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POSTOPERATIVE PAIN AFTER ADHESIVE RESTORATIONS: HOW TO DIAGNOSE, TREAT AND PREVENT

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The appearance of postoperative pain after performing an adhesively fixed composite restoration is quite often encountered in the daily practice. It is also a matter of issue in scientific literature, where postoperative pain or sensitivities are of the aspects, which is looked upon, when adhesive materials or procedures are investigated. Restored teeth may response with pain on thermal irritations or biting forces.
As reasons for these sensitivities effect, improper adhesive procedures, and undetected tooth cracks/infractures are discussed among others.
The lecture will give insight about diagnosis, possible treatment options and preventive measure to reduce the possibilities of postoperative pain sensitivities in adhesive dentistry.

THE INJECTION MOULDING TECHNIQUE: A NEW APPROACH FOR THE RESTORATION OF ANTERIOR TEETH

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The restoration of anterior teeth with resin composites is often a challenge for practitioners and will continue to be important in the future, especially with increasing aesthetic demands of many patients.
The Injection Moulding Technique offers an efficient alternative to conventional methods without the need for manual modelling. It provides a minimally invasive, controlled, simple, predictable and repeatable approach to direct anterior restorations, such as extensive incisal reconstructions, diastema closures or shape modifications.
This technique uses a transparent silicone index, into which high-strength flowable resin composites are injected. This allows for precise and controlled transfer of extra-oral designed restorations and enables the accurate replication of tooth morphology.
By using this method, clinicians can achieve consistent, high-quality aesthetic results with improved efficiency, making it a valuable option for both clinicians and patients. This presentation will discuss the procedural steps, clinical applications and practical benefits, providing valuable insights into this promising approach.

ORAL REHABILITATION PROTOCOL: DIRECT & INDIRECT MICRO-INVASIVE APPROACHES

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Today's restorative dental medicine not only cares about the health and appearance of teeth but also about the function and functional longevity. Knowledge of materials and precision of clinical and laboratory work are crucial for functional durability. The clinical part therefore places higher demands on the practitioner, especially if the therapy is minimally invasive. The first choice is always to save the tooth from unnecessary tooth preparation and to achieve maximum results with direct approach. Only non-vital teeth and severely damaged teeth should be treated with indirect restorations. For indirect solutions some protocols and workflows should be followed.
The protocol should be simple and understandable for the patient, the dental technician and the dentist. Moreover, the same protocol should apply to both analogue and digital dentistry. The first phase of the protocol is planning. This is the most important part for a predictable outcome. Once the plan has been made, it should be executed with highest possible precision in the dental office and laboratory.
The presentation will show a micro-invasive restorative approach to oral rehabilitation and explain how and when to use direct or indirect restorations.

INVISIBLE ORTHODONTICTS – VISIBLE CHALLENGES

Senka Meštrović
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In recent years, the aesthetic requirements related to orthodontic appliances have grown significantly due to the growing number of adult patients undergoing orthodontic therapy. Since the 1990s, the development of clear aligners has made a real revolution and a paradigm shift in dentistry and orthodontics. Progress in orthodontics has been achieved with the introduction of clear aligners made of biomaterials with CAD/CAM technology, which are increasingly preferred over traditional fixed appliances due to their aesthetics and comfort. The advantages of aligners are that they are made of transparent thermoplastic materials, patients can remove them, and they are personalized for each patient to make the tooth movements. The production of these splints primarily involves two techniques: thermoforming and 3D printing. Each of them includes different manufacturing procedures and the choice of materials suitable for the procedure itself, along with the necessary chemical and mechanical properties of the splints, which are essential for their efficiency, durability, comfort, and safety.

NEUROLOGY CARVED IN STONE. NEUROLOGICAL SIGNATURES AT THE STONE HEADS OF THE ST JAMES CATHEDRAL IN THE CITY OF ŠIBENIK, CROATIA.

Radoslav Bužančić, in memoriam Vedran Deletis
Republic Croatia, Ministry of culture, Head of the Conservation department in Split, Split

University of Split, Faculty of Humanities and Social Sciences in Split, Associate Professor Giorgio da Sebenico worked on Šibenik Cathedral from 1441 to 1473, during which time he took the building up to the level of the galleries of the central nave, which he did not complete. After his death, the building was taken over by Niccolo da Giovanni, a pupil of Filarete, sculptor and architect under whose management the cathedral was completed according to completely new drawings and approaches in the manner of Leon Batista Alberti.
With his own hand, Giorgio carved twenty stone portraits, of great naturalistic expressiveness. The other fifty or so portraits were created around 1460, when the building of the cathedral was continued, after a short interruption caused, among other things, by the plague of 1456. Much has been written about their authorship, all scholars agreeing that working alongside Giorgio were several talented assistants. The realism in the making of the portraits on the frieze of the cathedral has attracted the attention of a large number of art historians, who have in their research analysed the iconographic and the individual characteristics of the features of individual portraits. As against the earlier idea that the faces are portraits of fellow citizens or trophies, showing the heads of defeated enemies, recent writing sees in them portraits of celebrated historical figures.

From 71 heads, 23 of them were selected for further analysis having neurological signatures of their faces. The best angle for seeing neurological signatures was "En face" , the profileangle was not very useful. Vedran Deletis PhD selected 23 of them having carved neurologic signs.

DIGITAL TOOLS FOR SURGERIES THAT CAN OPTIMIZE AESTHETIC OUTCOME

Vinicius Machado
Graduate of the Federal University of Minas Gerais - Brazil
Oral and maxillofacial radiology specialist

High-performance aesthetic and functional outcomes require multidisciplinary integration, and digital tools have elevated the standard for dental surgeons, enhancing the three primary phases of any treatment: diagnosis, planning, and execution. Our aim is to address comprehensive clinical cases in which the use of Cad/Cam tools has been implemented in implantology, periodontology, and endodontics, transforming technology into healthcare for patients.

DIRECT COMPOSITE RESTORATION FOR COMPREHENSIVE TOOTH WEAR MANAGEMENT

Ivan Raychev
Part-time assistant professor at the Department of Conservative Dental Medicine, Sofia, Bulgaria

This comprehensive lecture addresses the management and treatment of tooth wear using direct composite resins. Designed for dental professionals, the presentation will explore effective and efficient restoration techniques applicable to both anterior and posterior dental segments.
A critical focus of the discussion will be on maintaining the central jaw position throughout treatment, a vital consideration for optimal occlusal relations and patient comfort. The lecture will outline when and how to begin restorative treatments, examining the boundaries of what can be achieved with direct composites. We will also discuss the role of digitalization in tooth wear management, highlighting how digital tools enhance diagnostic precision, refine treatment planning, and result in superior restoration outcomes.
Illustrated with diverse clinical cases, this presentation will showcase practical applications and real-world examples of the discussed methods. Attendees will gain a deep understanding of non-invasive, adhesive restoration techniques that emphasize tissue conservation and support the long-term dental health of patients with tooth wear.

UNIFYING DIGITAL TOOLS FOR PRECISION AND PREDICTABILITY

Pablo Ramírez
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The evolution of digital dentistry has transformed treatment planning and execution, enabling a more precise and predictable approach to restorative care. By integrating advanced technologies such as 3D printing, digital workflows, and in-house production, clinicians can enhance efficiency and elevate patient outcomes. Digital restorative interdisciplinary cases benefit from seamless collaboration, ensuring comprehensive treatment solutions tailored to each patient's needs. The synergy between these innovations allows for greater control over design, fabrication, and implementation, optimizing aesthetics and function while streamlining the overall workflow. This holistic approach empowers dental professionals to achieve superior results with a higher degree of accuracy and efficiency.

A STORY ABOUT RESTORATIVE DENTAL MEDICINE

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Restorative dental medicine has truly evolved over time to provide better, more efficient, and esthetically acceptable options for restoring teeth. The transition from amalgam to modern composite materials and bioactive materials has not only changed the way we perform restorations but also the way we think about tooth health and their integration with surrounding tissues.
Modern materials not only offer excellent functionality but are also biocompatible, meaning they have minimal impact on surrounding tissues and can even contribute to the recovery of damaged parts of the tooth. Bioactive materials, which stimulate remineralization, open new possibilities for preventing further damage and allow teeth to "heal" on their own.
Additionally, the development of new adhesive systems and precise technical methods allows dentists to apply these materials accurately and effectively, reducing the risk of errors and extending the durability of restorations. Ultimately, restorative dental medicine lays the foundation for maintaining oral health and improving patients' quality of life on a much deeper level.

RECONSTRUCTIVE PRE-PROSTHETIC REHABILITATION: CASE REPORT

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Prerequisite for each successfull prosthetic treatment is proper restorative pretreatment. When we can call it successfull? How to prevent therapeutic failure? Machine or hand techniques of rooth canal instrumentation? Do we need a microscope? This lecture will provide an answer to these questions through one clinical case where after endodontic treatment under a microscope rooth canal will be prepaired for cementing composite post and creating a core buldup. Proper restorative pretreatment and preparation technique for metal free restoration will be demonstrated. Preparation will also been evaluated with microscope. Special care will be taken on how not to make adhesive failure.

A NEW TYPE OF COMPOSITE MATERIALS: ONE FOR ALL

Danijela Marović
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Modern advancements in dental materials and techniques emphasize the simplification of procedures and increased efficiency, all while maintaining the high aesthetic standards demanded by patients. Bulk-fill composites have become the material of choice for posterior restorations due to their ease of use and efficiency. Meanwhile, new-generation universal composites offer streamlined solutions for anterior restorations. These materials blend seamlessly with natural tooth structure, feature a reduced number of shades for simplified shade selection, and minimize the need for layering of composites with different opacities—ultimately expediting the restorative process. However, can these materials truly be applied universally?
With an overwhelming array of materials and techniques available, selecting the most appropriate approach for each clinical case can be challenging. This discussion, illustrated through a series of clinical cases, will critically evaluate the advantages and limitations of various composite materials and techniques. Evidence-based recommendations will be provided to guide practitioners in achieving optimal outcomes in different clinical scenarios.

CENTION FORTE – A NEW ALTERNATIVE TO AMALGAM

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Because of the permanent caries destruction of dental tissue, the need for adequate material to compensate its loss arose. The first material that was used was amalgam, a mixture of mercury and one or several metal alloys. It was mercury that was a controversial component among practitioners, and it led to the so-called amalgam wars. Amalgams have a wide range of imperfections – preventive cavity expansions, unaesthetic gray color, marginal fractures and secondary caries. A significant step in terms of improving materials were composite fillings. The white color, shade selection, cost-effective preparation, round cavity walls outweigh the use of amalgam fillings. After composite resins, glass-ionomer cement appeared as the two component material, which later became available in capsules as well, for easier and more accurate use. Glass-ionomer cements have certain benefits, which include releasing fluoride ions without a need for dry working field which makes them the first choice in treating deep pulp cavities and repairing deciduous teeth. Due to poor coloring, lower possibility of polishing and greater costs, their use has dropped. New one-component material, Cention forte, a composite resin sort, came into use two years ago. The benefits over the previously used materials are abundant. Color of the material satisfies the aesthetic standards, it can be applied in a single layer and polishes well. Apart from fluoride, it releases calcium and hydroxyl ions and also acts as a dental depot, maintaining a neutral pH in the mouth

BIOACTIVE MATERIALS – TRUTHS, MYTHS, AND CLINICAL APPLICATIONS

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The term "bioactivity" is frequently used to describe restorative and endodontic materials, but its appropriateness is increasingly questioned. True bioactivity implies that a material

stimulates a biological response that promotes tissue healing. However, most restorative materials, including glass ionomers and ion-releasing composites, do not come into direct contact with living tissues and therefore cannot exert tissue response. Similarly, "remineralization" is often equated with mere ion release, despite insufficient clinical evidence demonstrating that any ion release profile effectively remineralizes dental hard tissues or prevents secondary caries. This lecture will examine the issues and implications of imprecise terminology, emphasizing the need for clearer, scientifically grounded classifications to prevent misconceptions and ensure a more accurate interpretation of restorative materials' properties. Bioactive materials used in restorative dental medicine (calcium hydroxide, mineral trioxide aggregate - MTA) and endodontics (MTA, bioceramics) will be presented, their methods of use described, and through a series of clinical cases, therapeutic possibilities and potential limitations will be demonstrated.

A COMPLETE "ROOT TO CROWN" ONE VISIT THERAPY AS A SOLUTION FOR A COMPROMISED PATIENT

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Aim: To provide quick and efficient endo-restorative solution for a geriatric patient with comorbidities regarding an endodontically treated, chronically infected tooth with s severely damaged crown.
Materials and Methods: A 90-year old woman with limited mobility, was transported from a nursing home for the elderly at the Department of Dental Diseases, University Hospital Centre Zagreb due to a broken upper left first incisor. Her medical history included chronic cardiovascular diseases and a full body tremor. An X-ray revealed a previously endodontically treated tooth with an infection. The clinical examination revealed a subgingivally broken crown with an exposed metal screw post and old root canal filling. The usual protocol for these patients involves a multi-step, multi-visit treatment plan. However, considering the patient's overall condition and age, it's opted a single-visit root canal retreatment with rotary NiTi instrumentation system (FQ, Komet USA, size Q5) followed by an MTA-based sealer (AH Plus Bioceramic, Dentsply Sirona) for obturation. Following the endodontic retreatment, a fiber-reinforced composite post (RelyX Fiber Post, 3M ESPE, size 1) was used for retention with resin cement (RelyX Universal, 3M), and the core build-up was performed with flowable composite (Filtek Supreme Flowable, 3M ESPE, shade A3). Finally, a direct composite crown restoration was completed using nanohybrid composite (Filtek Supreme XTE, 3M ESPE, shade A2 and A3) to achieve optimal esthetics and function. This therapy plan was reviewed and discussed with the patient.
Results: Both esthetic and functional solutions were achieved in one visit, allowing the patient to return to the nursery home the same day. Conclusion: Modifying therapeutic procedures in dental medicine is crucial to provide adequate health care and reduce potential risks that could further compromise the patient's health and quality of life.
Key words: Single visit, Geriatric patient, Compromised patient, One visit Endodontics

IN VITRO ACCURACY OF IPEX APEX LOCATOR UNDER SEVEN DIFFERENT CANAL IRRIGANTS.

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Aim: Conductive solutions used as canal irrigants inside the root canal have been reported to affect the accuracy of apex locators. The purpose of this study was to analyze the accuracy of Ipex apex locator using seven different canal irrigants.
Meterials and Methods: Forty multi-rooted extracted teeth were included in this study. The actual canal length (ACL) was determined using a #10 file until the tip was visualized (12× magnification) just within the apical foramen (AF). The teeth were placed in a conductive medium of alginate to test the ACL and electronic canal length (ECL) using apex locator in various conditions. Seven irrigant solutions were used in the root canal: 0.9% saline, FileEZE EDTA 19%, Glyde EDTA 17%, Consepsis V Chlorhexidine 2% CHX, Chlorcid 3%, citric acid 20%, and EDTA 18% and digital apex locator Ipex (NSK, Tochingi, Japan). Statistical analysis was calculated using a one-way ANOVA test for repetitive measurements. The differences between the groups were identified by Bonferroni corrections.
Results: The Ipex showed an accuracy of 82.5% with 0.9% saline solution, 80% with Chlorcid 3%, and 70% with Consepsis V CHX 2% solution. The differences among the canal irrigants were significant for Ipex ($p < 0.0001$) device. The mean values showed the greatest variations in ECL accuracy with the combination of Ipex and Glyde EDTA 17% ($p = 0.026$).
Conclusions: Canal irrigants have an impact on the accuracy of apex locator. The apex locator Ipex showed an accuracy of 80% and greater when 0.9% saline and Chlorcid 3% solutions were used.
Key words: Root Canal Irrigants, Tooth Apex, sodium hypochlorite, Chlorhexidine, working length.

DIRECT FIBER-REINFORCED COMPOSITE BRIDGE FOR REPLACEMENT OF A MISSING MANDIBULAR MOLAR: A CASE REPORT

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Aim: The objective of this case report was to present a clinical case of replacing a missing mandibular molar in a single-visit treatment using a direct Fiber Reinforced Composite (FRC) bridge in a 30-year-old patient.
Materials and Methods: Following the application of local anesthesia, the neighboring teeth were prepared by removing existing restorations. A rubber dam was placed to maintain a dry working field and the adhesive procedure was performed using the universal bonding agent G-Premio bond (GC, Tokyo, Japan) according to the manufacturer's instructions. EverStick C&B (GC, Tokyo, Japan) was used to construct a main fiber frame which consisted of one horizontal fiber adhesively bonded in the cavities of the adjacent teeth along with two short fibers positioned perpendicular to the horizontal fiber to support the composite material and prevent delamination and fracture of the mesial and distal cusps of the fabricated tooth. The composite material (Gradia Direct posterior, A2) was then used to build-up of the fiber-reinforced composite bridge. Final finishing and polishing were performed to ensure good function and aesthetics.
Results: The finished bridge exhibited contours that harmonized with the adjacent teeth and achieved a good color match. The occlusion was adjusted to ensure light centric contact on the replaced tooth with normal occlusion on the abutment teeth.
Conclusion: Fiber-reinforced composite bridges are a minimally invasive solution for the replacement of a single tooth. This technique requires conservative tooth preparation in the posterior region.
Key words: Minimally invasive dentistry, FRC, FRC bridge, Missing tooth

MICROHARDNESS TESTING OF NEW COMPOSITE MATERIALS AFTER SIMULATED DEGRADATION IN ETHANOL

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Aim: To compare the microhardness of new commercial composite materials Admira Fusion x-tra (Voco) and Omnichroma (Tokuyama) with a reference material (Filtek Z250, 3M), and to determine the degradation of their micromechanical properties after ethanol exposure.
Materials and methods: For each material, five disk-shaped samples (d=6, h=2 mm) were prepared, which were polymerized with light intensity of 1000 mW/cm² for 20 seconds. After marking the side of the sample facing the light-curing unit, the samples were polished using ultra-fine abrasive paper (P4000) and polishing cloth with the addition of Al_2O_3 powder to a high gloss and then immersed in distilled water. After one day, the initial microhardness was measured using the Vickers method, with a 100 g load, a dwell time of 15 seconds, and five repetitions for each sample. The microhardness measurement was performed on the side of the sample facing the polymerization unit as well as on the opposite side. After the initial measurements, the samples were immersed in absolute ethanol for seven days, after which microhardness measurements were repeated in the same manner. Statistical analysis was performed using a mixed model ANOVA.
Results: After exposure to ethanol, a statistically significant change in microhardness was observed for the materials Admira Fusion x-tra and Omnichroma. The mean microhardness values (VHN) after seven days of ethanol exposure for Omnichroma decreased from 54.83 to 37.79, while for Admira Fusion x-tra, the microhardness values decreased from 56.89 to 44.13. Filtek Z250 did not show a statistically significant change in microhardness after ethanol exposure. The initial microhardness for Filtek Z250 was 80.23, and after ethanol exposure, it was 81.35.
Conclusion: The reference material Filtek Z250 exhibited more stable micromechanical

properties, while a statistically significant decrease in microhardness was observed for the materials Admira Fusion x-tra and Omnichroma after simulated ethanol degradation. The new fillers in the materials Admira Fusion x-tra and Omnichroma may be responsible for the more pronounced degradation of these materials. This work was supported by the Croatian Science Foundation under the project number HRZZ-IP-2024-05-2884
Key words: Composite Resins, Hardness Tests, Ethanol, Surface Properties

RELEASE OF CALCIUM IONS FROM EXPERIMENTAL COMPOSITE MATERIAL FUNCTIONALIZED WITH BIOACTIVE GLASS AFTER POLISHING TREATMENT

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Aim: To investigate the release of calcium ions from a composite material functionalized with bioactive glass after treatment with different polishing agents.
Materials and Methods: An experimental composite with 20 wt% bioactive glass and a control material with inert fillers were prepared. Light-cured samples (6 mm diameter, 2 mm height) were immersed in a lactic acid solution (pH 4) for 35 days. Calcium ion concentration (Ca^{2+}) was measured using UV-Vis spectrophotometry (Arsenazo III method, 650 nm) every 7 days. After 35 days, the samples were treated with: (1) polishing rubber, (2) ultrafine sandpaper, or (3) a rotating brush with prophylactic paste, and re-immersed in the lactic acid solution for 49 days. Ca^{2+} levels were monitored every 7 days. Statistical analysis was performed using a mixed model ANOVA.
Results: Initial Ca^{2+} concentrations were similar across all experimental groups, gradually decreasing (6.8–0.7 mg/mL). The negative control material showed significantly lower Ca^{2+} concentrations (30-80 times lower). Treatment with the rotating brush had no significant effect on Ca^{2+} release (0.65–0.34 mg/mL). However, the polishing rubber and sandpaper increased Ca^{2+} release initially, with sandpaper- treated samples showing 4.61 mg/mL in the first week and polishing rubber at 3.45 mg/mL. Both groups showed decreased Ca^{2+} release by week 4 (sandpaper: 0.33 mg/mL, rubber: 0.43 mg/mL).
Conclusion: Polishing rubber and sandpaper treatments can enhance the re-release of calcium ions, potentially improving the remineralizing effect of the bioactive glass-functionalized composite material. This work was supported by the Croatian Science Foundation under the project number HRZZ-IP-2024-05-2884.
Key words: UV-vis Spectrometry, Arsenazo III, Bioactive Glass, Calcium

THE IMPACT OF BREASTFEEDING AND PRESCHOOL CHILDREN'S DIET ON EARLY CHILDHOOD CARIES IN CROATIA

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Aim: This study aimed to evaluate parents' understanding of how dietary habits affect orofacial health and contribute to the development of early childhood caries. Materials and methods: An online cross-sectional survey was conducted with 595 parents of children aged 3 to 6 years using a self-structured questionnaire. Information was gathered on sociodemographic factors, child characteristics, breastfeeding practices, daily diet, perceived impact of diet on orofacial health, and self-reported dental caries. Descriptive statistics, chi-square tests, and regression models were used for data analysis.
Results: The average knowledge score was 4.8 ± 2.8 out of a maximum of 12 points, indicating a significant lack of knowledge. Parents provided the most accurate answers to questions about the harmful effects of pacifier use on oral health (93.9%), prolonged consumption of sweetened beverages (85.7%), and night-time milk feeding as a risk factor for the development of caries (85.0%). Only 11.1% of parents acknowledged the role of extended breastfeeding based on a child's demand in contributing to the development of tooth decay.
Conclusion: The findings of this study reveal a significant gap in parents' understanding of the impact of breastfeeding and nutrition on oral health, particularly regarding early childhood caries. These results highlight the need for targeted educational initiatives to enhance parents' knowledge and raise awareness about the essential role of proper breastfeeding, balanced nutrition, and good oral hygiene in preventing dental caries.
Key words: Caries, Preschool children, Breast feeding

INFLUENCE OF FILLER CONTENT ON THE MICROHARDNESS OF EXPERIMENTAL COMPOSITES AFTER 24-HOUR WATER STORAGE

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Aim: The manufacturers of the commercial composite materials do not disclose the exact composition of the materials. This study examined the effect of varying filler content on the microhardness of experimental composites after 24-hour water storage. The goal was to establish baseline material properties.
Materials and Methods: Five experimental composites containing 55–75 wt% filler were formulated using a Bis-GMA/TEGDMA (60/40 wt%) resin matrix, reinforced with a combination of silanized micro and nanofillers. A total of 100 of rectangular specimens (16×2×2 mm) were fabricated and polymerized in four 20-second cycles at light intensity 1500 mW/cm². Samples (n=20 per group) were stored in 4 ml of distilled water at 37°C for 24 hours. Microhardness was assessed using the Vickers hardness test (100 g load, 15 s dwell time, five measurements per specimen). Statistical Analysis. A two-way ANOVA assessed the effects of filler content and ageing conditions, followed by Tukey's post-hoc test (α=0.05).
Results: Filler content had a significant impact ($p<0.05$) on the microhardness outcomes of experimental composites after 24-hour water storage. The composite with the highest filler content (75 wt%) exhibited the greatest microhardness (72.1 ± 1.5 VHN), while the lowest filler content (55 wt%) resulted in the lowest microhardness (39.2 ± 0.9 VHN). A gradual increase in microhardness was observed with increasing filler content, with values of 45.8 ± 1.2 VHN for 60 wt%, 52.3 ± 1.4 VHN for 65 wt%, and 61.7 ± 1.6 VHN for 70 wt%.
Conclusion: Higher filler content improved the initial microhardness of experimental composites after 24 hours of distilled water storage, demonstrating a clear correlation between filler load and mechanical performance. The results confirm that increased filler content enhances the structural integrity of the composite at an early stage. This work was supported by the Croatian Science Foundation under the project number HRZZ-IP-2024-05-2884.
Key words: Experimental composites, Microhardness, Filler content, Distilled water storage, Vickers hardness test.

MINIMALLY INVASIVE ROOT CANAL PREPARATION USING DENTSPLY SIRONA PROTAPER ULTIMATE: A CASE REPORT

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Aim: Minimally Invasive Endodontics (MIE) is an approach focused on preserving natural tooth structure while ensuring thorough cleaning, shaping, and obturation of root canals, which is critical for attaining successful long-term regenerative outcomes. This case report outlines the clinical and radiographic results of single-visit regenerative endodontics using Dentsply Sirona ProTaper Ultimate system.
Materials and methods: A 60-year-old female patient presented with a periapical lesion involving the upper left central incisor. After diagnostic evaluation, endodontic treatment with Dentsply Sirona ProTaper Ultimate rotary instruments was indicated. Treatment began with a Slider file to establish the glide path and achieve full working length. The Shaper file improved cutting efficiency and debris removal in the coronal two-thirds, while Finishers (F1, F2, F3) refined the apical third, increasing diameter and taper without enlarging the rest of the canal. Irrigation with 5% NaOCl was performed using a Dentsply Sirona irrigation needle, effectively cleaning up to the apex. After final irrigation with 17% EDTA for smear layer removal and 0.9% NaCl, the canal was dried with paper points and obturated with a Gutta-Percha cone matching the diameter of the last Finisher (F3). The coronal portion was filled with smaller diameter Gutta-Percha, and the tooth was temporarily sealed with GC Fuji I. A periapical radiograph was obtained to evaluate the success of the treatment.
Results: The parallelogram cross-section of ProTaper Ultimate files minimizes friction, maximizes cutting efficiency, and improves flexibility by creating space for debris removal. Radiographic evaluation confirmed a precise fit of the Gutta-Percha point, reducing waste and improving efficiency. Ultimately, treatment is less time-consuming as it eliminates the need for K-file usage.
Conclusion: The ProTaper Ultimate system enhances fluid dynamics for disinfection, improves debris removal, and prepares the canal for optimal filling and sealing, while reducing apical extrusion. Its multiple taper design ensures the preservation of the coronal portion, making it an effective, minimally invasive approach. Sincere appreciation to

Dentsply Sirona for their generous donation of instruments and materials.
Key words: Minimally invasive, Endodontics, ProTaper Ultimate, Rotary instruments, Incisor

THE INFLUENCE OF ARTIFICIAL AGING ON THE MECHANICAL PROPERTIES OF NEW UNIVERSAL COMPOSITE MATERIALS

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Aim: This study investigated the influence of aging on the macromechanical properties of the newly introduced bulk-fill materials. Flexural strength (FS) and flexural modulus (FM) were evaluated after 24 hours or accelerated aging by termocycling.
Materials and methods: Five materials were tested: Tetric Plus, Tetric Plus Flow, Tetric PowerFill, Tetric PowerFlow (all Ivoclar, Liechtenstein) and Ecosite Bulk Fill (DMG, Germany) as control. Specimens (16x2x2 mm, n=40) were photopolymerized with a 1050 mW/cm2 in 6 20-second cycles. They were divided into two groups and tested after 24 hours or thermocycling (5-55°C) after 3 weeks in distilled water at 37°C. FS and FM were determined using the three-point bending test according to ISO 4049 using an universal testing machine with a crosshead speed of 1 mm/min. The data was statistically analysed using one-way ANOVA and Tukey post-hoc test.
Results: After 24 hours, the highest FS values had Ecosite (158+/-18 MPa) and Tetric Plus (155+/-15 MPa), while the lowest was found for Tetric PowerFlow (122+/-10 MPa). Thermocycling significantly reduced the FS for all high-viscosity materials, but the FS values of both flowable materials remained unchanged. FM after 24h was the highest for Ecosite Bulk Fill (10.0+/-0.6 GPa) and Tetric PowerFill (9.9+/-0.8 GPa) and lowest for Tetric PowerFlow (6.8+/-0.7 GPa). After termocycling, there was no statistically significant difference in FM for Ecosite Bulk Fill, while Tetric PowerFlow (8.1+/-0.3 GPa) and Tetric Plus Flow (8.0+/-0.4 GPa) had higher values.
Conclusion: All materials satisfied the requirements of the ISO 4049 standard despite the significant reduction in FS after accelerated aging. This work was supported by the Croatian Science Foundation under the project number HRZZ-IP-2024-05-2884.
Key words: Universal Composite Materials, Polymerization, Flexural Strength, Flexural Modulus

INFLUENCE OF FILLER CONTENT ON THE MACROMECHANICAL PROPERTIES OF EXPERIMENTAL DENTAL COMPOSITES (FINAL)

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Aim: This study evaluated the impact of 24-hour destilled water storage on the specifically flexural strenght (FS) and flexural modulus (FM) of experimental dental composites with varying filler content.
Materials and Methods: Five experimental composites with varying filler content from 55 to 75 wt% in 5% increments were prepared. The composites were prepared using the BisGMA and TEGDMA resin matrix in a 60/40 ratio and fillers, consisting of Ba-glass microfillers and Si-nanofillers, were added. Specimens (n=20 per group) were prepared and polymerized 2 times on each side (4 times total) using a total light-curing energy of 1500 mW/cm². Samples were stored in distilled water at 37°C. FS and FM were measured using a three-point bending test. Statistical Analysis. A two-way ANOVA determined the effects of filler content and ageing protocols. Tukey's post-hoc test was used for pairwise comparisons (α=0.05).
Results: The flexural strength (FS) ranged between 130 MPa and 175 MPa, with no statistically significant differences among the materials with filler content ranging from 55 to 75 wt% ($p > 0.05$). The highest FS value (173.6 ± 23.1 MPa) was observed in the 75 wt% composite, while the lowest FS values were found in the 55 wt% and 60 wt% composites. Flexural modulus (FM) showed a significant increase ($p < 0.05$) with increasing filler content. The 55 wt% group exhibited the lowest FM (4.9 ± 0.7 GPa), while the 75 wt% group had the highest FM (10.0 ± 1.2 GPa).
Conclusion: After 24 hours of storage, higher filler content resulted in increased FM but did not significantly influence FS. This suggests that, in the short-term, an increase in filler content enhances the stiffness of the composite but does not necessarily improve its resistance to fracture under bending forces. This work was supported by the Croatian Science Foundation under the project number HRZZ-IP-2024-05-2884.
Key words: Experimental composites, Ageing protocol, Distilled water, Flexural strength, Flexural modulus

RELEASE OF CALCIUM IONS FROM BIOACTIVE GLASS MODIFIED MATERIALS BASED ON GLASS IONOMER CEMENTS

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Aim: The aim of the study was to determine the kinetics of calcium ion release from high-viscosity glass ionomer cement, glass-hybrid material, and their modifications with experimental bioactive glass.
Materials and methods: Two commercial encapsulated materials were used in the study: Fuji IX (GC, Tokyo, Japan) and Equia Forte HT (GC, Tokyo, Japan). Original powders were modified by 5wt% experimental fluoride-containing phosphate-enriched bioactive glass (BAG-F). Capsules with original and modified powders were mixed according to the manufacturer's instructions and stored in 5 ml of distilled water or diluted lactic acid, pH 5.5 (L). Eight groups of 10 samples each (5x2 mm) were obtained: 1. Fuji (F), 2. Equia (E), 3. Fuji in L (FL), 4. Equia in L (EL), 5. Fuji+BAG-F (FB), 6. Equia+BAG-F (EB), 7. Fuji+BAG-F in L (FBL), 8. Equia+BAG-F in L (EBL). Recordings of calcium ions concentration in distilled water and lactic acid were carried out in triplicate with a calcium-selective electrode after 1, 4, 7, 14 and 21 days. For the statistical analysis of calcium ion release Two Way ANOVA and Least Significant Difference test (LSD) were performed. The level of significance was set at α=0.05.
Results: The differences in Ca2+ release between the groups were significant regarding material and time intervals ($p<0.001$). The highest level of Ca2+ release was recorded in FBL 1.773±0.95 mg/l, followed by FB 1.452±0.69mg/l, FL 1.239±0.5mg/l, F 0.962±0.39mg/l, EBL 0.847±0.32mg/l, EB 0.788±0.29mg/l, EL 0.754±0.23mg/l, and E 0.712± 0.mg/l. The differences between all Fuji groups were significant ($p<0.05$). In E and EL group, Ca2+ release was significantly lower than in EB and EBL ($p<0.05$). The differences were not significant between E and EL ($p<0.05$) and EB and EBL ($p<0.05$).
Conlcusions: Modification of Fuji and Equia with BAG-F significantly increased the release of Ca ions. Exposure of Fuji to a more acidic medium significantly increased the release of Ca ions. The acidic environment did not significantly affect the release of Ca ions in Equia. This work was supported by the Croatian Science Foundation under the project number HRZZ-IP-2022-10-6065.
Key words: Bioglass, Calcium release, Glass ionomer cement

EVALUATION OF MECHANICAL PROPERTIES OF MULTI-SHADE COMPOSITE MATERIALS IN CLINICALLY RELEVANT CONDITIONS FOR ANTERIOR RESTORATIONS

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Aim: The aim of the present study was to investigate the differences in mechanical properties of composite materials used for anterior restauration, in enamel (E) and dentin (D) shade as well as their combination (E+D), applied in clinical practice for class IV restorations.
Materials and methods: Three different multi-shade composite system were used: G-ænial ACHORD (GC, Japan), Empress Direct (Ivoclar, Liechtenstein) and Filtek Universal (3M, USA), in E, D, E+D, with universal composite Tetric EvoCeram (Ivoclar) as reference. A total of 200 specimens (16x2x2mm; n=20) were polymerized with 1100 mw/cm2. E and D specimens were prepared in one layer and polymerized 6x20s. In E+D group, 1.5 mm dentin layer was first polymerised, followed by the polymerisation of 0.5 mm enamel layer, each layer per 3x20s. Flexural strength (FS) and flexural modulus (FM) were evaluated by three-point bending test after accelerated aging by termocycling (5-55°C for 10,000 cycles). The data was statistically analysed with one-way ANOVA and Tukey post-hoc test (α=0.05).
Results: The highest FS values were determined for Filtek Ultimate for all groups [E+D (154±20 MPa), D (152± 25 MPa) and E (142±21 MPa)] and Empress Direct for D (141±21MPa) and E+D (140±17MPa), while the lowest values were found for control (88±8 MPa). The combination of E+D for Filtek Ultimate and Empress Direct enhanced FS when in comparison with Filtek Ultimate and Empress Direct (126±19MPa) E group. However, this change was not statistically significant. Given combination of E+D for Filtek Ultimate (9.8±0.4GPa) and Empress Direct (8.0±0.5GPa) had lower values of FM when compared to the E groups of Filtek Ultimate (10.3±0.7GPa) and Empress Direct (9.1±0.5GPa).
Conclusion: Mechanical properties of the materials tested depended on the filler characteristics. For certain materials, the combination of E and D shades improved their individual FS. This work was supported by the Croatian Science Foundation under the project number HRZZ-IP-2024-05-2884. Keywords: mechanical properties, flexural strength,

flexural modulus, multi-shade composite materials.
Key words: Mechanical Properties, Flexural Strength, Flexural Modulus, Multi-Shade Composite Materials

THE INFLUENCE OF ULTRA-FAST CURING ON THE MECHANICAL PROPERTIES OF UNIVERSAL BULK-FILL COMPOSITES

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Aim: The aim of this study was to evaluate and compare the effects of ultra-fast polymerization on the flexural strength (FS) and flexural modulus (FM) of bulk-fill composite materials.
Materials and methods: Five bulk-fill composites were tested: Tetric Plus, Tetric Plus Flow, Tetric PowerFill, Tetric PowerFlow and Ecosite Bulk Fill. A total of 400 samples, 20 per material, curing condition and aging (16x2x2 mm) were prepared and polymerized under two curing conditions: ultra-fast (3s, 3000 mW/cm2) and moderate (10s, 1000 mW/cm2) polymerization. Specimens were stored in distilled water at 37 °C for 24 h or subjected to 10.000 thermocycling (TC) cycles of 5-55°C. FS and FM were tested by a three-point bending test. Statistical analysis was performed using one- way ANOVA and Turkey post-hoc test (p = 0.05).
Results: Flexural strength was highest for Tetric Plus for 3s curing after 24h (159±23MPa), but decreased to 90±19MPa after TC. Ecosite and Tetric Plus showed the highest FM values for both 3s and 10s curing in the short-term after 24h and after TC (9.3-10.6GPa). PowerFlow had the lowest FM at 3s curing after 24h (5.8±0.9GPa), which increased to 6.6±0.7GPa after TC. The differences between 3s and 10s polymerization at FS were more pronounced after TC than after 24h, with the low-viscosity composites showing greater variations.
Conclusion: The results show that the effect of polymerization depends on the material composition, with low-viscosity resins exhibiting higher elasticity and degradation resistance. Under the limitations of the present study, medium-intensity curing is recommended for curing of tested materials. This work was supported by the Croatian Science Foundation under the project number HRZZ-IP-2024-05-2884.
Key words: Composites, Polymerization, Bulk-fill, Thermocycling

TRENDS AND EPIDEMIOLOGICAL DATA ON DENTAL TRAUMA AMONG CHILDREN AND ADOLESCENTS IN CROATIA – PRELIMINARY STUDY

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Aim: This preliminary study aimed to determine the epidemiological factors of dental trauma cases among children and adolescents in Croatia from 2015 to 2023. The goal was to establish a comprehensive understanding of the trends, demographics, and key factors related to dental trauma in Croatian children and adolescents.
Materials and Methods: The study included participants aged 0 to 18 years who had experienced dental trauma recorded with ICD-10 diagnoses S02.5 (tooth fracture) and S03.2 (tooth luxation). Demographic, diagnostic, and therapeutic data were collected from the Croatian Institute of Public Health for the period between 2015 and 2023. Statistical Analysis: Descriptive statistical methods were used to assess demographic characteristics, including age, sex, and geographical distribution. Data analysis was conducted using Stata software version 15.1 (StataCorp, USA).
Results: The total number of dental trauma cases during the study period was 27,609. Fractures accounted for 93.25% of the total dental trauma cases, while 12.05% of the cases were recorded in the capital city, Zagreb. A general increasing trend was observed in the number of dental trauma cases, with the number rising from 3,147 in 2015 to 3,865 in 2023, despite a slight decrease in 2020, likely due to the impact of the COVID-19 pandemic.
Conclusion: This study identifies an upward trend in dental trauma among children and adolescents in Croatia, with fractures being the most common injury. The temporary decline in 2020 suggests external factors, such as the COVID-19 pandemic, may influence incidence rates. These findings underscore the need for targeted prevention strategies and improved public health initiatives to reduce dental trauma in this population. Further research is recommended to identify risk factors and optimize preventive measures.
Key words: Tooth Injuries, Tooth Fractures, Tooth Avulsion, Pediatric Dentistry, Epidemiology

THE INFLUENCE OF IONIZING RADIATION ON THE RECHARGE OF FLUORIDE FROM DENTAL MATERIALS

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Aim: To examine the effect od ionizing radiation for head and neck radiotherapy procedure on the recharge of fluoride from dental materials after artificial aging.
Materials and Methods: Glass ionomer and composite resin materials known for their flouride release were used in this study. Samples of Equia, Fuji Triage, Fuji IX, Cention, Activa Presto, Beautifil and Luminos (n=10) were made in teflon molds (8x2 mm) and diveded into a control and experimental group. Experimental group was exposed to ionizing radiation for a total of 35 days and recived a dose of 70 Gy, 2 Gy per day. After the artificial aging procedure of 6 months, the samples were subjected to a surface treatment with Duraphat varnish with a high concentration of sodium fluoride 2.26%. Intake of fluoride was mesaured with a fluorine-selective electrode on the first 10 days, 21. and 35. day. Fluoride values were logarithmized and ANOVA was used for analysis.
Results: The median recorded fluoride values were higher with Equia Forte, Fuji IX and Fuji Triage compared to others during the entire period of the research in both groups. With Activa Presto, Beautifil and Luminos there was low release of a fluoride during the entire period of the research. With Cention and Equia Forte there was no statistically significant difference in fluoride release between the experimental and control groups. With Fuji Triage and Fuji IX, the release of fluoride were higher in the experimental group compared to the control group, 1.374 times with Fuji Triage and 1.663 with Fuji IX on the first day of research.
Conclusion: Under the limitations of this in vitro study, we can conclude that all of the materials tested can be used as filling materials for patients undergoing head and neck radiotherapy. Ionizing radiation has no effect od fluorine release in Cention and Equia while in Fuji Triage and Fuji IX we find a significant difference and higher release in the experimental group. Glass ionomer cements are highly recommended as they showed higher fluoride recharge under the influence of ionizing radiation.
Key words: Ionizing Radiation, Dental Materials, Fluorine Recharge, Duraphat Varnish

ENDODONTIC TREATMENT PRACTICES AMONG STUDENTS AT THE UNIVERSITIES OF ZAGREB AND LJUBLJANA

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Aim: To compare endodontic teaching methods at the School of Dental Medicine, University of Zagreb, and the Faculty of Medicine, University of Ljubljana, examining how institutional and national contexts influence endodontic technique instruction.
Materials and Methods: A 12-question survey assessed 5th and 6th-year dental students' curriculum emphasis on endodontics, procedural stress levels, confidence, root canal treatment frequency, adherence to evidence-based protocols, radiographic imaging importance, CBCT use, material selection, irrigation techniques, and instrument availability. In Zagreb, 62 of 119 students completed the survey, while in Ljubljana, 41 of 93 did. Statistical analysis: Descriptive statistics were used to analyze and summarize the survey responses. Data from the online questionnaire were presented as frequencies and percentages to compare responses between the two universities.
Results: In Zagreb, 48% of students perceived endodontics as equally emphasized as other disciplines; in Ljubljana, 46% held that view, with an additional 44% considering endodontics more emphasized. 48% of Zagreb students rated endodontic procedures as stressful compared to 63% in Ljubljana. ¬50% of Zagreb students felt moderately confident and 15% very confident, while in Ljubljana, 37% felt moderately confident and 10% very confident. All respondents regarded radiographic imaging as very important. Both institutions universally use gutta-percha and sodium hypochlorite. Manual irrigation activation was preferred by 74% of Zagreb students and 20% of Ljubljana students, with the majority (76%) use endoactivator. Advanced instrument availability was rated poorly in Zagreb (37%) and average in Ljubljana (39%).
Conclusion: The results indicate measurable differences in endodontic education between the institutions. Ljubljana students report higher stress and uncertainty, whereas Zagreb students display greater confidence despite limited access to advanced instruments. These findings suggest that reviewing teaching methods and resource availability may help achieve a more balanced educational experience. Further research could contribute to curriculum optimization and improved clinical preparedness.
Key words: Endodontics, Education, Confidence, Teaching Methods, Survey

SEX ESTIMATION ON DIGITAL ORTHOPANTOMOGRAMS USING ARTIFICIAL INTELLIGENCE – A PILOT STUDY

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Aim: This pilot study aimed to evaluate the reliability of artificial intelligence (AI) in determining the sex of adult individuals based on digital orthopantomograms.
Materials and Methods: A total of 20 digital orthopantomograms of adult individuals with known age and sex were randomly selected from the database of the Department of Dental Anthropology, School of Dental Medicine, University of Zagreb. A digital AI-based application, developed at the Faculty of Electrical Engineering and Computing, University of Zagreb, in collaboration with the School of Dental Medicine, University of Zagreb, classified sex into two categories: M (male) and F (female). The known sex of the individuals served as the reference value. Statistical Analysis: Statistical analysis was conducted using the Jamovi software. The difference between actual and AI-predicted sex was assessed using the Chi-square test (χ^2). The model's reliability was evaluated through Receiver Operating Characteristic (ROC) curve analysis, with the Area Under the Curve (AUC) used to quantify model accuracy.
Results: In this pilot study, artificial intelligence classified sex with 70% accuracy. The Chi-square test (χ^2 = 0.00, p = 1.000) indicated no statistically significant difference between actual and AI-predicted sex. ROC analysis demonstrated high model reliability, with AUC = 0.910, suggesting a strong discriminatory ability in distinguishing sexes. The optimal classification threshold, determined by maximizing the sum of sensitivity and specificity, was 67, achieving 70% sensitivity and 90% specificity.
Conclusion: Although the findings indicate moderate AI accuracy in sex determination, an AI-based system offers new possibilities for practical applications in forensic dentistry. Further research with a larger sample size is necessary to enhance the existing algorithm and expand the application of artificial intelligence.
Key words: Sex Determination, Artificial Intelligence, Orthopantomogram, Forensic Dentistry, Algorithms

EVALUATION OF THE MDAS/MDAS-EP TESTS FOR MEASURING DENTAL ANXIETY: A PILOT STUDY

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Aim: Dental anxiety is a common phenomenon that affects a significant portion of the population. A patient's level of anxiety varies on a continuous scale from none to extreme, creating an obstacle to receiving initial preventive care and therapy. The Modified Dental Anxiety Scale (MDAS) is a short self-rating questionnaire and an essential tool that helps clinicians assess and manage dental anxiety. The MDAS-DEP questionnaires were used for the first time on a smaller sample of the Croatian population.
Meterials and Methods: The MDAS questionnaire for conservative dental treatment and the MDAS-DEP questionnaire for oral surgical procedures were used. Additionally, the questionnaires contained nine questions related to the causes of fear when visiting the dentist, possible prevention methods, and potential solutions for managing dental anxiety. The research was conducted in a polyvalent dental medicine practice on a sample of twenty adult patients selected through random sampling. Statistical analysis was performed using the z-test. Absolute and relative frequencies of individual responses, along with confidence intervals for the population, were determined. The analysis was conducted using SPSS for Windows v.20 (IBM, USA).
Results: The majority of patients (70%) do not visit the dentist regularly due to fear, and there are statistically significantly more ($p<0.05$) such respondents than those who avoid dental visits for financial reasons. Fear is primarily caused by pain (55%), anesthesia (30%), and the sound of a drill (15%). A total of 65% of patients believe that relaxation techniques (e.g., music, breathing exercises, relaxation) could help reduce fear and dental anxiety, while 40% think that informing the dentist in advance about pain could be beneficial. Furthermore, 65% of respondents would opt for sedation, and 45% for psychological support, but the differences between these preferences are not statistically significant ($p>0.05$).
Conclusion: Dental anxiety is one of the most common challenges in dental treatment. This study assesses dental anxiety through the Croatian versions of the MDAS and MDAS-DEP tests. The findings suggest that fear, financial constraints, pain, and anesthesia are the primary factors contributing to dental anxiety.
Key words: Dental anxiety, Modified Dental Anxiety Scale, Oral health

THE LINK BETWEEN PERIODONTITIS AND COLORECTAL CANCER AND THEIR SYNERGISTIC EFFECT ON GLUCOSE METABOLISM

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Aim: There are known associations of periodontitis and colorectal cancer, but knowledge on the connections existing between the two are not fully understood. The aim of our study was to assess prevalence and clinical severity of periodontitis in patients with localized colorectal cancer. Secondly, the dynamics of metabolic derangements, particularly glucose metabolism were studied as well.
Materials and methods: Diagnostic procedures included endoscopies with patohistology, laboratory exams, insulin resistance homeostasis model assessment method (HOMA index), anthropometrics and radiology imaging. Periodontal status was evaluated by full-mouth periodontal examination. Data analyses were performed by a statistician using IBM SPSS for Windows software, version 29.0.1. The Kolmogorov-Smirnov test was performed and according to the results, non-parametric tests and data display methods were used in further data analysis.
Results: 79 patients with localized colorectal carcinoma, with slight male predominance 55.7%, age 65.7±12.4years. Three quarters of patients (73.4%, 95%CI-63.0%-82.2%) were diagnosed with periodontitis. Patients with periodontitis and colorectal cancer had significantly increased glucose levels (fasting and after oral glucose challenge), (both $p<0.05$). Also, increased values of HOMA index were found in patients with periodontitis vs. controls (without periodontitis) and colorectal cancer; 6.38±5.74 vs. 3.58±2.6 ($p=0.012$); Spearman's-Rho-correlation coefficient=0.271 ($p=0.039$).
Conclusions: The most consorted connections between periodontitis and colorectal cancer were found among parameters of metabolic domain, especially glucose concentrations and insulin resistance. Further studies, which would include novel and emerging antidiabetic treatments, and their effects on prevention or control of both diseases would be warranted.
Key words: Colorectal Carcinoma, Periodontitis, Glucose Metabolism

BIOCOMPATIBILITY OF FLUORIDE TOOTHPASTES

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Aim: This study evaluated the cytotoxic and genotoxic effects of fluoride-containing toothpastes on buccal mucosal cells, focusing on fluoride compound type, fluoride presence, and exposure duration.
Materials and Methods: A total of 88 participants were assigned to four groups: a control using non-fluoridated toothpaste and three experimental groups using toothpastes with sodium fluoride, sodium monofluorophosphate, or amine fluoride. Buccal cell samples were collected at baseline (T0), 30 days (T1), and 45 days (T2) and analyzed using the buccal micronucleus cytome assay.
Results: All fluoride toothpastes significantly increased micronuclei, nuclear buds, and „broken egg" cells at T1 and T2 ($P \leq 0.001$) compared to the control. Sodium monofluorophosphate and amine fluoride showed sustained elevations in nuclear buds and „broken egg" cells, while sodium fluoride exhibited a gradual rise in cytogenetic markers. Significant differences were observed between groups and time points, with non-parametric tests confirming these variations. Regression analysis identified gender, age, and dental history as key predictors of cytogenetic susceptibility.
Conclusion: Our results suggest that fluoride-containing toothpastes may induce changes in cytogenetic markers of buccal mucosal cells, with differences observed based on fluoride compound type and exposure duration. However, these findings should be interpreted with caution due to the inherent limitations of the buccal micronucleus cytome assay.

Further research is warranted to better understand the long-term implications of fluoride use in oral hygiene.

Key words: Buccal Mucosa, Fluorides, Cytotoxicity, Oral Health, Genotoxicity

TREATMENT OF MULTIPLE DENTIGEROUS CYSTS BY DECOMPRESSION IN A NON-SYNDROMIC PEDIATRIC PATIENT: A REPORT OF TWO CASES

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Aim: Dentigerous cysts (DCs), typically associated with unerupted teeth, are the second most common odontogenic cysts. However, multiple dentigerous cysts are rarely observed in children without syndromic conditions. Compared to the adults, dentigerous cysts are relatively rare in children and only 9% of dentigerous cysts occur in the first decade of life.
Material and methods: This study reports two cases that involve healthy male children who presented with multiple cystic lesions in the jaw. Traditional treatment often requires enucleation and extraction of the affected tooth, which can lead to significant complications and impact the child's quality of life. Instead, a conservative decompression approach was employed, utilizing custom made tubes to maintain communication between the cystic cavity and oral environment, thus reducing intracystic pressure. The patient's parents were instructed to irrigate the cyst cavities with 0.9% saline solution. Follow-up appointments were scheduled every three months post surgery.
Results: This method resulted in the complete resolution of the lesions and successful eruption of permanent teeth, preserving vital anatomical structures and avoiding aggressive surgical procedures.
Conclusion: These results highlight the effectiveness of decompression in managing multiple dentigerous cysts in pediatric patients, emphasizing its benefits in maintaining oral function and aesthetics while minimizing surgical risks. A cooperative patient, histopathological examination, and follow-up appointments are crucial for successful treatment outcomes.

Key words: Multiple dentigerous cysts, Decompression, Children, Oral Surgery

THE IMPORTANCE OF TESTING FOR PERIODONTOPATHOGENIC BACTERIA: ASSOCIATION WITH AGE, GENDER, SYSTEMIC DISEASES, AND SNORING

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Aim: Periodontal disease is a chronic inflammatory condition with significant implications for oral and systemic health. Different factors, including age, gender, systemic diseases, sleep-disordered breathing, and specific periodontopathogenic bacteria (Aggregatibacter actinomycetemcomitans, Porphyromonas gingivalis, Prevotella intermedia, Tannerella forsythia, and Treponema denticola), contribute to the development of periodontal diseases. The aim of this study was to emphasize the importance of bacterial testing in dental practice, assess the prevalence of five periodontopathogenic bacteria, and analyze their association with variables such as age, gender, systemic disease and snoring.
Materials and Methods: This was a cross-sectional study on 149 adult patients (62 male and 87 female) diagnosed with chronic periodontitis. Participants completed a questionnaire providing sociodemographic and clinical data, and subgingival plaque samples were analyzed by real-time PCR for the presence of five periodontopathogenic bacteria. Statistical analysis was conducted using JASP (Ver. 0.18.3). Categorical variables are expressed with frequencies and percentages. Differences in categorical variables were analyzed using the Pearson chi-square test or Fisher's exact test.
Results: Statistically significant results were obtained regarding the association between age and periodontopathogenic bacteria. Positive results for Porphyromonas gingivalis and Tannerella forsythia were associated with ages between 41 and 60 and over 60 years old. For the bacterium Aggregatibacter actinomycetemcomitans, the statistical results in the distribution of patients regarding snoring were borderline significant. More individuals who did not snore had positive results.
Conclusions: Older age had the greatest impact, and the majority of patients who were positive for the tested bacteria were females. These results emphasize the significance of early testing for periodontopathogenic bacteria and risk assessment in periodontal disease management prior to treatment of any periodontal and dental pathology. Thus, for patients over 40 years old, identification of periodontopathogens should be incorporated into the standard protocol before initiating treatment.

Key words: Periodontal Disease, Periodontopathogenic Bacteria, Systemic Diseases, Snoring

THE IMPACT OF INSULIN RESISTANCE ON THE ORAL CAVITY – A SYSTEMATIC REVIEW

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Aim: The purpose of this study is to systematically review scientific research on the relationship between insulin resistance and oral health to determine is there a scientific evidence confirming an increased tendency for pathological processes in the oral cavity in patients with insulin resistance (IR).
Materials and methods: Literature search was done on MedLine/PubMed and Google Scholar. The search terms „IR AND periodontitis", „IR AND caries", „IR AND oral health", „IR AND gingivitis" were used. The occurrence of changes in subgingival microbiota, gingivitis, periodontitis, caries, tooth loss and recurrent aphthous stomatitis (RAS) was investigated in 21 included clinical studies. The research conducted on animals, studies in which IR is mentioned as part of the metabolic syndrome, and studies in which IR was not confirmed in subjects by metabolic tests or HOMA-IR findings, were not included.
Results: The impact of IR on the periodontium was statistically significant in 13 out of 15 includes studies. Insulin-resistant people have an increased value of BOP (59.03% mean value of the available results) and an increased depth of probing ≥4mm. IR is significantly associated only with the chronic and advanced form of periodontitis (82% in the CP group vs. 15% in the AP and control group), while it has no effect on mild and aggressive. Elevated HOMA-IR finding is associated with a higher incidence of tooth loss in one study (OR=1.301; 95% (CI) = [1.102, 1.537]; $p < 0.001$) and with the occurrence of recurrent aphthous stomatitis (RAS) ($p<0.0001$), especially in the active stage ($p=0.022$) in another study. IR is associated with a higher incidence of caries (OR=3.30; CI(95%=0.19-1.0 $p=0.011$; SC=0.335, $p<0.001$) but not with the incidence of other KEP (DMFT) index indicators, in three studies. IR shows a trend in changing the number and composition of common periodontal microorganisms, but without statistical significance, in three studies.
Conclusion: It has been observed that insulin resistance contributes to the development of pathological changes in the oral cavity. Further research is needed to investigate this relationship in more detail, especially for changes in the oral mucosa, tooth loss, changes in saliva, and the occurrence of caries.

Key words: Insulin Resistance, Oral Health, Periodontal Disease

PREDICTIVE FACTORS FOR EFFECTIVENESS OF MASTICATORY-GUSTATORY STIMULATION AND EDUCATIONAL INTERVENTION ON BURNING PAIN IN BURNING MOUTH SYNDROME

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Aim: Burning Mouth Syndrome (BMS) is a chronic condition characterized by persistent oral burning sensations without detectable lesions. Its unclear etiology and limited treatment options pose significant clinical challenges. This study evaluates key predictors influencing the effectiveness of masticatory-gustatory stimulation combined with an educational intervention in reducing burning pain among 50 BMS patients (M:12, F:38; median age: 63.5 years [IQR: 39-84]).
Materials and methods: A multinomial logistic regression model was used to assess predictors of response to intervention, with „no change" in pain intensity as the reference category. Predictors included symptom duration, susceptibility to placebo effects from prior presumed treatments, xerostomia, burning pain intensity, dysgeusia, and symptoms of oral dysesthesia. Age and sex were examined as confounders.
Results: The model explained 84.1% of the variance (Nagelkerke R^2). Significant

predictors included symptom duration (p=0.005), susceptibility to placebo effects from prior presumed treatments (p=0.008), and xerostomia (p=0.034), while burning pain intensity (p=0.102), dysgeusia (p=0.361), and symptoms of oral dysesthesia (p=0.509) were not. Age and sex had no effect (p=0.561, p=0.879). Patients without susceptibility to placebo effects from prior presumed treatments had a 99.7% lower likelihood of remission (CI: 76.1%-99.9%). Short symptom duration (<3 months) increased remission probability by 189 times compared to symptoms persisting for over a year (CI: 2.45-14,586.79), while a duration of 3-6 months increased it by 553 times (CI: 5.65-54,286.05). For symptom improvement, having symptoms for 6-12 months increased the likelihood of improvement by 80 times compared to symptoms lasting over a year (CI: 1.26-5184.49). Despite wide confidence intervals, shorter symptom duration consistently predicted better outcomes.

Conclusion: Shorter symptom duration and susceptibility to placebo effects from prior presumed treatments are strong positive predictors of treatment response in BMS. These findings emphasize the importance of early intervention and tailored treatment strategies to improve patient outcomes.

Key words: Burning Mouth Syndrome, Predictive Factors, Pain Intensity, Masticatory-Gustatory Stimulation, Educational Intervention

THE EFFECT OF PHOTODYNAMIC THERAPY ON SUBGINGIVAL BACTERIA AND THE DEVELOPMENT OF WHITE SPOT LESIONS

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Aim: To examine the impact of photodynamic therapy (PDT) on the bacterial composition of subgingival plaque and the development of white spot lesions (WSL) in orthodontic patients.

Materials and methods: 48 patients undergoing fixed orthodontic treatment were randomly assigned to four groups including negative control. PDT was administered around the brackets of the upper ten teeth of the participants in the first test group (toluidine blue-based dye + 660 nm diode laser). The second group was subjected to the application of 1% CHX varnish, whereas the third group received TCP-5% NaF varnish. Interventions were performed three times, 6 weeks apart. Subgingival plaque samples were collected before the intervention (T0) and 18 weeks later (T3). Quantitative PCR was performed to evaluate the periodontal bacteria. Evaluation of WSL was performed using intraoral photographs captured at time points T0 and T3. STATISTICAL ANALYSIS: Post hoc LSD test, Fisher exact test, Chi - square test

Results: In the PDT group, T. forsythia was eliminated in 30% of subjects (p=0.625), whereas an insignificant reduction in F. nucleatum was recorded during the study period (p=0.799). In the control group, no single bacteria in the subgingival plaque were eliminated, whereas the number of T. forsythia and F. nucleatum bacteria increased insignificantly (p=0.263 and p=0.386 respectively). No new lesions were observed in the PDT or CHX groups. The PDT group had the lowest number of advanced lesions compared with the other groups. The two existing lesions resolved only in the CHX group. In the control group, 9 new lesions appeared, and none regressed (p=0.008).

Conclusion: PDT, CHX, and TCP-5% NaF varnish did not significantly reduce the number of periodontally pathogenic bacteria in subgingival plaque. Photodynamic therapy is more effective in preventing white spot lesions than TCP-5% NaF varnish, a known remineralizing agent.

Key words: Orthodontics, Photodynamic Therapy, White Spot Lesions, Subgingival Bacteria

THE RISK OF SURFACE SIMILARITY AND HOW IT AFFECTS 3D-PRINTED ALIGNERS

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Aim: The surface similarity phenomenon is a cognitive bias in which individuals assume that materials with similar appearances or functions require the same maintenance, even if their structural properties differ. This effect can lead users to apply cleaning protocols designed for thermoformed aligners to 3D-printed aligners without considering material-specific interactions. This study investigates the consequences of such assumptions by evaluating how different cleaning methods influence the surface integrity, mechanical properties, and stability of 3D-printed aligners.

Materials and methods: Eighty-four polyurethane-based 3D-printed aligner specimens were fabricated using direct light processing technology from Clear A liquid resin (Senertek, Izmir, Turkey) and divided into three cleaning groups: (1) brushing, (2) brushing with toothpaste, and (3) immersion in an alkaline cleaning solution (Corega). Surface roughness was assessed using profilometry and atomic force microscopy, hardness via the Ball Indentation Method, and color stability using a VITA Easyshade colorimeter. Water absorption was measured over 14 days in saline and Corega solution.

Results: Mechanical cleaning methods, especially with toothpaste, significantly increased surface roughness (ΔSa = 37.45 nm, $p < 0.001$) and hardness ($p < 0.05$), while Corega slightly reduced roughness (ΔSa = -4.86 nm). Color changes were minimal, but brushing decreased the "b" color value ($p = 0.012$). Water absorption stabilized at 8.47% in saline, whereas Corega exposure led to an initial increase followed by a decline, suggesting material degradation ($p < 0.001$).

Conclusions: Applying cleaning protocols from thermoformed aligners to 3D-printed aligners without considering material-specific differences may compromise aligner longevity. Brushing increases roughness and hardness, potentially affecting bacterial adhesion and wear resistance, while prolonged exposure to chemical cleaners risks structural degradation. These findings highlight the need for aligner-specific cleaning guidelines to prevent unintended consequences driven by surface similarity misconceptions.

Key words: Aligners, 3D-Printing, Cleaning

DEHYDRATION PATTERN OF 3D-PRINTED AND THERMOFORMED ALIGNERS

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Aim: Orthodontic aligners are continuously exposed to moist conditions in the oral cavity, which may affect their physical properties. This study aimed to evaluate the water loss patterns of 3D-printed and thermoformed aligners following a 14-day immersion in distilled water.

Materials and methods: A total of 36 aligners, 9 of each brand: Invisalign (Align Technology, San Jose, CA, USA), ClearCorrect (Straumann, Basel, Switzerland), Tera Harz TC-85 resin (Graphy, Seoul, Republic of Korea), and Clear-A (Senertek, İzmir, Turkey), were immersed in distilled water at 37 °C in an incubator (Cultura, Ivoclar Vivadent, Schaan, Liechtenstein) for 14 days. Water absorption was analysed according to ISO 62:2008.

Results: After 14 days of immersion, an increase in mass was observed, with Invisalign showing a 4.91%, Clear Correct 3.57%, Tera Harz TC-85 3.09%, and Clear-A 2,76% increase. After 1 h of drying, the water loss was 93.69%, 80.45 %, 68.72 %, and 67.76% for Invisalign, Clear Correct, Tera Harz TC-85, and Clear-A, respectively. After 5 hours of drying, water loss was 98.36%, 87.17% 84.17%, and 83.44%. After 8 hours of drying, water loss was 99.22%, 89.99%, 89.11% TC-85 and 83.44%. After 24 hours, Invisalign and Clear Correct lost nearly all the absorbed water, while Tera Harz TC-85 and Clear-A lost it completely. After 1 hour of drying, the retained water content in the aligners was 0.31%, 0.69%, 0.97%, and 0.89% respectively.

Conclusion: Although statistically significant differences in the dehydration pattern of different aligners were found, storing them for one hour per day in dry conditions eliminates the negative effect of hygroscopic expansion.

Key words: Water Absorption, Aligners, 3D-Printing

THE EFFECT OF SALINE SOLUTION ON THERMO-MECHANICAL PROPERTIES OF POLYMERIC ALIGNERS IN ORTHODONTICS

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Aim: The effectiveness of polymeric aligners is strongly dependent on the mechanical properties of the material. Near the glass-to-rubber transition, the modulus of the material decreases by several orders of magnitude, and the behavior of the material when dynamically loaded changes. The absorption of any media affects the mechanical properties, even if the changes are reversible. If there is affinity between the media and the polymer, the molecules are placed between the macromolecules.

Materials and methods: The consequent swelling increases free volume and the molecules act as plasticizers. The changes in the material's properties can be analyzed by means of Dynamic mechanical analysis (DMA). DMA was used to examine the influence of saline solution on polyurethane-based material, „Tera Harz TC-85", produced by Digital light processing method (DLP). The DMA was performed at a temperature interval from room temperature to 88 °C. Storage modulus (E') and loss factor (tan δ) were monitored and

the glass transition was analysed.
Results: Exposing the material to saline solution for 5 days caused a decrease in E', tan δ, and glass transition temperature (Tg). Further soaking did not affect the results. The DMA spectra of samples dried for 3 days, showed that the effect of plastification was reversible. When heated from room temperature to 35 °C, the modulus of as prepared and soaked samples decreased by 53% and 75%, respectively. At 35 °C the modulus of the soaked sample was 59% lower than that of the dry sample.
Conclusion: The temperatures in the oral cavity are close to the Tg range where the mechanical properties of the polymer are highly sensitive to temperature variations. The saline solution acts like a plasticizer decreasing the stiffness and the Tg of the material but the effect is reversible.
Key words: Clear Aligners, Dynamic Mechanical Analysis, Mechanical Properties, Saline Solution, Tera Harz TC-85

WHAT IF IT IS NOT IDEAL? ORTHODONTIC-PROSTHETIC TREATMENT WITH CLASS III MALOCCLUSION-CASE REPORT

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Aim: The aim of this case report is to show a multidisciplinary approach to oral rehabilitation of a patient who refuses orthognathic surgery.
Materials and methods: A 18-year old male patient complained of tension in his incisors teeth when biting and a lack of confidence when smiling. Retroclined upper incisors, slightly retrusive upper lips, shorter midface and larger maxilla-mandibular difference with functional narrow maxilla, edge to edge contact of the upper with lower incisors with slight, incisally transparent enamel of the centrals with sharp incisal edge because of traumatic occlusion. Statistical analysis: Orthodontic treatment using fixed appliance and application of class III elastics since the patient declined orthognathic surgery. Anterior edge to edge bite was corrected for one year and half via mandibular retraction and maxillar protraction but there were spaces between centrals and laterals because of their reduced mesiodistal widths. Immediately after removing the appliance, the incisors were ground for prosthetic rehabilitation with zirconium crowns to achieve aesthetic harmony and improve the appearance of the small incisors.
Results: The patient was very happy with his new appearance, smile and self-confidence.
Conclusion: Modern trends and options for caring orthodontic patients who want aesthetic solutions after therapy often require an interdisciplinary approach from multiple specialists from different dental branches in order to achieve an optimal therapy plan and satisfactory aesthetics.
Key words: Class III Malocclusion, Nonextraction Orthodontic Treatment, Prosthetic Rehabilitation, Circonium Crowns

SURFACE HARDNEST OF POLISHED DENTAL ZIRCONIA: INFLUENCE OF POLISHING AND YTTRIA CONTENT ON PHASE COMPOSITION AND MICROHARDNESS

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Aim: The aim was to elucidate the influence of yttria content and polishing on the surface properties and microhardness of these distinguished materials.
Materials and methods: Specimens were milled out of four diverse zirconia discs: ZirCAD Prime; Ivoclar Vivadent AG (I), CERCON ht ML; Dentsply Sirona (S), ZIRCONIA YML; Katana (K) and ZirCAD LT; Ivoclar Vivadent AG (IK). To quantify the surface microhardness of each specimen, Vickers microhardness measurements were conducted. Powder X-ray diffraction (XRD) with Rietveld refinement was used to assess the crystal structure of representative samples from each material. PXRD data were collected from three positions (incisal, transite, and cervical layers) of specimens previously subjected to microhardness test.
The normality of distributions was checked by inspecting normal Q-Q plots and additionally verified with the Shapiro–Wilk test. Parametric statistics were used to compare microhardness among the four materials tested. The omnibus one-way ANOVA was followed by multiple comparisons among the materials using Tukey's adjustment.
Results: Microhardness analyses of the investigated samples yielded hardness values ranging from 1548.2 ± 62.32 VHN (lowest) and 1676.61 ± 37.77 VHN. Statistical analysis (ANOVA: F = 2.556 N, p = 0.092) revealed no significant differences in microhardness among the four investigated groups, indicating comparable microhardness across all tested materials. PXRD analysis showed that polishing generally led to a decrease in the cubic phase and an increase in the tetragonal phase, except for sample K, where both cubic and tetragonal phases decreased. Specifically, polishing resulted in a significant reduction of the cubic phase in samples I and IK (approximately 39 % and 37 %, respectively), while the tetragonal phase increased by approximately 20 % in sample I and 9 % in sample IK.nearly equal mix of both phases (47.3 and 52.7). In I2 and I3, t-ZrO_2 content remained consistent.
Conclusion: Although the differences in microhardness were not statistically significant, significant variations were observed in the phase composition of the materials.In line with the reported data for high-hardness zirconia ceramics, the upper-end range of this study highlights the influence of material composition, fabrication methods, and testing conditions to materials quality and applicability. Further investigation into these factors, particularly the specific mechanisms of phase transformation and the influence of the monoclinic phase on surface hardness, would provide a more comprehensive understanding of the observed similarities and differences.
Key words: multilayer zirconia; microhardness; ZirCad Prime; Cercon ht ML; Katana ZIRCONIA YML

IS PERIODONTAL CONDITION ASSOCIATED WITH ORTHODONTIC TREATMENT?

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Aim: One of the main challenges dentists face during orthodontic therapy is the unreliability of young orthodontic patients in adhering to preventive measures and maintaining proper oral hygiene. Therefore, gingivitis is common among orthodontic patients who do not follow proper oral hygiene practices. As a result, orthodontic patients often exhibit signs of gingival hypertrophy, bleeding, and increased tartar buildup. The aim of this research is to examine the prevalence of gingivitis in relation to the level of oral hygiene and involvement in orthodontic therapy.
Materials and methods: The study was conducted at the Health Center in Mostar and in a specialized orthodontic clinic. The test group consisted of 80 patients undergoing orthodontic therapy, while the control group included 40 patients. To assess oral hygiene, the modified Silness-Löe plaque index was used, and gingival inflammation was evaluated using the Silness-Löe gingival index. The intensity of oral mucosal inflammation was rated on a scale from 1 to 3. Student's t-test for independent samples or one way analysis of variance was used for independent samples (ANOVA), depending on the number of categories to test differences between continuous variables.
Results: Patients with fixed appliances have significantly higher gingival index levels compared to those not wearing an orthodontic appliance (p = 0.002) and those wearing a removable appliance (p = 0.003). It was found that participants with fixed appliances showed significantly lower levels of oral hygiene compared to those not undergoing orthodontic therapy (p < 0.001) or those wearing removable appliances (p < 0.001), while no statistically significant difference was found between participants not wearing orthodontic appliances and those wearing removable appliances (p = 0.522).
Conclusion: Patients undergoing orthodontic therapy, particularly those with fixed appliances, showed significantly higher levels of oral mucosal inflammation and lower levels of oral hygiene compared to patients not receiving orthodontic treatment. These results clearly indicate that fixed orthodontic appliances pose a greater risk for plaque accumulation and inflammation development.
Key words: Orthodontic therapy, oral hygiene, oral mucosal inflammation.