

# Book of abstracts of the 7<sup>th</sup> International Congress „Science and Clinical Work Sinergy“

October 20-21, 2023, Zagreb, Croatia

**Organized by:** Department of Endodontics and Restorative Dentistry, School of Dental Medicine, University of Zagreb, in co-organization with the Croatian Society for Minimum Intervention Dentistry, Croatian Society for Endodontology and Croatian Society for Restorative Dental Medicine (Croatian Medical Association)

**Editors of the book of abstracts:** Anja Ivica, Ivan Šalinović

**Presidents of the congress:** Silvana Jukić Krmek, Ivana Miletić

**Organizational board:**  
Silvana Jukić Krmek, Ivana Miletić, Anja Baraba

**Scientific board:**  
Falk Schwendicke, Avijit Banerjee, Sevil Gurgan, Anja Ivica, Ivan Šalinović

## Poster abstracts

### TEMPERATURE RISE DURING POLYMERIZATION OF COMPOSITE MATERIALS USING HIGH IRRADIANCE CURING UNITS

Marta Alerić<sup>1</sup>, Svenia Antić<sup>1</sup>, Matej Par<sup>2</sup>, Zrinka Tarle<sup>2</sup>, Danijela Marović<sup>2</sup>

<sup>1</sup> Student of School of Dental Medicine, University of Zagreb, Croatia

<sup>2</sup> Department of Endodontics and Restorative Dental Medicine, School of Dental Medicine, University of Zagreb, Zagreb, Croatia

**Aim:** Excessive temperature rise during polymerization can lead to pulp damage. The aim of this study was to evaluate the dynamics of temperature rise during polymerization of bulk-fill composites with different polymerization programs of high irradiance curing units.

**Materials and methods:** Five bulk-fill composites were investigated (SDR Plus, Filtek One Bulk Fill, Tetric PowerFill, Tetric PowerFlow). Composite specimens (n = 5) were prepared in a Teflon mold (d=5 mm h=2 or 4 mm). A LED curing unit Bluephase PowerCure was used for photopolymerization with 3 protocols: 3s - 3 seconds with 3000 mW/cm<sup>2</sup> or 10s - 10 seconds with 1000 mW/cm<sup>2</sup> at 4-mm depth, and 20s - 20 seconds with 1000 mW/cm<sup>2</sup> at 2 mm. Temperature rise during polymerization was measured in real time using a thermal imaging camera (ETS 320 electronics test bench camera, Teledyne FLIR LLC) and the maximum temperature reached and the time to reach the maximum temperature were recorded. After cooling, the samples were again illuminated to distinguish intrinsic temperature rise due to polymerization reaction from extrinsic temperature rise due to the polymerization device.

**Results:** The 3s polymerization protocol contributed to an equal temperature rise as for the standard 10s protocol at 4 mm depth for all materials tested, except for Filtek One, where a significantly lower temperature rise was measured. The highest overall temperature rise compared to room temperature was recorded for SDR Plus in the 10s protocol at 4 mm and amounted to 32.64 °C, with most of the temperature increase due to intrinsic temperature rise (30 °C). The heating from the curing unit was the greatest for the 20s polymerization protocol at 2 mm depth.

**Conclusion:** Despite the very high light intensity, 3s polymerization did not result in an increased temperature rise. The type of material had a stronger effect on the temperature rise than the polymerization program.

This research was funded by the Croatian Science Foundation, project IP-2019-04-6183.

**Key words:** Composite; Polymerization; Bulk-fill composite

### ASSESSING SELF-PERCEIVED ORAL HEALTH AND ORAL HEALTH LITERACY AMONG THE CROATIAN POPULATION: A CROSS-SECTIONAL STUDY

Marija Badrov<sup>1</sup>, Antonija Tadin<sup>1,2</sup>, Lidija Gavić<sup>1</sup>

<sup>1</sup> Study of Dental medicine, School of Medicine, University of Split, Split, Croatia

<sup>2</sup> Clinical Hospital Center Split, Split, Croatia

**Aim:** Despite being largely preventable, oral diseases remain globally prevalent and are associated with significant health and economic burdens. This study aimed to provide insights into the self-assessment of oral health and oral health literacy among the general population of the Republic of Croatia.

**Materials and Methods:** The research was conducted using an online questionnaire that included socio-demographic characteristics of the respondents, questions related to self-assessment of oral health, knowledge about oral health, use of dental services, and sources of information about oral health.

**Results:** The research findings revealed that 44.6% of respondents perceived their oral health as very good. Regardless of that, 32.5% of respondents reported having caries, while 38.2% mentioned problems with tooth sensitivity. The majority of respondents mentioned regular check-ups as the reason for their last visit to the dentist (62%), and 74.1% of them visited the dentist without fear or discomfort. Approximately 69% of respondents believed that low oral health literacy and the low priority of oral health were the main reasons for poor oral health and oral hygiene in Croatia. For 74.6% of respondents, dentists were the primary source of information about oral health. And only 59.4% of respondents expressed an interest in education regarding oral health and oral hygiene.

**Conclusion:** The results of this research indicate that Croats consider knowledge about oral health to be very important, yet self-assess their own knowledge as moderate. The surveyed population believes that the primary reasons for poor oral health and oral hygiene habits are the low priority of oral health and insufficient oral health literacy. Therefore, it is essential to develop educational interventions to improve awareness and knowledge in this area.

**Keywords:** Adults; Oral health literacy; Oral health status; Self-rated oral health

### ASSOCIATION BETWEEN APICAL PERIODONTITIS AND THYROID DISORDERS: A CROSS-SECTIONAL STUDY

Elvis Božac<sup>1</sup>, Ema Paljević<sup>1</sup>, Jelena Vidas Hrstić<sup>1</sup>, Ivana Brekalo Pršo<sup>1</sup>, Romana Peršić Bukmir<sup>1</sup>

<sup>1</sup> Department of Restorative Dentistry and Endodontics, Faculty of Dental Medicine, University of Rijeka, Rijeka, Croatia

**Aim:** The present cross-sectional study aimed to investigate the association of hypothyroidism and periapical status in adult patients.

**Materials and Methods:** The present study involved 32 adult patients diagnosed with hypothyroidism and 32 age and gender matched participants who reported no history of any systemic disease. Patients were examined to record the number and periapical status of teeth, the DMFT index, and the number of root-filled teeth. Periapical status was recorded from panoramic radiographs using the periapical index scoring system.

**Statistical analysis:** Considering the data distribution was not normal, the continuous variables were tested using Mann-Whitney U test. Associations were tested through multivariate regression analysis (backward model) with dependent variable set as periapical disease ratio (number of teeth with apical periodontitis divided by number of teeth present). Explanatory variables were age, gender, hypothyroidism, number of decayed teeth, number of teeth with coronal restorations and number of root-filled teeth.

**Results:** There was no significant difference between the two groups of participants regarding the median number of present teeth (p=0.510), teeth with AP (p=0.828) or DMFT scores (p=0.095). Three variables demonstrated significant association with periapical disease. The periapical disease ratio significantly increased with the presence of hypothyroidism, number of decayed teeth, and number of root-filled teeth (all p<0.001). The selected variables explained 57% of observed variation in periapical disease ratio (R<sup>2</sup>=0.567; P<0.001).

**Conclusion:** The present results demonstrated significant association of hypothyroidism with poor periapical status in multivariate analysis model. However, considering the design of the study, the cause-effect relationship cannot be confirmed.

**Keywords:** Dental Caries; Hypothyroidism; Periapical Periodontitis; Root Canal Treatment

#### LIGHT TRANSMISSION DURING THE POLYMERIZATION OF COMPOSITE MATERIALS WITH CURING UNITS OF DIFFERENT SPECTRAL CHARACTERISTICS

Paulina Daničić<sup>1\*</sup>, Glorija Bojo<sup>1</sup>, Matej Par<sup>2</sup>, Zrinka Tarle<sup>2</sup>, Danijela Marović<sup>2</sup>

<sup>1</sup> Student of School of Dental Medicine, University of Zagreb, Zagreb, Croatia

<sup>2</sup> Department of Endodontics and Restorative Dentistry, School of Dental Medicine, University of Zagreb, Zagreb, Croatia

**Aim:** The aim of this study is to compare the light transmission of different spectral characteristics through bulk-fill composites during polymerization.

**Materials and methods:** Four composite materials were tested in this study (Tetric PowerFill, Ivoclar Vivadent; Quixfil, Dentsply Sirona; Tetric PowerFlow, Ivoclar Vivadent; SDRflow+, Dentsply Caulk). The unpolymerized composite material (d=6 mm, h=2 mm, n=6 mm) was placed in a cylindrical Teflon mold over the aperture of the NIST calibrated spectrometer (MARCResin Calibrator, BlueLight Analytics inc.) and illuminated perpendicularly from above for 20 s with a polymerization lamp in a fixed position. Three polymerization lamps were tested: (I) Bluephase<sup>®</sup>PowerCure (Ivoclar Vivadent) with an average intensity of 958 mW/cm<sup>2</sup>, (II) Translux<sup>®</sup> Wave (Kulzer) with an average intensity of 1372 mW/cm<sup>2</sup> and (III) VALOTM Cordless (Ultradent) with an average intensity of 824 mW/cm<sup>2</sup>. For data analysis, irradiation with wavelengths of 360-424 nm for the violet spectrum and 424-540 nm for the blue spectrum was chosen. The change in light transmission was observed for each composite material depending on the curing unit used.

**Results:** All tested materials transmitted blue wavelengths 2-8 times more than the wavelengths in the violet region of the spectrum. VALOTM Cordless showed the highest blue transmission, with the exception of Tetric PowerFill, which showed equal values for VALOTM Cordless and Bluephase<sup>®</sup>PowerCure. There was no significant difference in the transmission of the violet part of the spectrum between VALOTM Cordless and Bluephase<sup>®</sup>PowerCure, except for PowerFlow. Translux<sup>®</sup> Wave emits only blue spectrum and its transmission value was the lowest for all materials.

**Conclusion:** Light transmission through tested materials is highly dependent on the emission spectrum of the polymerization unit and the chemical composition of the composite. Blue light penetrates the material better than violet light due to light scattering of lower wavelengths when passing through the composite material.

This research was funded by the Croatian Science Foundation, project IP-2019-04-6183.

**Keywords:** Polymerization; Composite; Bulk-fill materials

#### SATISFACTION OF DENTISTS WITH THE SKILLS ACQUIRED DURING THEIR STUDIES

Nikolina Drašković<sup>1\*</sup>, Mia Vrdoljak<sup>1</sup>, Josip Vrdoljak<sup>2</sup>, Antonija Tadin<sup>1</sup>

<sup>1</sup> Study of dental medicine, School of Medicine, University of Split, Split, Croatia

<sup>2</sup> School of Medicine, University of Split, Split, Croatia

**Aim:** The interplay between technical expertise and soft skills is of paramount importance in patient management and the operation of a dental practice. The primary goal of this cross-sectional study was to assess dentists' satisfaction levels regarding the „hard“ and „soft“ skills they acquired during their studies at different faculties in the Republic of Croatia.

**Materials and Methods:** We conducted this survey using an online questionnaire that covered demographic information, the level of satisfaction in acquiring essential skills and knowledge, technical competencies, and intangible soft skills.

**Results:** When comparing the satisfaction levels of dentists in relation to the technical skills acquired from various dental medicine branches based on their place of graduation, dentists who completed their studies in Zagreb expressed the highest satisfaction with what they learned in endodontics ( $P = 0.004$ ). Dentists who graduated in Split were most satisfied with pedodontics ( $P \leq 0.001$ ) and oral medicine ( $P = 0.023$ ), while dentists who graduated in Rijeka were most satisfied with prosthetics, as well as orthodontics ( $P \leq 0.001$ ). In terms of the satisfaction levels among dentists concerning the „soft“ skills they have acquired, significant differences were observed in the areas of „Flexibility and adaptability,“ „Teamwork,“ „Critical thinking and creative problem-solving,“ and „Artistic skills.“ Dentists who graduated in Rijeka showed the highest level of satisfaction in these specific domains.

**Conclusion:** Dentists expressed moderate satisfaction with the knowledge acquired from clinical branches of dental medicine and their soft, intangible skills. The findings of this research can provide valuable insights to individual faculties in the Republic of Croatia, enabling them to improve their curricula and educational methods across various dental medicine branches and skill sets.

**Keywords:** Doctors of dental medicine; Dentistry; Technical skills; Satisfaction

#### DENTIN BOND STRENGTH OF EXPERIMENTAL COMPOSITE MATERIALS WITH FLUORINE-MODIFIED BIOACTIVE GLASS – RESULTS AFTER 6 MONTHS

Ksenija Dukarić<sup>1\*</sup>, Tobias T. Tauböck<sup>2</sup>, Thomas Attin<sup>2</sup>, Danijela Marović<sup>3</sup>, Zrinka Tarle<sup>3</sup>, Matej Par<sup>3</sup>

<sup>1</sup> Student, School of Dental Medicine, University of Zagreb, Zagreb, Croatia

<sup>2</sup> Department of Conservative and Preventive Dentistry, Center of Dental Medicine, University of Zurich, Zurich, Switzerland

<sup>3</sup> Department of Endodontics and Restorative Dentistry, School of Dental Medicine, University of Zagreb, Zagreb, Croatia

**Aim:** To investigate the dentin bond strength of experimental composites with a fluorine-modified bioactive glass (BG) after 6-month artificial aging.

**Materials and methods:** Three experimental composites were prepared with 10%, 20%, and 40% of BG, with a total filler content of 70%. A control material without BG was prepared, and a giomer was used as a commercial reference. The composite materials were placed using a silicone mold (diameter = 3.1 mm) on a dentine substrate on which a universal adhesive system had previously been applied. After light-curing, the samples were stored in distilled water at 37 °C until bond strength testing after 1 and 6 months. A total of 180 samples were prepared (18 samples per material x 5 materials x 2 time points). Bond strength was measured in the shear loading mode (0.5 mm/min) using a universal testing device.

**Results:** All tested materials (experimental composites with 10%, 20%, and 40% of BG, as well as the control composite and commercial reference composite) showed statistically similar values of dentin bond strength. A statistically significant decrease in bond strength after 6 months compared to 1 month was observed in the experimental composites with 10%, 20%, and 40% BG, while in the control composite and the commercial reference composite, there was no statistically significant change between 1 month and 6 months.

**Conclusion:** Although a statistically significant degradation of dentin bond strength was observed after 6 months in all experimental composites with fluorine-modified BG, the results obtained with these materials did not differ significantly from the values of the reference materials.

**Keywords:** Bond strength; Experimental composite materials; Remineralizing composite materials; Bioactive glass

#### CONTRAST AGENT IN A FIBRIN HYDROGEL FOR REGENERATIVE ENDODONTICS

Anja Ivica<sup>1\*</sup>, Porawit Kamnoedboon<sup>2</sup>, Ivan Šalinović<sup>1</sup>, Ivana Miletić<sup>1</sup>, Silvana Jukić Krmek<sup>1</sup>, Matthias Zehnder<sup>3</sup>, Franz E. Weber<sup>2</sup>

<sup>1</sup> Department of endodontics and restorative dentistry, School of Dental Medicine, University of Zagreb, Zagreb, Croatia

<sup>2</sup> Oral Biotechnology and Bioengineering, University of Zurich, Zurich, Switzerland

<sup>3</sup> Preventive Dentistry, Periodontology, and Cariology, University of Zurich, Zurich, Switzerland

**Aim:** The application of scaffold used in regenerative endodontics should be traceable. In this study, a fibrin hydrogel was combined with a contrast agent (Lipiodol) approved for systemic application. The aim of this study was to assess the cell migration towards different hydrogels.

**Materials and methods:** Fibrin hydrogels were prepared from a commercially available fibrin sealant (Tisseel) that consists of fibrinogen-based and thrombin-based solutions. A radiopaque Lipiodol was added to the test gel (30% by volume), while Tris buffer was used in a control group. Migration of stem cells towards hydrogels (n=3) were tested. The stem cells were placed on the top of Transwell inserts with a pore size of 8 µm, while the control gel or the gel with Lipiodol was placed on the bottom. For the positive control, 20% of FBS was used. Normal medium without any addition of FBS, was used as a negative control, as well as pure Lipiodol. Inserts with stem cells were left in the incubator for 24 h. Cells were fixed, permeabilized and stained. Cells that migrated from the insert to the other side of the membrane were visualized using microscope. Four pictures were taken from each insert, and cells were counted therein using ImageJ. Results were compared using pairwise *t*-test,  $p < 0.05$ .

**Results:** The contrast agent Lipiodol did not influence cell migration of stem cells and they migrated towards the gel that contained Lipiodol in the same manner as they would towards the fibrin alone ( $p > 0.05$ ).

**Conclusion:** Lipiodol can render a fibrin hydrogel radiopaque and maintains its ability to trigger the migration of stem cells.

**Keywords:** Regenerative endodontics; Fibrin gel; Scaffold

## CROATIAN HIGH SCHOOL STUDENTS' ATTITUDES TOWARDS ORAL HEALTH AND ORAL HYGIENE HABITS

Veronika Jović<sup>1</sup>, Sara Martinić<sup>1</sup>, Nika Kosović<sup>1</sup>, Anja Ivica<sup>2</sup>, Ivan Šalinović<sup>2</sup>, Silvana Jukić Krmek<sup>2</sup>

<sup>1</sup> Students, School of Dental Medicine, University of Zagreb, Zagreb, Croatia

<sup>2</sup> Department of Endodontics and Restorative Dentistry, School of Dental Medicine, University of Zagreb, Zagreb, Croatia

**Aim:** Essential requirements for maintaining oral health are education and motivation for performing oral hygiene. The goal of this study is to find out students' attitudes towards oral health and oral hygiene habits and to review the importance of education on oral health during elementary school and high school education in preventing the occurrence of caries and gum disease.

**Materials and methods:** 338 high school students aged 15 to 19 from Zagreb, Sisak and Split participated in the study. The age of the respondents ranged from 15 to 19 years. All respondents filled out a survey questionnaire.

**Results:** Most respondents answered that they brush their teeth two or more times a day (86.39%). Respondents who brush irregularly and whose gums bleed believe that they are more likely to have caries within the next year ( $r=0.145$  and  $r=0.198$ ). There was no statistically significant difference between male and female respondents in their fear of dentists ( $t=-0.75$ ,  $p>0.05$ ). There was no statistically significant difference between male and female respondents in the fear of anesthesia ( $t=1.81$ ,  $p>0.05$ ).

**Conclusion:** Further education and motivation of young people is needed to maintain oral hygiene and oral health. Research shows a positive trend of raising awareness about oral health.

**Keywords:** Oral health; Oral hygiene; Dental anxiety; Adolescents

## MEASUREMENT OF KINETICS AND DEGREE OF CONVERSION OF BULK-FILL COMPOSITES IN CLINICALLY RELEVANT CONDITIONS

Ana Marošević<sup>1</sup>, Matej Par<sup>2</sup>, Zrinka Tarle<sup>2</sup>, Danijela Marović<sup>2</sup>

<sup>1</sup> Student of School of Dental Medicine, University of Zagreb, Zagreb, Croatia

<sup>2</sup> Department of Endodontics and Restorative Dentistry, School of Dental Medicine, University of Zagreb, Zagreb, Croatia

**Aim:** Bulk-fill composites are applied in 4-5 mm thick layers, and some manufacturers claim that newer generations can be polymerized for 3 seconds. The aim of this study was to analyze the polymerization kinetics and degree of conversion of bulk-fill composites at the surface (0.1 mm), depths of 2 and 4 mm, and with different polymerization protocols.

**Materials and methods:** Five bulk-fill composites were tested (QuiXfil Posterior Restorative, Filtek One Bulk Fill Restorative, Tetric PowerFill, SDR Plus Bulk Fill Flowable and Tetric PowerFlow). Cylindrical specimens ( $n=6$ ) were made in a silicone mold with a diameter of 2 mm and a height of 2 or 4 mm. They were polymerized using the Bluephase<sup>®</sup> PowerCure (Ivoclar Vivadent) LED lamp with three polymerization protocols: (I) 3 s with average intensity of 2,600 mW/cm<sup>2</sup>; (II) 10 s with average intensity of 1,000 mW/cm<sup>2</sup> or (III) 20 s with average intensity of 1,000 mW/cm<sup>2</sup>. Spectra were recorded continuously for 5 min using the FTIR spectrometry (Nicolet<sup>™</sup> iS50 FTIR Spectrometer, Thermo Fisher Scientific Inc.) at depths of 2 and 4 mm.

**Results:** All materials showed the highest degree of conversion at the surface and for 20 s protocol, and the lowest for the 3 s protocol at 4 mm depth. Tetric PowerFlow showed the highest degree of conversion and the highest maximum reaction rate for all polymerization protocols, followed by Tetric PowerFill in terms of maximum polymerization rate. Filtek One Bulk Fill Restorative displayed the lowest degree of conversion for 3 s protocol at 4-mm depth and the lowest maximum reaction rate for all protocols. There was no difference in the time to reach the maximum polymerization rate, except for Filtek One Bulk Fill for 10-s protocol at the 4 mm depth.

**Conclusion:** Longer polymerization resulted in higher degree of conversion of tested bulk-fill composites. Rapid polymerization with a high light intensity is not suitable for all materials.

This research was funded by the Croatian Science Foundation, project IP-2019-04-6183.

**Keywords:** Polymerization; Composite; Bulk-fill materials

## DIAGNOSTICS OF OCCLUSAL CARIES USING THE ELECTROCONDUCTIVE METHOD - A PILOT STUDY

Martin Narančić<sup>1</sup>, Nika Nikolina Veček<sup>2</sup>, Anja Ivica<sup>3</sup>, Ivana Miletić<sup>3</sup>, Silvana Jukić Krmek<sup>3</sup>

<sup>1</sup> Dental Polyclinic Zagreb, Zagreb, Croatia

<sup>2</sup> Dental practice of Dr. Marija Košić Veček, Split, Croatia

<sup>3</sup> Department of Endodontics and Restorative Dentistry, School of Dental Medicine, University of Zagreb, Zagreb, Croatia

**Aim:** Diagnosis of occlusal caries is quite subjective, especially if there is no visible cavitation. In an effort to standardize the diagnostic procedure, new quantitative methods

are being sought, which would help the therapist in the diagnosis and planning of the treatment. The purpose of the research is to compare the electroconductive method and ICDAS with histological findings and to determine the sensitivity and specificity of the electroconductive method based on alternating and direct current in the diagnosis of occlusal caries.

**Materials and methods:** A total of 19 areas on 13 extracted teeth were assessed using the ICDAS method and two electroconductive devices, the CarieScan Pro device based on alternating current and a prototype measuring device based on direct current. As measuring probes, endodontic instruments were used in both devices, spreaders #10, #15 and #20, made of stainless steel and nickel titanium alloy, and for the CarieScan Pro original probe. After that, vertical cuts were made in relation to the occlusal surface with the saw (Isomet, Buehler, Illinois, USA), 1.5 mm thick through the examined points, and the histological preparations were examined under a stereomicroscope with a magnification of 15x, photographed and analysed. The results were statistically analysed with Spearman's correlation coefficient, and the sensitivity and specificity for electroconductive methods were determined.

**Results:** Spearman's correlation coefficient shows that there is the highest agreement between the ICDAS method and histological findings (0.9).

The specificity in caries detection of the CarieScan Pro device and prototype increases with the diameter of the stainless steel and nickel-titanium spreader. The specificity was highest with spreader #20, and it amounts 40% with the CarieScan Pro device, and 60% with the direct current prototype. The highest specificity of the tested devices, 70%, was achieved by the CarieScan Pro device with the original probe.

**Conclusion:** ICDAS method showed the best results in caries detection, what justifies its widespread usage in clinical practice. Increase in measurement specificity with the thickness of the instrument could be associated with better sticking of the instrument within the carious lesion, which results in better electroconductivity.

**Keywords:** Caries; Electroconductivity; Endodontic instrument

## SURGICAL EXTRUSION OF THE SECOND LOWER PREMOLAR - A CASE REPORT

Martin Narančić<sup>1</sup>, Nikolina Nika Veček<sup>2</sup>, Silvana Jukić Krmek<sup>3</sup>

<sup>1</sup> Dental Polyclinic Zagreb, Zagreb, Croatia

<sup>2</sup> Dental practice of Dr. Marija Košić Veček, Split, Croatia

<sup>3</sup> Department of Endodontics and Restorative Dentistry, School of Dental Medicine, University of Zagreb, Zagreb, Croatia

**Aim:** Surgical extrusion is a procedure of last resort in the effort of saving a tooth that cannot be adequately restored. Most often, it is about teeth damaged by caries with a defect at the bone level. In order to create conditions for adequate restorative or prosthodontic reconstruction, the tooth is repositioned coronally within the socket.

**Case report:** A 55-year-old female patient is referred to the Department of Endodontics and restorative dentistry for the retreatment of the left lower second premolar. The patient reports no symptoms and the fracture of the crown few months ago. Clinical examination revealed the clinical crown almost at the bone level. The depth of probing showed normal periodontal condition. A short root canal filling and periapical radiolucency are found on the preoperative x-ray. To avoid tooth extraction and create conditions for adequate post-endodontic restoration, it was decided to perform surgical tooth extrusion. Mental nerve block was applied, followed by atraumatic tooth extraction with light co-bleaching of only the apical part of the socket. The tooth was immediately placed back into the socket in a more coronal position and fixed with a cross mattress suture. After a week, root canal retreatment was performed. Root canal filling was removed with an expanding instrument (XP Shaper, FKG Dentaire, Switzerland), and additional shaping and cleaning of the root canal was done with reciprocating instruments. The root canal was irrigated with 2.5% sodium hypochlorite activated using a sound activation technique in several cycles and filled with a single-cone technique in combination with a bioceramic sealer (Well-Root ST, Vericom, Korea). The tooth is temporary filled with glass ionomer cement. Postoperative x-ray showed homogenous endodontic root canal filling extending to the apex. A follow-up radiograph after 4 months shows initial healing of the periapical tissue as well as normal integrity of the PDL without signs of ankylosis and root resorption.

**Conclusion:** Surgical extrusion enables interalveolar repositioning of severely damaged teeth without the need for flap surgery. Although it is considered a predictable procedure to facilitate the restoration of severely damaged teeth, it is necessary to consider the risk of tooth fracture during extraction and consider other forms of therapy such as surgical crown lengthening and orthodontic extrusion.

**Key words:** Surgical extrusion; Endodontics, Retreatment

## ASSESEMENT OF SELF-EFFICACY IN ENDODONTICS BETWEEN STUDENTS AFFECTED AND UNAFFECTED BY THE LOCKDOWN

Ema Paljević<sup>1</sup>, Luka Šimunović<sup>2</sup>, Ivana Brekalo Pršo<sup>1</sup>, Elvis Božac<sup>1</sup>, Ivana Vidović Zdrilić<sup>1</sup>, Romana Peršić Bukmir<sup>1</sup>, Jelena Vidas Hrštic<sup>1</sup>

<sup>1</sup> Department of Endodontics and Restorative Dentistry, Faculty of Dental Medicine, University of Rijeka, Rijeka, Croatia

<sup>2</sup> Student of the fifth year, Faculty of dental medicine, University of Rijeka, Rijeka, Croatia

**Aim:** The objective of this study is to evaluate the changes in self-efficacy related to endodontic competencies among dental students throughout their academic education and to compare these changes between generations affected and unaffected by lockdown.

**Materials and methods:** The Endodontic General Self-Efficacy Scale was used for this longitudinal study. Data was gathered from two generations of dental students who willingly completed the same set of three self-efficacy questionnaires annually for three years, coinciding with the conclusion of each academic year.

**Results:** Analysis of repeated measurements for each participant showed statistically significant differences in self-efficacy levels over the span of three years ( $F(1.580) = 80.226$ ;  $P < .05$ ). Furthermore, there was a statistically significant discrepancy in self-efficacy regarding the performance of endodontic procedures across the three repeated measurements ( $F(1) = 13.958$ ;  $P < .05$ ) among different groups. A post-hoc analysis confirmed the distinction between the groups. Notably, active participation, encompassing both less complex and complex procedures, as well as the duration spent in a dental office were linked to an increase in self-efficacy.

**Conclusion:** Considering the limitations of this study, these results indicate a progressive increase in self-efficacy as dental students advanced through their academic education. It is noteworthy that self-efficacy tended to rise among students unaffected by lockdown. However, in their final year of study, the difference in self-efficacy levels of both groups was not statistically significant. This equalization may be attributed to the influence of social persuasion components.

This work has been fully supported by the University of Rijeka project (uniri-mladi-biomed-22-56).

**Keywords:** COVID-19; Dental students; Education; Endodontics; Self efficacy.

## THE INFLUENCE OF BRACKET MATERIAL ON THE DEGREE OF CONVERSION OF RESIN-BASED ORTHODONTIC ADHESIVE SYSTEMS

Ivona Profeta Krznar<sup>1</sup>, Matej Par<sup>2</sup>, Zrinka Tarle<sup>2</sup>, Senka Meštrović<sup>3</sup>

<sup>1</sup> PhD student, School of Dental Medicine, University of Zagreb, Zagreb, Croatia

<sup>2</sup> Department of Endodontics and Restorative Dental Medicine, School of Dental Medicine, University of Zagreb, Zagreb, Croatia

<sup>3</sup> Department of Orthodontics, School of Dental Medicine, University of Zagreb, Zagreb, Croatia

**Aim:** The purpose of this study was to examine the influence of bracket material on the degree of conversion of resin-based orthodontic adhesive systems.

**Materials and methods:** Five orthodontic adhesives systems were tested: four light-cured (Transbond XT (3M), Transbond LV (3M), Enlight (Ormco), Heliosit (Ivoclar Vivadent) and one dual-cured (Phase II Dual Cure, Reliance). Materials were tested in three groups: without bracket (CO, control group, n=6), with metal bracket (MB, n=6), and with ceramic bracket (CB, n=6). A total of 90 samples were tested. Samples were light-cured using an LED curing unit with a continuous intensity of 1000 mW/cm<sup>2</sup> (Bluphase G2, Ivoclar Vivadent) for 20 s positioned directly above material or CB, and 10 s mesially and 10 s distally for samples with MB. The degree of conversion (DC) of orthodontic adhesive systems was monitored for 10 min at the data collection rate of 2 s<sup>-1</sup> using attenuated total reflectance Fourier transform infrared spectroscopy (ATR – FTIR). Statistical analysis was performed using one-way ANOVA with Tukey post-hoc correction at an overall level of significance of 0.05.

**Results:** In the MB group, DC values were significantly lower for all materials compared to the CO group (2.8% - 14.8%), and the CB group (2.6% - 13.3%). Within the CB group, DC values were statistically similar to the CO group, except for Enlight and Phase II Dual Cure, where they were significantly lower (1.3 - 1.5%).

**Conclusion:** The presence of a metal bracket significantly reduced DC values regardless of the material composition and type (light-cured, dual-cured), whereas such an effect was observed only for certain materials in the presence of a ceramic bracket.

**Keywords:** Degree of conversion; FTIR; Orthodontic adhesive systems

## COMPARISON OF INITIAL FLUORIDE RELEASE FROM LIGHT-CURED ION-RELEASING MATERIALS

Ivan Šalinović<sup>1</sup>, Anja Ivica<sup>1</sup>, Silvana Jukić Krmek<sup>1</sup>, Ivana Miletić<sup>1</sup>

<sup>1</sup> Department of endodontics and restorative dentistry, School of Dental Medicine, University of Zagreb, Zagreb, Croatia

**Aim:** The purpose of this study was to compare the initial fluoride release from three commercially available light-cured ion-releasing dental restorative materials.

**Materials and methods:** Three materials were tested: Fuji II LC (glass-ionomer cement), Riva LC (glass-ionomer) and Cention Forte (alkasite). Teflon moulds were used to create samples (n=12), with a thickness of 2mm and a diameter of 8mm. These samples were subsequently immersed in deionized water for varying durations of 24 hours, 7 days, and 30 days. After the specified immersion periods, ion-selective electrode measurements were taken. The collected data were subjected to descriptive statistical analysis, including calculations of mean and standard deviation. Further statistical analysis involved the application of a mixed-design ANOVA to draw inferences, with a predefined statistical significance level of 0.05.

**Results:** Fluoride release (mg/L) after 24 h, 7 days and 30 days respectively was 2.893±0.0531, 2.986±0.100 and 4.428±0.0772 for Fuji II LC, 2.859±0.0531, 3.484±0.174 and 4.773±0.206 for Riva LC, 0.646±0.0584, 5.466±0.201 and 5.751±0.0774 for Cention Forte. Two glass-ionomer materials released significantly higher amounts of fluoride ions after 24 h, compared to Cention Forte ( $p < 0.001$ ). However, both after 7 days and 30 days Cention Forte released significantly more fluoride ions than Fuji II LC and Riva LC ( $p < 0.001$ ).

**Conclusion:** Fuji II LC and Riva LC released more fluoride ions than Cention Forte after 24 hours. After 7 days and 30 days Cention Forte outperformed both glass-ionomer cements.

**Keywords:** Fluoride release; Glass-ionomer cement; Alkasite

## DOES POST-PROCESSING AFFECT THE FLEXURAL MODULUS OF 3D PRINTED ALIGNERS?

Luka Šimunović<sup>1</sup>, Antonija Jurela<sup>2</sup>, Karlo Sudarević<sup>2</sup>, Senka Meštrović<sup>1</sup>

<sup>1</sup> Department of Orthodontics, School of Dental Medicine, University of Zagreb, Zagreb, Croatia

<sup>2</sup> Private dental clinic, Zagreb, Croatia

**Aim:** The use of 3D printing technology has transformed the orthodontic landscape, enabling the production of personalized orthodontic aligners. Flexural modulus has an impact on force level delivered by an aligner and should be adequate to produce it. An area of interest remains on how the post-processing of these printed aligners impacts their mechanical properties.

**Materials and Methods:** Specimens were printed using the Tera Harz TC-85 resin (Graphy, Seoul, Korea). After printing, they underwent one of four post-processing protocols: standard centrifugation, an ethanol rinse, an isopropanol rinse, and a combination of isopropanol and water rinse. Subsequent to these treatments, the specimens were further polymerized in either an ambient air or an oxygen devoid environment. The elastic modulus of the materials was determined through a three-point bending test, conducted on a Mark-10 testing machine with IntelliMESUR® software (Mark-10 Corporation, Copiague, NY, USA).

**Results:** The type of post-processing applied showed a significant impact on the flexural modulus of the specimens ( $p < .001$ ). Specifically, specimens that underwent centrifugation exhibited the highest flexural modulus, whereas those rinsed with isopropanol showed the lowest. Contrarily, the environment in which the specimens were polymerized, with or without oxygen (using N<sub>2</sub>), showed no significant difference in terms of the flexural modulus ( $p = .079$ ).

**Conclusion:** Among the studied protocols, centrifugation demonstrated superior results. On the other hand, the choice between polymerization in ambient air versus a nitrogen environment seems less influential. This study provides valuable insights for clinicians and manufacturers aiming to optimize the performance of 3D printed orthodontic aligners.

**Keywords:** Aligners; Orthodontics; Polymerization

## EFFECTS OF IONIZING RADIATION ON THE SHEAR BOND STRENGTH OF COMPOSITE MATERIALS TO DENTIN

Dora Zagorac<sup>1</sup>, Mihaela Vrebač<sup>1</sup>, Timor Grego<sup>2</sup>, Eva Klarić<sup>3</sup>, Ana Ivanišević<sup>3</sup>

<sup>1</sup> Student, School of Dental Medicine, University of Zagreb, Zagreb, Croatia

<sup>2</sup> Clinic of Oncology, University Hospital Centre Zagreb, Zagreb, Croatia

<sup>3</sup> Department of Endodontics and Restorative Dental Medicine, School of Dental Medicine, University of Zagreb, Zagreb, Croatia

**Aim:** The purpose of this research was to evaluate the effect of ionizing radiation applied in radiotherapy of oncology patients on the shear bond strength of bulk-fill composite materials to dentin.

**Materials and methods:** Samples of dentin discs (N=90) were put in acrylate, polished and randomly divided into 6 groups (n=15) according to radiation exposure and according to restorative material: 1) control group SDR (SDR Plus Bulk Fill Flowable); 2) control group TET (Tetric EvoFlow Bulk Fill); 3) radiation + SDR; 4) radiation + TET; 5) SDR + radiation; 6) TET + radiation. The eighth-generation universal adhesive (Scotchbond Universal Plus Adhesives) was used in all samples. Groups 3-6 were exposed to a cumulative radiation dose of 70 Gy, 2 Gy per day for 7 weeks. The bond strength in MPa was determined using the UltraTester tearing machine. The results were analyzed by two-way variance analysis (ANOVA) and Tukey HSD post hoc test at the significance level of 5% ( $p < 0.05$ ).

**Results:** Radiation before and after restoration resulted in a decrease of the shear bond strength. The bond strength was statistically significantly lower in the groups irradiated immediately after the restoration ( $p < 0.05$ ). The difference between the materials was not statistically different ( $p > 0.05$ ). In the control groups, adhesive failure modes prevailed, while in the irradiated samples there was a higher proportion of cohesive fractures. Cohesive fractures in dentin were more common in radiation before restoration, while the proportion of cohesive fractures in the material was higher in radiation after restoration.

**Conclusions:** Radiotherapy affects the bond strength of restorative materials to dentin, and radiation immediately after the restoration results in the lowest bond strength, irrespectively of the used bulk fill composite material.

**Keywords:** Head and Neck Neoplasms; Radiotherapy; Dental Materials; Dental Bonding; Dentin

### MANAGING DEEP CARIES LESIONS

Falk Schwendicke<sup>1\*</sup>

<sup>1</sup> Department of Oral Diagnostics, Digital Health and Health Services Research, Charité - Universitätsmedizin Berlin, Berlin, Germany

Traditional therapy of deep carious lesions meant their complete, i.e., indiscriminate, removal. Regarding the available scientific data on less invasive approaches in the treatment of deep lesions and the approach in the rehabilitation of resulting cavities, the lecture will present the data obtained from the review of the Cochrane database and will put it in the perspective of the biological approach to the treatment of deep lesions and the modern materials available today for caries treatment.

**Keywords:** Deep Caries Lesion; Caries; Minimal Intervention

### CONTEMPORARY CARIES MANAGEMENT IN PRIMARY CARE USING THE MINIMUM INTERVENTION ORAL CARE DELIVERY FRAMEWORK

Avijit Banerjee<sup>1\*</sup>

<sup>1</sup> Conservative & MI Dentistry, Faculty of Dentistry, Oral & Craniofacial Sciences, King's College London, London, UK

During the lecture, the concept of minimal intervention in oral care will be described and discussed, which is focused on the patient and should be used to help the dental team in working with patients in caries prevention and during treatment. Four interrelated clinical domains, one of which is minimally invasive operative dental medicine (MID), will be described, and how they are used to promote primary, secondary, and tertiary prevention protocols to maintain the lifelong oral health of patients in primary care. The importance of shaping patient behavior, motivational interviewing and involving all members of the oral care team in therapy will be highlighted in this evidence-based presentation.

**Keywords:** Caries; Prevention; Oral care

### PROSTHETIC DRIVEN SOFT-TISSUE MANAGEMENT CONCEPT: HOW TO PREDICTABLY ACHIEVE RESTORATIONS ON IMPLANTS THAT REPLICATE HEALTHY NATURAL TOOTH

Matej Kuliš<sup>1\*</sup>

<sup>1</sup> Private dental clinic, Ljubljana, Slovenia

Patients are becoming increasingly demanding when it comes to high aesthetic results when replacing teeth with dental implants. It is no longer enough to just restore the lost function, but the goal is to achieve a natural appearance of the crown on the implants. The cervical contour of the gingiva is of great importance for the aesthetics and health of the crown on the implants, and the emergence profile of the soft tissue of the dental implant should correspond to the gingiva of a healthy, natural tooth. Immediately after tooth loss, there is remodeling of soft and hard tissues, which usually results in discordant gingiva and compromised aesthetics. The bone can be preserved at the time of extraction, or it can be augmented before or during the implant placement, but the gingiva often needs to be additionally reconstructed so that the crown on the implant has an emergence profile like a natural tooth. Different reconstructive surgical procedures have been developed that achieve better results, however, it is always a challenge to achieve an optimal emergence profile. The aim of this lecture is to describe in detail the prosthetic management of soft tissues during various implant placement protocols in order to enable a high-quality and natural appearance of the periimplant soft tissue.

**Keywords:** Implant; Dental crown; Soft tissues

### BIOCERAMIC MATERIALS - SIMPLE AND SUCCESSFUL IN ALL INDICATIONS

Jurica Matijević<sup>1</sup>

<sup>1</sup> Department of Endodontics and Restorative Dental Medicine, School of Dental Medicine, University of Zagreb, Croatia

Bioceramic materials have found their place in restorative dental medicine and endodontics as an irreplaceable factor in the daily treatment of teeth. They have demonstrated their

success scientifically and clinically in many indications, starting with the preservation of the vitality of the dental pulp, the repair of iatrogenic breakthroughs in the endodontic space, orthograde treatment of the root canal, and use in endodontic surgery. Thanks to their increasing availability and affordability, they are increasingly becoming an integral part of general dental practice. The lecture will focus on a rather heterogeneous group of materials under the common name of bioceramics, their properties, indications, and clinical prerequisites necessary for their maximum effectiveness, as well as limitations and possible problems in the application of these materials. Clinical outcomes of the use of bioceramic materials will also be presented.

**Keywords:** Bioceramics; Obturation Technique; Sealer

### POSTENDODONTIC TREATMENT OF TEETH - MODERN MATERIALS AND TECHNIQUES

Anja Baraba<sup>1\*</sup>

<sup>1</sup> Department of Endodontics and Restorative Dental Medicine, School of Dental Medicine, University of Zagreb, Croatia

The development of new materials and techniques in the field of endodontics and restorative dental medicine has enabled fast and efficient instrumentation, disinfection and filling of root canals in just one visit, as well as postendodontic supply of teeth with direct and indirect restorations with materials that are aesthetic and resistant to the effects of forces that occur in the oral cavity. During the lecture, the importance of quality postendodontic care, indications for different types of restoration and the latest materials that enable functional and aesthetic reconstruction of endodontically treated teeth will be explained.

**Keywords:** Postendodontic treatment; Post; Direct restoration

### SAFE TEETH WHITENING - TECHNIQUES AND PROCEDURES

Eva Klarić<sup>1\*</sup>

<sup>1</sup> Department of Endodontics and Restorative Dental Medicine, School of Dental Medicine, University of Zagreb, Croatia

For more than a century, whitening has been used to achieve a brighter and more desirable color of natural teeth. The performance of the procedure itself, as well as the chemistry of the reactions that take place during it, have been well researched and scientifically supported and contribute to the safety of the procedure itself. They can result in a permanent effect, but most often the stability of the tooth color after the whitening procedure is limited in time. The most used whitening procedures are whitening in the office, under the control of a dentist, and whitening at home. The first procedure uses high concentrations of bleaching agents that are applied to the teeth after protecting the soft tissues. For whitening at home, low concentrations of bleaching agents are used, and they are inserted into individually prepared splints. The purpose of this lecture is to acquaint doctors of dental medicine with modern whitening techniques and procedures, the correct selection of candidates for whitening, indications and contraindications for teeth whitening, and the most common mistakes and doubts that we encounter before, during and after the teeth whitening procedure itself.

**Keywords:** Teeth Whitening; Tooth Color; Bleaching Agents

### ONE SHADE DIASTEMA CLOSURE - MYTH OR REALITY

Danijela Marović<sup>1\*</sup>

<sup>1</sup> Department of Endodontics and Restorative Dental Medicine, School of Dental Medicine, University of Zagreb, Croatia

Shortening the operative time in daily clinical work is one of the dominant trends in dentistry today, with minimally invasive work principles and uncompromising preservation of the quality, durability, and aesthetics of restorations. For the posterior segment, bulk-fill composites were constructed, which are placed in 4-5 mm layers, while in the anterior segment, emphasis was placed on improving the optical properties of the material, to shorten the time of deciding on the appropriate shade and exclude the complicated combination of several different materials of different shades and translucency. In this lecture, emphasis will be placed on a simple and quick technique of diastema closure with one shade of composite and with maximum preservation of hard dental tissues. Indications and contraindications and advantages and disadvantages of this method of work will be discussed. We will refer to the basic aesthetic principles of smile design, the golden proportion, correction of irregularities in the shape and size of the teeth, and the realization of the primary, secondary and tertiary surface texture by polishing.

**Keywords:** Diastema Closure; One Shade; Direct Restorations