused deposition modeling and b) inverted stereolithography, in comparison with the computer-assisted design.

Materials and method. A type IV scannable gypsum model of an ideal upper arch was digitized with a 3D scanner (Cerec In-Eos X5, Sirona, USA). The virtual model was adjusted for additive manufacturing using dedicated software. This adjusted virtual model (REF) was further reconstructed using 2 different methods: a. a 3D fused deposition modeling printer (FDM) out of 3 mm red ABS filament and b. an inverted stereolithography printer (SLA) using white photopolymer resin. The two reconstructed models were digitized with the same 3D scanner and two virtual models resulted (FDM and SLA); these virtual models were compared with the adjusted virtual model using software for inspection.

Results. The average positive and negative deviations between the CAD model (REF) and test datasets indicate that inverted stereolithography accomplished the most accurate results (SLA, 0.153 mm/-0.204 mm; SD 0.282), followed by the fused deposition modeling (FDM, 0.154 mm/-0.255 mm; SD 0.444).

Conclusion. Additive manufactured replicas of plaster casts are influenced by problems linked to the size of the detail to be reproduced, which is often similar to or finer than the fabrication layer. Inverted stereolithography allows the layer height to be adjusted between 0.1 mm to 0.025 mm, thus being better suited for this type of application.

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THE USE OF DENTAL SEALING IN CLUJ, ROMANIA: FREQUENCY, MATERIALS AND TECHNIQUES – A QUESTIONNAIRE SURVEY STUDY

DANIELA CORNEA¹, RADU OPREAN², DIANA DUDEA³

¹Department of Prosthetics and Dental Materials, “Iuliu Hatieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

²Department of Analytical Chemistry and Instrumental Analysis, “Iuliu Hatieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

³Department of Prosthetics and Dental Materials, “Iuliu Hatieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

Aims. Dental decay is a condition that affects both temporary and permanent dentitions; prophylactic methods for dental decays consists of: dental sealing, use of fluorides, oral hygiene and healthy diet habits. This article focuses on the frequency, dental materials and techniques used for caries prophylaxis by using dental sealing in Cluj County.

Materials and methods. The study used a set of questionnaires that was applied to 175 dentists from Cluj. The questionnaire contained 11 questions and it was delivered either directly or via internet methods.

Results. From the interviewed dentists, 85.7 % perform dental sealing and 86.7% use materials based on composite resins in this respect. For diagnostic purposes 76% of the dentists use inspection and palpation, 68.66% use cotton rolls and aspiration for isolation, 74% use professional brushing, 74% indicate 6 months ` check-ups and 60 % of the dentists redo the sealing if the sealant is partially or entirely lost or provide fillings in case of secondary decays.

Conclusions. Most of the interviewed dentists perform dental sealing and consider it as a good caries prophylaxis method. Most of them use composite resins as pit and fissure sealant, but the techniques are different among the interviewed dentists.

MEASUREMENT OF CONDYLE DISPLACEMENT BETWEEN CENTRIC RELATION AND MAXIMUM INTERCUSPATION BY GRAPHIC REGISTRATIONS IN ORTHODONTIC PATIENTS

CARMEN COSTEA¹, SORIN VASILACHE², ALEXANDRINA MUNTEANU¹, MICHAELA MESAROȘ¹,
MANDRA BADEA³

¹Discipline of Pedodontics, Faculty of Dental Medicine, “Iuliu Hațieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

²Student, Faculty of Medicine, “Iuliu Hațieganu” University of Medicine and Pharmacy, Cluj Napoca, Romania

³Dental Therapy Department, Faculty of Dental Medicine, “Iuliu Hațieganu” University of Medicine and Pharmacy, Cluj Napoca, Romania

Objectives. The purpose of this study was to evaluate the discrepancy at the condylar level between centric relation and maximum intercuspation in patients seeking orthodontic treatment.

Methods. The records of 30 patients who presented for routine orthodontic treatment in a private practice were used. The models were mounted based on an estimated hinge axis recorded by facebow and articulated in centric relation with registrations obtained with the two piece wax method without neuromuscular deprogramming. A pink wax registration of maximum intercuspation was also taken. Using condylar position instrumentation (MCD, AD2 USA) graphic registrations (in all three planes: orizontal, vertical and transversal) of centric relation and maximum intercuspation were obtained based on which measurement of condylar discrepancy was done. The condylar displacement was evaluated concerning frequency, direction and magnitude.

Results. Every patient presented condylar displacement in at least one plane, in most of the cases the displacement being postero-inferior as the teeth were brought into maximum intercuspation. Clinically significant were considered discrepancies ≤ 1 mm in the horizontal and vertical plane and ≤ 0.5 mm in the transversal plane.

Conclusions. Because of the high incidence of condylar displacements, condylar position instrumentation should be used before orthodontic treatment in order to unmask the real skeletal relationships and avoid misdiagnosis.

EFFECT OF STAINING SOLUTIONS ON COLOR STABILITY OF NEW EXPERIMENTAL GIOMERS

IOANA HODISAN^{1,4}, VASILE PREJMEREAN², DOINA PRODAN³, LOREDANA COLCERIU⁴,
CRISTINA PREJMEREAN³, MARIA TOMOAI-A-COTISEL¹

¹Faculty of Chemistry and Chemical Engineering, “Babes-Bolyai” University, Cluj-Napoca, Romania

²Faculty of Mathematics and Computer Science, “Babes-Bolyai” University, Cluj-Napoca, Romania

³“Raluca Ripan” Institute of Research in Chemistry, “Babes-Bolyai” University, Cluj-Napoca, Romania

⁴“Iuliu Hațieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

*Corresponding author: Ioana Hodisan, e-mail: ioanahodisan@yahoo.com

Objectives. The present study investigated the color stability of new experimental giomers when exposed to usual staining solutions.

Materials and method. Five new experimental giomers (G1, G2, G3, G4 and G5) were selected for this study. Nine specimens (30 mm diameter, 2.0 mm thickness) of each material were fabricated. The specimens were then randomly divided into 3 groups and immersed for 72 hours into the following solutions: red wine (pH=2.5), coffee (pH=4.6) and orange juice (pH=3.8). After 72 hours the specimens were cleaned under running water and dried on a filter paper. Color parameters were measured using 2 methods. The first method used a spectrophotometer (UNICAM 4 UV-VIS) to measure the color changes before and after immersion in staining solutions. CIE L*a*b* values were recorded and color changes (ΔE) were calculated according to formula $(\Delta E^* = [(\Delta L^*)^2 + (\Delta a^*)^2 + (\Delta b^*)^2]^{1/2})$ for each specimen. Color changes were also recorded by analyzing the digital images of the giomer specimens before and after immersion using a software application named (“Discolor”).

Results. The two methods used to evaluate the color stability had similar results. The lowest color change was observed after immersion in orange juice while the highest was noted with exposure to red wine. For all staining solutions, ΔE values of G3 were the highest followed by G1 then G2. Giomers G4, G5 showed the lowest color change after exposure to staining solutions.

Conclusions. Correlating the three values of ΔE (wine, coffee, and juice) obtained with the experimental giomers, the least stained were giomers G4 and G5 that are based on urethane polymer matrix

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ISOLATION AND CHARACTERIZATION OF HUMAN STEM CELLS DERIVED FROM PERIODONTAL LIGAMENT AND DENTAL FOLLICLE

MONICA - ANGELA MAXIM¹, OLGA SORITAU², EMOKE PALL³, MARIA-ANCUTA JURJ⁴,
OANA MIHAELA ZANOAGA⁴, GRIGORE BACIUT⁵

¹Faculty of Dental Medicine, "Iuliu Hatieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

²"Ion Chiricuta" Oncological Institute Cluj-Napoca, Romania

³Faculty of Veterinary Medicine, University of Agricultural Sciences and Veterinary Medicine (USAMV)

⁴"Iuliu Hatieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

⁵Department of Cranio-Maxillofacial Surgery, "Iuliu Hatieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

*Corresponding author: Monica-Angela Maxim, e-mail: monicamaxim2004@yahoo.com

A rich source of mesenchymal stem cells is found in the dental tissues, like the dental pulp, the apical papilla, the dental follicle, the periodontal ligament and the deciduous teeth.

Objective. In this study we aimed to describe the isolation and the characteristics of mesenchymal stem cells isolated from the human periodontal ligament and from the dental follicle.

Methods. The mesenchymal stem cells have been isolated from healthy premolars extracted for orthodontic purposes, and from dental follicles of the third molars. The harvested dental fragments have been processed mechanically and enzymatically. During the third and fourth passage the isolated cells have been phenotypically characterized for the expression of the stemness markers, like Oct 3/4, Sox-2, Nanog, SSEA-1, CD 44, CD 29, CD 73, alkaline phosphatase by flow-cytometry and immuno-cytochemical analysis.

Results. The isolated cells have shown a fibroblast-like morphology and a high proliferation rate. The expression of the pluripotency markers like Oct 3/4, Sox-2, Nanog, SSEA-1 has shown the mesenchymal origin of the isolated cells.

Conclusions. The dental stem cells represent a platform for regenerative medicine because of their characteristics: the multipotency, the high proliferation rate and the differentiation into several cell lineages, offering a solution for the future through tissue regeneration or "de novo" formation of craniofacial structures that have been lost through trauma, congenital malformations and other diseases.

Acknowledgements. Dr. Maxim Monica Angela acknowledges financial support from an POSDRU grant no. 159/1.5/S/138776/ grant entitled: "Model colaborativ institutional pentru translatarea cercetarii stiintifice biomedicale in practica clinica – TRANSCENT".

APPLICATIONS OF ORAL HALITOSIS BIOCHEMISTRY IN PERIODONTAL SELF-CARE AND SELF-DIAGNOSIS

RADU CHIFOR, MÎNDRA EUGENIA BADEA, IULIA CLARA BADEA, IOANA CHIFOR, RAMONA AVRAM

Department of Preventive Dentistry, "Iuliu Hatieganu" University of Medicine and Pharmacy of Cluj-Napoca, Romania

Introduction. Halitosis or malodour which arises from the mouth is due to microbial putrefaction of food debris. It affects up to 50% of the adults. We aimed to understand the biochemical actions of mouthwashes on the self-perceived oral halitosis (SPOH). This could show if SPOH can be used as a self-diagnosis feature to alert the patient suffering of periodontitis to ask for a dental recall visit.

Material and methods. We studied the effects of 3 categories of mouthwashes on the SPOH. We chose clinically healthy young adults with good knowledge of oral hygiene procedures (dental students), so that the periodontal condition should not influence the results. We aimed to compare the SPOH at baseline and after one week of using 3 types of mouthwashes: chlorhexidine based (group A), plant extract based (group B) and fluorine based (group C). The studied group included 167 randomly selected dental students. SPOH decreased from 23.2% (39 students) to 10.4% (5 subjects).

Results. The mean recent plaque index PI0-3 decreased from 38.69% to 21.83% and mean plaque index older than 3 days, PI3 from 12.27% to 8.69%. The logistic regression model revealed that monthly income, oral hygiene and diet had a statistically significant influence on SPOH ($p < 0.05$). Group B had the most significant decrease in oral halitosis ($p < 0.05$).

Conclusions. Clinical decrease of SPOH is sustained by the chemical reactions between volatile sulphur compounds, short chain fatty acids and diamines responsible for halitosis and mouthwashes components. Thus, SPOH could be a self-diagnosis step for the patient to improve the oral hygiene and to ask for professional cleaning and anti-inflammatory treatment.

THE NANOFILLER EFFECT ON THE RESIDUAL MONOMERS AMOUNT OF THE GRAPHENE DENTAL NANOCOMPOSITES

CODRUTA SAROSI¹, STELA PRUNEANU², STANCA BOBOIA¹, MIUTA FILIP¹, CAMELIA ALB³,
SORINA SAVA³, MARIOARA MOLDOVAN¹

¹“Raluca Ripan” Chemistry Research Institute, “Babes Bolyai” University, Cluj-Napoca, Romania

²National Institute for Research and Development of Isotopic and Molecular Technologies, Cluj-Napoca, Romania

³Faculty of Dental Medicine, “Iuliu Hațieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

*Corresponding author: Codruta Sarosi, e-mail: codru_tza2003@yahoo.com

The purpose of the present study is to analyze the effect of the new nanofiller type graphene-oxide nanoparticles, on the residual monomer, of some dental nanocomposites.

Materials and Methods: Three experimental nanocomposites, two of them with graphene oxide nanoparticles as filler in different percentages were compared with commercial composite Herculite. Disks 8x5 mm in size were prepared for each material group (experimental composites with graphene CG1, CG2, in different percentages, experimental composite C3, and Herculite - Kerr) were polymerized by LED. Each specimen was stored in 25 ml chloroform at 60°C time for 8 hours. The monomer released in 8 hrs from the specimens was analyzed in High Performance Liquid Chromatography (HPLC) calibrated for the monomer extracts before.

Results: TEGDMA release was detected in all material groups after 8 hrs. BisGMA were not determined in any groups. Significant differences in release of TEGDMA were obtained between the different composites with graphene. The dental nanocomposites with highest percentage of graphene oxide nanoparticles presented a better value for the residual monomer.

Conclusions: Data has revealed that the monomer release could be detected significantly high from the composite materials polymerized. According to the experimental results the highest percentage of residual monomer in all investigated nanocomposites is due to unreacted TEGDMA.

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DETERMINATION OF TRANSLUCENCY AND RADIOPACITY FOR EXPERIMENTAL COMPOSITES

LAURA SILAGHI-DUMITRESCU¹, DOINA PRODAN¹, VIOLETA POPESCU², ALEXANDRINA ROMAN³, VASILE PREJMEREAN⁴, MARIOARA MOLDOVAN¹

¹“Babes Bolyai” University, “Raluca Ripan” Chemistry Research Institute, Cluj-Napoca, Romania

²Technical University of Cluj-Napoca, Romania

³“Iuliu Hațieganu” University of Medicine and Pharmacy of Cluj-Napoca, Romania

⁴“Babes Bolyai”, University, Faculty of Mathematics and Computer Science, Cluj-Napoca, Romania

*Corresponding author: Laura Silaghi-Dumitrescu, lauraiulia2000@yahoo.com

A phenomenon that contributes to the aesthetics of nanocomposites, translucency, occurs as a consequence of the small size of nanoparticles dispersed. Translucency of dental restorative materials is much less studied in the literature compared to other properties. Tooth color and translucency may be perceived by visual methods and/or instrumental methods.

Materials and Methods. In order to assess translucency, six experimental composition, C1, C2, C3, C4, C5, C6 (ICCRR Cluj) were tested and compared with commercial materials and Evetric (Ivoclar), NanoFil, on specimens of 3 x 2 mm size, polymerized with Optilux curing light (Kerr), 60 seconds in the 17 distinctive point. The index of the translucency was measured using a UV-VIS spectrophotometer, reflection spectra at 380-770 nm were recorded, and using the system the CIE L * a * b * color coordinates were determined. To determine radiopacity, we used a mathematical application, compared to aluminum plates from 1 to 10 mm.

Results. Experimental composite, reinforced majority with quartz and BaO glass shows a slight tendency towards human dental enamel translucency, but is much closer to human dentin IT, and the radiopacity values of all materials taken into study had values above setpoint of radiopacity human dentin.

Conclusions. Translucency materials can be controlled by the choice of monomers, type of filler and silanization. Improving the translucency parameter does not necessarily improve radiopacity.

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

ORTHODONTIC TREATMENT NEED IN CHILDREN WITH HEARING IMPAIRMENT

RALUCA DIANA SUHANI¹, MIHAI FLAVIU SUHAN², ALEXANDRINA MUNTEAN¹,
MICHAELA MESAROS¹, MINDRA EUGENIA BADEA³

¹Department of Pediatric Dentistry, Faculty of Dental Medicine, “Iuliu Hațieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

²Dental practice Ortoelitte

³Department of Preventive Dentistry, Faculty of Dental Medicine, “Iuliu Hațieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania

*Corresponding author: *Raluca Diana Suhani, email: raluca.suhani@gmail.com*

Aim. The aim of this study was to assess orthodontic treatment need among 6 to 18 years-old children with hearing impairment.

Material and Methods. The sample consisted of 145 school children with hearing impairment, aged 6 to 18 in the city of Cluj-Napoca, Romania. The subjects were further sub-grouped according to gender (74 males and 71 females) and age. Informed consents were obtained from each subject's parent or legal guardian.

An orthodontist examined the participants for treatment need, applying the Dental Health Component (DHC) and Aesthetic Component (AC) of the Index of Orthodontic Treatment Need. A questionnaire was used to evaluate self-perceived treatment need, dental aspect and occlusal function. Chi-square tests were used to evaluate gender and age differences in the distribution of treatment need.

Results. The survey population showed a high need for definite orthodontic treatment on basis of DHC, AC and ICON.

There were no statistically significant gender and age differences in the distribution of orthodontic treatment need among the children ($p > 0.05$).

Anterior maxillary and mandibular irregularity occurred in more than 33% of the sample cases. More than 40% of the students examined showed signs of crowding. Spacing occurred in almost 42% of the cases. Almost 37% of the sample had an antero-posterior molar relation discrepancy.

The results showed that about 19% of the subjects had more than one missing permanent tooth.

Conclusions. According to the findings of this study, there is a mandatory/strong need for orthodontic treatment in students with impaired hearing. The need for orthodontic treatment was determined by the presence of spacing, crowding, crossbite, increased overjet, and increased overbite.

Acknowledgment. Dr. Raluca Suhani is a fellow of POSDRU grant no. 159/1.5/S/138776 grant with title:

“Model colaborativ institutional pentru translația cercetării științifice biomedicale în practica clinică – TRANSCENT”.

OROFACIAL PAIN AND DYSFUNCTION IN PATIENTS WITH RHEUMATOID ARTHRITIS

R. TRISTIU¹, R. JUNCAR¹, L. LASCU¹, S. REDNIC¹, B. DUMITRU², S. EICK², A. SCULEAN², R. COSGAREA¹

¹Department of Prosthetic Dentistry, "Iuliu Hatieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

²Clinic of Rheumatology, "Iuliu Hatieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

³School of Dental Medicine, University of Bern, Switzerland

*Corresponding author: Roxana-Elena Tristiu, email: roxanatristiu@yahoo.com

Objective. Rheumatoid arthritis (RA) frequently affects the temporomandibular joint (TMJ) and masticatory muscles. The aim of this pilot study was to evaluate the presence of TMJ-dysfunction and orofacial pain in patients with RA in relation to their periodontal status.

Method. 21 patients suffering from RA (DAS \geq 3.2) were investigated for their periodontal condition (pocket depths, clinical attachment level, plaque, bleeding index) and TMJ affections (pain, sounds, deviation, limitation). Extra- and intraoral masticatory muscles were evaluated for pain at palpation; occlusion, interferences and premature contacts were registered.

Results. 13 patients (62%, mean age 52.61, 11 women) were diagnosed with chronic periodontitis (RA-PA group). There were no significant statistical differences regarding number, sex, age of the patients in the two groups (RA, RA-PA). 69% of the RA-PA patients and 62.5% of the RA patients were diagnosed with discal displacement. 52% of the patients exhibited articular pain at the TMJ palpation, the majority being in the periodontitis group (64%); 45% of the periodontitis patients also suffered of muscular pain. Most patients (76.2%) had pain at the intraoral palpation of the masticatory muscles, 11 (52%) showing pain at the extraoral palpation. 62% of the patients (85% with periodontitis) presented TMJ sounds during mouth opening. Interferences/premature contacts were registered in all patients.

Conclusion. Patients with RA and periodontitis showed significantly more symptoms for orofacial pain and affections of the TMJ as compared to patients suffering only from RA. Early diagnosis and treatment of periodontitis might prevent the development of TMJ dysfunction and orofacial pain.

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APPLICATIONS OF THE ANTIMICROBIAL PHOTODYNAMIC THERAPY IN DENTISTRY.

Location: V. Babeş Street 15, Department of Prevention in Dental Medicine
27th March 2015, 11:00 a.m. – 15:00 p.m.

Theoretical part: 11:00 a.m. – 12:50 p.m.

The theoretical part contains information concerning the applications of antimicrobial photodynamic treatment in dentistry: definition, principles of action, and devices for photodynamic therapy in dental medicine, indications, and precautions.

Practical demonstrations: 13:00 p.m. – 15:00 p.m.

The practical part consists of the presentation of several devices for antimicrobial photodynamic treatment, technique, as well as several practical demonstrations with the devices for photodynamic therapy.

Price of participation: 50 lei / participant

Organizers:

Department of Prevention in Dental Medicine:

PROFESSOR MÎNDRA E. BADEA, LECTURER RAMONA AVRAM, ASSISTANT-LECTURER IULIA BADEA, ASSISTANT-LECTURER RADU CHIFOR

AN INTEGRATED APPROACH TO DENTAL ESTHETIC RESTORATIONS – THE GIOMER FAMILY OF RESTORATIVE MATERIALS

DR. KOSMAS TOLIDIS DDS, MSC, PHD, PAEDIATRIC DENTIST, ASSOCIATE PROFESSOR

Dept. Operative Dentistry – Dental School of Thessaloniki, Chief Dental Officer of the Hellenic Republic

The introduction of different types of esthetic materials, from fissure sealants to fiber reinforced composite resin constructions allowed for the development of the concept of “Minimally Invasive Cosmetic Dentistry” which corresponds perfectly with the trend of preserving as much as possible hard dental tissues. The main key points of the presentations are:

- Definition and explanation of SHOFU’s concept of “***Minimally Invasive Cosmetic Dentistry***”
- Materials and instruments used in the application of modern restorative dentistry
- Shrinkage of composite resins, how affects the restoration, how is affected and avoided
- What is a GIOMER, special characteristics of GIOMER materials
- Bonding to tooth hard tissues, choice of bonding system, tips and directions
- Shade selection and proper composite layering, finishing and polishing
- Aesthetic posts, ceramic repair, tooth fragment re-attachment
- Use of fibers in restorative dentistry
- Discussion of special clinical cases

Following the theoretical presentation there will be a hands on and demonstration course of contemporary esthetic solutions to restorative problems using composite resins, fiber systems, repairing ceramic restorations etc. Also, participants will be able to apply techniques and materials on the demonstrated techniques.